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# **Applying health psychology in an academic environment**

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Submitted in fulfilment of the requirements of the degree of  
Professional Doctor in Health Psychology

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## **Declaration**

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# **Section A – Preface**



## **Preface**

The work for this professional doctorate in health psychology was completed whilst working as a Research Associate on a longitudinal cohort study of lifelong influences on health and wellbeing in old age, the 6-Day Sample study. The study objectives were to trace individuals who took part in a study in childhood and early adulthood, link the information collected in the original study with routinely collected health and mortality data stored in national databases, and to invite survivors to a follow-up study containing detailed measures of health, wellbeing and cognition in old age. The majority of the work for this portfolio stemmed from work in the area of life-course influences on wellbeing in older adults.

The ageing population brings many challenges in terms of chronic diseases, carer burden, and cognitive and functional decline. Researchers are increasingly focussing on a life-course approach to ageing, aiming to understand the influence of biological, physical and social exposures across the life course on subsequent health and wellbeing (Kuh, Ben-Shlomo, Lynch, Hallqvist & Power, 2003, Cooper et al., 2014). The health and wellbeing of older adults is one of the most pressing social issues today and is a major focus for policymakers and health professionals alike.

Poor subjective wellbeing has been shown to be positively predictive of mortality and morbidity (Chida & Steptoe, 2008), particularly in older adults (Lyyra, Tormakangas, Read, Rananen & Berg, 2006, Deng, Hu, Dong & Wu, 2010). High wellbeing, on the other hand, has been linked to a wide variety of positive life outcomes, including income, physical and mental health, and successful ageing. Politicians and health professionals are increasingly aware of the importance of wellbeing, often including measures of wellbeing in national indicators of a country's health and prosperity.

Understanding the determinants of subjective wellbeing and the mechanisms underlying these relationships is vital for identifying potentially modifiable targets for intervention. Previous research has suggested that internal, psychological resources such as personality, mood and sense of coherence are more important for maintaining good wellbeing than objective indicators such as wealth, education or occupation (Diener, Suh, Lucas & Smith, 1999).

## **Section B – Research**

The research thesis was undertaken on the 6-Day Sample study described above and consisted of four elements. First, the structure of wellbeing in this group of older adults was investigated. Confirmatory factor analysis was used to first test the factor structure of each of the three wellbeing measures used – the Satisfaction With Life Scale, the Warwick-Edinburgh Mental Wellbeing Scale, and the Mental Health subscale of the SF-36 – and then items from all three scales were entered into a model proposing a single factor structure of wellbeing. The individual scales showed poor to reasonable fit, the single-factor structure showed poor fit and the dual-factor (affective and cognitive wellbeing) structure showed reasonable fit to the data.

Second, data on early career goals and attainment from childhood and early adulthood was used to investigate the associations between occupational goal attainment, early career stability, social mobility, and wellbeing in old age. The results suggested that, for the most part, childhood circumstances had little effect on wellbeing or psychological resources in old age. However, early career instability, social class and social mobility might have some effect on psychological resources in old age, although this appears to differ between men and women.

Third, the associations between cortisol levels across the day and wellbeing were investigated. No significant results were found in this group.



Finally, multiple linear regression models were used to investigate the influence of a range of childhood and old age factors on wellbeing in old age. The results suggest that the strongest determinants of subjective wellbeing in this group of older adults were current anxiety and depression, sense of coherence, and the Big Five personality traits of extraversion, conscientiousness and emotional stability.

Two papers are presented in the portfolio. The first was published in 2014 in the international peer-reviewed journal *Longitudinal and Life Course Studies*. It takes the form of a discussion of the ethical issues involved in using routinely collected health data for research purposes, using the process of obtaining permission for the 6-Day Sample study as an example (Brett & Deary, 2014).

The second has been submitted for peer review to *Health Psychology Update*, and is a short piece offering advice on collecting objective physical health measures at a distance, again using the 6-Day Sample as an example. This paper was submitted following receipt of the student bursary to attend the British Psychological Society's Division of Health Psychology conference in September 2012.

## **Section C – Professional Practice**

### Teaching and training

The shorter teaching and training piece consisted of a repeated seminar to colleagues in Geriatric Medicine. This seminar formed part of their CPD requirements and took the form of an outline of the research into determinants of subjective wellbeing in older adults, using data from the follow-up studies of the Scottish Mental Surveys 1932 and 1947. Both deliveries went well: the first was attended mostly by medical doctors, including a mixture of junior and senior staff, while the second was attended mostly by nurses and allied health professionals, including physiotherapists and clinical

psychologists. Facilitated discussion raised different viewpoints concerning how these findings might be applied to their day-to-day work with older adults within a hospital setting.

The second teaching and training piece took the form of the provision of a 3-hour lecture to MSc Health Psychology students at City University, London. The lecture, entitled “Using existing data in health research: The value of longitudinal cohort studies and data linkage”, summarised the benefits and drawbacks of using longitudinal cohort studies for health psychology research, outlined the main UK cohort studies, introduced the concept of data linkage, and summarised findings from the follow-up studies of the Scottish Mental Surveys 1932 and 1947, including the 6-Day Sample. 15 students attended and gave excellent feedback.

#### Consultancy

The consultancy took the form of a 10-session, 20-hour introductory course to health psychology delivered to adult learners on behalf of Edinburgh University’s lifelong learning programme. The design and delivery of this course is described in the case study within the portfolio. This was attended by 12 students, around half of whom were health professionals. The experience gained and the lessons learned throughout the 10 sessions were invaluable in improving the course in both style and content. The course has been taught on a further two occasions during the completion of the doctorate, and the reflections within the case study and student feedback helped vastly improve subsequent deliveries of the course.

#### Implementing interventions to change health related behaviour

The behaviour change intervention targeted physical activity amongst staff within an academic environment. The majority of staff within this environment are office-based and as such exhibit sedentary behaviour throughout most of the working day. The

intervention combined enrolment in a nationwide Step Count Challenge – which involved wearing a pedometer and recording steps for 8 weeks – and a lunchtime walking group. The former aspect of the intervention was extremely successful, with all participants increasing their motivation to walk and their actual walking behaviour and several continuing this behaviour beyond the intervention.

## **Section D – Systematic review of the literature**

The decision was made to undertake the systematic review on a different topic in order to broaden the scope of the portfolio and to research an area of great personal and professional interest. During a placement undertaken for the Masters in Health Psychology in a community rehabilitation service for adults with acquired brain injury, it was noted that many clients' motivation was a real barrier to rehabilitation and often resulted in the premature withdrawal of services. Understanding the type of intervention which might increase motivation and engagement with rehabilitation in adults with acquired brain injury might be a great help to clinicians working with this complex and vulnerable group.

The systematic review sought to identify interventions for increasing engagement with rehabilitation in adults with acquired brain injury. After an extensive literature search, 15 studies were identified that met the inclusion criteria. The interventions described fell into two broad categories, often depending on the clients' rehabilitation stage: behavioural modification interventions targeting compliance and adherence to inpatient rehabilitation, where clients may lack awareness, and cognitive and meta-cognitive interventions targeting motivation for later rehabilitation stages. The review summarised the theoretical underpinnings of the interventions and discussed the findings in relation to goal setting within rehabilitation.

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# **Section B – Research**



# **Research thesis: The structure and life course determinants of subjective well-being in older adults: early career aspirations, personality and sense of coherence.**

## **Abstract**

### **Introduction**

With an ageing population, the health and well-being of older adults is one of the most pressing issues facing the world today. Subjective well-being refers to the way people evaluate the objective conditions of their life and is widely thought to consist of both affective and cognitive appraisal components. It has been found to be associated with a wide range of outcomes, including health, functioning, mortality, income and coping. Understanding the determinants of subjective well-being and the underlying mechanisms of these relationships is vital in identifying potential targets for intervention. This is particularly relevant in older adults, who experience increasing functional decline as part of the ageing process. Adopting a life course approach enables the investigation of the bio-psycho-social factors influencing well-being throughout life. This study utilises a unique sample of individuals studied extensively in childhood and early adulthood and followed up in old age. It aims to investigate the structure and life course determinants of subjective well-being in older adults.

### **Methods**

The 6-Day Sample of the Scottish Mental Survey consists of 1208 individuals born on 6 days of 1936 and followed up from the age of 11 to 27. 174 members of this group were recruited into a follow-up study at age 77, completing a questionnaire and physical testing measures. Childhood measures included background demographic factors, personality, and educational and occupational ambitions and attainment. Old age measures included social mobility, personality, optimism, resilience, mood, sense of

coherence, stress reactivity (cortisol) and three measures of subjective well-being (life satisfaction, mental well-being and mental health).

## **Results**

The three individual measures of well-being were found to load onto single traits with satisfactory to poor fit. A confirmatory factor analysis of all well-being items suggested a modest fit to a model incorporating two inter-related latent traits of affective and cognitive well-being.

None of the early career or occupational goal attainment factors were associated with well-being, with the exception of goal change in women. Job instability was found to be associated with sense of coherence manageability in men and resilience and sense of coherence comprehensibility in women, although in opposite directions.

There were no associations between measures of stress reactivity and well-being.

Hierarchical regression analyses suggested that the strongest determinants of subjective well-being in this group are current anxiety, current depression, and sense of coherence, with significant contributions from the Big Five personality traits of extraversion, conscientiousness, and emotional stability.

## **Conclusions**

The results have implications for improving subjective well-being in older adults.

Anxiety and depression are important targets for intervention in older adults as they are associated with increased mortality risk and cognitive decline. A strong sense of coherence is important in old age as it has been associated with a variety of positive health and well-being outcomes. The current study highlights the importance of these three factors and personality traits in determining well-being in old age, and illuminates some of the potential mechanisms for these relationships.



## **Introduction**

On 4<sup>th</sup> June, 1947, all children born in 1936 and at school in Scotland took part in the Scottish Mental Survey 1947 (Scottish Council for Research in Education, 1949, MacPherson, 1958, Deary, Whalley & Starr, 2009). In total, 70,805 children (around 95% of the year-of-birth population) were given a written intelligence test at the same time and with the same instructions. The test was the Moray House Test No. 12 and consisted of largely verbal reasoning-type questions, scored out of 76. Additional information on the size of family and their position within the family was collected for all children born in 1936 (n=75,252). All children born on the first three days of each month of 1936 (36-Day Sample, n=7306) and all surviving twins (n=1242) born in 1936 completed a 25-item sociological schedule, containing questions on father's occupation, mother's year of birth, child's birthplace, school attendance, evacuation during World War II, physical disabilities, and the child's height and weight in June/July 1947 (Scottish Council for Research in Education, 1958). This was generally completed by schoolteachers and head teachers or school nurses.

Those children born on the first day of every second month of 1936 (February, April, June, August, October and December; n=1215) were chosen as a representative sample of the population to be followed up throughout their schooling and into early adulthood. The primary purpose of this follow-up study was to investigate the influence of intelligence at age 11 on subsequent educational and occupational attainment. In total, 1208 individuals (590 male) were followed up for 16 years (Maxwell, 1969). They were known as the 6-Day Sample.

The 6-Day Sample members, now in their late 70s, offer a unique opportunity to investigate the influence of childhood and early adulthood experiences on health and

well-being in old age. Researchers are increasingly acknowledging the importance of lifecourse factors – particularly early life experiences – on subsequent health and well-being. Adopting a lifecourse approach enables researchers to investigate the multiple pathways and mechanisms which shape an individual's development from childhood through to old age (Cho, Martin & Poon, 2015; Stowe & Cooney, 2015). Longitudinal cohort studies are invaluable in addressing large-scale epidemiological questions around the causes and correlates of health (Kuh, Ben-Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C 2003; Cooper et al., 2012). The revival of historical cohorts enables researchers to utilise existing data, saving time and money. The Aberdeen Children of the 1950s study traced and recruited children born between 1950-1956 who took standardised reading tests and provided background socioeconomic and health information in 1962-1964 and developed this into a study of mid-life living conditions, health and health-related behaviours (Batty et al., 2004). Perhaps the most famous cohort revival is the Boyd-Orr cohort, which traced and recruited children who took part in a study of diet and health in 1937-1939 60 years later, obtaining background socioeconomic, health, and physical data during ongoing follow-up (Martin, Gunnell, Pemberton, Frankel & Davey Smith, 2005).

The study described in this thesis represents one element of a larger study which revives the 6-Day Sample, tracing and recruiting its members to investigate lifecourse influences on health and well-being in old age.

### Successful ageing: oxymoron or source of hope?

The world is greying. Europe is perhaps the oldest continent in the world; by 2025 around 1/3 of its population will be over 60, with the greatest increases within the oldest

groups (World Health Organisation, 2002; von Humboldt & Leal, 2013). In Scotland, it is estimated that, by 2031, 26% of the population will be over the age of 60, with an 84% increase on 2008 figures in the number of people over 75 (Frost, Haw, & Frank, 2010). Improving older adults' experiences of ageing can have a significant impact on their mental and physical health. A core social policy of many developed countries is to promote and maintain the health and well-being of older adults in order to reduce the impact on national health and pension systems of the chronic poor health and functional decline generally associated with the ageing process (Stephens & Flick, 2010; Stenner, McFarquhar & Bowling, 2011; McKee & Schüz, 2015). The health and well-being of older adults has been identified as one of the most pressing social issues today (Antonucci, Okorodudu & Akiyama, 2002). To date, policy makers have focussed their efforts on targeting modifiable external factors that have been shown to influence health and well-being, such as housing, access to services and opportunities for engagement in work and education (Scottish Government, 2008), as well as health behaviours such as smoking and physical activity. Improvements to older adults' current living conditions and lifestyle have frequently been shown to lead to significant improvements in health even into very old age (Vaupel, Carey & Christensen, 2003).

Although ageing is inevitably a time of functional decline, medical advances in the prevention and treatment of previously life-threatening illnesses mean that a large number of older adults are maintaining good physical and cognitive health for many years and make a significant contribution to their communities. One need only visit community projects, churches or charity shops to see the valuable contribution of these inhabitants of what Laslett (1991) terms the 'Third Age' – post-retirement and prior to the onset of physical disability.

Discourse around the notion of healthy or successful ageing has suffered from a lack of consensus on its definition. The general feeling is that it is a multi-faceted concept, encompassing more than merely the lack of disease or disease-related disability (Bowling, 2007; Martin et al., 2015). In their seminal work, Rowe and Kahn (1987; 1998) defined successful ageing as encompassing a “low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life”. In a review of the extensive research literature on the subject, Depp and Jeste (2006) found 29 different definitions of successful ageing, most commonly encompassing physical capability (26 of 29 studies), cognitive functioning (13), life satisfaction/well-being (9) and social/productive engagement (8).

Summarising the healthy ageing literature, McKee and Schüz (2015) propose a range of objective and subjective indicators of healthy ageing, including health status, physical and cognitive functioning, life satisfaction and well-being, and positive and negative affect. Jopp et al.’s (2015) study of lay perspectives on successful ageing supports this, suggesting a role for health and social resources, behaviours, and psychological factors (strategies, attitudes/beliefs, well-being, and meaning). Indeed, half of their sample of Americans and Germans mentioned well-being as an important aspect of successful ageing. Zammit, Starr, Johnson and Deary (2014) offers empirical support for a model of successful ageing encompassing psychosocial well-being, cognition and health status. Many researchers view better subjective well-being as an indicator of psychological adjustment and successful ageing (Baltes & Mayer, 1999; Wiesmann & Hannich, 2008).

Human development can be characterised as continual adaptation to changing circumstances, encompassing resource gains and losses (Martin & Martin, 2002). Many researchers argue that healthy ageing depends on successful adaptation to the increasing functional and cognitive losses associated with the ageing process (Baltes & Baltes,

1990). Baltes and colleagues propose that the key to successful ageing lies in the use of the adaptive psychological processes of selection, optimisation and compensation (Baltes & Baltes, 1990; Freund & Baltes, 1998). Faced with the unavoidable and often negative changes ageing brings, individuals achieve their goals and thereby maintain their subjective well-being by reducing the number and complexity of goals (selection), focussing resources more narrowly (optimisation) and utilising alternative strategies and resources in case of failure (compensation).

Health psychology is well-placed to contribute to the discourse surrounding healthy ageing, but has yet to match the contribution of other disciplines such as gerontology, sociology and cognitive science (McKee & Schüz, 2015). Stephens and Flick (2010) suggest three foci for health psychology research into ageing. First, health psychology might assist with understanding the determinants and definition of successful ageing in the general population, assisting policy makers in designing interventions or policies to promote and maintain good health and well-being in old age. Second, health psychology researchers might focus on improving adaptational processes in individuals facing functional decline. The third focus is on specific populations such as those suffering from chronic illness or those living in care or nursing homes.

The current study focusses on subjective well-being in older adults and its distal (childhood and early adulthood experiences) and proximal (current personality, stress reactivity, and psychological resources) influences.

## Subjective well-being: definition

The term subjective well-being refers, broadly speaking, to the ways in which people positively evaluate their lives (Diener, 1984). The last two decades have witnessed the emergence of positive psychology as a scientific discipline (Seligman & Csikszentmihalyi 2000). Combined with a greater understanding of the significance of well-being for individuals and society, this has led to a dramatic increase in research into the causes and consequences of subjective well-being (Diener & Seligman, 2004; Veenhoven, 2004, Jovanovic, 2011). This research interest has extended beyond psychology and medicine to encompass economics, with economists and politicians increasingly utilising measures of well-being or happiness as indicators of the impact of economic growth and policies, and to guide the development of public services and economic policy (Kahneman & Krueger, 2006; Helliwell, Layard & Sachs, 2015). Indeed, several governments across the world are working towards the development of national measures of well-being (Kahneman & Krueger, 2006).

However, the field has suffered from a lack of clarity over the conceptualisation and definition of subjective well-being. This has been reflected in the wide range of terminology used in the research literature, including psychological well-being, happiness, affect, quality of life and life satisfaction. This lack of consistency can lead to difficulties in consolidating research findings and reduces the generalizability of results. Ed Diener, one of the most influential researchers in the field, proposed that subjective well-being has three hallmarks: it is based on the experiences of the individual, it is positive in outlook and it encompasses the whole of a person's life (Diener, 1984). In an attempt to consolidate research in the field, Diener and colleagues have recently redefined subjective well-being as “an umbrella term for the different

valuations people make regarding their lives, the events happening to them, their bodies and minds, and the circumstances in which they live” (Diener, 2006: 400).

## Structure and measurement of subjective well-being

The field has suffered from measurement difficulties, largely as a consequence of the inconsistencies regarding the theoretical conceptualisation of subjective well-being. In a review of the research literature on subjective well-being, Pavot (2008) identified three main reasons restricting progress in the field: a narrow/incomplete assessment of subjective well-being, the proliferation of cross-sectional single method studies, and a lack of programmatic effort to refine assessment of subjective well-being. In recent years, however, there have been a number of attempts to clarify the structure of subjective well-being both theoretically and empirically using complex statistical modelling techniques.

Most researchers acknowledge that subjective well-being is far from being a unitary concept. The prevailing theoretical conceptualisation of subjective well-being is of two separate but interrelated components: affective well-being and cognitive well-being (Jovanovic, 2011). These reflect dominant philosophical theories of happiness and well-being (Schimmack, Schupp & Wagner, 2008). The affective component is thought by many to reflect the hedonic perspective on happiness, that is, the feelings of pleasure or displeasure that individuals experience in the course of their lives (Sumner, 1996; Schimmack et al., 2008). In an early exposition of psychological well-being, Bradburn proposed the existence of two independent components, positive affect and negative affect (Bradburn, 1969; Schimmack, 2008). Ed Diener (1984) extended this to define subjective well-being as incorporating cognitive evaluations or appraisals of global life satisfaction alongside positive and negative emotional or affective reactions to life

events (Diener & Diener, 1995; Diener & Lucas, 1999; Camfield & Skevington, 2008). This cognitive component stems from subjective evaluation theories of well-being. It supports the notion that individuals are best placed to evaluate their own lives (Sumner, 1996; Schimmack et al., 2008). Key to the cognitive component is the construct of life satisfaction, first proposed by Diener, which reflects an individual's cognitive appraisal of the conditions of their life (Diener, 1984; Diener & Lucas, 1999).

This tripartite formulation of subjective well-being – incorporating life satisfaction, positive affect and negative affect – has been widely tested in the research literature (Busseri & Sadava, 2011). Researchers have, however, varied in their conceptualisations of the relationships between these three components. Busseri and Sadava (2011) summarised the most common structural models for subjective well-being and cited empirical evidence for each. The first model, which underpinned early work by Diener and colleagues, adheres to a view of subjective well-being as consisting of these three separate, but related, components. The second proposes subjective well-being as being a hierarchical construct giving rise to the three components. A third model proposes that positive and negative affect relate to life satisfaction in a causal manner, although Busseri and Sudava note that there is little empirical evidence for this causality. The final two models Busseri and Sadava describe define subjective well-being as being either a composite or configuration of the three components. They argue that systematic attempts should be made to test these different structural models of subjective well-being empirically.

A large body of literature exists investigating the determinants and consequences of quality of life (QoL) as a measure of an individual's subjective evaluation of the conditions of their life. The WHOQOL Group's definition of quality of life is thus: "An



*individuals' perception of their position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept, affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, and their relationship to salient features of their environment"* (WHOQOL Group, 1995: 1404). As such, QoL can be conceptualised as a global aggregated measure usually incorporating objective and subjective indicators. Camfield and Skevington (2008) discuss the relationships between QoL and subjective well-being and highlight the similarities between the WHOQOL definition and the recent redefinition of subjective well-being by Diener and colleagues (Diener, 2006). Both, they argue, invoke broad evaluations by an individual of the conditions of their life, incorporating both internal and external factors. They contrast the two research fields, suggesting that research into QoL has largely been driven by measurement and methodology, while subjective well-being research has focussed on the theoretical aspects of the construct. They advocate a synthesis of ideas and research findings in the two fields.

A growing number of researchers investigating the structure of subjective well-being argue that well-being goes beyond the hedonic or subjective evaluative conceptualisations. They propose an alternative, eudemonic, perspective. This has its roots in self-determination theory and focusses on positive functioning and the meaning and purpose individuals glean from their lives (Deci & Ryan, 2000; Ryan & Deci, 2000; Ryff & Keyes, 1995; Vanhoutte & Nazroo, 2014). This conceptualisation of subjective well-being has given rise to new measures, including the Ryff measures of psychological well-being (Ryff, 1989, Ryff & Keyes, 1995) and the CASP-19 (Control, Autonomy, Pleasure and Self-realisation), which is a needs satisfaction measure targeted specifically at older populations (Hyde, Wiggins, Higgs & Blane, 2003). These

scales are becoming increasingly popular for use in large cohort studies, including those studying health and well-being in ageing such as the English Longitudinal Study of Ageing (Stephens, Breeze, Banks, & Nazroo, 2012).

Another distinction in the measurement of well-being is between remembered well-being and experiential well-being. The majority of well-being and quality of life measures require individuals to recall how they have been feeling about their lives over a particular period of time such as a fortnight, month or year. Kahneman and colleagues argue that, often, one's mood is modified by experiences throughout daily life (Kahneman, Krueger, Schkade, Schwarz & Stone, 2004). They propose an alternative means of measurement known as experience sampling. One such example is the day reconstruction method, in which individuals are asked to report their experiences and mood throughout the day (Kahneman et al., 2004; Pavot, 2008). This technique allows researchers to investigate the impact of daily stressors on mood and well-being and how daily fluctuations in both mood and well-being influence subsequent physical and mental health.

Despite the dominance of multidimensional models of subjective well-being, many studies purporting to investigate subjective well-being have included single measures, often incorporating only one component of subjective well-being. Many researchers adhering to the tripartite view consider optimal levels of subjective well-being to emerge from a combination of high positive affect, low negative affect and high life satisfaction. Albuquerque, Pedrosa de Lima, Matos and Figueiredo (2012) argue that any study of subjective well-being should ideally include measures of all three.

Researchers and policy makers increasingly understand the value of obtaining robust measures of well-being within large samples of populations. One example of a measure

designed specifically to measure well-being in this way is the Warwick-Edinburgh Mental Well-being Scale (WEMWBS). This scale attempted to simplify the field and bring together the affective emotional and cognitive-evaluative dimensions of well-being in a single scale (Tennant et al., 2007). The WEMWBS has been shown to have good construct validity in both Scottish and Northern Irish populations (Stewart-Brown et al., 2009; Lloyd & Devine, 2012).

### Consequences and impacts of subjective well-being

Researchers investigating the stability of three components of subjective well-being – positive affect, negative affect and life satisfaction – have noted that it is moderately heritable and relatively stable over time. Indeed, estimates suggest that 30% of the variability in subjective well-being over time is stable (Lucas, 2008). It is likely, therefore, that an individual's subjective well-being has some impact on their life experiences and objective circumstances.

A great deal of research has investigated the relationships between subjective well-being and other indicators such as physical and mental health, income, and successful ageing. For example, individuals who report higher global life satisfaction tend to achieve better life outcomes, including financial success and achievement, as well as reporting higher self-esteem, self-efficacy, experiencing better mental and physical health and exhibiting more effective coping strategies (Liu, Wang & Li, 2012).

### **Health**

A significant body of research suggests that subjective well-being in itself plays a vital role in determining health outcomes. Researchers have linked subjective well-being to a wide range of physical and mental health outcomes. A large number of studies have

found associations between low subjective well-being and subsequent mortality in a range of different populations (Idler & Benyamini, 1997; Iwasa, Kawaaai, Gongo, Inagaki & Suzuki, 2005; Kao, Lai, Lin, Lee & Wen, 2005; Gilhooly, Hanlon, Cullen, Macdonald & Whyte, 2007; Deng, Hu, Dong & Wu, 2010; Murray, Brett, Starr & Deary, 2010; Xu & Roberts, 2010; Steptoe & Wardle, 2012). In a recent systematic review, Chida and Steptoe (2008) identified 70 studies – 35 using healthy populations and 35 using disease populations – investigating the effect of psychological well-being or positive affect and mortality. Their meta-analysis suggests a protective effect of positive psychological well-being on mortality, with an overall hazard ratio in healthy populations of 0.82, and a hazard ratio of 0.98 in populations with existing disease. The authors suggest that this effect is independent of negative affect. However, the effect size varies according to study size and length of follow-up period, and the authors found evidence of considerable publication bias. Veenhoven (2008) also reviewed the literature and concludes that the effect of happiness on longevity in healthy populations is as strong as that of not smoking, although the results amongst those who are experiencing ill health are less consistent.

Higher levels of subjective well-being have been associated with a wide variety of health and psychological outcomes both in terms of functioning and adaptive coping styles (Diener, 2000; Busseri & Sadava, 2013; Lyubomirsky, Sheldon & Schkade, 2005). Life satisfaction has been related to fewer sleep complaints (Brand et al., 2010), lower burnout (Haar & Roche, 2010), and improved job performance (Jones, 2006; Erdogan, Bauer, Truxillo, & Mansfield, 2012).

Despite the wealth of evidence suggesting that higher subjective well-being leads to better health outcomes, there is still a great deal to be understood about the mechanisms

underlying this relationship. It is possible the relationship depends at least in part on health behaviours, since positive well-being has been linked to favourable health habits (Pressman & Cohen, 2005). Grant and colleagues (Grant, Wardle & Steptoe, 2009) investigated the relationship between life satisfaction and health-promoting behaviours such as not smoking, physical exercise, healthy eating, reduced alcohol consumption, and using sun protection in a sample of 17,246 students from 21 countries. Their results suggest a bidirectional relationship between life satisfaction and these behaviours, offering support for the notion that health behaviours partly account for the often-reported association between well-being and health.

A growing number of researchers are focussing their attention on the underlying biological correlates of well-being and the influence that emotional states have on biological and neurological pathways to health (Steptoe, 2011). Although the majority of research has focussed on the impact of negative emotional states on health, an increasing number of researchers are investigating the protective effects of positive emotions on health. Richman and colleagues (Richman et al., 2005) investigated the relationship between the positive emotions of hope and curiosity on subsequent physician-diagnosed disease outcomes in a large sample of community-dwelling adults aged 55-69 years. Their results suggested that higher levels of hope are associated with a decreased likelihood of having or developing hypertension, diabetes mellitus or respiratory tract infections, with higher curiosity associated with decreased prevalence of the former two.

Other researchers propose that high levels of subjective well-being are not only protective against the impact of negative emotions on an individual's health and functioning, but also help promote optimal human functioning (Diener & Seligman,

2004; Veenhoven, 2008; Busseri & Sadava, 2013). Fredrickson (1998, 2001) proposes that positive affect plays an important role in enabling the individual to broaden and build psychological resources and adaptation to ongoing demands, and undoes the harmful psychophysiological effects of negative emotions. Richman and colleagues apply this theory to the findings of their study, suggesting that positive emotions act not only to bolster an individual's immune system, but also to increase their attention to, and knowledge of, health-relevant information (Richman et al., 2005).

### **Income and socioeconomic indicators**

A great deal of research suggests that people who have a higher income or greater material wealth report better well-being (Diener & Biswas-Diener, 2002, Kahneman & Deaton, 2010). However, some studies have suggested that this relationship may be reciprocal, with 'happier' individuals achieving higher income than unhappy individuals (Diener, Nickerson, Lucas & Sandvik, 2002; De Neve & Oswald, 2012). Using a large US panel survey, De Neve and Oswald (2012) demonstrated that adolescents and young adults reporting higher life satisfaction or positive affect earned significantly higher income around 10 years later. This effect remained even after controlling for sibling effects, intelligence, education, physical health and well-being at the time of reported income. De Neve suggests that well-being might influence income through a number of different pathways, including education, personality and outlook (De Neve & Oswald, 2012). Other studies have shown an effect of well-being on income, marriage, employment and health (Graham, Eggers & Sukhtankar, 2004; Binder & Coad, 2010). It is most likely that an individual's well-being and socio-economic indicators, including income, are influenced by common causal pathways. For example, an individual high in extraversion might not only be predisposed to experience high levels of positive affect but also more likely to possess the social skills necessary to successfully obtain and

maintain lucrative job opportunities than individuals who are more introverted.

Similarly, an individual with low well-being may be less likely to pursue educational and occupational opportunities than their high well-being counterparts, perhaps due to a more negative world view or low self-esteem.

## Subjective well-being and ageing

Subjective well-being plays a particularly salient role in older adults and is often viewed as an indicator of healthy or successful ageing (Baltes & Mayer, 1999; Wiesmann & Hannich, 2008). Its importance is illustrated by numerous studies indicating that subjective well-being predicts subsequent mortality in older adults (Lyyra, Tormakangas, Read, Rantanen & Berg, 2006; Deng et al., 2010; Murray et al., 2010).

The nature of the relationship between age and subjective well-being remains ambiguous (Diener, 1984; Mollenkopf & Walker, 2007). Many studies report that subjective well-being improves with age (Mercier, Peladeau & Tempier, 1998; Keyes, Schmotkin & Ryff, 2002; Nilsson, Leppert, Simonsson & Starrin, 2010), while others report no difference between young and old adults (Stock, Okun, Haring & Witter, 1983), despite increased functional decline in older adults (Unruh et al., 2008). Some studies have reported an inverted-U shaped relationship between age and subjective well-being, with well-being increasing until middle age and then decreasing into old age (Mroczek & Spiro, 2005; Blanchflower & Oswald, 2008; Stone, Schwartz, Broderick & Deaton, 2010). Most research looking at the relationship between subjective well-being and age has been cross-sectional rather than longitudinal in nature and might therefore capture cohort effects rather than age differences per se (Schilling, 2006). Recent studies have supported the notion that the relationship between subjective well-being and age is subject to cultural influences. In a study investigating life satisfaction in two

large cohorts, Baird, Lucas and Donnellan (2010) found that life satisfaction amongst Germans remained stable from late teens to early 70s before declining sharply, whereas in Britain this relationship was more of an S-shape: decreasing into middle age, increasing until around 65 and then dropping sharply in the mid-70s. Other researchers have suggested that differences in well-being between different age groups measured cross-sectionally may be due not to age but to cohort differences in socio economic circumstances, educational and occupational opportunities, or in access to health care, rather than to age (Twenge & Campbell, 2001; Sutin et al., 2013). In an attempt to disentangle age and cohort effects on well-being, Sutin et al. (2013) investigated well-being in two US cohorts: the Baltimore Longitudinal Study of Aging, which includes individuals born between 1885 and 1980, and the National Health and Nutrition Examination Survey, which began in 1958. They found that, after controlling for cohort effects, well-being increased with age but that this effect had been masked in age analyses due to the fact that individuals in the older groups lived through the Great Depression and reported substantially lower well-being throughout their lives than groups growing up in more prosperous times.

Although there has been a paucity of research amongst older age groups (i.e. above 70), several studies have suggested an accelerated decline in subjective well-being amongst the oldest old (Schilling, 2006; Gerstorf et al., 2010). Baird, Lucas and Donnellan (2010) suggest that life satisfaction declines in later life as individuals approach the age of life expectancy and experience deterioration in their functional circumstances. This, they argue, leads individuals to appraise the objective conditions of their lives more negatively. Others suggest that older adults differ from younger adults in the emphasis they place on the emotional content of interactions and experiences, and are better able to regulate their emotions (Gross et al., 1997; Carstensen, Isaacowitz & Charles, 1999;



Baird et al., 2010). As a result, they are less likely to allow negative fluctuations in their daily experiences to impact on their global evaluation of their lives and are better able to maintain a strong subjective well-being in the face of daily challenges. This theory was supported by a study by Carstensen et al. (2011), which found that daily positive emotional experiences increase across adulthood, although with some decline evident in old age.

Researchers on the Berlin Aging Study – a large longitudinal study of older adults living in Berlin – have used a lifespan approach to ageing to investigate the correlates of changes in subjective well-being throughout old age. Utilising the selection, optimisation and compensation theory of Baltes and colleagues (Baltes & Baltes, 1990), they suggest that accelerating functional and cognitive decline in old-old age pushes the limits of this adaptive psychological capacity, resulting in lower subjective well-being (Baltes, Staudinger & Lindenberger, 1999). Baltes and colleagues cite the existence of distinct differences in the psychological profiles of individuals amongst the oldest age groups of the Berlin Aging Study reporting high versus low subjective well-being as evidence for this theory (Smith & Baltes, 1997). Other researchers have supported the suggestion that cognitive decline leads to poorer well-being in older adults due to a reduction in resources available for compensatory strategies (Rothermund & Brandstädler, 2003).

## Determinants of well-being

Understanding the factors influencing subjective well-being among older adults might suggest modifiable targets for intervention, on an individual, community or national (legislative) level. Previous research has investigated the influence of a range of lifecourse factors on subjective well-being.

In a review, Erdogan et al. (2012) distinguish between two perspectives on life satisfaction and subjective well-being (Diener, 1984; Headey, Veenhoven & Wearing, 1991). The bottom-up approach considers life satisfaction to be a function of satisfaction with separate life domains such as work, family, health and leisure (Heller, Watson & Ilies, 2004; Pavot & Diener, 2008). Although all domains contribute to overall life satisfaction, individuals differ in the value they place on each domain, and unhappiness in one domain can lead to reassessment of the importance of that domain in order to maintain overall life satisfaction (Wu, 2009). In contrast, the top-down approach views life satisfaction as a function of stable individual traits such as personality. The effects of these traits on subjective well-being may be mediated by current circumstances or life events, or by satisfaction in individual life domains (Erdogan et al., 2012).

### **Objective or external determinants of well-being**

Early research into the determinants of subjective well-being focussed on the role of objective circumstances, suggesting that when evaluating their lives, individuals might review the objective conditions of their life, decide on the relative importance of each, and sum these evaluations to create an overall judgement of their life satisfaction (Campbell, Converse, & Rodgers, 1976; Baird et al., 2010). However, more recent research suggests that although demographic characteristics do predict well-being, they account for only a small proportion of its variance (Diener, Suh, Lucas & Smith, 1999).

Nevertheless, due to its implications for policy makers, a considerable amount of research has focussed on the influence of objective circumstances such as income, health, socio-economic status, social support and environmental conditions on

subjective well-being. Although all have been found to be related to well-being, the strength of these associations varies. Cross-cultural studies suggest that the positive association between income and well-being is strongest in developed countries (Diener, Ng, Harter & Arora, 2010), where significant differences in well-being are frequently observed between rich and poor (Lucas & Schimmack, 2009). Lucas (2008) argues that external factors such as income, health and social network size are only weakly correlated with subjective well-being. Schimmack, Schupp and Wagner (2008) argue that these effects differ between affective well-being and cognitive well-being, whereby cognitive well-being is more susceptible than affective well-being to changes in the environment such as income or unemployment. Early meta-analyses by Okun, Stock and colleagues suggest that the role of factors such as occupation, income and education in predicting subjective well-being is limited, with mean effect sizes of between .10 and .20 and age, gender and marital status contributing little or no variance (Stock et al., 1983; Haring, Stock & Okun, 1984; Witter, Okun, Stock & Haring, 1984).

These findings have largely been replicated in older adults (Ren, Jin & Yang, 2010). Research investigating lifecourse factors influencing subjective well-being in older adults has suggested that current factors such as health, physical environment, social deprivation, working conditions, cognitive status, social support and activities all influence subjective well-being (Gabriel & Bowling, 2004; Bishop, Martin & Poon, 2006; Seymour et al., 2008), to a greater extent even than historical factors such as childhood deprivation and education (Blane, Higgs, Hyde & Wiggins, 2004). In a meta-analysis, Pinquart and Sörensen (2000) showed that socioeconomic status (education, income and occupational status), social network, and everyday competence are all associated with higher subjective well-being among older adults. Objective functional

and physical health have also been found to be important influences on life satisfaction and well-being in older adults (Larson, 1978; George & Landerman, 1984).

### **Early career factors, occupational goals and subjective well-being**

Utilising a developmental adaptation approach to the ageing process (Martin & Martin, 2002; Cho et al., 2015), early life experiences shape current resources and adaptational outcomes, which in turn influence well-being in old age. An important but relatively under-studied area is the influence of unfulfilled career aspirations on subjective well-being. Several researchers have suggested that the discrepancy between occupational or educational aspirations and actual attainment has implications for an individual's subsequent well-being (Levinson, Darrow, Klein, Levinson & McKee, 1978; Drebing & Gooden, 1991; Carr, 1997; Trusty & Harris, 1999; Nurmi & Salmelo-Ari, 2002; Reynolds & Baird, 2010). Most studies in this area have focussed on individuals in youth or midlife rather than in old age. Carr suggested that individuals who evaluate their lives in middle age as meaningful and successful typically experience higher emotional well-being than those who evaluate their lives as having fallen short of their own or others' expectations (Carr, 1999, 2004). In contrast, Reynolds and Baird (2010) found no effect of unrealised educational expectations on depression in young adults.

This relationship has been investigated from a number of sociological and psychological perspectives. Self-discrepancy theory (Higgins, 1987, 1989) and multiple discrepancies theory (Michalos, 1985) suggest that discrepancies between individuals' ideal and actual selves impact on their mental health, with larger 'gaps' exerting a greater influence. In support of this theory, discrepancies between individuals' perceptions of their current situation relative to their aspirations have been shown to account for as much as 50% of the variance in happiness or life satisfaction (Michalos, 1985; Pizarik &

Shoffner, 2009). Relative deprivation theory postulates that judgements of life satisfaction are based not on a person's absolute or objective position but on their position relative to some standard (Stouffer, Suchman, DeVinney, Star & Williams, 1949; Carr, 1997).

Investigations of the potential mechanisms behind the relationship between unfulfilled career aspirations and subjective well-being or psychological distress have largely focussed on the processes involved in goal attainment. The life-span model of motivation posits that personal goals are constructed in accordance with the demands, challenges and opportunities people encounter (Little, Salmela-Aro & Phillips, 2007; Salmela-Aro, 2009). These goals influence an individual's choices and can determine their life trajectories (Baltes, 1997; Salmela-Aro, 2009). Individuals regulate their goals and development by co-agency with others within their social context, and compensate for failures by adjusting their future goals (Brandstädter & Renner, 1990; Salmela-Aro & Nurmi, 1997).

### Self-regulation and adaptation to unattainable goals

Successful goal adjustment, including goal disengagement, has been shown to be related to better well-being (Heckhausen, Wrosch & Fleeson, 2001). Reynolds and Baird (2010) discuss the concept of 'adaptive resilience', which describes the developmental process by which individuals learn to adapt their skills and goals in response to obstacles and challenges. They suggest that individuals who identify and abandon unrealistic goals experience better mental health than those who do not (Wrosch, Bauer & Scheier, 2005; Wrosch, Miller, Scheier & Brun de Pontet, 2007; Reynolds & Baird, 2010). Wrosch, Scheier, Miller, Schulz and Carver (2003) describe the adaptive self-regulatory processes of goal disengagement and goal reengagement, which they suggest

individuals use to compensate for the psychological costs of pursuing unattainable goals. They found that higher levels of each were related to well-being in students, while in older adults goal reengagement was only related to well-being in individuals who also demonstrate high goal disengagement.

Brandtstädter and Renner (1990) propose an alternative model of goal pursuit and adjustment. They suggest that discrepancies between actual and desired states can be eliminated in one of two ways: adjustment of the circumstances (assimilative coping) or adjustment of personal preferences and goal orientations (accommodative coping) (Brandtstädter, 1989). The latter, they propose, accounts for the often-observed paradox of high life satisfaction under highly aversive or negative circumstances (Hofstätter, 1986). Brandtstädter and Renner's (1990) cross-sectional study demonstrates a gradual shift from assimilative to accommodative coping with age, which they suggest may reflect a greater perception that circumstances are more outside individual control in older than younger adults. This leads to a greater requirement amongst older adults to adjust personal goals in order to maintain well-being. This is very similar to the selection, optimisation and compensation processes proposed by Baltes and colleagues on the Berlin Ageing Study (Baltes & Baltes, 1990; Freund & Baltes, 1998)

Another important aspect of goal pursuit and attainment is control or autonomy.

Reynolds and Baird (2010) suggest that external attribution of goal attainment – that is, the attribution that the failure to attain one's goals is predominantly due to external rather than internal factors – can protect against the psychological impact of falling short (Reyna, 2000; van Laar, 2000). This suggestion is supported by Carr's qualitative study of women's intergenerational social comparisons: self-esteem was maintained in women who attributed their own less successful careers compared with their daughters

to cohort differences in women's control over career choices (Carr, 2004). Cognitive framing and organisation of goals have been found to predict well-being across a number of contexts (Pomaki, Karoly & Maes, 2009). Goal attainability – the appraisal of the likelihood of attaining a goal within the situational context – has been found to be associated with life satisfaction and affective well-being (Christiansen, Backman, Little & Nguyen, 1999; Ingledew, Wray, Markland & Hardy, 2005; Pomaki, Karoly & Maes, 2009). Goal-related self-efficacy – the expectation that one possesses the capabilities to carry through actions to facilitate the successful pursuit of goals (Bandura, 1997) – has been associated with lower reported depression (Karoly & Ruchman, 1995, Lecci, Karoly, Ruchman & Lanyon, 1996). These two goal-related appraisals may moderate the impact of goal progress on well-being. Pomaki et al. (2009) suggest that individuals with low goal self-efficacy and low goal attainability who meet their goals experience heightened well-being. In contrast, individuals with high goal attainability but low goal self-efficacy may attribute goal success to external circumstances rather than their own efforts, leading to lower well-being. In contrast, individuals high in both goal attainability and goal self-efficacy experience stable well-being that is unaffected by goal progress.

#### Occupational aspirations and the school-work transition

The transition between school and work is a critical point in the life course, with educational and occupational goals formulated at school leaving age often dictating future education and career pathways. Young adulthood is a time of profound change, during which individuals generally obtain the level of education which will underpin later occupations and income (Chisholm & Hurrelmann, 1995), and make their life choices in terms of partnership and family. Research has shown that parents and peers play an important role in adolescents' goal construction (Edwards, 2006, Salmela-Aro,

2009), and that educational and occupational aspirations are largely influenced by parents' social status (Sewell, Haller & Straus, 1957). Hardie (2014) found that not having occupational goals is related to increased depressive symptoms, supporting theories that aspiration formation is an important part of development (Heckhausen, 1999, Heckhausen & Tomasik, 2002; Tomasik, Hardy, Haase & Heckhausen, 2009). Staff, Harris, Sabates and Briddell (2010) studied the effect of uncertainty in early occupational aspirations, and found that girls and boys reporting uncertain aspirations at age 16 earned significantly lower wages 10 years later than those with more certain aspirations. They suggest that a lack of clear career aspirations, particularly in boys, might indicate a lack of motivation and perseverance, and might lead to frequent job changes during the school-work transition. This in turn undermines skill development and the benefit of work experience. In contrast, adjusting occupational goals may be an important adaptive element of development in adolescence (Brandtstädter & Renner, 1990; Heckhausen, 1999; Tomasik et al., 2009), and may protect young people from the psychological impact of pursuing unrealistic and unattainable goals.

Carr (1999) investigated the influence of unfulfilled career aspirations on subsequent well-being in a group of participants from the Wisconsin Longitudinal Study who graduated from high schools in 1957. Carr's study suggests that the relationship is more pronounced amongst men of this age than women. This was most likely due to the well-defined gender roles present in the 1950s: men were expected to earn money while women, once married, were expected to look after the home and children. High employment and low educational entry requirements for most jobs increased the control men had over their occupational choices. Therefore, failure to attain career goals was, predominantly, due to factors within the individual's control. Carr also investigated this relationship amongst women in this group, and found that unfulfilled career aspirations



impacted on mental health in later life but that this was reduced if a woman had raised a family (Carr, 1997). Women who at age 35-36 reported no occupational goals reported higher depression and a lower sense of purpose at age 50, with those who aspired to non-work roles such as housewife also reporting lower purpose in life. She suggests that women of this age group may experience feelings of regret and failure towards midlife, by which time societal changes resulted in greater opportunities for women, but only if they attributed a failure to achieve occupational goals to internal and not societal factors (Carr, 2004).

Many researchers have suggested that the content of goals affects their relationship with well-being. In an investigation of the structure of goal content in nearly 2000 undergraduates from 15 cultures, Grouzet et al. (2005) identified 11 types of goal broadly organised across two dimensions: intrinsic (focussed in inherent psychological needs) versus extrinsic (focussed on rewards and praise) and physical (focussed on hedonic pleasure and survival) versus self-transcendent (focussed on something higher). Self-determination theory (Deci & Ryan, 2000; Ryan & Deci, 2000) suggests that individuals with life goals that have intrinsic value –such as to be happy, to hold a fulfilling career or to belong – experience higher psychological well-being than those whose goals are extrinsic in nature – such as to earn more money, own more material possessions or attain a high social status (Kasser & Ryan, 1996; Romero, Gómez-Grafuela & Villar, 2012). In terms of occupational aspirations, Staff et al. (2010) suggest that, while boys' aspirations focus on money or prestige, girls focus more on the intrinsic value associated with work such as the development of skills or social relationships. Another aspect of self-determination theory as it relates to well-being, is the satisfaction of the basic psychological needs of autonomy, competence, and relatedness (Deci & Ryan, 2000). Miquelon and Vallerand (2008) investigated self-

determination theory in relation to the motives behind goal pursuit, suggesting that goals pursued for autonomous motives are more aligned to an individual's interests and values and therefore enhance well-being. In contrast, goals pursued for controlled motives such as guilt or reward do not reflect an individual's values and are unlikely to enhance well-being. They report findings from an empirical study (Miquelon & Vallerand, 2006) in support of this theory, but suggest that progress towards goals plays an important role in the associations between goal motives and happiness and self-realisation (Miquelon & Vallerand, 2008).

### Job characteristics and subsequent health and well-being

A number of researchers have investigated how aspects of the work domain influence health and well-being. In a review, Erdogan et al. (2012) identified three categories of work-related antecedents which influence life satisfaction. First, work satisfies an individual's financial, interpersonal, and power and status needs. This relates to Michalos's (1985) multiple discrepancies theory: work improves well-being by satisfying needs and decreasing the discrepancy between an individual's desired and actual self. Second, work is a source of mindful activity which provides an individual with meaning, challenge and opportunities for growth. Third, work can be a source of tension by introducing potential conflict between an individual's work and non-work life domains as well as daily hassles, which are in themselves related to life satisfaction (Hart, 1999).

A popular model explaining the relationship between work stress, health, and well-being is the job strain model of Karasek-Theorell (Karasek, 1979; Karasek & Theorell, 1990). This proposes that job strain is composed of high job demands (e.g. time or skill pressures) and low decision latitude (e.g. lack of control over how one's time or skills

are used in the workplace). Individuals experiencing high job demand and low decision latitude are unable to use their skills or alter their situation in order to reduce job stress, and are at increased risk of disease (Kuper & Marmot, 2003). Using data from the Whitehall II study of civil servants, Marmot and colleagues have demonstrated that job strain is related to incidence of coronary heart disease (Kuper & Marmot, 2003) and psychiatric disorder (Stansfeld, Fuhrer, Shipley & Marmot, 1999), and that low job control is an independent predictor of coronary heart disease, over and above socioeconomic status (Marmot, Bosma, Hemingway, Brunner & Stansfeld, 1997). Griffin, Fuhrer, Stansfeld and Marmot (2002) found that low control is associated with increased risk of depression and anxiety in both men and women, but that this relationship is strongest in middle grade jobs.

Many researchers have suggested that the effects of a stressful job vary according to personal resources and resilience (Erdogan et al., 2012). Adaptation theory emphasises the importance of modifiable personal characteristics which influence an individual's coping ability, such as resilience, optimism or sense of coherence.

### **Internal determinants: personality**

A growing number of studies have supported the notion that psychological factors such as personality, disposition, loneliness, and current mood influence subjective well-being over and above demographic and environmental factors (Costa & McCrae, 1980; McCrae & Costa, 1991; Diener & Lucas, 1999; Bain et al., 2003; Golden et al., 2009). There is considerable evidence for an association between personality traits and subjective well-being (Costa & McCrae, 1980; McCrae & Costa, 1991; DeNeve & Cooper, 1998; Diener, Oishi & Lucas, 2003; Steel, Schmidt & Shultz, 2008). Studies have suggested that personality might account for 35-39% of the variance in life

satisfaction (Diener & Lucas, 1999; Wood, Joseph & Maltby, 2008; Boyce, Wood & Powdthavee, 2013; Hahn, Johnson & Spinath 2013). Reviewing the literature, Ozer and Benet-Martinez (2006) conclude that personality is a strong predictor of subjective well-being, compared to only moderate contributions from contextual factors (Albuquerque, Pedroso de Lima, Matos & Figueiredo, 2012). In a meta-analysis, DeNeve and Cooper (1998) related 137 personality traits to life satisfaction and subjective well-being, and suggested that the strongest associations are with traits associated with emotional expression or with the interpretation of stressful events.

There are strong theoretical reasons why personality might play such a significant role in determining subjective well-being. Personality traits have relatively high stability over the lifecourse, providing a consistent indication of how an individual might perceive and respond to life's challenges (Costa & McCrae, 1994; Wrosch & Scheier, 2003; Matthews, Deary & Whiteman, 2009). Personality might, therefore, influence subjective well-being in two key ways. Firstly, stable personality traits might cause individuals to respond to life events in habitual ways and thereby influence the neural substrates and biological components of the stress response, as well as their coping mechanisms. Secondly, personality traits dictate an individual's preferences, affecting the choices they make and their life circumstances, which in turn influence well-being (McCrae & Costa, 1991; Matthews et al., 2009).

A large body of literature has been devoted to identifying which aspects of stable personality differences influence subjective well-being, with most focussing on three areas: the Five Factor (Big Five) model, dispositional optimism, and sense of coherence.

### The Five Factor model and well-being

Many personality theorists argue for the presence of five overarching factors which are viewed as being fundamental to the description of personality differences: neuroticism (N), extraversion (E), openness (to experience) (O), agreeableness (A), and conscientiousness (C) (Costa & McCrae, 1992; Matthews et al., 2009; Funder & Fast, 2010). Neuroticism, sometimes referred to by its opposite, 'Emotional stability', refers to the tendency to experience unpleasant or negative emotions such as anger, anxiety or depression. Extraversion refers to the tendency to experience positive emotions, to be outgoing and energetic, and to draw energy from the company of others. Openness, also referred to as 'intellect/imagination', reflects intellectual curiosity, creativity, and a preference for novelty and variety. Agreeableness refers to the tendency to be warm, compassionate, and co-operative with others. Conscientiousness reflects a tendency towards being well-organised, dependable, to show self-discipline, and to plan ahead.

Meta-analyses of the influence of the five-factor personality traits on subjective well-being suggest that high levels of neuroticism and/or low levels of extraversion may be linked to lower levels of subjective well-being (Costa, McCrae & Morris, 1991; DeNeve & Cooper, 1998; Diener et al., 2003; Steel et al., 2008), with mixed results for conscientiousness, agreeableness and openness (DeNeve & Cooper, 1998; Steel et al., 2008). Indeed, Steel et al.'s (2008) meta-analysis suggests that the Big Five predicted up to 18% of the variance in subjective well-being, with neuroticism as the strongest predictor at  $-.38$ , extraversion at  $.28$ , conscientiousness at  $.22$ , agreeableness at  $.14$  and openness at  $.03$ .

These results have been replicated in older adults using a number of different measures of well-being. Neuroticism has been linked to lower scores on the subjective components of health-related quality of life (Kempen, Jelicic & Ormel, 1997), poorer physical health and subjective well-being, and mortality (Friedman, Kern & Reynolds, 2010). Gomez, Krings, Bangerter and Grob (2009) studied young, middle-aged and older adults and found that neuroticism predicted subjective well-being and that this effect was more pronounced among the older adults. Brett et al. (2012) shows that low levels of emotional stability (the reverse of neuroticism), alongside high levels of depression, are the strongest predictors of quality of life in a group of 70-year-olds in Scotland. Keyes, Shmotkin and Ryff (2002) found that optimal well-being increases with higher age, education, extraversion and conscientiousness, and lower neuroticism among a large sample aged 25-74 years.

In terms of the components of well-being, one of the most robust findings in subjective well-being research is the relationship between extraversion and positive affect, and between neuroticism and negative affect (Costa & McCrae, 1980; Diener & Lucas, 1999; Pavot, 2008; Schimmack, 2008; Schimmack et al., 2008). Indeed, this finding is often cited as evidence for the existence of these two independent, but related, aspects of well-being. Many studies have supported the finding that extraversion and neuroticism are the strongest predictors of affective well-being, with the other three Big Five traits showing little or no association (Schimmack et al., 2008). Neuroticism is also often found to be the strongest predictor of the cognitive component of subjective well-being (Heller et al., 2004; Schimmack, Oishi, Furr & Funder, 2004). Some studies have suggested a smaller role for conscientiousness (Schimmack, Diener & Oishi, 2002). Results for extraversion have been quite mixed. In a large, nationally representative sample, Rammstedt (2007) found that extraversion makes only a small, non-significant

contribution to life satisfaction. Kokko, Tolvanen and Pulkkinen (2013) found that high extraversion and low neuroticism correlated strongly with psychological well-being in middle adulthood, with significant correlations also observed for high conscientiousness, agreeableness and openness. These associations were stronger for psychological well-being than life satisfaction.

Potential mechanisms for the relationship between Five Factor personality traits and well-being

One popular explanation for the relationship between extraversion and positive affect, and between neuroticism and negative affect, is that these two stable personality traits reflect differences in the neurological processing of affective information (Schimmack et al., 2008). An alternative explanation is that these traits are related to temperament. Individuals high in extraversion tend towards the experience of positive affect, and their sociable nature leads to greater social participation and support, which may increase affective well-being. In contrast, neuroticism is associated with a tendency to see events and situations in a negative light, to overestimate difficulties, respond more readily to negative feedback, and to ruminate on negative experiences (Diener et al., 2003; Lahey, 2009; Liu, Wang & Lu, 2012). Neuroticism has, therefore, often been linked with negative affectivity, a concept which reflects stable and pervasive differences in negative mood and self-concept (Watson & Clark, 1984). Individuals high in negative affectivity are more likely to experience high levels of distress throughout their lives, leading to negative health outcomes through over-activation of the stress response (Watson & Pennebaker, 1989). Negative affectivity also biases individuals' perceptions of their health and well-being, leading to over-attentiveness to physical symptoms. Kahn, Hessling and Russell (2003) suggested that this may lead to negative affectivity

being spuriously used to explain the relationship between predictive factors and subjective well-being.

These mechanisms were investigated in a study looking at the influence of neuroticism and extraversion measured in youth on mental well-being and life satisfaction 40 years later (Gale, Booth, Mottus, Kuh & Deary, 2013). Gale et al. suggest that extraversion had a direct, positive effect on well-being, while neuroticism acts indirectly by increasing individuals' susceptibility to psychological distress and physical health problems.

Some researchers argue that the remaining three personality factors – agreeableness, conscientiousness and openness to experience – affect subjective well-being by influencing an individual's objective circumstances (Boyce et al., 2013). This in turn improves their quality of life and subjective well-being. For example, people high in agreeableness may be more pleasant to be around and may foster better relationships and social support. Higher conscientiousness might lead a person to strive towards better life conditions and achieve a higher occupation and standard of living. Openness to experience is strongly correlated with intelligence, which in itself is a protective factor against ill health and mortality (Calvin et al., 2010).

Another potential mechanism through which personality traits impact on subjective well-being is the stress response. Personality traits influence an individual's approach and response to life's challenges. Bolger and Zuckerman (1995) propose a framework for studying the effects of personality on the stress process in which personality, particularly neuroticism, affects the exposure and reactivity to stressful circumstances, as well as individuals' coping choices and coping effectiveness. An individual's



experience of stress is likely to influence not only their levels of positive or negative affect but also their general appraisal of their life circumstances.

### Optimism

Dispositional optimism has been defined as the generalised tendency for a person to expect positive or favourable outcomes in life (Scheier & Carver, 1985, 1987; Scheier, Carver & Bridges, 1994). Optimism has been found consistently to predict aspects of subjective well-being and health in a variety of populations (Diener et al., 2003; Wrosch & Scheier, 2003; Eid & Diener, 2004; Karademas, 2006; Rasmussen, Scheier & Greenhouse, 2009; Carver, Scheier & Segerstrom, 2010). Optimism can be viewed as a psychological resource, increasing an individuals' psychological adjustment to stressful life experiences or chronic illness (Chang & Sanna, 2001; Fournier, de Ridder & Bensing, 2002). As such, it has been found to be important for maintaining well-being in older adulthood (Carver et al., 2010; Bowling & Iliffe, 2011; Olson, Fanning, Awick, Chung & McAuley, 2014).

#### Potential mechanisms for the relationship between optimism and well-being

A great deal of research has focussed on identifying the mechanisms underlying the positive association between optimism and subjective well-being. Scheier and Carver (1985), who developed the most commonly-used measure of dispositional optimism, the Life Orientation Test, conceptualised optimism as leading to more effective, problem-solving coping strategies, meaning that optimists are able to handle life's challenges more effectively and consequently maintain their psychological well-being more successfully than pessimists (Scheier, Carver & Bridges, 2001; Brissette, Scheier & Carver, 2002; Wimberly, Carver & Antoni, 2008). Many researchers have argued for

coping strategies as being the mechanism underlying the strong positive relationship between optimism and physical and mental health outcomes (Taylor & Armor, 1996; Karademas, 2006; Solberg, Nes & Segerstrom, 2006; Srivastava, McGonigal, Richards, Butler & Gross, 2006; Ferreira & Sherman, 2007; Segerstrom, 2007). In ageing, this mechanism is likely to become more salient as coping strategies such as selection, optimisation and compensation suggested by Baltes and Baltes (1990), and goal disengagement and reengagement (Wrosch et al., 2003) are vital for maintaining well-being in the face of increasing decline.

### **Sense of Coherence and the salutogenic perspective**

The salutogenic perspective to health and well-being has its origins in the work of Antonovsky (1979, 1987). Antonovsky suggests that the focus of research on health should not only be on investigating the causes of ill health (pathogenesis) but also on understanding the factors which maintain good health (salutogenesis). The model he proposes focusses on the resources within individuals which enable them to stay healthy. The salutogenic perspective is particularly relevant to the ageing process, in which individuals strive to maintain good health and well-being in the face of increasing challenges in functional and physical health (Wiesmann & Hannich, 2008, 2010, 2013). Antonovsky's theory denotes so-called salutary forces which are a result of an individual's life experiences, environment, and personality, and which enable them successfully to combat a wide variety of stressors, including ageing (Antonovsky, 1987). These forces – which he terms generalised resistance resources – include things like self-esteem, self-efficacy, social support, social class, personality, and cultural stability (Wiesmann & Hannich, 2013, 2014).

A key concept in the salutogenic perspective is sense of coherence (SOC), which Antonovsky (1987) defines as:

“a global orientation that expresses the extent to which one has a pervasive, *enduring though dynamic feeling of confidence that (1) the stimuli deriving from one’s* internal and external environments in the course of living are structured, predictable, and explicable; (2) the resources are available to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement.”

Antonovsky devised an “Orientation to Life” scale to measure SOC, which produces scores on three dimensions: comprehensibility, manageability, and meaningfulness. These are summed to give an overall SOC score. The 29-item and 13-item versions of this scale have been shown to have good validity, reliability and consistency in a variety of populations, including older adults (Naaldenberg, Tobi, van den Esker & Vaandrager, 2011).

In a 1996 paper, Antonovsky discusses the usefulness of the salutogenic model in health promotion research and practice and summarises research findings in the area (Antonovsky, 1996). He poses a number of questions about the relationship between SOC and health and well-being, including the nature of the relationship at different levels of SOC, how the strength of this association changes with age, and the mechanisms underlying this relationship. He makes reference to the growing field of psychoneuroimmunology, suggesting that SOC might work through attitudes or behaviour, emotions, or through changes to the body’s immune system. Sense of coherence has been posited by many researchers as a health promoting resource, strengthening resilience and contributing to a positive subjective state of health and well-being (Eriksson & Lindstrom, 2006). While Antonovsky proposes that high levels

of SOC indicate a disposition towards successful coping in the face of adversity (Antonovsky, 1979, 1987), others see it as a mediator between resistance resources and subjective health and well-being (Wiesmann & Hannich, 2008, 2010, 2013, 2014). In a study of 387 older adults, Wiesmann and Hannich (2013) found that SOC partially mediated the relationship between the generalised resistance resources and life satisfaction.

Antonovsky proposes that the sense of coherence is shaped in early adulthood and remains steady throughout life (1979, 1987). However, when considered alongside other personality constructs, sense of coherence has been shown to be less stable than the Big Five or optimism, often improving over time (Vastamäki, Moser, & Paul, 2009) or remaining stable only in individuals high in the trait (Hakanen, Feldt & Leskinen, 2007). Lövheim, Graneheim, Jonsén, Strandberg and Lundman (2012) found that sense of coherence generally increased over a 5 year follow-up in adults aged 85 and over, but that decreases in SOC were observed in those experiencing negative life events such as a loss of independence or cognitive decline.

Many researchers have empirically investigated the relationship between sense of coherence and other personality traits. Feldt, Metsäpelto, Kinnunen and Pulkkinen (2007) investigated the relationships between SOC and the Big Five personality traits and found a strong (-.85) association with neuroticism – suggesting these two are closely related constructs – and modest positive associations with the other four traits. In contrast, Strümpfer (1997) found only a moderate correlation between SOC and negative affectivity, a trait closely related to neuroticism and predictive of a wide range of health outcomes (Watson & Pennebaker, 1989). The existence of SOC as a personality trait with a unique influence on subjective well-being was supported by

Ebert, Tucker and Roth (2002), who found that while SOC, neuroticism and optimism predicted psychological well-being, only SOC is a significant predictor of perceived general health in students.

A higher sense of coherence has been associated with a wide variety of health and well-being outcomes including mortality (Surtees, Wainwright, Luben, Khaw & Day, 2006; Lundman et al., 2010) and self-reported health quality of life (Schneider et al., 2004; Julkunen & Ahlström, 2006; Floyd, 2008; Langius-Eklöf, Lidman & Wredling, 2009). A large number of studies have linked higher SOC with lower levels of psychological distress (Drory & Florian, 1998; Gustavsson-Lilius, Julkunen & Hietanen, 2007; Bíró, Balajti, Ádány & Kósa, 2010). The protective role of SOC in the face of adversity has found support in the research literature, with many researchers linking SOC to psychological adjustment (Lustig, Rosenthal, Strauser & Haynes, 2000; Rood, 2001; Kennedy, Lude, Elfström & Smithson, 2010) and others formally examining its protective properties (Gana, 2001; Floyd, 2008). In a study of myocardial infarction patients, Drory and Florian (1998) offer support for the importance of the SOC construct as a resource for stress resilience and found evidence for significant links with other resources such as optimism, self-efficacy, and perceived social support. Kennedy et al. (2010) suggest that SOC has an influential role in the processes of long-term psychological adjustment including appraisal and coping behaviours, while Albertsen, Nielsen and Borg (2001) found evidence for a mediating and moderating role for SOC in the relationship between work environment and stress symptoms.

In terms of ageing, salutogenic theory posits that older adults with a stronger SOC are more able to mobilise and exploit potential resources, thereby maintaining bio-psycho-

social integrity and subjective well-being in the face of the negative changes and physical and functional decline inherent in the ageing process (Antonovsky, 1979, 1987). This theory has found support in the research literature, with many studies finding a strong relationship between SOC and well-being in older adults (Schneider, Driesch, Kruse, Nehen & Heuft, 2006; Lundman et al., 2010). Nilsson et al (2010) investigated the relationship between SOC and psychological well-being in a large group aged 18-85 and found stronger SOC in the older age groups and a strong positive relationship between SOC and psychological well-being, which remained after adjusting for age, ethnicity and education. Wiesmann and Hannich (2008) found that SOC mediated the relationship between generalised resistance resources such as age, education, physical health, activity level, social support and personality and well-being, while Lutgendorf, Vitaliano, Tripp-Reimer, Harvey and Lubaroff (1999) found evidence for SOC's role in moderating natural killer cell activity in response to stressful life events in older adults. Schneider et al. (2004) found that sense of coherence, alongside self-rated depression and subjective physical complaints, are stronger predictors of subjective health in older adults than objective health conditions. Drageset et al. (2008) investigated the associations between sense of coherence and the subscales of the SF-36 measure (Ware & Krosinski, 2001) amongst nursing home residents and found that its strongest correlation (.61) is with the mental health subscale, with poor correlations with the physical health scales. A systematic review of the literature in 2005 reported that SOC is highly associated with the psychological aspects of health, including stress and behavioural aspects, with less of a relationship with physical health (Flensburg-Madsen, Ventegodt & Merrick, 2005). This is very much in keeping with the suggestions of Antonovsky and others that SOC is a health promoting resource, which improves health and well-being by mobilising existing resources (Drageset et al., 2008, Wiesmann & Hannich, 2013). Another systematic review confirms the finding that SOC

is more related to mental health than physical health (Eriksson & Lindstrom, 2006). A large number of correlational studies have supported the view that SOC determines psychological adaptation in old age, which is manifested as high subjective well-being (Wiesmann & Hannich, 2008). Dezutter, Wiesmann, Apers and Lucyckx (2013) used Erikson's life stage theory of ageing (Erikson, 1963, 1982), which proposes that coming to terms with one's past experiences is a vital developmental task for older adults, with successful acceptance of one's past failures and limitations resulting in ego integrity. They found that the strong association between SOC and life satisfaction in older adults was fully mediated by measures of ego integrity and its opposing construct, despair. They suggest that high SOC in older adults is associated with a greater ability to mobilise resources and facilitate coming to terms with past experiences (Dezutter et al., 2013).

### **Potential mechanisms – stress reactivity**

The mechanisms behind the relationship between internal resources such as personality, sense of coherence, and subjective well-being have yet to be fully described. One potential mechanism underlying this relationship is the individual differences in reactions to stressful circumstances. Veenhoven (2008), in his review of the relationship between happiness and longevity, suggests that chronic unhappiness influences health by activating the stress response, which in turn has long term harmful effects on health such as high blood pressure and a weakened immune response. Internal resources such as personality, resilience, or sense of coherence might influence an individual's coping strategies and their perceived ability to cope in the face of stressful circumstances.

In terms of ageing, increasing functional decline and poorer health may act as stressors, calling upon individuals' internal resources to maintain their well-being, in keeping

with the work of Baltes and colleagues (Smith & Baltes, 1997). Individuals who are high in neuroticism, for example, might be more likely to attend to somatic and other changes associated with ageing and to interpret them as symptoms of terminal decline. This activates the stress response, resulting in additional somatic changes such as increased heartrate, which is interpreted by the individual as symptomatic of the perceived decline and causes them to feel increased anxiety. This in turn leads to lower subjective well-being. Similarly, individuals with a strong sense of coherence or higher optimism might be more likely to interpret the same somatic and other changes as experiences well within their own ability to cope, which reduces their anxiety and maintains their subjective well-being. They might also be more likely to utilise problem-solving coping strategies such as calling on friends or family for assistance where needed, again reducing their anxiety.

### Overview of the stress response

Stress, broadly speaking, is the feeling that arises when a given situation is perceived to be outside of the individual's control or beyond their coping abilities (Lazarus & Folkman, 1984). The impact of stress on health has been well documented in the health psychology literature. An individual's biological reaction to stress is thought to occur via two primary pathways: the sympatho-adreno-medullary (SAM) axis and the hypothalamic-pituitary-adrenocortical (HPA) axis. The SAM pathway results in the production of catecholamines (adrenaline and noradrenaline), which raise the heart rate, mobilise energy within the blood stream and prepare the body for action. This is rather akin to the fight-or-flight response first proposed by Cannon (1932). The HPA axis produces corticotropin releasing hormone and culminates in the release of glucocorticoids (called cortisol in humans), which function both to aid the stress response and to mediate recovery from it. This axis is widely thought to underpin



Selye's general adaptation syndrome, the central tenet of which is that the body responds to different types of stressors in a similar way, and repeated activation of the stress response can lead to illness (Selye, 1956). Chronic stress can result in dysregulation of either axis (Chrousos, 1992), leading to chronic health problems such as high blood pressure, ulcers and suppression of the immune response. Psychological stress has been associated with greater incidence of cardiovascular disease in a wide range of groups (Rosengren, Tibblin & Wilhelmsen, 1991; Greenwood, Muir, Packham & Madeley, 1996; MacLeod et al., 2002). The vast psychoneuroimmunology literature expounds HPA axis dysregulation and its impact on the immune system, including greater incidence of and poorer healing from illness and disease (Kiecolt-Glaser & Glaser, 1995; Kiecolt-Glaser, McGuire, Robles & Glaser, 2002; Lugendorf & Costanzo, 2003).

#### Biological correlates of subjective well-being

Researchers investigating the mechanisms underlying the relationship between internal resources and subjective well-being and between subjective well-being and health have often focussed on the psychobiological processes involved in these relationships and specifically on neuroendocrine, immune and cardiovascular responses (Pressman & Cohen, 2005; Steptoe, Dockray & Wardle 2009; Steptoe, Demakakos, de Oliveira & Wardle 2012). The advantage of this focus is that the outcome of these processes can be measured objectively through so-called 'biomarkers'. A biomarker has been defined as "a characteristic that is objectively measured and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacological responses to a therapeutic intervention" (Atkinson et al., 2001). Biomarkers are particularly important in ageing research as they can indicate aspects of the ageing process that are otherwise unobservable (Crimmins, Vasunilashorn, Kim & Alley, 2008; Weinstein, Vaupel &

Wachter, 2008). Steptoe and colleagues have identified a range of positive biological correlates for well-being in older adults and suggest that these differ between men and women. For example, in a large nationally representative cohort of older adults, they found that higher subjective well-being is associated with dehydroepiandrosterone (DHEA-S, a multifunctional hormone with neuroprotective effects) and smaller waist circumference in men, lower levels of inflammatory markers and higher levels of HDL ('good') cholesterol in women, and lower levels of triglycerides and better lung function in both sexes (Steptoe, Demakakos, de Oliveira & Wardle, 2012). This is in keeping with previous research reporting an inverse relationship between subjective well-being and both ambulatory heart rate in men and lower levels of inflammatory markers in women (Steptoe, Wardle, & Marmot, 2005; Steptoe, O'Donnell, Badrick, Kumari & Marmot, 2008). Ryff et al. (2006) also found that psychological well-being and 'ill-being' had distinct biological correlates, based on seven different biomarkers (cortisol, noradrenaline, DHEA-S, waist-hip ratio, systolic blood pressure, HDL cholesterol and total HDL cholesterol). All of these biomarkers have been associated with increased risk of chronic disease and mortality in the general population (Steptoe, Demakakos, de Oliveira & Wardle, 2012).

#### Associations between cortisol measures and psychosocial factors

Cortisol is the final product of the HPA system. Under normal conditions, cortisol secretion in humans shows a pronounced and well-documented circadian rhythm. Typically, cortisol is highest first thing in the morning, declines throughout the day into the evening and rises sharply during the final few hours of sleep (Stone et al., 2001; Centre for Studies on Human Stress, 2007). Cortisol regulates its own release by activating feedback mechanisms. Elevated levels of cortisol and corticotropin releasing hormone – perhaps as a result of chronic activation, or dysregulation, of the HPA axis

– can lead to cortisol acting as a neurotransmitter and it has been implicated in the development of anxiety, depression and other affective disorders (Nemeroff, 1996; Gunnar & Vazquez, 2001; Raison, Capuron & Miller, 2006). Indeed, higher cortisol levels on waking – which have been shown to be a reliable biological marker for the assessment of adrenocortical activity (Pruessner et al., 1997) – have been associated with major depression (Gold, Goodwin & Chrousos, 1988; Brown, Varghese & McEwen, 2004) and trait negative affectivity (Polk, Cohen, Doyle, Skoner & Kirschbaum, 2005), and lower levels of cortisol secretion throughout the day have been associated with positive affect (Polk et al., 2005; Steptoe, Wardle & Marmot, 2005; Steptoe & Wardle, 2005). Cortisol, due to its involvement in immune and metabolic regulation, is also often seen as a risk factor for a number of physical illnesses including diabetes, coronary heart disease, abdominal adiposity and insulin resistance (Herbert et al., 2006; Dekker et al., 2008).

Cortisol levels are dictated by a strong basal diurnal rhythm. Levels are high on waking and increase 50-60% during the first 30-45 minutes before dropping rapidly over the next few hours and declining more slowly throughout the rest of the day (Kirschbaum & Hellhammer, 1989; Pruessner et al., 1997; Adam, Hawkley, Kudielka & Cacioppo, 2006). The so-called cortisol awakening response (CAR) has been used as a useful index of HPA axis function and stress reactivity (Pruessner, Wolf et al., 1997; Clow, Thorn, Evans, & Hucklebridge, 2004; Steptoe, 2007; Chida & Steptoe, 2009). A heightened CAR has been suggested to be an indicator of chronic psychosocial stress (Chida & Steptoe, 2009), and this suggestion has received support from studies of individuals experiencing job stress and overload (Schulz, Kirschbaum, Prüßner & Hellhammer, 1998; Pruessner, Hellhammer & Kirschbaum, 1999; Wüst, Federenko, Hellhammer & Kirschbaum, 2000; Steptoe, 2007), lower socioeconomic position (Li,

Power, Kelly, Kirschbaum & Hertzman, 2007), and in individuals experiencing depression or depressive symptoms (Pruessner, Hellhammer, Pruessner & Lupien, 2003; Steptoe, 2007).

Other researchers have investigated the relationship between psychosocial factors and the diurnal slope of cortisol secretion. Changes to the normative pattern are thought to indicate dysregulation of the HPA axis (Caplan, Cobb & French, 1979; Smyth et al., 1998) and have been associated with a range of psychosocial factors including gender, socioeconomic status, occupational factors, stressful life circumstances and positive affect (Adam & Gunnar, 2001; Steptoe et al., 2003; Kunz-Ebrecht, Kirschbaum & Steptoe, 2004; Polk et al., 2005; Cohen et al., 2006; Li et al., 2007). Ryff et al. (2006) found that a flatter cortisol slope is associated with higher levels of purpose in life and personal growth amongst a group of older women.

In terms of ageing, results have been more inconsistent, with some suggesting a negative relationship between cortisol awakening response and age (Kudielka & Kirschbaum, 2003) and others suggesting no relationship (Pruessner et al., 1997; Wüst, Wolf, Hellhammer, et al., 2000; Edwards, Clow, Evans & Hucklebridge, 2001; Wilhelm, Born, Kudielka, Scholtz & Wüst, 2007). Ryff et al. (2006) suggest that the associations between numerous biomarkers, including cortisol, and well-being get stronger in those aged 75+. In a study using data from the Whitehall II study of stress reactivity in civil servants aged 50-74, Steptoe et al. (2008) found that mean cortisol on waking and the cortisol awakening response are not associated with positive affect, but average cortisol over the day is inversely associated with positive affect even after controlling for a range of potential confounders including age, gender, body mass index, smoking, paid employment and time of waking.

## **A positive psychological profile**

Successful ageing is an elusive and multi-faceted concept. Research suggests that it may be a product of the interaction between life experiences, personality, behaviour, health and social resources, and psychosocial factors. A lifespan view of ageing proposes the existence of a psychological wellness profile which, in conjunction with available resources such as social support, contributes to successful ageing (Bryant, Corbett & Kutner, 2001). Baltes and colleagues found empirical support for this, using data from the Berlin Ageing Study to describe a positive psychological profile which is correlated with high subjective well-being amongst their oldest participants. This profile includes low depression, low neuroticism, high extraversion, high conscientiousness, high optimism, high sense of coherence and high social support. They suggest that individuals who exhibit this psychological profile are better able to cope with the challenges posed by the ageing process, and consequently maintain their subjective well-being further into old age (Smith & Baltes, 1997). Extending this profile to incorporate biomarker research, one might expect markers of healthy stress reactivity – lower cortisol levels, a flatter slope, and a lower awakening response – to be predictive of higher well-being.

Overall, the research suggests that subjective well-being in old age is influenced by an interaction between biological, psychological and social factors across the lifecourse. The adoption of a bio-psycho-social approach to health (Engel, 1977) has become increasingly popular amongst researchers in recent years and forms an ideal framework for consideration of lifecourse influences on subjective well-being in old age. A lifecourse narrative is emerging by which early life experiences shape an individual's adaptational psychological resources and stress reactivity, which, in conjunction with

their personality, interact with life circumstances in older age to influence the ageing process and, simultaneously, subjective well-being in old age.

Very few empirical studies have been able to investigate the interaction of these factors across the lifecourse; most longitudinal cohort studies either lack information from childhood and early adulthood, or involve participants who have not yet reached old age. The 6-Day Sample is a unique source of detailed information collected over 16 years between the ages of 11 and 27 on individuals who are now in their late 70s.

### **Summary of study aims, research questions, and hypotheses.**

This study aims to investigate the structure of subjective well-being and its longitudinal and cross-sectional determinants in a group of older adults who have been followed up extensively in childhood and early adulthood. The study was conducted in four stages.

In the first part, the structure of well-being in this group is investigated. The second part focusses on the influence of early career factors including occupational goal engagement, disengagement and attainment on subjective well-being and psychological resources in old age. The third part examines the relationship between subjective well-being and mood and various cortisol-based measures of stress reactivity. The final and main part of the study investigates the relationship between childhood intelligence and demographic factors, current physical health and mood, personality and subjective well-being in old age.

Each section of the study has been designed to answer unique research questions.

### Structure of well-being

Hypothesis 1: all the items from the three well-being measures of life satisfaction, mental well-being, and mental health – will load onto a single latent variable.

### Early career characteristics

Hypothesis 2: higher well-being in old age will be associated with a range of early career characteristics, including: successful attainment of early occupational goals, holding specific early occupational goals, changing occupational goals in response to unattainment, and early career stability.

### Cortisol

Hypothesis 3: higher well-being in old age will be associated with lower cortisol levels on waking, a smaller cortisol awakening response, and a flatter diurnal cortisol slope.

### Determinants of well-being

Hypothesis 4: Subjective well-being in old age will be predicted more by prospective variables than longitudinal variables.

Hypothesis 5: Subjective well-being in old age will be determined more by personality variables, including neuroticism, extraversion and conscientiousness than by objective measures such as physical health.

Hypothesis 6: The internal resources of optimism and sense of coherence will contribute more to subjective well-being than either objective measures or the Big Five personality traits.

## **Methods**

### Study design

This is a longitudinal prospective cohort study.

### Participants and recruitment

#### The 6-Day Sample

The 1208 members of the 6-Day Sample were born on the first day of the even-numbered months of 1936. They were selected to be a representative sample of the Scottish population born in 1936, and, after taking part in the Scottish Mental Survey 1947 (Scottish Council for Research in Education, 1949; Deary, Whalley & Starr, 2009), they were followed up for 16 years (Maxwell, 1969).

In 1947, these children were administered a comprehensive individual intelligence test, the Terman Merrill revision of the Stanford-Binet, Form L. In addition to the sociological schedule completed in 1947, their schoolteachers (generally their headmasters) completed two further schedules in 1950 and as they were about to leave school. The first schedule contained the headmaster's assessment of the pupil's personal characteristics and school progress, while the second contained details of school progress (including courses taken), and an assessment of their suitability for future employment. An additional medical questionnaire was completed while Sample members were still at school. Subsequently, each Sample member was assigned a home visitor – initially a teacher, child guidance officer, school nurse or health visitor – and visited at home in 1951. The home visitor assessed the cleanliness, emotional atmosphere, and cultural interests of the home, and rated the intelligence, personality and perceived interest in the pupil's career of the parents or guardians. Sample members



were then either visited or contacted annually by post to complete a short questionnaire outlining their education, health, occupation, marital status, children, interests (including participation in sports and club membership) and career aspirations. Home visitors or Sample members were encouraged to provide additional comments or information each year. All male Sample members were invited to complete additional questionnaires regarding participation in National Service.

In 1963 a lack of funding forced the study to close and all participants, including those who had previously refused, were contacted and invited to complete a final schedule. In total, some information was obtained on 1104 Sample members in 1963. Participation in the original 6-Day Sample study has been described elsewhere (Johnson, Brett, Calvin & Deary, in revision). 53% of the Sample members completed all 13 assessments, 16% completed all but 1, and another 13% completed all but 2 of the annual assessments.

All information from the 6-Day Sample study was transcribed into a database using Statistical Package for the Social Sciences (SPSS) version 19.

#### Ethical and other permissions

Ethical permission for the study was obtained from the Scotland-A Research Ethics Committee, (ref SS-0024). Permission for the use of vital status and health information without consent and for contacting participants without their consent was obtained from the Privacy Advisory Committee in Scotland (ref 39/12) and s251 support obtained from the Confidentiality Advisory Group of the Health Research Authority in England and Wales (ref ECC 6-02 (FT4) 2012) (Brett & Deary, 2014).

## Recruitment

The names (including married names as appropriate), dates of birth and, where available, the 1939 National Registration number, for all 1208 6-Day Sample members were sent to the National Records of Scotland (NRS) for tracing using the NHS Central Register (NHSCR) for Scotland. This register contains every individual who has ever been registered with a General Practitioner in Scotland since 1939. For individuals whose most recent registration was with a health board in England or Wales, identifiers were sent securely by NRS to the NHS Central Register for England and Wales.

Individuals found to be alive and living in Scotland or England and Wales were sent an invitation pack by staff at NHSCR Scotland and the Data Linkage Service (DLS) for England/Wales respectively. Single page reminder letters were sent by NHSCR Scotland or the DLS to all Sample members who had not responded (either positively or negatively) to the invitation within a reasonable time frame. In Scotland, invitation packs were sent to Sample members in November 2012 and reminder letters in February 2013, and in England (no Sample members were found to be living in Wales) invitation packs were sent in July 2013 and reminder letters in September 2013. Sample members who had, either in writing or by telephone, indicated that they intended to take part in the study but from whom no more had been heard, were sent a reminder letter by the study team around 6 months after the original invitation packs were sent out.

### Participants with incapacity or lacking capacity

In order to maintain the representativeness of the Sample, no participants living in Scotland were excluded from the study. Participants lacking the capacity to consent to the study or complete the study materials independently were encouraged in the invitation letter to seek assistance from a relative or carer. However, due to differences in legislation between Scotland and England/Wales, participants lacking capacity in

England/Wales were excluded from the follow-up study and this sentence was removed from their invitation letter.

#### The invitation pack

In response to anecdotal evidence of attrition during multi-stage recruitment processes in other revivals of historical cohort studies (Batty, personal communication, 2<sup>nd</sup> December 2011), the decision was taken to send all the study materials, including the questionnaire and physical testing kit, to all surviving members of the 6-Day Sample. Although concerns were raised that receiving this pack as the first contact from the study in nearly 60 years might put some Sample members off – perhaps particularly those experiencing cognitive and functional decline – this risk was balanced against the likelihood of Sample members dropping out inbetween initial contact and completing the physical testing kit. A similar tactic employed by the Aberdeen Children of the 1950s study achieved a 63% response rate (Batty et al., 2004).

The invitation pack took the form of a cardboard box containing the study paperwork (information sheet, information leaflet, reply slip, participant invitation letter, and covering letter from the organisations sending the packs on behalf of the study), return envelopes, study questionnaire, and a home physical testing kit. All participants – including those not wishing to take part and those choosing not to take part due to a lack of capacity – were encouraged to complete and return a reply slip. In addition to contact details, the reply slip asked participants for their date of birth and primary and secondary schools, which enabled them to be identified within the original 6-Day Sample data.

The study materials were designed for ease of use and trialled on age-appropriate volunteers (Brett & Deary, 2015). Both contained images intended to evoke positive memories of the original study and feelings of belonging without being overly coercive. Participants were encouraged to contact the research team to ask questions to enable them to make an informed, balanced, decision about taking part. Refusals were treated with respect and no attempt was made to alter the decision.

The home testing kit was designed to enable collection of objective health measures and has been described in more detail elsewhere (Brett & Deary, 2015). Its contents and the measures collected are summarised in Table B1. The home testing kit included detailed instructions and a demonstration DVD.

Table B1

Contents of the 6-Day Sample physical testing kit

Measure	Test	Equipment provided
BMI	Height / Weight	Pencil 3m flexible tape measure
Body morphometry	Waist, hip & calf circumference Leg length	Tape measure
Arm strength	Elbow flexions	1.5m low resistance TheraBand Countdown timer
Balance	One leg stand	Countdown timer
Lung function	Peak expiratory flow	Peak flow meter
Genetics	Saliva sample	Oragene testing kit
Stress reactivity	Salivary cortisol	3 x Salivette cortisol tubes
General	N/A	Branded pen & badge, 3 x postage paid return envelopes, 12-page A5 instruction booklet, DVD

The study questionnaire comprised three sections. The first covered demographic information, asking questions about participants' education and occupation, that of their children, and their parents' or guardians age at death and main occupation. It also contained questions on social support and neighbourhood belonging. The second section covered physical health, health behaviours and activities asking questions about participants' medical history, participation in four key health behaviours (smoking, alcohol consumption, healthy eating and physical activity), social and other activities, membership of organisations, hearing, sight, and the SF-36 health questionnaire. There was also space within this section for filling in the results of the home physical testing. The third and final section covered personality, emotions, well-being, and attitudes and experiences of ageing. The final page of the questionnaire contained the study consent form, which was detached from the questionnaire and stored separately in order to maintain the anonymity of questionnaire responses.

Study questionnaires and reply slips were checked on receipt and matched to 6-Day Sample members. Questionnaires were then checked for errors or missingness and participants contacted by letter to ensure completion.

## Measures

The study described here formed part of a larger study incorporating eight separate work packages investigating various aspects of health and well-being in old age (Brett & Deary, 2014), using longitudinal data collected in the 1940s-1960s as part of a study of the influence of childhood intelligence on subsequent educational and occupational attainment (Maxwell, 1969). Measures were selected from those available in the original 6-Day Sample data to best capture distal influences on well-being in old age, including education, social class, personality, home conditions (as a marker of early life stress), and early occupational experiences. Potential proximal influences of well-being were incorporated into the study design, including personality, adaptational psychological resources (i.e. resilience, optimism and sense of coherence), current mood, and objective and subjective measures of health and function. In order to investigate the structure of well-being in old age, multiple measures of well-being were incorporated into the study questionnaire. Cortisol measures were included as an indicator of dysregulation of the HPA axis of the stress response.

### Longitudinal measures

#### Years of education

The number of years of full-time education was calculated from the data available from the original 6-Day Sample study. In the late 1940s and early 1950s the school leaving

age in Scotland was 15 years. The majority of the Sample left school in 1951, at the end of the school term following their 15<sup>th</sup> birthday.

#### *Father's social class*

Father's occupation in 1947 was recorded in the sociological schedule. Occupational social class was calculated using the Classification of Occupation 1951 (General Register Office, 1956).

#### Qualifications

The highest qualification achieved by each participant was derived from data collected to age 27 in the original 6-Day Sample study, augmented by information provided by participants themselves on their educational qualifications achieved since the age of 27 in the follow-up study questionnaire. This was recoded into a numerical category variable along similar lines to those followed by the Lothian Birth Cohort studies (Deary et al., 2007): 0 = no qualifications; 1 = junior leaving certificate / equivalent; 2 = senior leaving certificate / Highers or equivalent / recognised trade apprenticeship completed; 3 = professional qualifications, e.g. nursing, teaching; 4 = University degree or above.

#### Intelligence

All 6-Day Sample members sat an individual intelligence test in 1947 at around age 11. This was the Terman Merrill Form L revision of the Stanford Binet intelligence test. Scores on this test are standardised across the population to give a mean of 100 and a standard deviation of 15.

Gender

Male/female.

Home conditions

During 1950/51, participants' home visitors completed a short home report, in which they were asked to rate the conditions of the participants' homes. They answered 8 questions, each on a 5-point scale from "Below average" to "Above average", covering the home's cleanliness, emotional atmosphere, and cultural interests. They were also asked to rate the parents' intelligence, personality and attitude towards the Sample member's career. Principal Components Analysis was used to extract scores on two factors using the regression method. The "home environment" factor consisted of the home's cleanliness, emotional atmosphere, cultural interests, parents' intelligence and personality. The "parental support" factor consisted of parents' attitude towards the Sample member's career and parents' intelligence. The item loadings onto each factor can be found in Table B2.



Table B2

*Factor loadings for the “home environment” and “parental support” factors following*

Principal Components Analysis

	Home environment	Parental support
Estimate of father's general intelligence	.776	.784
Estimate of mother's general intelligence	.775	.753
General impression of cleanliness of home	.760	---
Father's personality assessed by home visitor	.780	---
Mother's personality assessed by home visitor	.744	---
Emotional atmosphere of home	.673	---
Cultural interests of home	.721	---
Attitude of father to pupil's future career	---	.840
Attitude of mother to pupil's future career	---	.833
% variance explained	55.91%	64.49%

### Early career

School leaving: The vast majority of Sample members left school at the statutory leaving age of 15. They were asked at the age of 18 why they had not stayed on at school. Responses to this question were coded as a variable named “school control” according to whether they left school at this age by choice (e.g. they wanted to start working, or they disliked school) or by necessity (e.g. they had to start working to supplement the household income, or they were only registered on a three year secondary course). Where more than one type of reason was given, these were coded as mixed.

Early career aspirations: All Sample members and their parents/guardians were asked during the first few schedules (aged 15, 16, 17 and 18) what ambitions they had for their

careers, if any. Ambitions stated at 18 were considered to be the most robust, as they were generally formulated once Sample members had had an opportunity to experience the labour market for themselves. Where no information was available from age 18, ambitions stated at age 15 were used. Due to the uniquely detailed nature of this follow-up, it was possible to identify whether or not these goals were achieved over the course of the original 6-Day Sample study – that is, by age 27 – or during the lifetime of participants taking part in the follow-up study. These were coded as “Not met”, “Met”, “Exceeded” and “None given”. This was further dichotomised into a Yes/No variable as to whether participants held any career ambition(s) or none. Following suggestions from previous research that goal disengagement and reengagement are important processes in early occupational experiences, ambitions at age 18 were compared with those from age 15 and a new variable created indicating whether or not participants had changed their goals during this time. This was coded as “No”, “Yes”, “Goal met” or “No goal stated”.

Early career stability: The schedules completed between 1951 and 1963 contain information on the jobs each Sample member held within that time, including periods of unemployment and maternity leave. The number of jobs, including periods of unemployment, was calculated for each Sample member before the age of 18 and to age 27.

The variables school control, parental attitudes, whether ambitions were met or not, and the number of jobs held to 18, were entered into a Principal Components Analysis. The results suggested that, although related, they did not together represent an underlying factor and the variables are therefore treated separately in all subsequent analyses.

#### Occupational social class

Participants were asked to provide the details of their highest status occupation, and at what age this was held. This occupation was coded for occupational social class using

the Registrar General's Classification of Occupations 1980 (Office of Population Censuses and Surveys, 1980) from I (highest, professional occupations) to V (unskilled manual occupations).

### Social mobility

Social mobility – whether or not an individual moves up a social class from that of their parents – was calculated using the participants' own highest occupational social class across their lifetime and that of their fathers when they were aged 11. Two measures were calculated. First, the raw difference in class between each participant's and their father's social class was calculated (range -2 to +4). Second, participants were classified into three social mobility groups: moved up, no movement, and moved down.

### Job control

In the study questionnaire, participants were asked to indicate their position in their highest status occupation: Manager, Supervisor/foreman, Employee, Self-employed with employees, Self-employed without employees. This was treated as a proxy measure of job control and was dichotomised, with "Employee" classed as 'No control' and the remaining categories as 'Control'.

### Personality

Sample members' schoolteachers were asked to rate the Sample members' personalities within the first school schedule completed in 1950. This consisted of rating the Sample member on 6 personality traits: self-confidence, perseverance, stability of moods, conscientiousness, originality and desire to excel. These characteristics were selected from a longer list of traits devised by Terman (1925) for the Gifted Child Study. Each

was rated on a 5-point Likert-type scale from “Very” through to “Marked lack”.

Principal Components Analysis was used to extract the first unrotated component using the regression method. The item loadings onto each factor can be found in Table B3.

Personality ratings by teachers of their pupils have been shown to be moderately correlated with pupils’ own (with the exception of emotional stability) (Baker, Victor, Chambers & Halverson, 2004). Studies comparing teachers’ and parents’ ratings of pupils’ personalities have shown mixed results, some suggesting very little convergence (Miller & Davis, 1992; Ter Laak, Degoede & Brugman, 2001) and others suggesting better convergence for conscientiousness and openness/intellect (Barbaranelli, Caprara, Rabasca & Pastoreli, 2003) and extraversion and openness (Laidra, Allik, Harro, Merenäkk & Harro, 2006). This discrepancy may arise due to teachers’ ratings being, by necessity, based on their experiences of pupils’ behaviour within the restricted environment of the school or occasionally, on the teachers’ internal prejudices. As a result, it is likely to be based on pupils’ behaviour within school including academic performance, appearance, disruptiveness and attention. Although no measures of school behaviour were available for the 6-Day Sample, intelligence has been shown to be a strong predictor of academic performance (Laidra, Pullman & Allik, 2007). Therefore, any variation in teacher-rated personality due to IQ was removed by residualizing the personality factor for scores on the Stanford-Binet IQ test. This variable was then used in subsequent analyses. Although a crude measure, this personality measure has already been shown to relate to intelligence, subsequent educational and occupational achievement and mortality (Deary, Batty, Pattie & Gale, 2008; Calvin, Batty, Brett & Deary, 2015).

Table B3

*Factor loadings for “teacher-rated personality” following Principal Components*

Analysis

	Factor loading
Teacher's opinion of pupil's self-confidence	.414
Teacher's opinion of pupil's perseverance	.857
Teacher's opinion of pupil's stability of mood	.564
Teacher's opinion of pupil's conscientiousness	.815
Teacher's opinion of pupil's originality	.663
Teacher's opinion of pupil's desire to excel	.822
% Variance explained	50.05%

Prospective measures

Age in years

Age in years at the time of completing the study questionnaire was calculated.

Current mood

Current mood was measured using the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983). This contains 14 questions (7 each for anxiety and depression) regarding how participants have been feeling over the course of the last week. Each question is scored 0-3 with a total possible score on each scale of 21, with probably significant anxiety or depression states traditionally indicated by scores of 11 or over.

Personality – Five Factor inventory

The majority of personality theorists argue for a five factor structure to personality.

These five factors – Extraversion, Emotional Stability (also known as Neuroticism),

Agreeableness, Intellect/Imagination (also known as Openness) and Conscientiousness – were measured using the 50-item version of the International Personality Item Pool (IPIP; Goldberg, 2001).

### Optimism

Dispositional optimism was measured using the Life Orientation Test-Revised (LOT-R; Scheier, Carver & Bridges, 1994). This contains 10 items on a 5-point Likert-type scale; 3 in a positive direction (e.g. “In uncertain times, I usually expect the best”), 3 negative (e.g. “If something can go wrong for me, it will”) and 4 filler items. After reversal, scores on the 6 non-filler items are summed to give an optimism score out of 24.

### Resilience

This was measured using the Brief Resilience Scale (Smith et al., 2008). This consists of 6 items (e.g. “I tend to bounce back quickly after hard times”) scored on a 5-point Likert-type scale. After reversal of 3 items, the mean of all 6 items is calculated to give the resilience score.

### Sense of Coherence

Sense of coherence was measured using the 13-item Orientation to Life scale (Antonovsky, 1987). This consists of 13 questions scored on a 7-point scale and gives scores on the three aspects of sense of coherence: meaningfulness (4 items, e.g. “Doing the thing you do every day is... a source of deep pleasure and satisfaction...a source of pain and boredom”), manageability (4 items; e.g. “Has it happened that people whom you counted on disappointed you?”) and comprehensibility (5 items; e.g. “Do you have

the feeling that you are in an unfamiliar situation and don't know what to do?"). These are then summed to give an overall sense of coherence score out of 91.

### Physical health

Participants were asked whether or not they had ever experienced a number of specific illnesses and medical disorders. These included high blood pressure, high cholesterol, diabetes, heart problems, stroke, problems with blood circulation, thyroid disorders, leg cramps, arthritis, Parkinson's disease, dementia, cancer, depression, and any other health problem. Further details, including date of diagnosis, type of problem and any treatment, was requested where necessary. Multiple spaces were available for cardiovascular and cerebrovascular disorders, cancers and other health problems. The total number of health problems ever experienced was summed to provide an objective indicator of lifetime health status. Any non-current health problems that did not represent chronic conditions such as diabetes, asthma, or cardiovascular conditions were removed from this sum to give an objective measure of current health status.

Participants were also asked to list their current medications, and these were summed to give an alternative objective measure of health status. This was found to have only a moderate correlation (.4-.5) with the number of medical conditions.

### Self-rated health and physical functioning

The SF-36 is a well-validated measure of self-rated physical and mental health containing 36 items (Ware & Kosinski, 2001). After reversal of some items, scores are converted onto a 0-100 scale to create 8 scales (consisting of the mean of their respective items) thought to load onto two components (physical health and mental health): physical functioning (10 items), general health (5 items), role functioning/physical (4 items), and energy/fatigue (4 items), and emotional well-being

(5 items), social functioning (2 items), role functioning/emotional (3 items), and pain (2 items). The two additional items (“How would you rate your health?” and “How does your health compare to one year ago?”) are treated separately. A Principal Components Analysis of the 34 items comprising the 8 scales did not confirm this two-component structure. Therefore, the scales were entered separately into subsequent analyses.

For the purposes of this study, the single self-rated health item and the physical functioning scale were used as measures of self-rated physical health and functioning.

### Cortisol

As part of the home physical testing kit, participants were provided with three Salivette cortisol tubes (Sarstedt, Rommelsdorf, Germany). Participants were asked to provide three samples of saliva for cortisol analysis: one on waking, one 45 minutes later and one at 10pm later that same day. They were also asked to write down the times at which they took these samples.

On receipt, the Salivette tubes were centrifuged for 5 minutes at 3000rpm at 4 degrees before being frozen at -80°C. Cortisol levels were measured at the University of Dresden using a commercial immunoassay kit with chemiluminescence detection (IBL-Hamburg, Hamburg, Germany).

Several of the cortisol values were extremely high. Following the recommendation of Professor Clemens Kirschbaum (personal communication, September 1, 2014), cortisol values above 70 ug/ml were deemed to be outliers, as they are above the values obtained for 95% of the population, and were removed from subsequent analyses. The cortisol results of three participants whose pattern of results differed greatly from expected – for example, a low awakening level and high evening level – were removed from the



analysis as it was felt they either made an error in collection or an extraordinarily stressful event occurred on the day of collection, neither of which can be controlled for after the fact.

The resulting distributions of cortisol values were close to normal but with a negative skew. Raw values were therefore square root transformed. Spearman rank-order correlations suggested that this did not alter the shape of the data.

The cortisol awakening response was calculated as the standardised residual produced by regressing the square root transformed cortisol level from time 2 onto the same measure for time 1. The time interval between each of the three samples was calculated in hours.

Diurnal cortisol slope was calculated as the standardised residual produced by regressing the square root transformed cortisol level from time 3 onto the same measure from time 1 and covarying by the time between the two measures.

#### Subjective well-being

Life satisfaction. This was measured using the Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985), which contains 5 questions which participants are asked to read and with which they are asked to indicate their level of agreement or disagreement on a 7-point scale (from Strongly Agree to Strongly Disagree). This scale has well established psychometric properties as a stable indicator of the life satisfaction element of subjective well-being and yields a score out of 35, with higher scores indicating greater life satisfaction.

Mental well-being. Mental well-being was measured using the Warwick-Edinburgh Mental Well-being Scale (WEMWBS). This scale consists of 14 positively-worded items relating to well-being and was developed as a tool for monitoring mental well-being at a population level (Tennant et al., 2007). It attempts to capture all aspects of well-being, including affective-emotional, cognitive-evaluative and psychological. Participants were invited to read a series of statements relating to mental well-being and indicate which of 5 options best described their experience of each over the preceding 2 weeks. Responses were summed to produce a well-being score out of 70, with higher scores indicating greater mental well-being.

SF36 Mental Health. The Mental Health sub-scale of the SF-36 (Ware & Kosinski, 2001) was used as a third measure of subjective well-being. This consists of 5 items scored on a 6-point Likert-type scale. Scores on the subscale are calculated by converting raw scores onto a 0-100 scale and calculating the mean for the 5 items.

## Statistical analyses

All variables used in analyses were investigated for normality and adherence to parametric assumptions.

### Structure of well-being

Confirmatory factor analysis for the three individual scales – the WEMWBS, the SWLS, and the mental health scale of the SF-36 – was performed by structural equation modelling using maximum likelihood algorithms performed with Amos (Analysis of Movement Structures) version 19.0. The overall model fit was evaluated using the chi square statistic in combination with the root mean square error of approximation

(RMSEA) and the comparative fit index (CFI). For the RMSEA, values below .05 indicate a good fit and values between .05 and .08 are interpreted as acceptable fit (Browne & Cudeck, 1992). For the CFI, values greater than .90 were interpreted as good fit (Hu & Bentler, 1999). All 24 items from these three scales were then entered into two models. These tested whether the items represented a single underlying latent variable of well-being or two interrelated components of affective well-being and cognitive well-being. As the items are all on different scales, least mean squares algorithms were used for this analysis.

To reduce the number of outcome measures and therefore analyses conducted, Principal Components Analysis was performed to extract the first unrotated component from the 24 well-being items. Factor scores on this component for each participant were created using the regression method and used in subsequent analyses.

#### Occupational goals, early career experiences and well-being

All analyses relating to occupational goals and early career experiences were completed separately for males and females due to the discrepancy in career opportunities between the genders in the 1950s, when the 6-Day Sample members were entering the workforce (Carr, 1999). Bivariate correlations – Pearson's  $r$  for parametric data and Spearman's  $\rho$  for non-parametric data – were calculated between all continuous childhood and early career factors, participant's social class at 27 and in total, raw social mobility, psychological resources (anxiety, depression, resilience, optimism and sense of coherence) and the four well-being measures (WEMWBS, SWLS, SF-36 Mental Health and the well-being factor).

Independent sample t-tests or one-way ANOVAs were performed to compare scores on the four well-being measures and all dichotomous and categorical variables including school leaving control, ambitions held and met, goals changed, job control and social mobility category.

### Cortisol and well-being

Bivariate correlations were calculated between the square root transformed cortisol levels, cortisol awakening response, cortisol slope and the well-being and mood measures.

### Determinants of subjective well-being

Bivariate and point bi-serial correlations – either Pearson's  $r$  or Spearman's  $\rho$  – were carried out to investigate the associations between the background variables (including age, gender, IQ, father's social class, home environment, parental support, social mobility (up/down/same), teacher-rated personality, own social class and qualifications), current physical health and functioning (self-rated health, number of current medical conditions, number of medications and the SF-36 physical functioning scale), current mood (anxiety and depression), personality (IPIP five factors and optimism), resistance resources (resilience and sense of coherence), and the four subjective well-being outcome measures (WEMWBS, SWLS, SF-36 Mental Health scale and the well-being factor).

Next, hierarchical multiple regression analyses were conducted to identify the determinants of subjective well-being and identify the unique contribution made by each category of predictor. In order to reduce the number of variables entered into each model and thereby increase statistical power, only those variables identified as having a

significant correlation (below  $p < .001$ ) with the well-being factor were included. An exception was made where multiple variables measured the same underlying construct; for example total sense of coherence was entered instead of the three SOC components, and the current health conditions variable was entered to represent objective physical health. The well-being factor was entered as the dependent variable. Current physical health and functioning variables were entered in the first block, current anxiety and depression entered second, the Big Five personality factors entered third, and resilience, optimism and total sense of coherence were entered in the fourth block.

## **Results**

### Recruitment

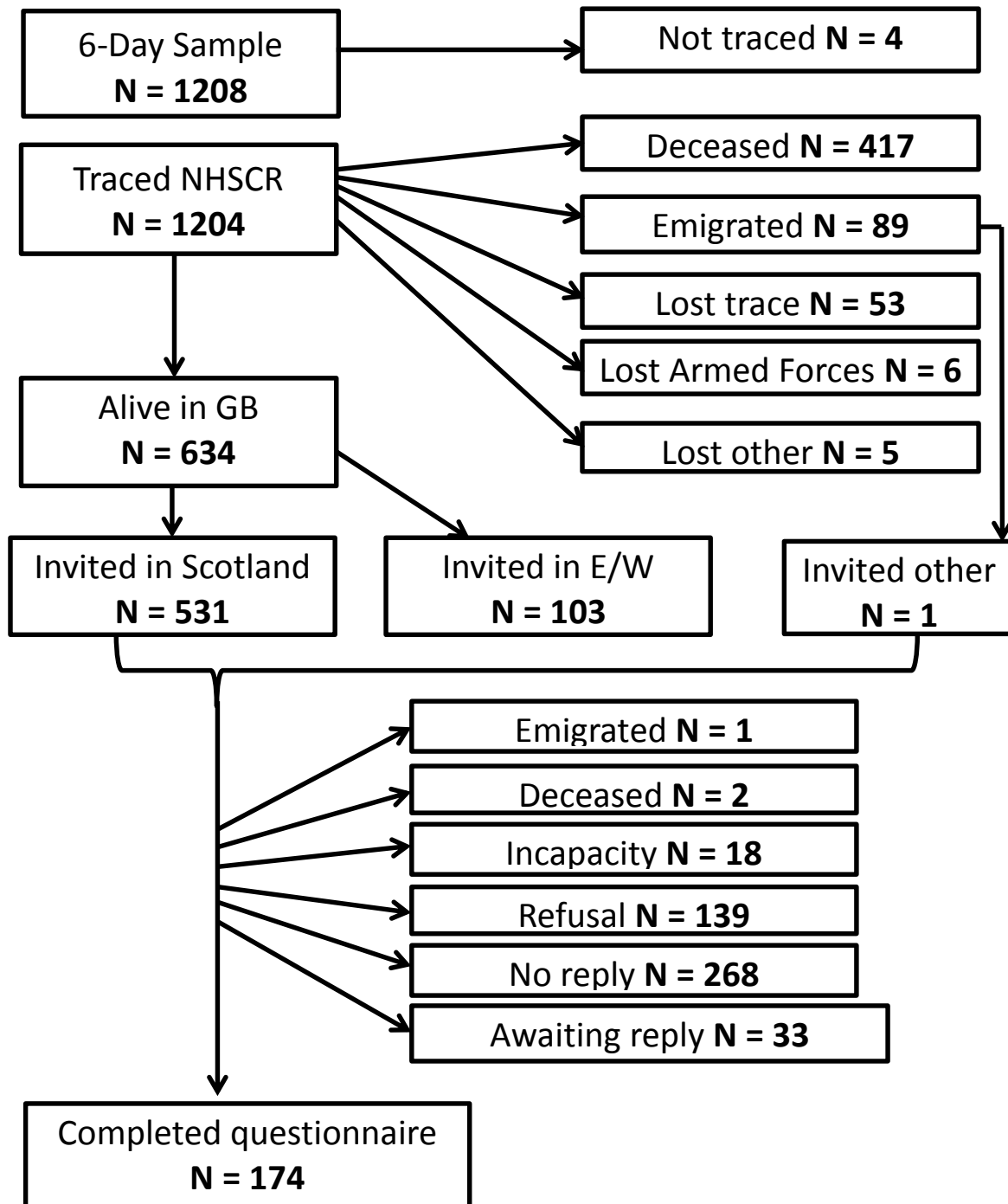
The recruitment process is summarised in the flowchart in Figure B1. In total, 634 invitation packs were sent to Sample members living in Scotland and England (none were living in Wales). One additional partial invitation pack – containing the study questionnaire and selected physical testing measures – was sent to a participant living in Australia who was the twin sister of a Scottish participant and also a 6-Day Sample member.

Two hundred and seventy-three (50.46%) participants responded to the initial invitation in Scotland and a further 70 (12.9%) responded following the reminder letter. In England 59 (65.35%) participants responded to the initial invitation and an additional 9 (8.9%) to the reminder. In total, 400 (63.09%) participants responded to the invitation either positively or negatively. 2 participants died during the recruitment phase and 1 emigrated. 174 (27.4%) participants returned a completed or partially completed questionnaire. Of the remaining respondents, 139 (21.89%) refused, 18 (2.83%) were lacking capacity and 33 (5.20%) responded positively but did not complete the questionnaire. Of the participants who refused, a small number expressed irritation at receiving the full invitation pack as the initial contact, opining that they would have been more likely to participate had they been invited by letter first. Unexpectedly, around 60 participants returned the invitation pack to the study team at their own expense. This perhaps reflects generational differences in attitudes to waste, and had this been anticipated the invitation letter would have discouraged it, or asked participants to request return postage. A number of participants who completed the

study expressed delight at having received the box, describing it as a 'box of tricks' that made them feel part of something special and unique.

Figure B1

Recruitment flowchart for the 6-Day Sample study





## Structure of well-being

Confirmatory factor analysis (CFA) was performed on each of the three well-being measures in turn. For the Satisfaction With Life Scale, the Comparative Fit Index (CFI) for the default model was .929, indicating a good fit, and the root mean square error of approximation (RMSEA) was .197, which is well above the level indicating an acceptable fit. The chi-square statistic was significant ( $\chi^2 = 37.833$ ,  $df = 5$ ,  $p < 0.001$ ), indicating that the data did not fit the model. Modification indices suggested that correlations between most of the individual items' error terms were needed to achieve a better model fit; however adding these correlations into the model rendered it unidentified and AMOS was unable to test its fit.

For the Warwick Edinburgh Mental Well-being Scale, the CFI was .842 suggesting an acceptable fit, the RMSEA was .105, suggesting a poor fit, and the chi-square statistic was again significant ( $\chi^2 = 221.561$ ,  $df = 77$ ,  $p < 0.001$ ), indicating that the data did not fit the model. Modification indices suggested adding correlations between several of the error terms might improve the model's fit, but these were not added in order to reduce the likelihood of over-fitting.

For the SF-36 Mental Health scale, the CFI was .942, the RMSEA was .113 and the chi-square statistic was significant, although at a lower level than the other two models ( $\chi^2 = 15.702$ ,  $df = 5$ ,  $p < 0.01$ ).

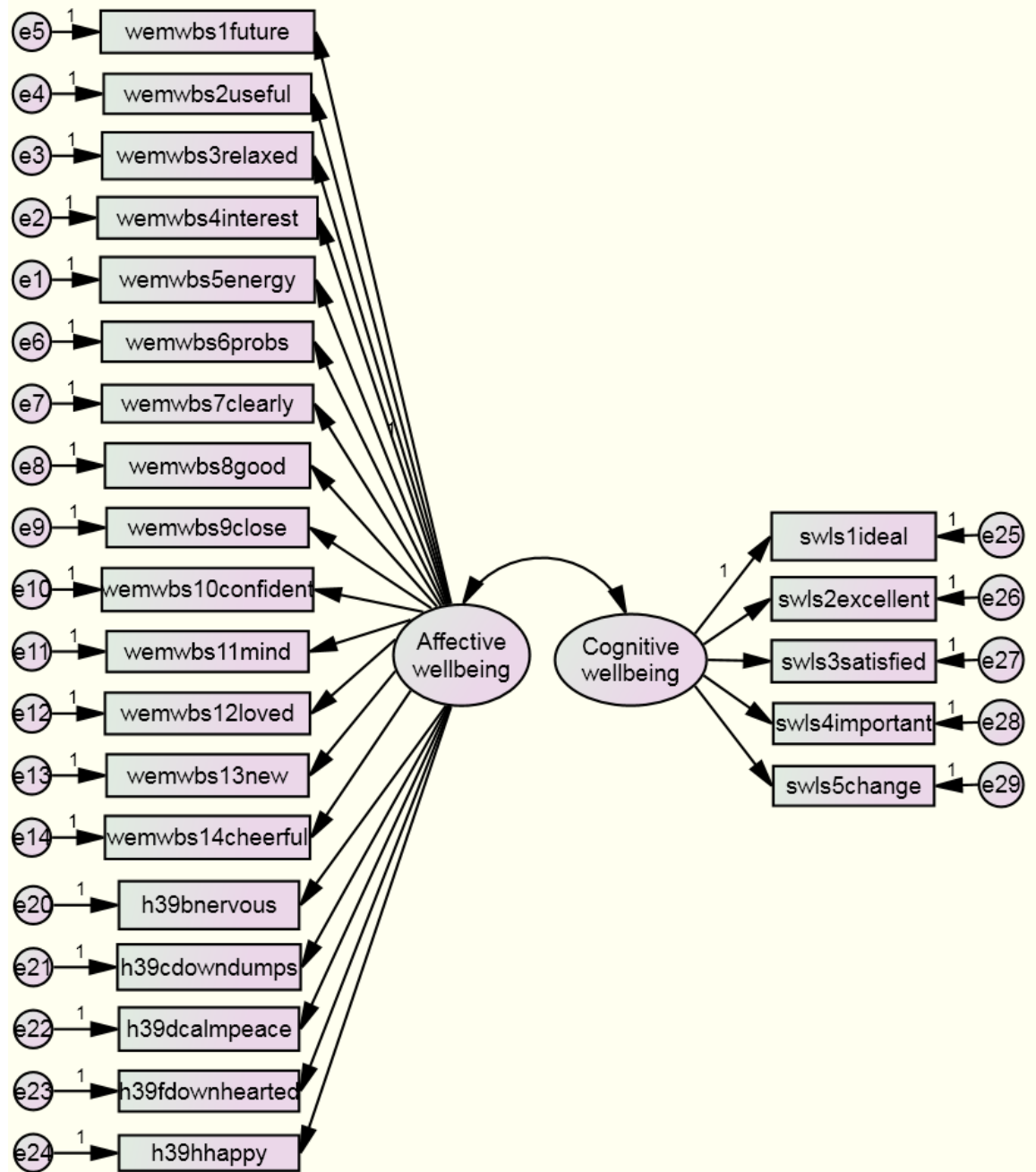
A model suggesting that all 24 items from the three well-being measures loaded onto a single latent well-being factor was tested but AMOS was unable to calculate either the CFI or RMSEA indices of model fit. The chi-square statistic was also not tested statistically but was

high ( $\chi^2 = 400.828$   $df = 252$ ), suggesting a very poor fit for the model. However, the goodness-of-fit (GFI) statistic was .939, suggesting a reasonable fit, and the Normed Fit Index (NFI) was .908, suggesting a marginally adequate fit (Bentler, 1992; Byrne, 2010).

To test the tripartite structure of well-being, CFA was conducted to test whether the 24 items loaded onto two latent well-being factors of affective well-being and cognitive well-being (the WEMWBS and SF36 mental health scales do not incorporate separate measurement of positive and negative affect). Like the single factor model, the chi-square statistic was high ( $\chi^2 = 209.783$ ,  $df = 251$ ). However, the GFI statistic was .968, and the NFI was .952, both suggesting a good fit (Byrne, 2010). This model is shown in Figure B2.

Figure B2

Structural Equation Model suggesting two latent factors of affective and cognitive well-being



Exploratory factor analysis of all 24 items from the three measures suggested the presence of five factors explaining 62.01% of the variance. The individual item loadings for these factors are shown in Table B4. The loadings did not follow the expected pattern: although the life satisfaction items loaded moderately highly onto the second factor, the pattern of loadings from the other items did not support the existence of separate affective and cognitive well-being factors. Therefore, the principal components analysis was performed again and scores on a single factor calculated for each participant using the regression method. These scores were used in subsequent analyses. The loadings of the 24 items onto this single well-being factor are shown in Table B5. This factor explained 34.35% of the variance in well-being in this sample. Although this is lower than the 62% explained by the five factors, their inclusion was not justified by the pattern matrix of factor loadings.

Table B4

Pattern matrix of factor loadings of 24 well-being items following Principal

Components Analysis

Scale	Item	Factor loadings					
		1	2	3	4	5	
Warwick	I've been feeling optimistic about my future	.466				.396	
Edinburgh	I've been feeling useful	.693					
Mental	I've been feeling relaxed	.605					
Well-being Scale	I've been feeling interested in other people	.467	-.302		.575		
	I've had energy to spare	.584					
	I've been dealing with problems well	.624					
	I've been thinking clearly	.639	-.349		-.306		
	I've been feeling good about myself	.691					
	I've been feeling close to other people	.528			.551		
	I've been feeling confident	.766					
	I've been able to make up my own mind about	.564	-.407				
	I've been feeling loved	.565			.454		
	I've been interested in new things	.537				.351	
	I've been feeling cheerful	.678					
	Satisfaction With Life Scale	In most ways my life is close to ideal	.702	.448	-.311		
		The conditions of my life are excellent	.643	.416			
I am satisfied with my life		.655	.545				
So far I have gotten the important things I want in		.561	.464				
If I could live my life again, I would change almost nothing		.489	.416	-.308		-.390	
SF36 Mental Health scale	Have you been a nervous person (reversed)	.489		.424		-.405	
	Have you felt so down in the dumps that nothing	.433		.625			
	Have you felt calm and peaceful	.557		.372			
How much of the time during the last 4 weeks...	Have you felt downhearted and low (reversed)	.475	.444	.476			
	Have you been a happy person	.494		.350		.318	
Total variance explained (%)		34.50	9.54	7.03	6.30	4.80	

Table B5

Factor loadings onto single well-being factor following Principal Components Analysis

Scale	Item	Factor loading
Warwick Edinburgh Mental Well-being Scale	I've been feeling optimistic about my future	.466
	I've been feeling useful	.693
	I've been feeling relaxed	.605
	I've been feeling interested in other people	.467
	I've had energy to spare	.584
	I've been dealing with problems well	.624
	I've been thinking clearly	.639
	I've been feeling good about myself	.691
	I've been feeling close to other people	.528
	I've been feeling confident	.766
	I've been able to make up my own mind about things	.564
	I've been feeling loved	.565
	I've been interested in new things	.537
	I've been feeling cheerful	.678
Satisfaction With Life Scale	In most ways my life is close to ideal	.702
	The conditions of my life are excellent	.643
	I am satisfied with my life	.655
	So far I have gotten the important things I want in life	.561
	If I could live my life again, I would change almost nothing	.489
SF36 Mental Health scale	Have you been a nervous person	.489
	Have you felt so down in the dumps that nothing could	.433
	Have you felt calm and peaceful	.557
How much of the time during the last 4 weeks...	Have you felt downhearted and low	.475
	Have you been a happy person	.494
Total variance explained		34.35%

### Goal attainment and early career factors

The highest qualification level achieved by men and women is shown in Table B6. To compare occupational attainment by gender and over time, occupational social class for participants' fathers, their own at age 27 and their own occupational social class by old age are shown for men and women in Table B7.

Table B6

Highest qualifications obtained by gender to old age

Qualification level	Males		Females	
	N	%	N	%
None	11	13.4	26	28.3
Standard grade, GSCE, ONC, etc.	39	47.6	35	38.0
Higher, A-level, HNC, etc.	4	4.9	3	3.3
Professional qualifications	11	13.4	20	21.7
Degree or higher	17	20.7	8	8.7

Table B7

Occupational social class of father, self at age 27, and self overall, and social mobility by gender

Occupational social class	Males (N = 82)			Females (N = 92)		
	Father N (%)	Age 27 N (%)	Ever N (%)	Father N (%)	Age 27 N (%)	Ever N (%)
I: Professional	4 (4.9)	17 (20.7)	15 (18.3)	6 (6.5)	1 (1.1)	3 (3.3)
II: Intermediate	16 (19.5)	18 (22.0)	36 (43.9)	12 (13.0)	25 (27.2)	40 (43.5)
III: Skilled	40 (48.8)	40 (48.8)	27 (32.9)	47 (51.1)	52 (56.5)	39 (42.4)
IV: Semi-skilled	8 (9.8)	5 (6.1)	3 (3.7)	16 (17.4)	12 (13.0)	5 (5.4)
V: Unskilled	11 (13.4)	1 (1.2)	0	10 (10.9)	2 (2.2)	3 (3.3)
Unknown	3 (3.7)	1 (1.2)	1 (1.2)	1 (1.1)	0	2 (2.2)
Moved up		45 (54.9)			43 (46.7)	
No movement		24 (29.3)			32 (34.8)	
Moved down		9 (11.0)			14 (15.2)	

Descriptive information for the background childhood variables is presented in Table B8.

Table B8

Means, etc. for the childhood variables

Variable	N	Range	Mean	Standard Deviation
Intelligence (Stanford Binet)	174	65-175	115.53	19.59
Father's social class	170	1-5	3.11	1.02
Years of full-time education	174	9.75-14.50	11.08	1.32
Number of jobs held to 18	153	1-9	2.16	1.33
Number of jobs held to 27	174	1-16	5.05	2.41
Social class aged 27	173	1-5	2.68	0.86
Social class total	171	1-5	2.42	0.81

Descriptive information for the variables collected in old age is presented in Table B9.

Table B9

Means, etc. for the older age variables

Category	Variable	N	Range	Mean	S.D.
Health	Number of health conditions ever	173	0-12	4.01	2.21
	Number of current health conditions	173	0-8	3.35	1.90
	Number of medications	173	0-13	4.16	3.05
	SF36 Physical Functioning scale	173	0-100	69.92	27.37
Mood	HADS anxiety	173	0-15	4.09	2.72
	HADS depression	174	0-15	3.29	2.56
Personality	IPIP Extraversion	172	14-50	32.31	6.74
	IPIP Agreeableness	168	24-50	40.99	4.96
	IPIP Conscientiousness	173	22-50	37.88	5.48
	IPIP Emotional Stability	171	22-50	36.43	6.35
	IPIP Intellect/Imagination	169	15-50	33.83	5.91
Resilience	Brief resilience scale	172	1-5	3.65	0.75
	Optimism (LOT-R)	174	4-24	17.48	4.01
	SOC: meaningfulness	173	12-28	22.53	3.62
	SOC: comprehensibility	171	6-35	26.15	4.65
	SOC: manageability	172	4-28	21.91	3.85
	Sense of Coherence total	170	35-91	70.65	10.20
Well-being	SF36 Mental Health scale	173	24-100	83.00	12.23
	WEMWBS	171	36-70	54.57	7.00
	SWLS	172	5-35	27.05	5.30

The correlations by gender between the early career measures, home environment, social class and the well-being measures, including current anxiety and depression and scores on the various psychological resources measures are shown in Table B10. In order to reduce the risk of a type I error – that is, falsely rejecting the null hypothesis of a correlation equal to 0 – a Bonferroni correction was applied. Following the recommendations of Morrison (1976) and Curtin and Schulz (1998), the  $\alpha$ -level for rejecting the null hypothesis and ascribing statistical significance was calculated by dividing the traditional  $\alpha$ -level of 0.05 by the number of correlations. Given that the correlations for men and women are independent, this was calculated using the number of correlations for each group. The  $\alpha$ -level applied for 210 correlations was, therefore,  $p < .000238$ .



For the women, none of the early career, early life, social class or social mobility measures were associated with any of the well-being measures. Marginally significant associations were found between higher years of education and higher optimism, and between a greater number of jobs held to 27 and higher resilience and stronger SOC comprehensibility, but none reached the Bonferroni  $\alpha$ -level of significance.

For the men, a different pattern emerged. The home environment factor was inversely associated with three of the well-being measures: WEMWBS, SWLS and the well-being factor. The number of jobs held to 27 was marginally inversely associated with SOC manageability. Social class at age 27 was marginally positively associated with both anxiety and depression in old age, suggesting that lower social class was related to higher levels of both. Both higher social class overall and social mobility were associated with greater scores on the resilience scale and on both the SOC comprehensibility dimension and SOC total score, but neither reached the Bonferroni  $\alpha$ -level of significance.

The results of the independent sample t-tests and one-way ANOVAs for all dichotomous and categorical variables can be found in Table B11 for men and B12 for women. For men, the only significant finding was that individuals with more control in their job reported higher WEMWBS scores ( $t=-2.113$ ,  $p=.038$ ). For women, a significant result was observed for goal change, with women whose goals were met between 15 and 18 reporting higher life satisfaction ( $F=3.259$ ,  $p=.025$ ), and a similar result observed for the well-being factor ( $F=2.803$ ,  $p=.045$ ). However, all of these results were significant at  $p<.05$  and did not survive correction for multiple comparisons.

Table B10

Correlations between occupational attainment factors, well-being and resilience resources. Women above diagonal, men below

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Father's social class	---	<b>-.356</b>	<b>-.382</b>	<b>-.240</b>	.123	.120	<b>.388*</b>	.203	<b>.681*</b>	-.112	.127	.090	-.030	-.090	.069	-.077	.013	<b>.227</b>	-.015	.066	.080
2. Home environment	<b>-.317</b>	---	<b>.815*</b>	.180	<b>-.261</b>	<b>-.255</b>	<b>-.338</b>	-.060	-.156	.170	-.173	-.042	.082	.001	-.002	.163	.075	-.115	-.150	-.054	-.159
3. Parents' attitude	<b>-.448</b>	<b>.749*</b>	---	.186	-.145	-.112	<b>-.273</b>	.002	<b>-.291</b>	.078	-.235	-.059	.025	.096	.173	.190	.140	-.116	.007	.014	-.034
4. Years education	<b>-.359</b>	<b>.282</b>	<b>.401</b>	---	<b>-.488*</b>	-.039	<b>-.530*</b>	<b>-.257</b>	.050	-.116	.000	-.036	<b>.223</b>	.131	.187	.203	.191	.131	.042	.025	.055
5. Jobs by 18‡	.143	-.286	-.289	<b>-.479*</b>	---	<b>.468*</b>	<b>.370</b>	.118	-.024	-.046	-.076	.160	-.030	.020	.004	-.025	.022	-.063	-.061	-.037	-.063
6. Jobs by 27‡	.180	.022	.039	<b>-.260</b>	<b>.578*</b>	---	-.078	-.052	.079	-.138	-.036	<b>.262</b>	.135	.091	<b>.226</b>	.034	.123	.097	.063	.017	.060
7. Social class 27	<b>.270</b>	-.104	-.226	<b>-.560*</b>	<b>.371</b>	.209	---	<b>.518*</b>	-.058	.044	.089	-.036	<b>-.215</b>	-.161	-.205	-.191	-.190	-.080	-.050	-.057	-.052
8. Social class total‡	.145	-.158	-.186	<b>-.249</b>	.135	-.005	<b>.477*</b>	---	<b>-.499*</b>	-.063	-.013	-.121	-.171	-.113	-.111	-.084	-.135	-.042	.055	-.118	-.007
9. Social mobility‡	<b>.762*</b>	-.137	-.243	-.219	.076	.136	-.016	<b>-.486*</b>	---	-.085	.152	.205	.135	.018	.167	-.025	.104	.182	-.072	.086	.034
10. HADS anxiety‡	.033	.025	.083	<b>-.237</b>	.114	.213	<b>.271</b>	.138	-.018	---	<b>.368</b>	-.253	<b>-.274</b>	<b>-.337</b>	<b>-.372</b>	-.259	<b>-.391*</b>	<b>-.619*</b>	<b>-.479*</b>	<b>-.306</b>	<b>-.566*</b>
11. HADS depression‡	-.062	.054	-.055	-.200	.114	.081	<b>.243</b>	.049	-.073	<b>.362</b>	---	<b>-.348</b>	<b>-.332</b>	<b>-.438*</b>	<b>-.278</b>	<b>-.343</b>	<b>-.390*</b>	<b>-.336</b>	<b>-.576*</b>	<b>-.461*</b>	<b>-.598*</b>
12. Resilience	.079	-.201	-.148	.047	-.113	-.028	-.188	<b>-.226</b>	.218	<b>-.333</b>	<b>-.468*</b>	---	<b>.416*</b>	<b>.327</b>	<b>.474*</b>	<b>.322</b>	<b>.431*</b>	<b>.385*</b>	<b>.442*</b>	<b>.358</b>	<b>.489*</b>
13. Optimism‡	.123	.105	.189	.076	-.178	-.117	-.216	-.098	.170	<b>-.300</b>	<b>-.554*</b>	<b>.511*</b>	---	<b>.437*</b>	<b>.419*</b>	<b>.376</b>	<b>.484*</b>	<b>.363</b>	<b>.510*</b>	<b>.298</b>	<b>.484*</b>
14. SOC meaning‡	.128	-.197	-.046	.107	-.130	.032	-.083	-.136	.199	<b>-.311</b>	<b>-.501*</b>	<b>.453*</b>	<b>.501*</b>	---	<b>.522*</b>	<b>.631*</b>	<b>.832*</b>	<b>.392*</b>	<b>.486*</b>	<b>.410*</b>	<b>.509*</b>
15. SOC comprehend	.127	-.090	-.049	.102	-.132	-.075	-.173	<b>-.244</b>	<b>.244</b>	<b>-.500*</b>	<b>-.328</b>	<b>.427*</b>	<b>.466*</b>	<b>.528*</b>	---	<b>.632*</b>	<b>.858*</b>	<b>.406*</b>	<b>.447*</b>	<b>.343</b>	<b>.475*</b>
16. SOC manage	.202	-.064	-.091	.130	-.170	<b>-.243</b>	-.156	-.175	.219	<b>-.434*</b>	-.285	<b>.306</b>	<b>.397*</b>	<b>.320</b>	<b>.694*</b>	---	<b>.882*</b>	<b>.447*</b>	<b>.405*</b>	<b>.452*</b>	<b>.484*</b>
17. SOC total	.167	-.158	-.054	.119	-.179	-.124	-.178	<b>-.244</b>	<b>.260</b>	<b>-.496*</b>	<b>-.425*</b>	<b>.474*</b>	<b>.555*</b>	<b>.711*</b>	<b>.925*</b>	<b>.813*</b>	---	<b>.512*</b>	<b>.537*</b>	<b>.495*</b>	<b>.600*</b>
18. SF36 Mental Health	.044	-.040	-.037	.149	-.052	-.070	-.210	-.183	.101	<b>-.530*</b>	<b>-.450*</b>	<b>.473*</b>	<b>.363</b>	<b>.357</b>	<b>.529*</b>	<b>.420*</b>	<b>.538*</b>	---	<b>.517*</b>	<b>.487*</b>	<b>.723*</b>
19. WEMWBS	.173	<b>-.281</b>	-.139	.106	-.034	-.008	-.152	-.077	.206	<b>-.387</b>	<b>-.623*</b>	<b>.391</b>	<b>.544*</b>	<b>.625*</b>	<b>.473*</b>	<b>.377</b>	<b>.574*</b>	<b>.519*</b>	---	<b>.503*</b>	<b>.923*</b>
20. SWLS	.129	<b>-.310</b>	-.179	-.017	-.072	-.072	-.148	-.025	.142	-.162	<b>-.427*</b>	<b>.353</b>	<b>.399*</b>	<b>.417*</b>	<b>.427*</b>	<b>.499*</b>	<b>.553*</b>	<b>.429*</b>	<b>.504*</b>	---	<b>.747*</b>
21. Well-being factor	.180	<b>-.287</b>	-.145	.101	-.085	-.052	-.189	-.087	.209	<b>-.373</b>	<b>-.647*</b>	<b>.475*</b>	<b>.555*</b>	<b>.634*</b>	<b>.551*</b>	<b>.530*</b>	<b>.666*</b>	<b>.680*</b>	<b>.939*</b>	<b>.739*</b>	---

‡Spearman's rho is shown for these variables in both genders

P value following Bonferroni correction for 210 comparisons per gender = .000238; **Bold** = .05 > p > .000238; **Bold\*** = p < .000238

Table B11

Results of t-tests and one-way ANOVAs comparing well-being by goal and job categories: men

Measure	Group	N	SF-36 MH		WEMWBS		SWLS		Well-being factor	
			Mean (sd)	t/F (p)	Mean (sd)	t/F (p)	Mean (sd)	t/F (p)	Mean (sd)	t/F (p)
School leaving control	No	9	82.22 (16.14)	.174 (.841)	55.11 (12.03)	.070 (.932)	27.22 (6.82)	.058 (.944)	.06 (1.67)	.052 (.949)
	Yes	30	83.59 (10.60)		54.03 (7.33)		27.07 (5.24)		-.06 (1.0)	
	No reason given	12	85.33 (12.69)		54.67 (6.30)		26.50 (5.04)		.02 (.99)	
Had ambition?	Yes	72	84.62 (10.87)	-.838 (.404)	54.77 (7.53)	.092 (.927)	26.99 (5.39)	1.260 (.211)	.04 (1.03)	.330 (.742)
	No	10	81.60 (8.88)		55.00 (4.88)		29.20 (3.49)		.15 (.70)	
Ambitions met?	Not met	24	82.67 (12.30)	.648 (.586)	53.67 (9.24)	1.665 (.181)	25.79 (6.00)	2.002 (.121)	-.14 (1.18)	1.412 (.246)
	Met	35	85.41 (11.14)		56.65 (6.52)		28.29 (5.18)		.29 (.99)	
	Exceeded	13	86.15 (6.85)		51.92 (5.39)		25.69 (4.11)		-.25 (.71)	
	None given	10	81.60(8.88)		55.00 (4.88)		29.20 (3.49)		.15 (.70)	
Goals changed?	No	6	82.00 (17.84)	.314 (.815)	50.67 (3.93)	.801 (.497)	25.83 (5.81)	.160 (.923)	-.44 (.89)	.575 (.633)
	Yes	33	84.48 (10.99)		54.72 (8.28)		27.36 (6.12)		.06 (1.18)	
	Goal met	11	86.80 (10.34)		56.09 (8.61)		27.55 (3.56)		.18 (1.03)	
	No goal stated	32	83.63 (9.05)		55.22 (5.99)		27.31 (4.76)		.11 (.80)	
Job control	No control	14	81.14 (12.79)	- 1.203 (.233)	51.07 (6.72)	-2.113 (.038)	26.29 (5.03)	-.780 (.438)	-.38 (.95)	-1.852 (.068)
	Control	67	84.90 (10.13)		55.45 (7.11)		27.49 (5.31)		.15 (.99)	
Social mobility	Moved down	9	79.11 (13.38)	2.615 (.080)	49.63 (7.65)	2.640 (.078)	25.78 (6.94)	.665 (.517)	-.64 (1.20)	2.911 (.061)
	No movement	24	82.00 (13.08)		54.29 (7.52)		27.04 (5.64)		-.04 (1.12)	
	Moved up	45	86.49 (8.28)		55.87 (6.89)		27.89 (4.76)		.24 (.87)	

Table B12

Results of t-tests and one-way ANOVAs comparing well-being by goal and job categories:

women

Measure	Group	N	SF-36 MH		WEMWBS		SWLS		Well-being factor	
			Mean (sd)	t/F (p)	Mean (sd)	t/F (p)	Mean (sd)	t/F (p)	Mean (sd)	t/F (p)
School leaving control	No	21	81.33 (13.41)	.668 (.516)	53.70 (5.89)	.784 (.460)	25.95 (5.92)	.695 (.502)	-.19 (.91)	1.021 (.365)
	Yes	40	81.17 (13.48)		53.61 (6.34)		26.93 (5.24)		-.13 (.95)	
	No reason given	12	86.00 (10.99)		56.25 (8.45)		28.33 (5.93)		.28 (1.13)	
Had ambition?	Yes	68	82.59 (11.82)	-.810 (.420)	54.94 (7.18)	-1.441 (.153)	26.94 (5.16)	-.229 (.819)	.02 (1.00)	-1.121 (.265)
	No	24	80.00 (17.38)		52.55 (5.32)		26.64 (6.21)		-.26 (1.04)	
Ambitions met?	Not met	16	84.00 (10.33)	.754 (.523)	54.81 (8.70)	1.199 (.315)	25.50 (5.28)	.521 (.669)	-.06 (1.22)	.782 (.507)
	Met	44	83.09 (11.98)		55.48 (6.56)		27.32 (5.31)		.10 (.90)	
	Exceeded	8	77.00 (13.65)		52.25 (7.52)		27.75 (3.92)		-.29 (1.06)	
	None given	24	80.00 (17.38)		52.55 (5.32)		26.64 (6.21)		-.26 (1.04)	
Goals changed?	No	6	77.33 (11.50)	.428 (.733)	48.33 (6.98)	2.040 (.114)	21.67 (5.39)	3.259 (.025)	-1.04 (1.10)	2.803 (.045)
	Yes	30	81.03 (16.07)		54.60 (7.46)		26.80 (5.99)		-.05 (1.14)	
	Goal met	18	84.00 (8.89)		56.11 (5.21)		29.22 (3.52)		.30 (.66)	
	No goal stated	37	82.38 (13.38)		54.28 (6.65)		26.61 (5.16)		-.06 (.94)	
	Job control	No control	51	81.85 (13.24)	-.052 (.958)	53.77 (6.55)	-.657 (.513)	26.42 (4.67)	-.560 (.577)	-.13 (.92)
	Control	36	82.00 (14.07)		54.74 (7.10)		27.09 (6.36)		-.00 (1.13)	
Social mobility	Moved down	14	79.43 (15.44)	.621 (.540)	55.43 (8.73)	.346 (.708)	25.93 (5.81)	.208 (.813)	-.06 (1.26)	.017 (.983)
	No movement	32	81.38 (11.02)		54.55 (5.71)		27.06 (5.01)		-.03 (0.86)	
	Moved up	43	83.72 (14.62)		53.74 (7.04)		26.79 (5.74)		-.08 (1.07)	

## Stress reactivity: Cortisol

The means, etc. for the cortisol measures are shown in Table B13. Contrary to previous research, the cortisol awakening response was found to have a mean close to 0 and a median of -.40, suggesting that cortisol levels actually decreased in around half the participants. The diurnal slope followed a more expected pattern with a negative mean and median, suggesting that most participants' levels fell during the day.

The correlations between the cortisol measures and the outcome measures are shown in Table B14. The only significant correlation at the Bonferroni-corrected  $\alpha$ -level ( $p < .00076$ ) suggested that a greater cortisol awakening response was associated with lower current depression.

Table B13

Means, etc. for the raw (non-transformed) cortisol measures

	N	Minimum	Maximum	Mean	Median	Standard. Deviation
Cortisol time 1	149	0.75	69.73	24.54	22.62	12.00
Cortisol time 2	148	3.63	65.28	25.76	23.18	11.49
Cortisol time 3	148	0.74	46.82	4.56	3.48	4.59
Time (in hours) between cortisol 1 and 2	149	0.67	4.75	0.82	0.75	0.40
Time (in hours) between cortisol 2 and 3	149	1.17	16.75	13.38	13.25	1.53
Time (in hours) between cortisol 1 and 3	149	12.00	17.58	14.28	14.00	1.09
Cortisol awakening response - raw figure	145	-29.58	40.00	0.69	-0.40	13.23
Cortisol slope: raw: time 3 - time 1	144	-57.67	0.37	-20.14	-18.32	11.50
Cortisol slope adjusted for time	144	-51.91	0.38	-20.27	-18.29	11.52

Table B14

Correlations between the cortisol variables and the well-being measures

Measure	1	2	3	4	5	6	7	8	9	10	11
1. Cortisol time 1 sqrt	---										
2. Cortisol time 2 sqrt	<b>.348*</b>	---									
3. Cortisol time 3 sqrt	<b>.246</b>	.204	---								
4. Mean cortisol	<b>.775*</b>	<b>.750*</b>	<b>.454*</b>	---							
5. CAR (residualised)	.000	<b>.938*</b>	.127	<b>.514*</b>	---						
6. Slope (residualised and controlled for time)	.120	.177	<b>.990*</b>	<b>.383*</b>	.145	---					
7. HADS anxiety	-.120	-.139	-.015	-.146	-.147	.026	---				
8. HADS depression	-.092	-.168	-.008	-.157	.175	-.006	<b>.331*</b>	---			
9. SF36 Mental Health	.134	.160	.035	.125	.157	.022	<b>-.608*</b>	<b>-.508*</b>	---		
10. WEMWBS	-.022	.013	.021	-.042	.033	-.011	<b>-.428*</b>	<b>-.596*</b>	<b>.513*</b>	---	
11. SWLS	.047	.124	.002	.054	.121	-.028	<b>-.286*</b>	<b>-.485*</b>	<b>.462*</b>	<b>.504*</b>	---
12. Well-being factor	.023	.083	.017	.011	.097	-.015	<b>.515*</b>	<b>-.651*</b>	<b>.703*</b>	<b>.929*</b>	<b>.744*</b>

Note. P value for statistical significance following Bonferroni correction for 66 comparisons = .00076. **Bold** = .05 > p > .00076; **Bold\*** = p < .00076. sqrt = Square Root

## Determinants of subjective well-being

Descriptive information for all the childhood variables is shown in Tables B6 to B8, and for the old age variables in Table B9.

The bivariate and point bi-serial correlations between all the predictor and outcome measures included in this analysis are shown in Table B15. Applying the Bonferroni correction gave an  $\alpha$ -level of  $p < .00014$ . The strongest correlations were between the four well-being measures and the psychological resources of resilience, optimism and sense of coherence. Amongst the life course factors, social class showed moderate to strong associations with intelligence and, understandably, father's social class and social mobility; type of qualification was associated with intelligence, father's and own social class, and parental support and home environment were strongly associated (.795). The three current health measures – conditions, self-rated health and SF-36 physical functioning – were all intercorrelated, and all showed moderate to strong correlations with all four measures of subjective well-being. Self-rated health was correlated with current anxiety and depression, and physical functioning with depression only. Current symptoms of anxiety and depression both showed moderate to strong negative associations with the psychological resources of resilience, optimism and sense of coherence, and the four well-being measures; higher scores on these resources were associated with lower levels of anxiety and depression. However, different patterns of associations were observed with the Big Five personality traits – anxiety was strongly associated with emotional stability, while depression had moderate associations with conscientiousness and emotional stability. Resilience, optimism and sense of coherence all showed moderate to strong positive associations with the Big Five personality traits although the correlation between resilience and agreeableness did



not survive Bonferroni correction. Of the personality traits, emotional stability was strongly positively associated with all four well-being measures. All five factors were associated with WEMWBS scores and extraversion was positively associated with SF-36 mental health. The teacher-rated personality measure was not significantly correlated with any of the measures collected in childhood or old age.

Table B15 Correlations between predictor and outcome variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1. Age in years	---																										
2. Gender	<b>-.215</b>	---																									
3. IQ age 11	.109	-.100	---																								
4. Father's social class $\neq$	-.117	<b>.208</b>	<b>-.441*</b>	---																							
5. Home environment	.021	<b>-.187</b>	<b>.306</b>	<b>-.211</b>	---																						
6. Parental support	.012	<b>-.266</b>	<b>.301</b>	<b>-.233</b>	<b>.795*</b>	---																					
7. Social mobility $\neq$	-.011	-.096	.054	-.086	-.122	<b>-.204</b>	---																				
8. Own social class $\neq$	<b>-.203</b>	<b>.219</b>	<b>-.383*</b>	<b>.543*</b>	-.135	-.128	<b>-.509*</b>	---																			
9. Qualifications $\neq$	.068	<b>-.151</b>	<b>.588*</b>	<b>-.609*</b>	<b>.271</b>	<b>.213</b>	<b>.158</b>	<b>-.523*</b>	---																		
10. Teacher's rating of personality	<b>-.150</b>	<b>.160</b>	<b>-.172</b>	.035	-.026	-.008	.054	-.008	-.022	---																	
11. Current health conditions $\neq$	-.104	.079	<b>-.255</b>	<b>.254</b>	.046	.023	-.047	.119	<b>-.244</b>	.045	---																
12. Self-rated health	-.072	-.037	<b>-.183</b>	<b>.248</b>	-.145	-.131	.032	.072	<b>-.202</b>	.017	<b>.356*</b>	---															
13. SF36 physical functioning $\neq$	-.015	-.067	.069	<b>-.198</b>	.071	.153	-.020	-.036	<b>.177</b>	-.020	<b>-.312*</b>	<b>-.563*</b>	---														
14. HADS anxiety $\neq$	-.099	.075	<b>-.275</b>	<b>.161</b>	.079	.036	-.043	.060	<b>-.157</b>	.036	<b>.193</b>	<b>.363*</b>	<b>-.207</b>	---													
15. HADS depression $\neq$	-.084	-.050	-.077	<b>-.154</b>	-.063	-.164	-.047	.013	-.114	-.024	<b>.199</b>	<b>.469*</b>	<b>-.470*</b>	<b>.355*</b>	---												
16. IPIP Extraversion	.067	.011	<b>.207</b>	<i>-.154</i>	.114	.156	<i>.154</i>	-.130	.114	-.060	-.024	<b>-.219</b>	.139	-.085	<b>-.266</b>	---											
17. IPIP Agreeableness	-.108	<b>.266</b>	.063	-.050	.030	.018	.203	-.093	.082	.065	.116	-.105	-.030	.018	<b>-.160</b>	<b>.286</b>	---										
18. IPIP Conscientiousness	.031	<b>-.172</b>	-.131	-.091	-.063	.055	.150	-.086	-.028	-.109	-.017	<b>-.218</b>	<b>.253</b>	-.076	<b>-.318*</b>	<b>.150</b>	<b>.306</b>	---									
19. IPIP Emotional Stability	-.054	-.091	<b>.271</b>	<b>-.188</b>	.042	.151	<b>.167</b>	<b>-.164</b>	<b>.243</b>	.069	-.138	<b>-.295*</b>	<b>.225</b>	<b>-.528*</b>	<b>.307*</b>	<b>.236</b>	<b>.208</b>	<i>.185</i>	---								
20. IPIP Intellect	.031	<b>-.179</b>	<b>.451*</b>	<b>-.264</b>	.169	<b>.199</b>	.016	<b>.181</b>	<b>.420*</b>	-.111	-.030	<i>.183</i>	.114	-.089	-.135	<b>.370*</b>	<b>.254</b>	<b>.201</b>	<b>.248</b>	---							
21. Resilience	.042	-.103	.122	.138	.098	-.063	<b>.206</b>	<b>-.192</b>	.130	-.074	-.072	<b>-.323*</b>	<b>.246</b>	<b>-.300*</b>	<b>-.397*</b>	<b>.342*</b>	<b>.214</b>	<b>.310*</b>	<b>.510*</b>	<b>.229</b>	---						
22. Optimism $\neq$	-.050	-.072	<b>.227</b>	<b>-.200</b>	.120	.144	<i>.173</i>	<b>-.159</b>	<b>.234</b>	.011	-.091	<b>-.434*</b>	<b>.301*</b>	<b>-.290*</b>	<b>-.428*</b>	<b>.350*</b>	<b>.348*</b>	<b>.449*</b>	<b>.486*</b>	<b>.230</b>	<b>.462*</b>	---					
23. Sense of Coherence	.095	.005	<b>.192</b>	<b>-.186</b>	-.004	.089	.118	<b>-.182</b>	<b>.175</b>	.097	<b>.249</b>	<b>-.343*</b>	<b>.246*</b>	<b>-.444*</b>	<b>-.405*</b>	<i>.186</i>	<b>.389*</b>	<b>.293*</b>	<b>.487*</b>	.134	<b>.449*</b>	<b>.511*</b>	---				
24. WEMWBS	.100	-.032	.110	-.124	<b>-.206</b>	-.051	.051	-.026	.079	-.025	<b>-.192</b>	<b>.450*</b>	<b>.352*</b>	<b>-.434*</b>	<b>-.598*</b>	<b>.352*</b>	<b>.322*</b>	<b>.426*</b>	<b>.456*</b>	<b>.296*</b>	<b>.417*</b>	<b>.532*</b>	<b>.555*</b>	---			
25. SWLS	.122	-.037	.029	<b>-.151</b>	-.151	-.041	.053	-.074	.110	-.091	<b>-.218*</b>	<b>-.356*</b>	<b>.198</b>	<b>-.226</b>	<b>-.435*</b>	<b>.257</b>	.094	<b>.209</b>	<b>.284*</b>	.130	<b>.357*</b>	<b>.340*</b>	<b>.520*</b>	<b>.504*</b>	---		
26. SF36 Mental Health	.028	-.095	<b>.178</b>	<b>-.209</b>	-.058	-.043	<b>.176</b>	-.129	.118	.066	<b>-.238</b>	<b>-.347*</b>	<b>.340*</b>	<b>-.584*</b>	<b>-.384*</b>	<b>.269*</b>	.097	.147	<b>.561*</b>	.135	<b>.422*</b>	<b>.360*</b>	<b>.515*</b>	<b>.513*</b>	<b>.462*</b>	---	
27. Well-being factor	.115	-.053	.120	-.150	<b>.201</b>	-.059	.105	-.064	.104	-.034	<b>-.259*</b>	<b>-.485*</b>	<b>.230</b>	<b>-.473*</b>	<b>-.623*</b>	<b>.374*</b>	<b>.242</b>	<b>.373*</b>	<b>.516*</b>	<b>.247</b>	<b>.484*</b>	<b>.520*</b>	<b>.630*</b>	<b>.929*</b>	<b>.744*</b>	<b>.703*</b>	

Note.  $\neq$  Spearman's Rho is shown for these non-parametric variables. P value for statistical significance following Bonferroni correction for 351 comparisons = .00014. **Bold** = .05>p>.00014; **Bold\*** = p<.00014

The results of the four steps of the hierarchical multiple regression model with the well-being factor as the dependent variable and the prospective variables of physical health and functioning, current mood, Big Five personality factors and psychological resources entered as predictors is shown in Table B16. Casewise diagnostics identified 1 outlier, representing 1 participant whose well-being factor score was more than 3 standard deviations above the value predicted by the model. Removal of this outlier improved the fit of the final model (adjusted  $R^2 = .679$  versus  $.644$ ) and significantly altered the contributions of individual predictors. Specifically, the contributions of conscientiousness and emotional stability were greater in the second model and intellect/imagination considerably lower. This outlier was, therefore, removed from all subsequent analysis. The final model explained 67.9% of the variance in well-being ( $F(13, 142) = 26.205, p < .001$ ). Each step contributed unique variance although the contributions of the individual predictors varied. Self-rated health was significantly associated with well-being at the first step, but this association was attenuated to non-significance at the second step, when current anxiety and depression were entered. Both mood variables remained significantly associated with well-being throughout. Of the Big Five factors, conscientiousness and emotional stability were significantly associated with well-being at the  $p < .01$  level and extraversion at the  $p < .05$  level, however all three associations were attenuated to the  $p < .05$  level at the fourth step. Only sense of coherence reached significance at the fourth step with resilience and optimism both contributing very little additional variance. Overall, the physical health and functioning variables contributed 23.8% of the variance in well-being, current mood an additional 31.2%, Big Five personality factors 11.1% and psychological resources (almost entirely due to sense of coherence) 3.1%. The final model suggests that well-being in this group of older adults is largely explained by current depression, sense of coherence, and current anxiety, with a small amount of additional variance explained by

conscientiousness, extraversion and emotional stability. Interestingly, despite together contributing 23.8% of the variance in well-being, none of the physical health measures contributed significantly to the final model after mood, personality and psychological resources had been added.

Table B16

Results of the hierarchical regression analysis with well-being factor as dependent variable

Step	1				2				3				4			
	Beta	SE Beta	$\beta$	p	Beta	SE Beta	$\beta$	p	Beta	SE Beta	$\beta$	p	Beta	SE Beta	$\beta$	p
Current health conditions	-.058	.042	-.110	.164	-.034	.032	-.064	.291	-.050	.028	-.094	.082	-.027	.028	-.050	.347
SF36 physical functioning	.005	.003	.146	.106	-.004	.003	-.112	.130	-.004	.002	-.107	.105	-.003	.002	-.090	.164
Self-rated health	<b>-.378</b>	<b>.100</b>	<b>-.341</b>	<b>.000</b>	-.111	.081	-.100	.175	-.015	.073	-.013	.838	-.004	.073	-.003	.960
HADS anxiety					<b>-.130</b>	<b>.023</b>	<b>-.351</b>	<b>.000</b>	<b>-.103</b>	<b>.023</b>	<b>-.278</b>	<b>.000</b>	<b>-.079</b>	<b>.023</b>	<b>-.213</b>	<b>.001</b>
HADS depression					<b>-.219</b>	<b>.029</b>	<b>-.516</b>	<b>.000</b>	<b>-.184</b>	<b>.027</b>	<b>-.433</b>	<b>.000</b>	<b>-.157</b>	<b>.028</b>	<b>-.372</b>	<b>.000</b>
IPIP Extraversion									<i>.018</i>	<i>.008</i>	<i>.122</i>	<i>.024</i>	<i>.020</i>	<i>.008</i>	<i>.130</i>	<i>.018</i>
IPIP Agreeableness									.011	.011	.052	.325	-.002	.011	-.007	.892
IPIP Conscientiousness									<b>.031</b>	<b>.010</b>	<b>.167</b>	<b>.002</b>	<i>.025</i>	<i>.010</i>	<i>.136</i>	<i>.010</i>
IPIP Emotional Stability									<b>.030</b>	<b>.010</b>	<b>.186</b>	<b>.002</b>	<i>.022</i>	<i>.010</i>	<i>.137</i>	<i>.033</i>
IPIP Intellect/Imagination									.014	.009	.079	.139	.015	.009	.086	.094
Brief Resilience Scale													-.008	.086	-.005	.930
Optimism (LOT-R)													.010	.016	.041	.537
Sense of Coherence													<b>.024</b>	<b>.007</b>	<b>.226</b>	<b>.001</b>
R <sup>2</sup> change				<b>.253*</b>				<b>.312*</b>				<b>.111*</b>				<b>.031</b>
Adjusted R <sup>2</sup>				<b>.238*</b>				<b>.550*</b>				<b>.653*</b>				<b>.679*</b>

Note. SE = Standard Error. Italics = p&lt;.05; Bold = p&lt;.01; Bold\* = p&lt;.001

## **Discussion**

This study is uniquely placed to investigate social, psychological, and biological influences across the life course on subjective well-being in old age. The combination of detailed demographic information, estimates of personality, career aspirations and attitudes from early adulthood and equally detailed measures of demography, personality, mood, health, attitudes and subjective well-being, and cortisol in old age is unusual in the research literature.

### **Structure of well-being**

This study includes three separate measures of subjective well-being designed to measure both the affective and cognitive appraisal aspects of well-being. Confirmatory factor analysis of the three measures produced mixed results. The Satisfaction With Life Scale and the SF36 Mental Health scale both produced models with acceptable fit to the data, while the Warwick Edinburgh Mental Well-being Scale showed a poor fit. None of the models met all the criteria for a good fit. This is largely in keeping with previous research. Lloyd and Devine (2012) investigated the psychometric properties of the WEMWBS and achieved similar fit indices in their confirmatory factor analysis. A study investigating change in life satisfaction in old age demonstrated slightly better fit using confirmatory factor analysis at various time points across 8 years, however the authors also note that modification indices suggested correlations between several of the individual items of the SWLS scale (Gana, Bailly, Saada, Joulain & Alaphilippe, 2013).

A model proposing that all 24 items from the three measures loaded onto a single latent variable of well-being was only a marginally acceptable fit to the data. However, a model testing the tripartite view of well-being (albeit with positive and negative affect

within the same latent variable) was found to have a good fit to the data, suggesting that the 24 items loaded onto two interrelated components of well-being: WEMWBS and SF36 mental health scale items onto affective well-being and the five SWLS items onto cognitive well-being.

Exploratory factor analysis suggests the presence of five factors collectively explaining 62% of the variance. However, the pattern matrix of factor loadings did not support any of the suggested models of subjective well-being and this solution was rejected. The first factor was found to explain 34.5% of the variance and the pattern matrix suggested that all 24 items loaded at at least the .4 level (range .433-.766) onto this factor. The study therefore suggests that these three measures can be combined to give a measure of well-being which encompasses both affective and cognitive aspects of the construct.

## Occupational goals

The present study found little evidence for an influence of early career factors on subjective well-being in old age. In particular, neither the non-attainment of early occupational goals nor the lack of occupational goals in early adulthood were significantly associated with any of the measures of well-being in either gender. There are a number of potential explanations for this null finding.

First, this part of the study utilised secondary analysis of data collected in the 1950s. The aim of the original 6-Day Sample study was to investigate the influence of intelligence on subsequent educational and occupational attainment; the attainment of occupational goals was not the main focus and therefore the questions asked were quite simple in nature. The majority of research into the importance of goal setting, self-

efficacy and goal dis-engagement and re-engagement has taken place since the 1950s, and questions around these aspects of occupational goals would not have been asked. In addition, it is difficult to tell from the data available how these questions were asked of Sample members at age 15-18, if they were asked at all. In some cases it may be that parents answered the questions on behalf of their children. Even if Sample members answered themselves, if this was done in the presence of their parents, or if the home visitor role was fulfilled by their headteacher, they may have felt pressure to give socially desirable responses.

Second, 6-Day Sample members who participated in the follow-up study were self-selected and may have been more likely to have met their goals than those who were invited but did not participate. An analysis of the differences between these two groups showed that 39.0% of follow-up study participants met their occupational goals by age 27, compared to 6.8% of those who chose not to participate or did not respond to the invitation. Further, only 34.3% of those taking part had not stated any occupational goals in early adulthood, compared to 84.6% of those not taking part. The follow-up study participants were certainly not representative of the 6-Day Sample in terms of occupational goal attainment; this may reflect differences in functioning between individuals setting and/or meeting or not setting and/or meeting occupational goals – supporting the findings of previous research of a deleterious effect of not meeting or stating occupational goals – or it may be that individuals who did not meet their goals did not wish to take part and be reminded of their perceived ‘failure’ by answering questions about their occupation and education. Either way, the results of the study may have been attenuated by this lack of representativeness.



Despite these limitations, the study did find some interesting associations. Amongst women, there was a significant association between goal change and life satisfaction and overall well-being. Individuals whose occupational goals had already been met by the age of 18 reported higher well-being than those who had either not stated any goals or who had changed their goals (presumably in response to goal failure), and these individuals in turn had higher well-being than individuals whose goals had not been met and had not been changed. This is in keeping with previous research which has found that goal disengagement and re-engagement are important aspects of early career experiences, and are protective of well-being. In addition, social norms in the 1950s meant that women were expected to leave the workplace following marriage or childbirth, with the result that few women were able to pursue careers (Carr, 1999). The cultural and social expectations were that girls' main interests would lie in domestic pursuits rather than careers, with the result that most girls left school at the leaving age in order to take low-skill, low-paid jobs in factories or shops until marriage (Gaskell, 1983; O'Connor & Goodwin, 2005; Spencer, 2005). Indeed, amongst the 6-Day Sample, few of the girls expressed career-related goals and several stated their goal as "to find a husband". A small number of women went on to further education or to develop a career; generally these were the more academically gifted women from more privileged backgrounds. It is reasonable to surmise, therefore, that girls who adjusted their career aspirations in accordance with societal expectations and pressures beyond their control would experience lower levels of stress and higher well-being than those who continued to pursue 'unattainable' goals. This theory fits with Spencer's (2005) account of the experiences of women leaving school in the 1950s. She emphasises the importance to these women of fitting life as it was, which often led to personal struggles to overcome discrepancies between their own desires and their life choices.

There was a non-significant trend towards higher well-being amongst men who moved up a social class from their fathers relative to men who did not move, or who moved down. It is likely that this association does suggest a beneficial effect of social mobility – and a deleterious effect of moving down – on subjective well-being amongst men, but that it did not reach significance due to the small number of participants involved in this analysis. The fact that this association was not observed amongst women is perhaps not surprising, given that opportunities for social mobility amongst women were considerably lower than for men as social norms resulted in the majority giving up work on marriage or children (Carr, 1999).

The decades following World War II heralded a period of rapid economic growth and almost full employment (Stewart, 1972, Matthews, 1983), and social mobility was high. The occupational paths of the men in the 6-Day Sample represent a microcosm of this general social change. Many of the Sample members' fathers worked in low paid, unskilled jobs classified in the lowest categories of occupational social class. During the 1950s, when the 6-Day Sample members entered the job market, the development of large industries throughout Scotland meant that opportunities for school leavers were plentiful, particularly in the towns and cities (Bynner, 1991; Pollock, 1997; Roberts, 1984). The combination of high levels of employment and lower educational requirements for most occupations increased the occupational choice for boys entering the workforce. Many have referred to this time period as a “golden age” in which young peoples' transition from school to work was easy and problem-free (Vickerstaff, 2003). The existence of employment bureaus across the country also ensured that young people were rarely unemployed (Ministry of Labour and National Service, 1956; Sheldrake & Vickerstaff, 1987). However, within the 6-Day Sample, individuals using the bureaus often had little choice in their placements and frequent changes of job were common. It

was not unusual for boys to take up an apprenticeship one day, leave at lunchtime, and take up another apprenticeship the next morning. It was extremely easy to find work but in many cases finding work suited to one's character, temperament, skills and ambitions was more difficult. Nevertheless, the opening of factories in new industries such as automobile manufacture resulted in a proliferation of skilled engineering posts for young men. Success in these and most other industries relied on attendance at evening classes, which suited individuals with ambitious, conscientious and hard-working temperaments (Vickerstaff, 2005). It is possible that social mobility exerted an influence on subsequent well-being in two key ways. Individuals moving up in social mobility may have ultimately received a greater income than their fathers and been able to maintain a higher standard of living than they experienced in childhood which, following the bottom-up perspective of determinants of well-being, improved their objective circumstances and subsequent well-being. Alternatively, following the top-down view of well-being, individuals achieving a higher occupational social class than their fathers may have done so due to their own internal resources such as personality, ambition and hard work, which may also influence their subjective ratings of their well-being.

Many researchers have suggested that the effects of occupational stress vary by personal resources and resilience; adaptation theory emphasises the influence of modifiable personal characteristics such as resilience, optimism or sense of coherence, on an individual's coping ability. This study investigated the associations between early career factors and internal psychological resources. The strongest associations observed in men suggest an inverse relationship between number of jobs held by age 27 and the manageability subscale of the sense of coherence measure and an association between higher social class overall, and upwards social mobility, and the comprehensibility

dimension and total score on the sense of coherence measure. These findings suggest that men who held more jobs between 15 and 27 –indicative of early career instability – experience a lower sense of manageability in old age. Similarly, men with higher occupational social class and upwards social mobility experience higher sense of coherence overall and on the comprehensibility dimension. Antonovsky (1979, 1987) suggests that SOC is formed in early adulthood and remains relatively stable throughout adult life. Early career instability in these men may have been due to external or family circumstances resulting in periods of unemployment or frequent changes of job, or due to a lack of the internal resources such as ambition or conscientiousness required to find and keep a suitable job. Both are likely to affect an individual’s perception of the world and their SOC. In contrast, achieving a higher occupational social class overall and greater social mobility can be seen to be indicative of greater success, which increased an individual’s understanding or comprehensibility of the world.

In women, the strongest associations indicate a positive relationship between years of education and optimism, and between number of jobs to 27 and resilience. The former finding is not surprising: women experienced considerably fewer educational opportunities in the 1950s than today, with the result that educational attainment was more likely to raise a woman above her peers in terms of skills and job opportunities. This may, therefore, have led to an increased optimism about the future. The positive association between jobs to 27 and resilience in women is more intriguing as it suggests that women who held more jobs experience greater resilience in old age. It is likely that a different mechanism is at play here: women who experience greater early career instability – perhaps due to external factors such as marriage or children – might use these experiences to develop coping resources, which is expressed as greater resilience

in old age. This finding merits further investigation focussing on the mechanisms behind this relationship.

In contrast to the findings of Marmot and colleagues (Marmot et al., 1997; Griffin et al., 2002), this study found no association between job control and subjective well-being. There are a number of reasons why this might be. First, the measure of job control was very crude, based simply on the management status of their main occupation, and participants were not asked any questions specifically on this topic. Second, the participants in this study were all – with one or two exceptions – well beyond retirement age. It is likely that any stress associated with occupations last held, in most cases, over 10 years previously, would exert very little effect on current well-being. Several researchers have suggested that individuals have a propensity towards a given level of subjective well-being or life satisfaction, and that even after extremely stressful life events such as death of a spouse or unemployment they tend to revert back to this prior level (Myers & Diener, 1995). The same effect has been found for positive events such as marriage or an increase in income or improvement in material circumstances, which frequently lead to only temporary increases in life satisfaction or well-being (Kahneman & Krueger, 2006; Layard, 2006; Clark, Diener, Georgellis & Lucas, 2008). This theory of adaptation is important when considering the influence of life events, particularly those occurring early in life, on subsequent well-being. Some researchers suggest that life events only exert a significant impact on subjective well-being for 3 months (Suh, Diener & Fujita, 1996; Erdogan et al., 2012), while others suggest it may vary depending on the type and severity of event (Clark et al., 2008). This pattern has been referred to as the “hedonic treadmill” and might in part explain the so-called well-being paradox, whereby aversive or negative circumstances have little long-term impact on subjective well-being (Hofstätter, 1986; Kahneman & Kruger, 2006).

## Cortisol

The present study did not find the expected associations between cortisol levels, awakening response or diurnal slope and well-being. Indeed, the only significant association was an inverse correlation between cortisol awakening response and depression, which contradicts previous research suggesting a higher CAR in individuals experiencing depressive symptoms (Pruessner et al., 2003; Steptoe, 2007).

The lack of significant results is surprising given the vast literature on the importance of cortisol as a marker of stress reactivity. There are a number of practical reasons why this might have occurred. First, the results of this study did not show the expected rise on awakening. Indeed, only around half the participants showed a rise between the first and second cortisol samples. This may have been due to variations in waking time between participants. Many researchers have suggested that the size of the awakening response is strongly influenced by the time of awakening (Edwards et al., 2001; Kudielka & Kirschbaum, 2003). This has been suggested to be related to individual differences in the HPA diurnal profile, with early awakers secreting more cortisol during the first 45 minutes post awakening and exhibiting a steeper decline over the course of the day (Edwards et al., 2001; Federenko, Dechoux, Hellhammer, Wüst & Kirschbaum, 2001; Kudielka & Kirschbaum, 2003). However, further exploration of the data suggests a small and non-significant correlation between cortisol awakening response and self-reported sampling time. A more likely explanation is that participants' reporting of sampling time was inaccurate. Kudielka, Broderick and Kirschbaum (2003) used electronic monitoring to investigate compliance with saliva sampling protocols in a group of 47 community-dwelling participants aged 15 to 75 years and found that 26%

of participants failed to obtain saliva samples at the correct time at least once, with 82% of the non-compliant participants giving two or more non-compliant samples and 55% failing to take the second sample, from which the awakening response was calculated, inside of the required time frame. They found that, whereas compliant participants showed the expected increase half an hour after waking, non-compliant participants showed only minimal changes. Even if participants were compliant and took the second sample 45 minutes post-waking, this may not have sufficiently captured the awakening response. The cortisol awakening response is strongest during the first 30-45 minutes after awakening; cortisol levels then drop rapidly over the next few hours (Kirschbaum & Hellhammer, 1989; Pruessner et al., 1997; Adam et al., 2006). If participants were tardy in producing the second sample, this may have been outside of the first hour after waking and once this drop in levels had begun. Additionally, although participants were instructed to take the first sample before consuming any food or drink or brushing their teeth, no such instruction was given for the second sample and this may have been contaminated as a result.

Second, the study did not include any measures of participants' mood or experiences throughout the day on which the cortisol samples were taken. Cortisol levels reflect the functioning of the HPA pathway, which is responsive to experiential input (Kirschbaum & Hellhammer, 1989; Johnson, Kamilaris, Chrousos & Gold, 1992). As such, cortisol levels are influenced by changes in mood that occur naturally throughout the day. For example, research has shown that negative emotional states are associated with higher cortisol levels a few minutes later (van Eck, Berkhof, Nicolson & Sulon, 1996; Smyth et al., 1998; Peeters, Nicolson & Berkhof, 2003; Adam, 2006), and that these effects may cumulate over the course of the day resulting in a flatter diurnal cortisol slope (Adam et al., 2006). These effects have been shown to extend to the next day, with negative

feelings such as loneliness, sadness and feeling threatened or overwhelmed associated with higher CAR the next day (Adam et al., 2006).

Third, patterns of stress reactivity in participants in the follow-up study may not be representative of those of the general population of older adults or even of the complete 6-Day Sample group. Higher cortisol levels, a heightened awakening response and a steeper diurnal cortisol slope are all indicative of overactivation of the HPA axis and the stress response, which is related to a range of negative health outcomes such as high blood pressure, cardiovascular disease, and dysregulation of the immune system. Therefore, individuals within the 6-Day Sample who experienced greater levels of stress are more likely to have suffered from these serious illnesses and either died before the time of the invitation or be less likely to participate in the follow-up study due to ill health. The participants in the follow-up study may therefore have lower levels of cortisol than might be expected and their results might be restricted in range.

Despite the proliferation of research into biomarkers of healthy ageing, very few studies have investigated the associations between cortisol measures and well-being in older adults. Those that have, report inconsistent or null results (Pruessner et al., 1997; Wüst, Wolf, Hellhammer, et al., 2000; Edwards et al., 2001; Wilhelm et al., 2007) or do not use exclusively old age populations (Steptoe et al., 2008). It may be that dysregulation caused by chronic activation of the stress response throughout the lifecourse has either dissipated by old age or, more likely, has little or no impact on the subjective experience of ageing. Indeed, neither current anxiety nor depression – both of which were strongly associated with subjective well-being – was associated with any of the cortisol measures. This discrepancy between the subjective experience of anxiety and cortisol measures mirrors the results of Ryff et al. (2006), who found no association between



cortisol slope and trait anger and depressive symptoms. The results of this study suggest that cortisol has little or no effect on subjective well-being in old age.

## Determinants of well-being

The main analysis in this study investigated the determinants of subjective well-being in older adults. The results suggest that, in this group, 67.9% of the variance in subjective well-being can be explained by a model which includes current physical health and functioning, current mood, personality and psychological resources.

The first hypothesis, that subjective well-being in old age would be predicted more by prospective variables than longitudinal variables, was supported by the results. None of the background demographic variables were significantly correlated with well-being at the prescribed level of significance. Father's social class was significantly associated with the mental health and life satisfaction measures, perhaps indicating higher income and better objective circumstances in the childhood home, and the home environment factor was moderately associated with the well-being factor, but none of these relationships were sufficiently strong to be entered into the regression analyses. A unique feature of the 6-Day Sample is the inclusion of a well-validated measure of childhood intelligence. In keeping with previous research, this was not found to be associated with any of the well-being measures (Gow, Pattie, Whiteman, Whalley & Deary, 2007; Brett et al., 2012). Although few studies include both longitudinal and cross-sectional determinants of well-being, those that do echo the results of this study, suggesting that current circumstances play a greater role in determining well-being than past circumstances (Blane et al., 2004; Seymour et al., 2008).

Of the prospective variables, self-rated health contributed a greater amount of variance than either current health conditions or the SF36 physical functioning scale. However, this association was attenuated to non-significance when current symptoms of anxiety and depression were entered into the model and, once all other variables had been entered, self-rated health contributed only a very small amount of variance. This finding is not surprising. Personality variables such as neuroticism and current anxiety and depression are all strongly associated with the construct of negative affectivity, which is thought to lead to over attentiveness to negative circumstances and a propensity to experience negative emotions (Watson & Clark, 1984; Watson & Pennebaker, 1989). This in turn can lead to over-attentiveness to somatic symptoms, an over-reporting of physical symptoms, and lower ratings of self-reported health.

The strongest predictor of well-being was current depressive symptoms. This is very much in keeping with previous research (Bain et al., 2003; Seymour et al., 2008; Brett et al., 2012). Unlike the study by Brett et al., current symptoms of anxiety also remained a strong predictor of well-being throughout the model.

The second hypothesis, that subjective well-being in old age would be determined more by the Big Five personality factors of neuroticism, extraversion and conscientiousness than by objective measures such as physical health, was also supported by this study.

Both conscientiousness and emotional stability (the inverse of neuroticism) were strong positive predictors of well-being on initial entry into the model, with a smaller contribution made by extraversion. Although their contribution was attenuated, all three remained significant predictors of well-being throughout the model. Agreeableness and intellect/imagination (openness) did not significantly contribute variance to the model.

This supports the findings of previous research suggesting a larger role for extraversion,

neuroticism and conscientiousness, and less of a role for agreeableness and openness (DeNeve & Cooper, 1998; Steel et al., 2008).

The third hypothesis, that well-being in old age would be determined more by the internal resources of resilience, optimism and sense of coherence than either objective measures or the Big Five personality traits, received mixed support from this study. Resilience as measured by the Brief Resilience Scale made minimal contribution to the model. Very few studies have investigated the relationship between scores on this scale and well-being, although given the importance of resilience for coping mechanisms there is a strong theoretical argument for suggesting it might make a significant contribution to well-being. Optimism also made a non-significant contribution to the model. This contradicts previous research, which has shown optimism to be a significant determinant of well-being (e.g. Carver et al., 2010). Interestingly, although the correlation matrix suggests that optimism and resilience were both significantly associated with all measures of well-being, when entered into the model alongside sense of coherence and the personality variables, they contribute very little additional variance. Sense of coherence, on the other hand, was the second largest determinant of well-being in this group after depressive symptoms. This supports the growing body of research advocating the importance of this concept in maintaining subjective well-being in old age (e.g. Wiesmann & Hannich, 2013).

The overall picture suggested by the results of this study is that a large proportion of the variance in subjective well-being is explained by current health and mood. Together, these variables explained 55% of the variance in well-being, with current minor symptoms of anxiety and depression contributing 31.2% alone. Personality variables

explained an additional 11.1% of variance but their contribution was attenuated to a lower level of significance once sense of coherence was added to the model.

## Implications

The study suggests that subjective well-being in old age is best predicted by a combination of current mood and sense of coherence, with a smaller contribution from the personality variables of extraversion, conscientiousness and emotional stability (neuroticism). Given the moderate correlations between sense of coherence and the personality variables – particularly emotional stability – it may be that stable personality traits influence an individual's sense of coherence into old age. Indeed, proponents of the Big Five and sense of coherence suggest that all of these traits develop in early adulthood and remain stable throughout life (Antonovsky, 1987; McCrae & Costa, 1988). One suggestion might be that early life experiences shape personality traits and sense of coherence in parallel and these in turn influence an individual's experiences throughout their life into old age. Although this study offers some evidence for a relationship among males between early career experiences (particularly job instability) and sense of coherence (particularly the manageability dimension), the low correlations between childhood factors (including father's social class, home environment and parental support), and personality and sense of coherence do not support this theory.

In terms of mechanisms, the current study investigated the role of stress reactivity. However, support for this mechanism was limited. Cortisol, as a marker of chronic activation of the stress response and dysfunction of the HPA axis, has been shown to be related to current mood and well-being. However, the present study suggests that current subjective experiences of anxiety play a greater role in predicting current well-

being. This is not surprising, given the cross-sectional nature of this analysis. In addition, the participants in the follow-up study were, largely, experiencing better physical health and functioning than might be expected for their age. Two issues are at play here. First – as mentioned earlier in the discussion – chronic activation of the stress response can lead to immune dysfunction and cardiovascular disease, with the result that individuals experiencing high levels of stress may also be experiencing chronic illness and not have been able to take part. Second, the current experiences of stress and activation of the stress response experienced by follow-up study participants may have been lower due to their higher functioning and better physical health.

The study did support an association between subjective well-being and the psychological resources of resilience, optimism and sense of coherence. All were strongly correlated with all four measures of well-being. However, in the regression model, only sense of coherence made a significant contribution to the variance in well-being. It is likely that these three measures suffer from a great deal of construct overlap. All three measures ask participants to consider their general outlook on life and to consider how they generally respond to difficult or stressful situations – e.g. “I have a hard time making it through stressful events” (resilience), “How often do you have feelings that you’re not sure you can keep under control?” (Sense of coherence) and “I rarely count on good things happening to me” (optimism). Although the correlations between the three items were all slightly lower than their correlations with the well-being factor, it is perhaps not surprising that only sense of coherence made a significant contribution to well-being.

One unique aspect of the study is its ability to investigate early life influences, particularly early career factors, on psychological resources and well-being in old age. It

would seem that social class is associated with sense of coherence only in men, early career stability exerts different effects in men and women, and education is positively associated with optimism in women only. One explanation for this latter finding is that education – which, after all, was not as accessible to women then as it is today – strengthened these women's self-confidence and ability to cope with life's challenges.

One of the enduring conundrums of longitudinal cohort research of this kind is the translation of results into interventions or policy guidelines which can improve the lives of the target population. Well-being is receiving increasing attention from politicians and economists as a measure of the health of populations (Kahneman & Krueger, 2006; Helliwell et al., 2015; Powdthavee, in press). Local and national governments are increasingly using happiness as a measure of social progress, utilising well-being research to guide the design of public spaces and services (Helliwell et al., 2015). Economists utilise subjective well-being ratings to better understand the impact of economic growth on citizens, acknowledging that individuals' ratings of their preferences and life circumstances are subjective and frequently based on social comparisons that are important to that individual (Kahneman & Krueger, 2006). Improving the well-being of the population also has clear economic and political benefits. Happy people make more money, spend more, are more socially engaged and community-minded, are more likely to have good health and cost health services less, and are more likely to have happy, healthy children. Understanding the determinants of happiness and well-being enables governments to tailor policy in order to achieve higher population well-being and its associated benefits.

This is particularly evident with older adults whose health and well-being has been identified as being one of the most pressing social issues today (Antonucci, Okorodudu

& Akiyama, 2002), largely due to the rapid growth in this demographic throughout the world and the associated costs in terms of health care and other public services.

Investigating the determinants of subjective well-being and the mechanisms by which internal resources such as personality might influence subjective well-being, and understanding the contribution of potentially modifiable factors such as perceived social support, mood, and sense of coherence can suggest potential targets for intervention.

Previous research has suggested that interventions promoting participation in meaningful activities and occupations improve mental well-being in later life (Age Concern and Mental Health Foundation, 2006; Kidd, 2008; Sprange et al., 2013).

Taking a salutogenic approach, increased understanding of the characteristics of individuals reporting consistently high subjective well-being has informed positive interventions. These interventions, in which individuals are encouraged to engage in intentional positive activities such as counting blessings, performing kind acts or visualising their ideal future (Lyubomirsky, 2001; Lyubomirsky & Layous, 2013), have been shown to significantly increase subjective ratings of happiness (Sin & Lyubomirsky, 2009). A review of interventions promoting good health and well-being among older adults (NICE, 2008; Windle et al., 2008) identified an intervention that was effective in enhancing the physical and mental health, occupational functioning and life satisfaction of community-dwelling older adults. Combining group and individual sessions, the intervention aims to improve self-confidence and positive behaviours, and encourages participants to undertake personal goal setting and to be active in their own personal development (Clark et al., 1997; Hay et al., 2002; Clark et al., 2001; Mountain, Mozley, Craig & Ball, 2008; Clark et al., 2012; Sprange et al., 2013). The inclusion of goal setting and active involvement in personal development ties in with the suggestions of others that the self-regulatory processes of successful goal adjustment are important

in enabling older adults to maintain better well-being in the face of the challenges of ageing (Heckhausen et al., 2001; Wrosch et al., 2003).

Although the current study found only a few significant associations between childhood home conditions and early career circumstances and well-being in old age, this and many other research studies suggest that childhood and the transition into early adulthood are important in determining future educational and occupational paths. Early life stress, including difficult objective circumstances, can impact on the development of internal resources including personality, resilience, and sense of coherence and can have implications for the function of the HPA axis of the stress response (Gunnar & Vasquez, 2001). The setting and adaptation of educational and occupational goals during the teenage years contributes to the development of goal setting skills, including goal dis-engagement and re-engagement, which are important for dealing with difficult circumstances across the life course, including ageing (Heckhausen et al., 2001; Wrosch et al., 2003). The provision of life skills training in schools and other educational establishments may be vital in equipping young people for the challenges of the labour market, while also enabling them to develop psychological resources that might aid coping and reduce stress throughout their adult life into old age.

The present study suggests that the strongest predictors of well-being in older adults may be current symptoms of anxiety and depression, and sense of coherence. Anxiety and depression are common, particularly amongst the oldest old, and have huge implications in terms of daily functioning and social engagement. In addition to subjective distress, individuals experiencing high anxiety or anxiety disorders are at increased risk of the onset of disability, are more likely to experience negative somatic symptoms, and are at increased risk of mortality from suicide and cardiovascular



diseases (Bryant, Jackson & Ames, 2008; Bassil, Ghandour & Grossberg, 2011).

Depression in older adults is a risk factor for dementia and mild cognitive impairment (Wilson et al., 2014). Depressive symptoms have been the target of a number of successful interventions in older adults. In their meta-analysis, Sin and Lyubomirsky (2009) identified 51 positive psychology interventions – that is, interventions aimed at cultivating positive feelings, behaviours, or cognitions – that both enhanced well-being and reduced depressive symptoms. They found that the benefits of these interventions increased with age, which they suggest may be due to more effective emotional regulation and self-regulation associated with older age (Carstensen, Isaacowitz & Charles, 1999; Linley et al., 2007). The authors suggest that interventions are most effective when participants exert a high level of effort and continuously practice positive techniques (Seligman, Steen, Park, & Peterson, 2005; Sin & Lyubomirsky, 2009; Lyubomirsky, Dickerhoof, Boehm & Sheldon, 2011). One of the most effective interventions identified by this review was that of Davis (2004), which involved life review individual therapy in a group of 14 older adults, and demonstrated an effect size of 0.81.

Sense of coherence is an important target for intervention in older adults due to its strong associations with health and well-being and its potential role as a mediator between generalised resistance resources – such as self-esteem, social support, or social class – and subjective ratings of health and well-being (Wiesmann and Hannich, 2008, 2010; Wiesmann, Niehörster & Hannich, 2008; Wiesmann, Niehörster & Hannich, 2009). Furthermore, although Antonovsky's original theory posits sense of coherence as a life orientation largely shaped by early adulthood, he also acknowledges that re-evaluation of one's world view and sense of coherence in the light of the challenges of retirement and old age (e.g. functional decline, the loss of working roles and loved ones)

is an important part of development in later life (Antonovsky & Sagy, 1990; Wiesmann & Hannich, 2013). Erikson's life span theory (1963, 1982) suggests that coming to terms with one's past experiences is a vital developmental task in later life. Individuals with a high sense of coherence view the world as more comprehensible, meaningful and manageable, and may be more able to accept their past failures and limitations and maintain their ego integrity (Dezutter et al., 2013).

Few studies to date have described interventions specifically targeting sense of coherence in older adults. Studies in occupational health care have demonstrated that interventions can work to successfully improve sense of coherence in older adults (Vastamäki et al., 2009; Kähönen, Näätänen, Tolvanen, & Salmela-Aro, 2012). One such intervention by von Humbolt and Leal (2013) investigated the impact of person-centred therapy on the sense of coherence dimensions in older adults. Participants demonstrated an increase in SOC, particularly on the comprehensibility dimension. The authors suggest that the emphasis of person-centred therapy on empowering the client to move towards decision-making and full functionality may have mediated the promotion of SOC and comprehensibility in particular.

The current study supports the findings of previous research that the Big Five personality traits of extraversion, neuroticism and conscientiousness influence subjective well-being (DeNeve & Cooper, 1998; Steel et al., 2008) in a sample of older adults. Although personality is generally thought to be stable across the lifespan and may not constitute an intervention target in itself, the dispositional traits, behaviours and emotional states it engenders suggest potential intervention targets. Techniques such as cognitive reframing might be suitable to encourage individuals high in neuroticism and low in optimism and sense of coherence who present with psychological distress to

view their current circumstances in a more positive and meaningful light. A wealth of evidence from psychoneuroimmunology suggests that trait and state anxiety in patients undergoing surgery is associated with poorer outcomes post-operatively (Munafò & Stevenson, 2001; Mavros et al., 2011). However, psychological preparation for surgery has been shown to improve post-operative outcomes (Johnston & Voegele, 1993). This research could potentially be extended to incorporate psychological interventions in preparation for the stressors associated with ageing and functional decline.

### Study limitations

The study has several limitations. Firstly, the small sample size means that the study does not have sufficient statistical power to detect small effects. It is also likely that any effects observed have been attenuated by the study's small sample size. In addition, the large number of statistical tests carried out required a very stringent Bonferroni correction for multiple comparisons, which a considerable number of the results did not meet.

Second, participants in the follow-up study were not representative of the 6-Day Sample as a whole. This study is unusual in that the wealth of information available from childhood and early adulthood makes it possible to compare individuals choosing to take part in the follow-up study with those who chose not to participate, as well as those who have died by the time of invitation. A recent analysis suggests that follow-up study participants are more intelligent, had more education to age 27, had fathers with a higher occupational social class, and had more stable moods and higher perseverance as rated by their headteachers at age 14 (Johnston et al., in revision). Similar characteristics were found conversely to predict mortality to age 76, including lower dependability (a

composite measure of the teacher-rated personality items), lower intelligence, and a greater number of personal and health problems in early adulthood (Calvin, Deary, Paterson, & Brett, in revision). It is not surprising that this recruitment bias occurred. The follow-up study invitation consisted of a physical testing kit and a lengthy (56-page) questionnaire. The decision to send the entire pack as the initial contact with 6-Day Sample members after 50 years was taken in order to maximise recruitment of this small, unique, group of individuals, following reports of attrition at each stage of multi-phase recruitment (Batty, personal communication, 1<sup>st</sup> December 2011). This was a risky strategy as receiving the box out of the blue may have alarmed or irritated some participants, or provoked anxiety in participants experiencing physical or cognitive decline, who may have perceived the task at hand to be beyond their capabilities. In order to investigate the potential negative impact of sending the box in this way, a further study by the same team recruiting members of the 36-Day Sample adopted a more piecemeal approach: sending first a shorter (20-page) questionnaire, asking participants to indicate willingness to participate in a more detailed study, before sending the physical testing kit. The initial positive response rate was 23.3%. Just over half agreed to the more detailed study and only 44.8% of original responders completed all elements of the study (10.4% of invitees – compared to 27.4% of the 6-Day Sample). Although the 36-Day Sample members were only tested once in 1947 and lack the 16-year engagement of the 6-Day Sample, these figures offer support for the decision regarding the invitation pack.

Although the study materials were designed for ease of use, completing the study may well have been beyond the capabilities of individuals experiencing physical or functional decline. The cognitive load of the questionnaire must also not be underestimated: although participants were encouraged to complete it at their leisure and over

a few days, many of the questionnaires, especially the personality questionnaires, require a high level of cognitive ability and concentration. Many sets of questions are of the format whereby a trunk (e.g. “How many times over the last four weeks have you felt...”) is followed by specific questions. Participants must, therefore, hold the trunk in working memory while simultaneously considering the individual questions and choosing and indicating the correct answer (Bowling, 2005).

Third, the 6-Day Sample itself, while representative of the Scottish population born in 1936, may not be generalizable to other cultures. The circumstances in the UK and Scotland in particular during the 1950s and 1960s when these individuals were young adults were unique. As mentioned earlier, the post-War era heralded a time of full employment and educational and job opportunities were plentiful. This was particularly the case for boys. For girls, however, societal norms resulted in the majority of them leaving the labour market on starting a family. In both genders, younger or older cohorts were more likely to be entering the labour market at a less prosperous time or, in some cases, during a recession, resulting in less job stability and greater unemployment. Cohort effects have been found to have a significant impact on the generalizability of the results of this kind of longitudinal study (Twenge & Campbell, 2001; Sutin et al., 2013).

Fourth, the longitudinal aspects of the study necessarily entailed secondary analysis of existing data. In addition to the lack of clarity over how the occupational questions were asked already mentioned above, the use of data collected over 50 years ago has broader implications for the remainder of the study. For example, the personality questions used in the original 6-Day Sample originated from Terman’s Gifted Child Study (1925) rather than from any of the measures which are more widely used and well-validated

today, such as the Eysenck personality inventory. This therefore reduces the potential for comparison across studies as was possible in Gale et al.'s work (Gale et al., 2013); although the questions were repeated in old age they were superseded by superior instruments such as the Big Five factors. In addition, the personality questions in 1952 were answered by Sample members' teachers rather than themselves or their parents. As previously discussed, there is some discrepancy between teacher ratings of personality – which are inevitably based on pupils' school performance and behaviour in the school environment – and those of parents or pupils themselves (Miller & Davis, 1992; Ter Laak et al, 2001; Baker et al., 2004). Indeed, comparison between teacher ratings and scores on the same questions answered by participants and a spouse or family member in the follow-up study questionnaire found little or no association (Harris, Brett, Johnson & Deary, in revision). Similarly, the data on occupational goals was derived from questions asked in the 1950s, when attitudes towards educational and occupational prospects for men and women were very different from that of subsequent decades (Carr, 1999). This may have resulted in bias introduced by the manner in which the home visitors elicited responses to these questions. Although frustrating, these idiosyncracies are minor compared to the unique level of detail offered by the 6-Day Sample data collected at such a key developmental stage.

Although specific measures were included in the follow-up study in old age in order to answer research questions about well-being, this formed part of a larger study and compromises were made in order to reduce the volume of questions asked. For example, subjective measures of goal attainment or self-efficacy were not included, nor any measures of goal engagement/disengagement in old age, which is strongly predictive of well-being (Wrosch et al., 2003). In addition, using well-validated measures of well-being, personality and psychological resources enabled comparison with other studies

but raised issues in terms of suitability of wording for the study's participants. For example, the use of Americanisms such as "gotten" (SWLS) and "sad sacks" (sense of coherence) elicited some interesting comments from this older Scottish cohort. Other questions relating to specific underlying constructs can be difficult for participants to interpret, such as "I enjoy my friends a lot" (LOT-R) or "I have difficulty understanding abstract ideas" (IPIP). Nevertheless, the benefits of using these instruments far outweigh these problems.

The majority of the variables included in the main regression analyses of the determinants of well-being were collected cross-sectionally, reducing the possibility of making any causal inferences. Although the cortisol measures were designed to be a marker of chronic activation of the stress response, the largely null findings from these precluded their inclusion in the main analysis and, consequently, any investigation of the mechanisms for this relationship – for example, mediation of the relationship between neuroticism, anxiety and well-being.

An additional limitation is the lack of any measure of recent stressful life events or of internal resources such as self-esteem or self-efficacy. Both have been shown to be important factors influencing the subjective well-being of older adults. The death of a spouse, for example, or a recent loss of independence or increasing cognitive decline, can all have a significant impact on an individual's evaluation of their current circumstances and well-being, as well as on their current mood. Self-esteem and self-efficacy have both been suggested as generalised resistance resources (Wiesmann & Hannich, 2013), and their absence from the follow-up study restricts any inferences regarding their relationship with sense of coherence or personality traits.

Finally, the majority of the measures used in the prospective aspects of the current study were collected by self-report. This may have resulted in shared method variance, which can introduce systematic bias and artificially inflate or deflate associations, reducing the conclusions that might otherwise be drawn about the relationships between constructs (Doty & Glick, 1998; Reio, 2010). Self-report measures are particularly susceptible to the effects of negative affectivity, high levels of which often leads to an over-inflation of negative circumstances and emotions (Watson & Pennebaker, 1989; Kahn, Hessling & Russell, 2003). In terms of the relationships between personality and subjective well-being, Steel et al. (2008) formally tested the influence of shared method variance in their meta-analysis and found that the observed relationships between personality and subjective well-being were subject to minimal shared methods bias and were, therefore, genuine. The well-being and other subjective measures may have been subject to social desirability; although the responses were treated anonymously, participants may have felt that answering questions about their global life satisfaction negatively could be tantamount to admitting failure. Some of the well-being and mood questions were rather personal in nature, and may have been outside of the comfort zone of some participants, for example “I’ve been feeling loved”, a question from the WEMWBS.

The inclusion of predominantly self-report items may also have resulted in reporting bias, even for medical conditions. This was evident in the reporting of ‘other conditions’. Often, participants reported medical problems already mentioned elsewhere, or acute conditions such as broken bones and minor ailments such as psoriasis or asthma, which other participants may have perceived as being of insufficient severity to be reported. In addition, some participants may not have provided information about certain or all medical conditions due to a desire to keep this information private, or because of cognitive fatigue. In order to combat this problem



and ensure that all serious medical conditions were included, consent was sought from all participants to link their research data with nationally-held databases of hospital admissions and cancer registrations (Brett & Deary, 2014).

## Conclusions

The health and well-being of older adults has been identified as being one of the most pressing social issues today at the core of social policy (Antonucci, Okorodudu & Akiyama, 2002; Stephens & Flick 2010; McKee & Schüz, 2015). Well-being is increasingly being recognised as a national indicator of health and prosperity, and is seen by many as an indicator of psychological adjustment and successful ageing (Baltes & Mayer, 1999; Wiesmann & Hannich, 2008). The current study utilises material from a unique cohort of individuals who were followed up extensively in childhood and early adulthood and recruited in old age to further our understanding of the lifecourse determinants of subjective well-being in older adults. The study's findings suggest an association between early career factors such as job instability and lifetime social mobility, and psychological resources such as optimism, resilience and sense of coherence. The study's main finding is that the strongest predictors of subjective well-being in old age are current mood and sense of coherence, with the personality traits of extraversion, emotional stability and conscientiousness also playing a role. Measures of stress reactivity were only partly associated with well-being. The results support a model of successful ageing which suggests that early life experiences influence the development of adaptational psychological resources, which interact with personality, mood and current life circumstances to influence subjective well-being in old age. However, further research is needed to fully understand the mechanisms of these

relationships – and particularly to confirm the nature and role of stress reactivity in older adults – in order to identify potential targets for intervention and thereby enable older adults to maintain their subjective well-being when faced with the challenges of ageing.

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**Research paper 1: Realising health data linkage from a researcher's perspective: following up the 6-Day Sample of the Scottish Mental Survey 1947**

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Scottish Mental Survey; intelligence; ageing; health; wellbeing; lifecourse epidemiology; data linkage; health outcomes.

## Abstract

Health and wellbeing in old age are influenced by genetic, environmental and social factors throughout the life course. At present, few longitudinal studies offer information from childhood through to old age. Data linkage between multiple sources of health data enhances the value of existing longitudinal data. Regulations governing access to personal data for health research exist to protect the privacy and confidentiality of data on behalf of the individual. This paper outlines the process of obtaining permission for data linkage from a researchers' perspective, using a case study which offers an unusual opportunity to understand life course influences such as socio-economic status, childhood deprivation and measured intelligence on health and wellbeing in old age in an entire year-of-birth population. The Scottish Mental Survey 1947 (SMS1947, n = 70,805) has childhood intelligence data from individuals born in 1936 and attending schools in Scotland in June 1947. Representative sub-groups of the SMS1947 provided additional sociological information. The 6-Day Sample (n = 1,208), born on 6 days of 1936, were followed up for 16 years to age 27. Their younger siblings also took an intelligence test and were followed up for several years. Our team's planned research on the SMS1947 falls into two distinct parts. The first is a revival of the 6-Day Sample study involving tracing Sample members and inviting survivors to a follow-up study. The second part aims to carry out linkage between existing data on the SMS1947, its sub-groups, and the younger siblings, and morbidity and mortality data from central databases in Scotland and in England and Wales.

We conclude by offering some recommendations for simplifying the process of obtaining permission to access linked health data, and place these into the context of the shifting landscape of data linkage in the UK and beyond.

## Introduction

There is a growing acknowledgement amongst researchers in epidemiology and public health of the influence of biological, physical and social exposures across the life course on subsequent health and wellbeing (Kuh, Ben-Shlomo, Lynch, Hallqvist & Power, 2003; Lynch & Davey Smith, 2005; Blane, Netuveli & Stone, 2007; Foresight Mental Capacity and Wellbeing Project, 2008; Richter & Blane, 2013; Kuh, Cooper, Hardy, Richards & Ben-Shlomo, 2014). Life course research provides an inter-disciplinary framework for understanding how genetic as well as environmental factors such as socio-economic status, occupational hazards and childhood deprivation influence medical and social inequalities in health and mortality. Life course epidemiology relies heavily on the use of longitudinal studies, which enable researchers to track the health and social trajectories of individuals over time.

Cohort studies are particularly valuable if they follow the same individuals from early life into adulthood (Pearson, 2011). They can reduce confounding by factors such as age or geographical location. The British birth cohorts, for example, offer a wealth of information from birth or early years through adulthood and into early old age, and have helped to address key questions on health inequalities, mental wellbeing, health behaviours, and genetic influences on health and ageing (Power & Elliott, 2005; Wadsworth, Kuh, Richards & Hardy, 2006; Pearson, 2011; Cooper et al., 2012; Kuh et al., 2012).

The oldest British birth cohort, born in 1946, reached retirement age in 2011 (Wadsworth et al, 2006). This restricts, for the moment, the usefulness of the British cohorts in answering questions about health in older age. A number of longitudinal cohort studies exist specifically to investigate ageing processes. A recent systematic

review identified 67 longitudinal studies of older adults across all continents (Seematter-Bagnoud & Santos-Eggimann, 2006). Most participants were aged 50 or above at the time of recruitment, and although the length of follow-up varied from 2 to more than 30 years, the majority followed participants up for less than 10 years. Both factors limit the usefulness of these studies in investigating life course influences on ageing. In the UK, longitudinal studies of ageing include the Whitehall II study of retired civil servants (Marmot & Brunner, 2004), and the English Longitudinal Study of Ageing (Stephens, Breeze, Banks & Nazroo, 2012). Both have produced many findings on health and wellbeing from the latter stages of working life into retirement and old age. However, they include minimal information from childhood and early adulthood, which are key periods of transition and exposure to social and environmental influences (Foresight Mental Capacity and Wellbeing Project, 2008).

Another valuable resource to life course epidemiology is population-based data collected by government or military organisations. These sometimes contain detailed medical, psychological and cognitive records on large numbers of individuals. For example, many epidemiologists have made use of Swedish conscription data, which is not only detailed but involves over 1 million young men followed for decades (Batty et al., 2007, 2009). The Vietnam Experience Study, although smaller in number, has been used to investigate determinants of health and mortality (Batty et al., 2008; Weiss, Gale, Batty & Deary, 2009). Udjus (1964) conducted innovative research on the relationships between physical growth and intelligence, education and family size using data from Norwegian conscripts (Udjus 1964; Tanner, 1966). However, military-based studies exclude women, and individuals who do not meet strict medical criteria. By contrast, data on cognitive function and educational attainment are available for much of the population through schools and examination boards, and can greatly contribute to

longitudinal studies (e.g. Deary, Strand, Smith & Fernandes, 2007; Calvin, Fernandes, Smith, Visscher & Deary, 2010; Booth et al, 2014).

### **Data linkage to enhance longitudinal research**

The majority of longitudinal studies still rely on data provided by the participants themselves, either by self-report or the collection of objective health measures such as biomarkers. However, the value of these data is reduced by attrition and the inaccuracies of self-report data. Maintaining regular contact with longitudinal study participants is costly in terms of time, effort and resources. Researchers are, therefore, increasingly turning to alternative data sources. One such source is the computerised administrative health (and non-health) data which most developed countries now collect routinely. The primary purpose of these data is to enhance planning and policy decision-making by providing detailed information on the population's health and service use. This type of health data commonly comprises death certification, hospital admissions, hospital consultations and prescription records, with increasing coverage of consultation at general practitioners, disability assessment and sickness absence. Their value easily extends to medical research, providing extensive population-based information on the aetiology of disease, its course and outcome. In longitudinal cohort studies, linkage between research data and routinely-collected health records can be used to verify the quality and accuracy of self-report data such as medical history. However, administrative health data collected at point of service use is limited in scope, including only individuals who consult health services. Furthermore, unlike some military or conscript data, health records generally contain scant information on health behaviours or function.

The research value of administrative health data can be further enhanced when data from different sources relating to the same individuals are combined. Data linkage of this kind is not a new concept (Dunn, 1946). The linkage of health data with non-health data such as social care, benefits, crime or census records, has a multitude of benefits, not only to medical research but also in terms of public health, cost efficiency and administrative accuracy (Holman et al., 2008; Scottish Government, 2010). The use of large, multiple, population-based administrative data sets conserves patient privacy by using a single identifier, thereby reducing the need for personal identifiers such as name and date of birth (Holman et al., 2008). Due to the organisational and collaborative effort required, very few such data sets exist internationally, and most by necessity tend to exist at a regional rather than country-wide level. Linked data sets currently exist in Manitoba, Canada; British Columbia, Canada; Rochester, Minnesota; Oxford, England; Scotland, Western Australia; and New South Wales, Australia (Roos, Menec & Currie, 2004; Scottish Government, 2010). One exception is Finland, which holds personal data on its population in large, linked data sets (Gissler & Haukka, 2004). In the UK, the Longitudinal Study – England and Wales (Goldring & Newman, 2010), the Northern Ireland Longitudinal Study (O’Reilly, Rosato, Catney, Johnston & Brolly, 2012) and the Scottish Longitudinal Study (Boyle et al., 2009) have successfully linked health and non-health data, including Census data, on a representative sample of these country’s populations. These linked data sets represent excellent examples of collaborative working and have enabled researchers and policy makers to address important research questions around health inequalities that would otherwise have been impossible to answer.

Rapid technological advances in recent years have made it possible to collect, store and analyse vast amounts of personal data and this has led to a worldwide debate around



issues of privacy and confidentiality (Regidor, 2004). Data protection legislation was introduced in countries throughout the world, with the explicit aim of protecting the individual's right to privacy while recognising the need to collect and store personal data (e.g. European Union (EU) Data Protection Directive 95/46/EC, 1995; UK Data Protection Act, 1998). Health data collected at the point of use is subject to the common law duty of confidentiality. Patients use health services with the expectation that the information they are providing will be kept confidential, and registered clinicians are bound by the statutes and regulations of their professions. As a consequence, additional legislation governs the use of personal data relating specifically to health. In the UK, the government-commissioned Caldicott Report of 1997 highlighted six key principles and made 16 recommendations about the flow and handling of patient information within the NHS (The Caldicott Committee, 1997). Caldicott Guardians were appointed within each NHS organisation to uphold these principles. More recently, information governance frameworks incorporating legal rules, guidance and best practice were put in place to guard against the inappropriate use of patient information. In Finland, the Personal Data Act stipulates that health and social information can only be gathered by informed consent from the individual, with the exception of data collected for statistics and historical or scientific research (Gissler & Haukka, 2004).

### **The issue of consent**

The majority of debate concerning the use of health data in research, centres around the issue of consent. Mason and Laurie (2010) argue that "it is undeniable that consent remains the primary policy device in legitimating medical research". Indeed, all medical and epidemiological research that requires the presence of individuals should be carried out in accordance with the ethical principles of research on human subjects laid out in the Declaration of Helsinki (1964) (Regidor, 2004; Laurie & Sethi, 2011). Research

subjects must give voluntary consent, after having been informed of the purpose, methods and possible risks and benefits of the research study in question. Of course, in many epidemiological or longitudinal studies using health data, obtaining informed consent from each and every individual is not possible. This is particularly the case in studies with large numbers of subjects, where obtaining consent would be too costly and time-consuming, or where subjects have died, or in studies using historical data (Regidor, 2004; Laurie & Sethi, 2011). The requirement to obtain informed consent can also introduce bias, as those who do not provide consent often systematically differ from those who do (Kho, Duffett, Willison, Cook & Brouwers, 2009; Al-Shahi Salman et al., 2014). Further issues arise in longitudinal research beginning in childhood, where consent needs to be updated once respondents reach an appropriate age. The EU Directive (1995) currently makes provision for circumstances in which obtaining informed consent may not be possible. Article 81 states that although consent must ideally be obtained for all research using personal data, exceptions could be made for research serving “exceptionally high public interests” and that “cannot possibly be carried out otherwise” (Directive 95/46/EC, 1995; Mansell, 2013).

The ethical and moral implications of the use of health data without consent have been discussed in detail by Regidor (2004). Regidor highlights the impact that differing interpretations of the EU Directive have on access to personal medical data in countries across the EU. Often, restrictions on access to data are placed by the data custodians themselves, with considerable variation within and between countries. Even where data sets are linked, researchers may be required to apply for separate approval from each data custodian, as occurs in the Western Australia Data Linkage System (Holman et al., 2008), or for further approvals where the data set is particularly large or contains particularly sensitive health information, as with the Finnish health and social welfare

registers (Gissler & Haukka, 2004). In the United States, legislation varies by state, rendering it almost impossible to conduct population level health research and introducing the possibility that key demographic or social groups are under-represented in medical research (Melton, 1997; Regidor, 2004). Progress, some argue, is informed less by the benefits of such research and more by the perceived risks (Regidor, 2004; Flowers & Ferguson, 2010; Laurie & Sethi, 2011). Certainly, the administrative burden of complying with the requirements of research regulation and management causes delay and wastage in medical research (Al-Shahi Salman et al., 2014).

### **Data linkage in the UK**

The situation in the UK appears, at first, to be more promising. In recent years there has been an increasing acknowledgement within the government of the value of health data in life course research. The UK's current Prime Minister argued for the opening up of patient data for research (Cabinet Office and Prime Minister's Office, 2011; Walker, 2011). There is a recognised need for systems to enable smooth, safe and secure linkage between research studies and health and other records. Recent initiatives such as the Medical Research Council's funding of eHealth Centres, the Economic and Social Research Council's funding of four Administrative Data Research Centres across the UK, and infrastructure initiatives such as the Scottish Informatics Programme (SHIP), the NIHR Research Capability Programme in England, and the Welsh Secure Anonymised Information Linkage System (SAIL), are all working towards the availability of electronic health records for research purposes within a secure and ethically-approved environment.

Clearly then, there is potential value in data linkage, there are databases and information structures in place to support it, and there is encouragement to do it from the scientific

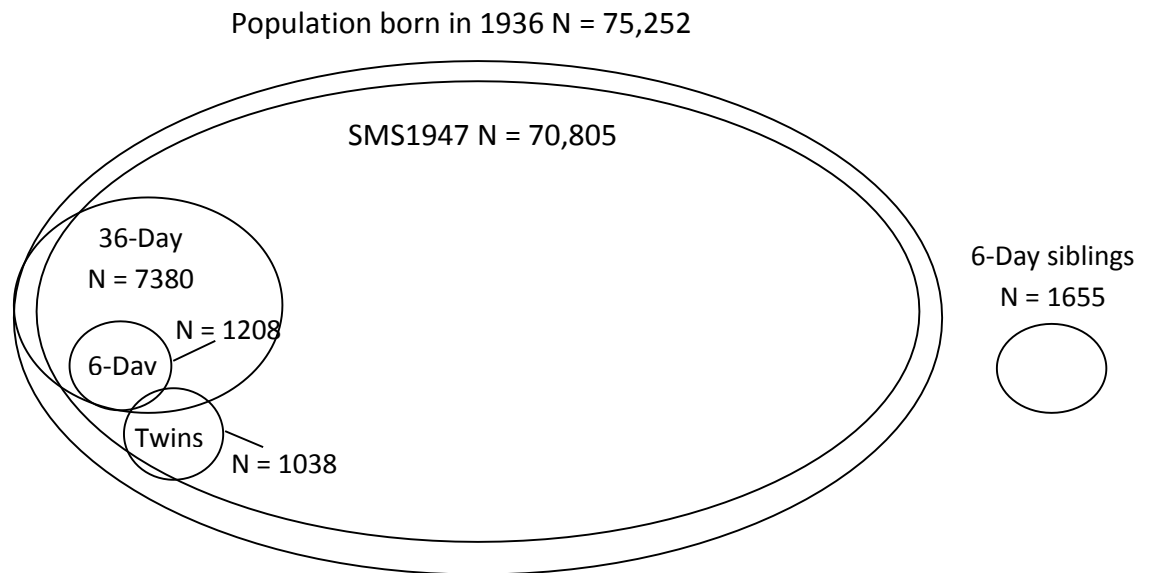
community and the government. However, the reality of gaining permission to carry out data linkage is often complex, with inconsistencies in the interpretation of legislation and the restrictions placed on access to different types of health data (Regidor, 2004; Laurie & Sethi, 2011). In this paper, we present a case study of the processes involved in our obtaining permission to link health data, held within the UK, with existing life-course data from the Scottish Mental Survey 1947. We will then make recommendations based on our experience and discuss the shifting landscape of data linkage in the UK and what it might mean for researchers.

### The Scottish Mental Survey 1947 and its proposed research uses

The Scottish Mental Survey 1947 (SMS1947) took place on 4<sup>th</sup> June 1947 (Mental Survey Committee, 1949; Deary, Whalley & Starr, 2009). It tested the intelligence of almost all children born in 1936 and attending Scottish schools. It applied a version of the Moray House Test No. 12 to 70,805 children. It was organised by the Scottish Council for Research in Education. Three subsamples were tested afterwards to collect more information. The 7,380 children born on the first three days of each month had a four-page ‘Sociological Schedule’ filled in; they were named the 36-Day Sample (Mental Survey Committee, 1953, 1958). The Sociological Schedule data were also collected on all 542 twin pairs born in 1936. The 1,208 children born on the first day of the even-numbered months had, in addition to the Sociological Schedule, an individual Stanford-Binet IQ test and home visits and interviews almost every year until they were 27. They were named the 6-Day Sample (MacPherson, 1958; Maxwell, 1961, 1969). Their younger siblings had the Stanford-Binet IQ test applied as they reached age 11. Eventually, 1,554 of these siblings were tested. Figure B3 illustrates the relationships between the sub-groups of the SMS1947.

Figure B3

Venn diagram of the Scottish Mental Survey 1947 and its sub-groups



The 6-Day Sample offers a rich and detailed source of information on childhood and early adulthood in a representative sample of the Scottish population born in 1936. The existing data has already been used to answer research questions on relationships between education and cognition (Deary, Batty, Pattie & Gale, 2008; Paterson, Pattie & Deary, 2010, 2011; Calvin, Crang, Paterson & Deary, 2014).

No members of the SMS1947 had been contacted since youth, and their data had been largely unused for decades (Deary et al., 2009). The 6-Day Sample study has two ideas. First, it aims to re-contact surviving members of the 1,208-strong 6-Day Sample in their 70s, and to collect data on their lives since childhood and on their current health and cognitive capabilities. Second, it aims to link the childhood data from the whole Scottish Mental Survey 1947 (70,805-strong) anonymously to health records in the UK. We next go into more detail on each of these broad aims.

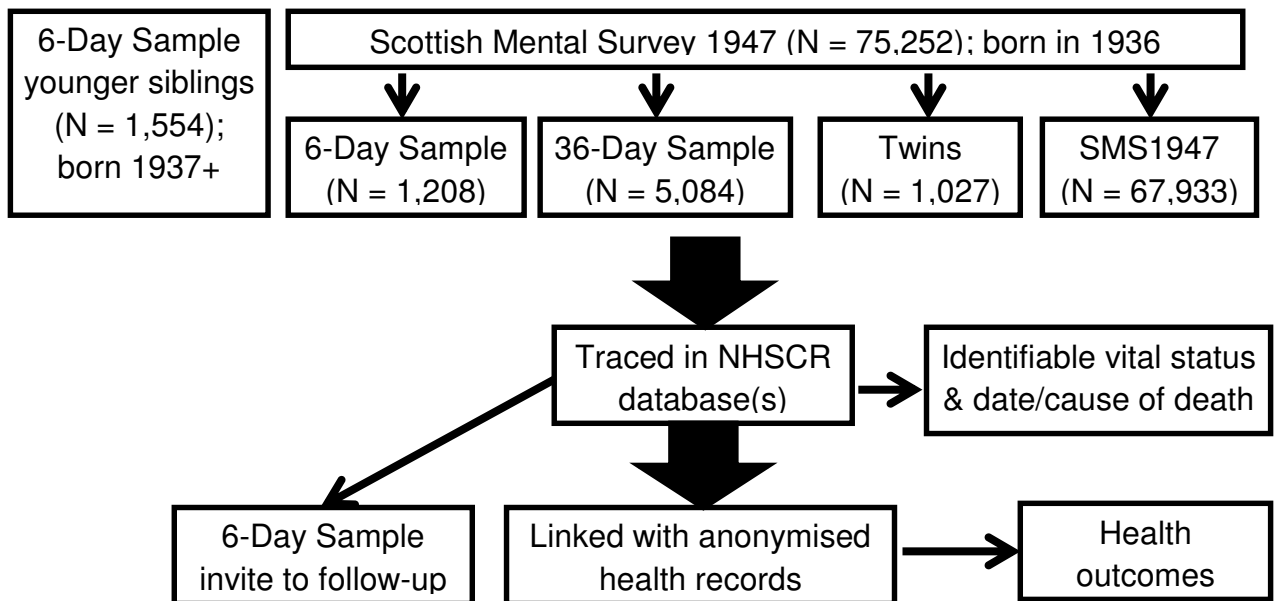
The first aspect of the study meant that the 1,208 members of the 6-Day Sample had to be traced through the NHS Central Register in Scotland, and in England and Wales. We considered that we could not contact people who had emigrated permanently from the UK. Then, identified, surviving members of the 6-Day Sample would be invited, through the Registrar General for Scotland and their equivalent in England and Wales, to a follow-up study, carried out by post and telephone. This would involve answering questions about their lives, health and wellbeing, carrying out some basic physical tests at home, and completing some simple cognitive tests over the telephone. Sub-groups of the follow-up study participants would be invited to three sub-studies: an in-depth life course interview, a validation clinic visit, and a urinary cortisol study.

The second aspect of the study involved proposed linkage to UK health records: all members of the 6-Day Sample study would be located in the Scottish Morbidity Records and equivalent databases in England and Wales. Information within these databases will be linked anonymously (to the researchers) with the information gathered during childhood and early adulthood. Given the effort that this would require, it was decided to undertake this process not only for the 6-Day Sample but for the entire Scottish Mental Survey 1947 group (70,805 individuals, which increased to 75,252 when we included those who did not sit the intelligence test in 1947), and the 6-Day Sample's younger siblings. Childhood intelligence data were available for the majority of these individuals and the study plan represents what could be the most comprehensive epidemiological study of the associations between childhood intelligence and subsequent health outcomes ever conducted.

Figure B4 illustrates the study aims in diagrammatic form.

Figure B4

Diagram of the 6-Day Sample study aims



### The permissions process: summary

A summary of the organisations we applied to is provided in Table 1 and a narrative of the process is in Appendix 1 (available in the Supplementary File). In total, 7 separate regulatory bodies or organisations were applied to for permission to receive data from four different sources: the NHS Central Register (NHSCR), Scottish Morbidity Records (SMR), Hospital Episode Statistics (HES) and the Office for National Statistics (ONS). Seven amendments or re-submissions were made as a result of changes to the study protocol or other supporting documents. The name and function of two of the bodies in England and Wales changed while our application was being processed. In total, 210 documents were sent in support of applications, amendments or re-submissions (not all of which are detailed in Table B17). From beginning to end, the process took 538 days between January 2012 and July 2013. Figure B5 shows a timeline of the permissions process.

## The permissions process: ethical issues

The main ethical issues in our study were capacity and consent.

First, there was the possibility that, due to their age, some participants might be suffering from dementia or other disease that might impair their ability to give informed consent for the follow-up study. In order to maintain the representativeness of the 6-Day Sample, we wished to include these people in the study where possible, and we received ethical approval from a national Research Ethics Committee (REC) in Scotland to do so. However, participants in England/Wales were subject to different legislation and, rather than delay recruitment further by applying to an English REC, we elected to exclude the (very small) number of participants lacking mental capacity in England/Wales.

Second, the study relied on our using personal data without explicit consent from participants. For the linkage aspects, this was necessary in order to maintain the representativeness of the sample – not only would it be practically impossible to obtain consent from relatives of participants who had died, or from participants who had emigrated, but obtaining consent might have introduced systematic bias into our sample (Al-Shahi Salman et al., 2014). For the follow-up study, personal data held within NHSCR databases was required to send out the invitations – although we ourselves did not receive this information directly.



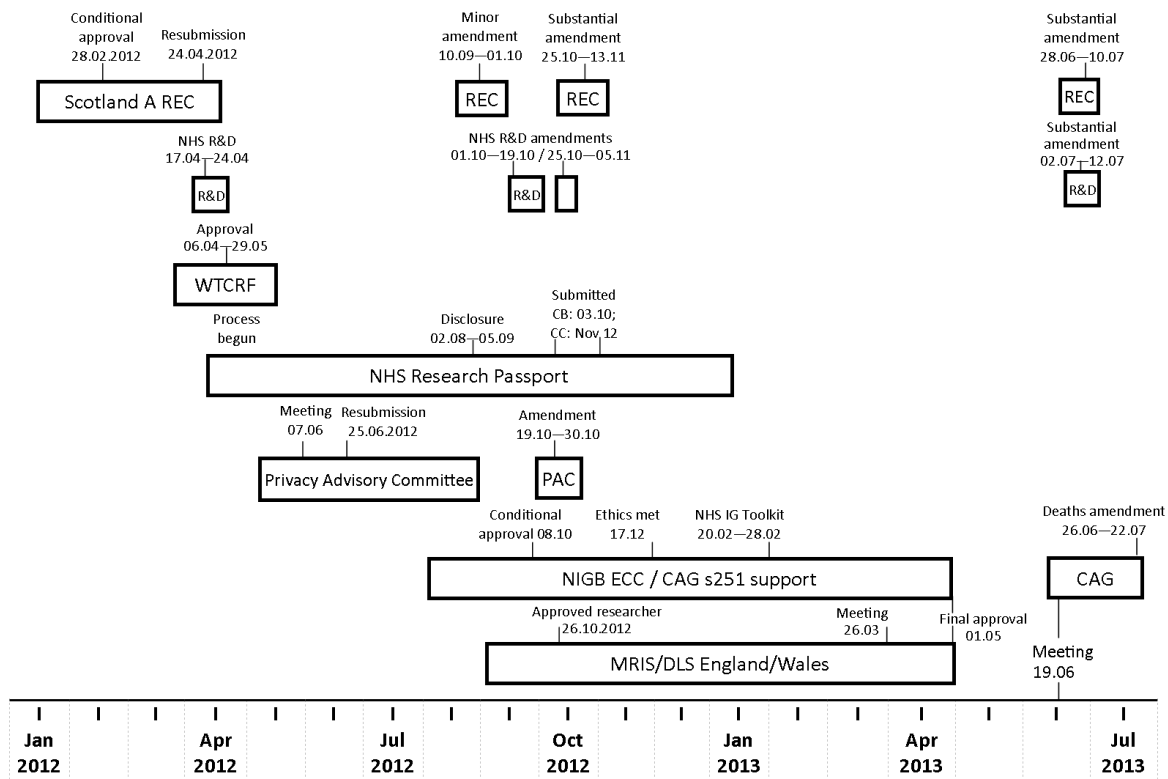
Table B17 Summary of the permissions process

Organisation	Permission sought	Supporting documents	Time to initial approval	Amendments	Number of documents for amendments	Time to final approval
NHS Research Ethics Committee Scotland A	General ethical approval	29	86 days	2	13	268 days
NHS Lothian R&D*	General study approval	27	7 days	2	12	202 days
Wellcome Trust Clinical Research Facility	Follow-up study approval	13	53	0	N/A	53 days
NHS Research Passport	Permission to speak to participants	8	275 days	0	N/A	275 days
Privacy Advisory Committee	Data custodian for Scottish Morbidity Records & NHSCR data	30	113 days	1	2	169 days
Ethics and Confidentiality Committee of the NIGB (now the Confidentiality Advisory Group of the HRA)	Support under section 251 of the Health and Social Care Act (2006) to use health data without consent	49 (including NHS IG Toolkit)	203 days	1	0	339 days
Data Linkage Service, Health and Social Care Information Centre	Data custodian for Hospital Episode Statistics & ONS deaths and cancer data	26	230 days	1	11	230 days
<b>Summary</b>	--	<b>182</b>	<b>--</b>	<b>7</b>	<b>38</b>	<b>538 days</b>

Note. \* REC approval required first

Figure B5

Timeline of the permissions process for the 6-Day Sample study



Acronyms used: REC = Research Ethics Committee; R&D = NHS Lothian Research & Development; WTCRF = Wellcome Trust Clinical Research Facility; PAC = Privacy Advisory Committee; NIGB = National Information Governance Board; ECC = Ethics and Confidentiality Committee; MRIS = Medical Research Information Service; DLS = Data Linkage Service; CAG = Confidentiality Advisory Group.

In Scotland, permission was sought from the Privacy Advisory Committee, which provides advice, on a non-statutory footing, to the owners of Scottish health data, the NHS Information Services Division (ISD) and National Records of Scotland. In England/Wales, permission was sought from the Ethics and Confidentiality Committee of the National Information Governance Board (this has since been renamed and repositioned as the Confidentiality Advisory Group of the Health Research Authority).

This body has statutory powers, under section 251 of the Health and Social Care Act 2006, to give approval for the use of medical data without consent.

In their review of current practices for the use of personal information for medical research in the UK, Laurie and Sethi (2011) summarised it as a ‘consent or anonymise, with authorisation’ approach. The 6-Day Sample study incorporated all three approaches – consent for the follow-up study, in which individuals provided data directly to us, anonymisation for the data linkage aspects, and authorisation for the provision of identifiable death data, for which neither consent nor anonymisation were appropriate.

### The permissions process: challenges

A main challenge to us as researchers was gaining understanding of the legislation and framework for data linkage. This was not helped by the complexity of the current landscape, and the often unclear and conflicting guidelines (Laurie & Sethi, 2011).

Although we embarked on a steep and successful learning curve, navigating the complexities inevitably delayed the process. One inconsistency which caused delay was the differing interpretation of the Statistics and Registration Service Act 2007 between Scotland and England/Wales. This led to some confusion over whether we were to receive identifiable or anonymised cause of death data.

Another substantial challenge was information governance. As researchers, we have a duty to ensure that the data provided by research participants is taken care of. To this end, practices were already in place to protect the data, store it securely, and prevent unauthorised access or loss. However, the majority of these practices were transmitted and maintained by members of the research team and had not been written in the form

required by the external organisations. We submitted our Ethics and Confidentiality Committee (ECC) application on Friday 17<sup>th</sup> August 2012, having spent several weeks producing a written ‘System Level Security Plan’ as required. On Monday 20<sup>th</sup> August 2012 the NHS Information Centre put into force a rule that stated that all researchers applying for secondary use of health data needed to complete the NHS Information Governance Toolkit. The full implications of this were not clear until many months later. The Toolkit is designed for completion by NHS Trusts in order to ensure that they are complying with legislation and the common law duty of confidentiality. We were advised to complete this at an institution level – i.e. on behalf of the whole of the University of Edinburgh. However, despite being part of a large institution with the associated benefits in terms of infrastructure and expertise, the existing University-wide data protection policies applied mostly to the handling of student data and were not sufficient for the handling of the particular research data of our project. In addition, the University has a diverse research community and practices and infrastructure varied between different research groups and departments. As a result, we were obliged to complete the Toolkit on behalf of just our research study. Although we only had to make minimal alterations to our existing practices, the Toolkit required evidence of all information governance practices. With some assistance from computing officers, we created 19 new documents in order to meet the Toolkit’s requirements. And we passed.

The final challenge was perhaps the most intriguing. Although we weren’t the first study to conduct data linkage on individuals in Scotland and in England/Wales, it transpired that we were the first study to request data from the three countries on the same individuals across time. Therefore, considerable effort was expended in fostering collaborative relationships between the organisations providing the data, and putting

systems in place to ensure smooth linkage between the two external data sets and our own existing data.

## Discussion

This case study—which is fully described in the narrative account in the supplementary material—outlines the lengthy process involved in obtaining permission to link life course data from an existing research study with nationally-held health databases. Nevertheless, all permissions were eventually granted and the linkage and follow-up is now underway. This is not the first attempt in the UK to ‘revive’, many years later, a study first conducted in childhood. Both the Boyd-Orr cohort (Gunnell, Frankel, Nanchahal, Braddon & Davey Smith, 1996; Martin, Gunnell, Pemberton, Frankel & Davey Smith, 2005) and the Aberdeen Children of the 1950s study accomplished this (Batty et al., 2005) successfully. The complexities of tracing and contacting research participants decades later contrast with cross-sectional studies taking a snapshot of a population sample at a specific time-point, and those longitudinal cohort studies that have successfully maintained continuous contact with participants since baseline testing. As the second-oldest birth cohort in the UK with childhood data (the oldest being its predecessor, the Scottish Mental Survey 1932 (Scottish Council for Research in Education, 1933; Deary et al., 2009), and one of only a handful of year-of-birth cohorts in the world, the Scottish Mental Survey 1947 offers a rare opportunity to link childhood intelligence (and, to a lesser extent, deprivation) with future health outcomes across the life course and into older age. The sub-groups of the SMS1947, in particular the 6-Day Sample, represent an opportunity to investigate the influences of psychosocial circumstances, social and environmental exposures, and occupational characteristics in early adulthood on subsequent health and social mobility.

We began this process with a novel yet simple idea: to trace an entire year-of-birth population and link information collected in childhood with subsequent health outcomes, and to invite a sub-group of this population to a follow-up study of health and wellbeing in old age. The process has been long with many challenges along the way. Protecting the privacy and confidentiality of personal data held within administrative databases is paramount. Most health data is routinely collected for the purposes of monitoring a population's health and evaluating health service use and utility. Although this is done without individuals' explicit consent, the common law duty of confidentiality means that individuals have the right to expect their personal data collected during the course of any contact with health services to be protected and their confidentiality maintained. Regulating access to health data is a necessary means of achieving this. Whereas no researcher would disagree with the need for regulation, it could be argued that, at times, different interpretations and implementations of legislation governing personal health data adds unnecessary complexity to the process of obtaining approval.

## **Recommendations**

Reflecting on our experience, there are a number of recommendations we could make that would streamline the permissions process and reduce wastage.

A data linkage information portal for researchers

Each country or administrative area could create an information centre as a single point of entry for researchers wishing to use their data for medical research. This portal should detail all the existing data sets, their ownership and provenance, access restrictions and information on how researchers can obtain permission to access the data. There is precedent for such a centre; the Finnish Information Centre for Register

Research (<http://rekisteritutkimusen.wordpress.com/>) fulfils this purpose in Finland and linked administrative data sets such as that in Western Australia (<http://www.datalinkage-wa.org/>) also use this kind of entry point. However, these are the exceptions rather than the rule.

A centralised system for applying for permissions

Many countries have recognised and responded to the need for a more streamlined process of ethical review (Al-Shahi Salman et al., 2014); however, for the most part, the complexities of regulation and legislation involved in data linkage have to date prevented this from being extended to include review of applications to access health data for research purposes. An important aspect of this system would be the review of supporting documents, which frequently change in response to feedback from regulatory bodies and need to be re-reviewed by ethics committees. This process, for our study at least, was time-consuming and prone to human error – for example, simply forgetting to double check the version number and date on the 29<sup>th</sup> supporting document led to a two week delay in obtaining NHS R&D approval. A more efficient system would involve uploading supporting documents and submitting them for review centrally.

More guidance and training for researchers

Many researchers, like ourselves, are unfamiliar with the legislation and processes surrounding the use of data for which we are not directly responsible, and would benefit from outside guidance. Ideally, this would involve a single point of contact throughout the process with someone with expertise in the area. Although most researchers are already taking steps to protect their own research data, basic information governance training – including an overview of relevant legislation – should be mandatory for all

researchers embarking on this process. Experienced researchers themselves might be a rich source of guidance and training. Initiatives such as Cohort and Longitudinal Studies Enhancement Resources (CLOSER: [www.closerprogramme.co.uk](http://www.closerprogramme.co.uk)) provide a platform for collaboration between studies, enabling them to pool resources and expertise, provide training, facilitate data linkage, encourage harmonisation across studies and increase the impact of longitudinal studies on policy and practice. The case study presented here has already provided input to the Scottish Government's data linkage strategy and plans (Brett & Deary, 2013; Deary, 2013).

A single repository of linked datasets which researchers can access in a secure environment

As with the existing linked administrative datasets in Western Australia, Finland and other countries, linking health and non-health datasets using a single identifier reduces the need for personal identifiers, reduces the likelihood of linkage errors, and protects the privacy of individuals. Accessing data in a secure environment or 'safe haven' reduces the need for such strict information governance requirements within a researcher's own environment, and enables access to those who lack the infrastructure to provide a secure environment. However, secure environments need to meet researchers' needs. Occasionally, several researchers within a team work in parallel on the same dataset and need to be able to pass results or even data between themselves. The data provided to researchers needs to be in a format they can use for analysis to avoid unnecessary and costly hours spent manipulating the data within the safe haven. Often, researchers wish to use their own written software or code in order to manipulate data, which can be prohibited or difficult to implement within a secure environment. The Secured Unified Research Environment (SURE), a remote-access computing facility funded by the Australian and New South Wales Governments as part of the



Population Health Research Network, provides a blueprint for a researcher-friendly secure environment (<https://www.sure.org.au> ). Where a secure environment is not available or practical (for example, where researchers are geographically distant from a suitable safe haven), legally binding data use agreements provide an alternative. Unfortunately, these do not always ensure that the organisation holding the data retains control over its use, which can lead to difficulties such as that currently experienced by the HSCIC in England (House of Commons Health Committee, 2014b).

The management of public perception of the use of personal data for medical research  
Public perception of the use of personal data, either with or without consent, is influenced by the media. Decisions on the use of personal data for medical research, especially without consent, rely on a delicate balance between the protection of privacy and confidentiality, and research carried out for the ‘public good’ (Regidor, 2004; Gissler & Haukka, 2010; Laurie & Sethi, 2011). All too often, this is inadequately portrayed in the media and focus lands on the negative aspects of data used in this way. In the UK, the Prime Minister David Cameron’s enthusiasm for opening up NHS data has taken the form of the care.data project, which aims to link all NHS data together and greatly enhance medical research and permit access to the private sector. However, some argue that its implementation to date has left a lot to be desired, with the media focussing on the commercial exploitation of health data (Goldacre, 2014a, 2014b). The result is that the project has been ‘put on hold’ (House of Commons Health Committee, 2014a, 2014b) and all access to HES data is currently under review (Whitfield, 2014). In contrast, the Western Australian Data Linkage System (WADLS) has, almost from its inception, encouraged public involvement in research based on linked data through active consultation, public surveys, consumer representation on management committees and the publication of regular bulletins in the public domain outlining the

WADLS and its research findings (Brook, Rosman & Holman, 2008; Holman et al., 2008).

Data linkage and data sharing have important roles to play in life course epidemiology. Linked data have the power to identify trends in population health and understand the aetiology of disease, and to inform better decisions about care and improve quality and safety standards within health and social care. Data linkage can unlock the potential of routinely-collected health and non-health data dating back up to 50+ years. The increasing use of data linkage necessitates important decisions about ownership, access and confidentiality. Stringent controls need to be in place to ensure that access to health records is granted according to public interest and confidentiality is maintained throughout. However, as evidenced by the present case study, this process is often complex due to inconsistencies in legislation and interpretation of legislation across countries and data custodians. The process of obtaining permission is lengthy and often difficult to navigate, which inevitably leads to delays and wastage (Al-Shahi Salman et al., 2014). In the 6-Day Sample study, wastage occurred where a consideration of the costs and effort required to obtain additional permissions (for example, to link to health records held in Wales and Northern Ireland) was considered disproportionate to the potential gains. Nevertheless, it is important for us to state that all individuals within the regulatory bodies were helpful and expressed interest in the study and its aims.

Aside from these legislative and administrative complexities, research using routinely collected health records is not without its problems. There are two main sources of bias arising from the use of health records. First, the quality of health records needs to be considered. Aside from the inherent bias arising from the inclusion of only individuals who consult health services, health records rely on accurate completion by clinicians

and hospital coders. Studies have shown cause of death certification to be problematic in terms of omissions and errors (Middleton et al., 2011). Indeed, the process is currently undergoing reform in England and Wales (Office for National Statistics, 2012). Second, linkage errors occur, particularly where probabilistic matching techniques are employed (Harron, Wade, Gilbert, Muller-Pebody & Goldstein, 2014). Separating linkage from analysis, as generally occurs in research using linkage to health records, means that researchers are unable to evaluate the impact such errors might have on their results (Harron, Wade, Muller-Pebody, Goldstein & Gilbert, 2012; Harron et al., 2014).

The landscape of data linkage is constantly changing. Concerns have been raised over the revision of the EU Data Protection Directive, which may result in even more stringent controls on the use of personal data without consent, rendering studies such as the 6-Day Sample less likely to take place (Mansell, 2013). The situation in the UK is promising. Politicians and decision-makers are recognising the added value of data linkage (Cabinet Office and Prime Minister's Office, 2011; Walker, 2011) and encouraging funding to be channelled in this direction. Four Farr Institutes of Health Informatics Research are in the process of being set up across the UK. In Scotland, the Government commissioned a Data Sharing and Linkage Service in collaboration with data custodians and researchers, and its proposed design – as well as the proposed implementation of the Farr Institutes – meets many of the recommendations detailed above (Data Sharing and Linkage Service, 2013).

Given the great encouragement to undertake data linkage, and the initiatives that are taking place throughout the world, we hope this case study will be valuable for those researchers who, like our team's investigators, mostly come from the social and medical

sciences and who wish to conduct life course research on human health and wellbeing. We concede that the process might be more straightforward for experts in data linkage. We offer this report as a guide and warning to researchers in the field, and as a stimulus to the greater simplification and harmonisation of organisations, processes and legislation.

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## Supplementary material: narrative account

### **A narrative of the permissions sought for the study**

The following narrative describes the process involved in our obtaining permission to carry out both the follow-up and linkage aspects of the study. We thought that this would be useful to other researchers, because our study: involved anonymous linkage and some follow-ups in person; involves organisations across Great Britain; is taking place at a time of changing regulations and organisations; and at a time when this sort of research is being encouraged.

### **Abbreviations used in the narrative:**

CAG = Confidentiality Advisory Group  
DLS = Data Linkage Service  
ECC = Ethics and Confidentiality Committee  
HES = Hospital Episode Statistics  
HRA = Health Research Authority  
IGT = Information Governance Toolkit  
ISD = Information Services Division  
MMR = Measles, Mumps and Rubella  
MRIS = Medical Research Information Service  
NHSCR = NHS Central Register  
NIGB = National Information Governance Board (for Health)  
NRS = National Records of Scotland  
ONS = Office of National Statistics  
PAC = Privacy Advisory Committee  
R&D = Research & Development  
REC = Research Ethics Committee  
RP = Research Passport  
SLSP = System Level Security Policy  
SMR = Scottish Morbidity Records  
SMS = Scottish Mental Survey  
WTCRF = Wellcome Trust Clinical Research Facility

### **Permission to access data in Scotland**

#### **Ethical approval**

The first application that was submitted was to the National **Research Ethics Committee (REC), Scotland-A**. This was deemed necessary (rather than local RECs) due to the potential inclusion of Adults With Incapacity within the follow-up study. In preparation for this, invitation letters, information sheets, reply slips and consent forms had to be produced for the main and sub-studies, along with the study protocol and other relevant documentation. When combined with proof of funding and scientific review, this constituted 29 supporting documents. The application was submitted on 31<sup>st</sup> January 2012 for consideration at the 23<sup>rd</sup> February meeting and conditional approval was granted on 28<sup>th</sup> February 2012. The conditions were that NHS Research & Development (R&D) approval was obtained, and modifications were made to a few of the supporting documents. These were completed, and final approval was granted on 26<sup>th</sup> April 2012.

Scotland A-REC submitted (one form, 34 pages): 31.01.2012

Supporting documents: 29

Conditional approval: 28.02.2012

Re-submission: 24.04.2012  
Supporting documents: 6  
Final REC approval: 26.04.2012

### **NHS R&D approval**

This approval is necessary for all studies using NHS patients or partly-sponsored by NHS organisations. The application form was completed alongside the REC form but submitted afterwards due to a misunderstanding as to whether or not REC approval was required first. Following submission of the application, a large number of queries were received – ranging from incorrect version numbers on documents through to the general ethos of the study – and answered by the first author on behalf of the study.

NHS R&D submitted (two forms, 36 pages & 10 pages): 17.04.2012  
Supporting documents: 27  
NHS R&D approval: 24.04.2012

### **Wellcome Trust Clinical Research Facility (WTCRF) approval**

As the study required the use of the WTCRF facilities for processing, storage and analysis of biological samples, and for the clinic validation sub-study, this required a further application. This was approved within two months following a number of queries and responses regarding the finer details of the study.

WTCRF submitted (three forms, 4, 5, & 2 pages): 06.04.2012  
Supporting documents: 13  
WTCRF approval: 29.05.2012

### **NHS Research Passport**

The Research Passport (RP) system enables the issuing of honorary research contracts or letters of access to Higher Education Institution researchers who need to undertake their research within the NHS. This provides evidence of the pre-engagement checks undertaken on the researcher in line with NHS Employment Check Standards. It was designed to streamline the process for obtaining permission for research from NHS organisations. With regard to the present study, it was suggested that this would be required for the two researchers, one of whom (researcher A) would be dealing with participants regularly and conducting cognitive (not physical) tests on them at the WTCRF whereas the other (researcher B) was likely to speak to participants over the telephone but not meet them in person. The process was begun in April 2012 following the NHS R&D approval. As part of the pre-employment checks conducted within the NHS, staff need to prove that they have received immunisations for various diseases including measles, mumps, rubella, polio, TB, diphtheria and tetanus. This proved to be a major sticking point in this case. Researcher A had previously worked for the NHS in 2001 and received a comprehensive health check at that point, including immunisations for Hepatitis B, TB and a blood test confirming rubella immunity. Researcher B had none of this. For the Research Passport, both were required to provide evidence of their immunisations. Both researchers grew up in England and received all the relevant childhood immunisations but had no proof of this. Both had to contact their General Practitioners to obtain access to their health records, and both discovered that their English records had been destroyed (in accordance with the law, which states that immunisation records should be kept only until a person reaches 25). Of particular note was the insistence that both researchers provided evidence of having received the measles, mumps and rubella (MMR) vaccination as children – an impossibility given their age. Researcher A passed the occupational health check. Researcher B was informed by the University's Occupational Health Unit that she would require additional immunisations: BCG, MMR and the diphtheria, pertussis and tetanus

vaccine. She was referred to the Respiratory Clinic for a BCG injection but was advised that unless she was in direct contact with patients NHS Lothian wouldn't permit her to have the injection. The matter was taken up by the School administrator for the University of Edinburgh, and after a month the NHS conceded that they had reviewed their procedures and she would not after all require the health check.

The RP process also included a Disclosure application, which in itself was time-consuming. Researcher A's entire application almost fell through after 5 months because the Disclosure was in her married name and the RP application (and research contract) in her maiden name. In all, the process took 9 months and both researchers received completely different outcomes. Researcher A received an honorary research contract with NHS Lothian and Research B received a letter of access to patients within NHS Lothian.

RP process begun: April 2012

Occupational health check – A: 27.06.2012

Disclosure application submitted (two forms, 4 pages each): 02.08.2012

Disclosure received: 05.09.2012

RP form submitted (one form, 6 pages) – A: 03.10.2012

Supporting documents: 5

RP form resubmitted following queries: 18.10.2012

Occupational health check – B: November 2012

RP form submitted (6 pages) – B: November 2012

Supporting documents: 3

Honorary research contract for NHS Lothian received – A: 29.11.2012

Letter of access received – B: January 2013

### **Privacy Advisory Committee (PAC)**

The PAC is an independent body in Scotland that provides advice on requests for the release of patient identifiable information by NHS Scotland's Information Services Division (ISD) or by the General Register Office for Scotland (now National Records of Scotland, NRS).

The study required approval from the PAC, which consists of a mix of health professionals and lay people, in order to perform both the linkage and the follow-up aspects of the study. The application form, which requires considerable detail regarding data security, was submitted on 14<sup>th</sup> May 2012 along with 28 supporting documents, following discussion and advice from the ISD's Caldicott Guardian. The Chief and Principal Investigators and the first author were invited to discuss the application in further detail with the Caldicott Guardian and another senior staff member on 7<sup>th</sup> June. Following this, a re-application to the PAC was submitted on 25<sup>th</sup> June 2012 containing 30 supporting documents, many of which were amended versions of those previously submitted to other bodies. The application was considered by the PAC during July and a three-page response with queries – mostly about the follow-up study – was received from the PAC members on 2<sup>nd</sup> August. These were responded to and further amendments made to the study protocol and some supporting documents, and final approval was received on 4<sup>th</sup> September 2012.

PAC submitted (one form, 20 pages): 14.05.2012

Supporting documents: 28

Meeting: 07.06.2012

Re-submitted (one rewritten form, 20 pages) 25.06.2012

Supporting documents: 30

Queries received: 02.08.2012

PAC approval: 04.09.2012

### **REC and NHS R&D amendments following PAC application**

As the process of obtaining PAC approval had involved amendments to several key supporting documents, including the participant consent form and information sheet, these needed to be approved by the REC and NHS R&D before the study could proceed.

REC amendment submitted: 11.09.2012

Supporting documents: 10

REC approval: 01.10.2012

NHS R&D amendment submitted: 01.10.2012

Supporting documents: 9

NHS R&D approval 19.10.2012

### **PAC amendment**

The study team elected to send a reminder letter to respondents and this was submitted as an amendment for consideration by the PAC. This was not put before the whole committee but was considered acceptable by senior staff at ISD.

PAC amendment submitted: 19.10.2012

Supporting documents: 2

PAC approval: 30.10.2012

### **Permission to access data in England/Wales**

#### **National Information Governance Board (NIGB) Ethics and Confidentiality Committee (ECC)**

Before the study could obtain permission to perform the linkage and follow-up of those participants currently residing or who had ever resided in England and Wales, s251 support was required from the NIGB. This allows identifiable patient information to be used without consent in very specific circumstances. The application form for this process was equal to the REC application form in length and breadth, but required a very detailed System Level Security Policy (SLSP) as evidence of data security. This took some time to complete and required input from two data managers within the Department of Psychology, and the Chief Information Officer for the College of Humanities and Social Sciences of the University of Edinburgh. The application form also incorporated an application to access the Hospital Episode Statistics. The application was submitted on 17<sup>th</sup> August 2012 and queries received and responded to on 30<sup>th</sup> August 2012. Approval was granted on 8<sup>th</sup> October 2012 on two conditions: that approval was obtained by an English REC (due to differences in legislation surrounding adults lacking capacity in England/Wales versus Scotland) and that the security of our system could be demonstrated. It later transpired that three days after our application was submitted, the NHS in England/Wales implemented a change of policy such that researchers applying for s251 support now needed to provide evidence of a satisfactory level of security using the NHS's Information Governance Toolkit, instead of the SLSP.

Following discussions with the Scotland-A Research Ethics Committee, it was decided that adults lacking capacity would be excluded from the follow-up study in England/Wales, and that the invitation letter would be re-worded to omit any reference to the use of a proxy respondent. This was resubmitted to the Scotland-A REC and NHS R&D as a substantial amendment, along with the inclusion of the reminder letter to non-responders. Both were approved in November 2012. Confirmation that the ethical condition for s251 support had been met was received on 17<sup>th</sup> December 2012. At this



point it became clear that the NHS Information Governance Toolkit (IGT) could not be completed at an organisational level, as is normally the case for NHS organisations, because differences in Information Governance procedures and systems across the University of Edinburgh would render the assessment inappropriate and inadequate for the purposes of the study. Advice was sought from IGT staff and the study, along with other follow-up studies of Scottish Mental Survey participants undertaken in the same department, was registered in early January. Completion of the IGT assessment involved the creation of new policies and documents specifically relating to the SMS1947 follow-up studies, additional training for all staff, and the purchase of an entirely new computing system to maximise access control. The IGT was submitted on 20<sup>th</sup> February 2013 with 28 supporting documents. This was reviewed and deemed to be satisfactory on 28<sup>th</sup> February 2013. Confirmation of partial approval relating to the linkage aspects of the study was received on 8<sup>th</sup> March 2013.

NIGB ECC application (one form, 19 pages): 17.08.2012

Supporting documents: 21

NIGB ECC conditional approval: 08.10.2012

Scotland-A REC substantial amendment (one form, 5 pages): 25.10.2012

Supporting documents: 3

NHS R&D substantial amendment: 25.10.2012

Supporting documents: 3

NHS R&D approval: 05.11.2012

REC approval 13.11.2012

Confirmation of ethics requirement having been met: 17.12.2012

NHS IG Toolkit submitted (online completion, 17 requirements): 20.02.2013

Supporting documents: 28

NHG IG Toolkit deemed satisfactory: 28.02.2013

Partial Approval received: 08.03.2013

### **Medical Research Information Services (MRIS; now the Data Linkage Service), Health and Social Care Information Centre (HSCIC), England/Wales**

This service provides extracts of anonymised health data to researchers. The application to access the Hospital Episode Statistics (HES) formed an integral part of this application alongside the general MRIS form. The application was submitted on 13<sup>th</sup> September 2012 and queries were received on 1<sup>st</sup> October 2012. As a result of these queries, it transpired that death registration data would be obtained from the Office of National Statistics (ONS) and not the HES, which would require a further application to achieve Approved Researcher status for all study staff dealing with this data. This was completed in October 2012 and approval obtained in the spring of 2013.

Further sets of queries were received from the ONS and the Data Linkage Service (DLS) in January and February 2013. One of these queries resulted in the addition of cancer registration data to our application, which is maintained and held by ONS as a separate entity to the Hospital Episode Statistics. The study application was assigned for consideration at their meeting on 26<sup>th</sup> March 2013.

The NIGB ceased to exist from 31<sup>st</sup> March 2013. From 1<sup>st</sup> April, the Health Research Authority (HRA) has hosted this expert advice function in relation to s251 applications and a Confidentiality Advisory Group (CAG) has been established to provide this expert advice. The DLS is now part of the Health and Social Care Information Centre (HSCIC), which was established on 1<sup>st</sup> April 2013 under the Health and Social Care Act 2012 to make provision about information relating to health or social care matters.

The study team were informed that, due to the changes in legislation regarding the statutory powers of the newly-created HSCIC, approval for the follow-up aspect of the study was on hold pending the meeting on 26<sup>th</sup> March 2013.

MRIS/DLS/HES application (five forms, 10, 11, 8, 6, & 5 pages): 13.09.2012

Supporting documents: 19

Additional supporting documents sent in response to queries: 11

Approved Researcher application (six forms, 8 pages & five forms of 11 pages):  
26.10.2012

Supporting documents: 7

Consideration at meeting: 26.03.2012

Final approval (s251 support): 01.05.2013

### **Tying it all together: NHSCR, ISD, PAC, HSCIC and CAG**

Approval for the follow-up and linkage aspects of the study in England/Wales was granted on 1<sup>st</sup> May 2013. The first author met with colleagues at ISD on 10<sup>th</sup> May to discuss the practicalities of the data linkage in Scotland. In particular, there was a need for ISD to create an ID for each participant that would incorporate group membership but that would prevent the study team from identifying individuals. This ID would then carry across to England/Wales and enable the study team to put together individuals' data from all three countries. A meeting was arranged for 19<sup>th</sup> June 2013 at NHSCR Dumfries to discuss this process further. The meeting was attended by both authors as well as representatives from NHSCR and the DLS.

A process began of liaising with the DLS/HSCIC over the data linkage. In order to proceed, a Data Sharing Agreement was drawn up by the DLS/HSCIC. This was looked over by the University of Edinburgh's legal team and minor changes suggested.

However, one major issue arose: the Agreement stated that the study would be receiving only anonymised and not identifiable death registration data. It transpired that the s251 support only covered anonymised data. On 19<sup>th</sup> June it emerged that, due to differences in interpretation of the Statistics and Registration Service Act 2007, death registration data were treated differently in England/Wales than in Scotland. Whereas in Scotland death registration data are in the public domain, in England/Wales access is restricted. The study would not be receiving identifiable death data because this was not specifically mentioned in the application form to the ECC or MRIS – although it was mentioned in our ethics application and study protocol. It became clear to us that the study in fact had three and not two aspects: there were: (1) the follow-up study, (2) the linkage to anonymised health data, and (3) the linkage to identifiable death registration data. Following on from this meeting, IJD contacted the CAG and formally requested identifiable death registration data in addition to anonymised date and cause of death.

It also emerged during the meeting on 19<sup>th</sup> June that the Hospital Episode Statistics data only covered England and a separate application would be required to obtain health data for participants who have ever lived in Wales. A decision was made not to pursue this.

A further meeting took place at end of July between ISD, NHSCR, the first author and DLS/HSCIC to further clarify the process of data linkage across the border.

Meeting at ISD: 10.05.2013

Meeting at NHSCR Dumfries: 19.06.2013

Death registration amendment to CAG: 26.06.2013 Amendment approved by

CAG: 22.07.2013

Meeting at ISD: 30.07.2013

The summary of the permissions process is as follows.

Total number of separate bodies applied to: 7

Total number of amendments or re-submissions: 7

Number of times the study protocol changed following applications: 4

Number of bodies whose names and functions have changed during this process: 2

Total number of supporting documents sent: 210.



## **Research paper 2: How to....obtain accurate objective measurements of health at a distance**

Published as:

Brett, C. E. & Deary, I. J. (2015). *Health Psychology Update*, 24(2), 43-48.

### Abstract

Large scale longitudinal studies are an excellent tool for increasing our understanding of the aetiology of health and disease. Obtaining accurate measures of health status is important in these kinds of studies. However, self-report measures of health are subject to bias and obtaining objective health measures can be costly. This paper outlines the process and challenges of designing a home testing kit to enable participants to obtain objective health measures themselves, using the example of a new cohort study, the 6-Day Sample.

### Introduction: the problem

Longitudinal cohort or population-based studies are an invaluable tool for addressing epidemiological questions around the causes and correlates of health (Kuh, Ben-Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C 2003; Pearson, 2011; Cooper et al., 2012). Asking a large number of individuals the same questions increases statistical power and enables researchers to investigate the influence of confounding variables such as age, sex, geography, educational and occupational level. Obtaining a measure of health status – both past and present – is essential.

Traditionally, large scale studies have favoured self-report as a means of collecting this data, with a considerable literature on the reliability and predictive validity of self-reported health (Idler & Benyamini, 1997; DeSalvo, Bloser, Reynolds, He & Muntner, 2006, Kuhn, Rahman & Menken, 2006). However, obtaining accurate self-report

measures of current health status can be problematic. It is well known that people tend to over-estimate participation in positive health behaviours such as physical activity (Prince et al., 2008) or healthy eating (Schoeller, 1990) and underestimate negative health behaviours such as drinking (Stockwell et al., 2004) and smoking (Connor-Gorber, Schofield-Hurwitz, Hardt, Levasseur, & Tremblay, 2009). Even simple physical measures such as height and weight are often reported inaccurately. Height is generally over-estimated, particularly among shorter (Stewart, 1982; Gunnell et al., 2000) and overweight adults (Rowland, 1990; Vailas & Nitzke, 1998). Older adults frequently over-estimate their height, perhaps reporting height from an earlier age (Gunnell et al., 2000; Sahyoun, Maynard, Zhang & Serdula, 2008; Shiely, Hayes, Perry & Kelleher, 2013). Weight is often inaccurately reported (Rowland, 1990; Vailas & Nitzke, 1998; Sahyoun et al., 2008; Shiely et al., 2013). As Body Mass Index (BMI), which is calculated from height and weight, is a vital indicator of health status, these self-report inaccuracies can have implications for a study's findings.

To overcome these limitations, researchers have placed increasing emphasis on objective measurements of health, including so-called biomarkers, which embody sub-clinical changes in health which might act as precursors to disease and poor health. In aging research, biomarkers represent the underlying biological and physiological processes of aging, enabling researchers to calculate a more accurate measure of an individual's physiological and functional age than chronological age alone (Baker & Sprott, 1988; Anstey & Smith, 1999; Sprott, 2010). In order to collect objective health measurements, many studies, such as the English and Scottish Health Surveys (<http://healthsurvey.hscic.gov.uk/support-guidance/public-health/health-survey-for-england.aspx>, <http://www.scotland.gov.uk/Topics/Statistics/Browse/Health/scottish-health-survey>) and the UK Biobank, (Allen et al., 2012) now conduct extensive physical and/or

cognitive testing of their participants. This approach maximises the quality of the data collected through detailed protocols and careful training, and allows for the safe collection of blood and other biological samples.

But for many studies this approach is impossible due to costs or practicalities, or inappropriate due to the nature of the sample population. Researchers are looking to find new ways of obtaining accurate, objective measures of physical health that can be administered by individuals themselves with minimal expenditure.

### Methods: the 6-Day Sample study

The current article outlines the measures used in a new longitudinal cohort study, the 6-Day Sample (Deary, Whalley, & Starr, 2009; Brett & Deary, 2014). This group of 1208 individuals, born on 6 days of 1936, were chosen as a representative sample of the Scottish population. They were followed up from age 11 to 27, providing comprehensive information on their intelligence, family, personal characteristics and educational and occupational attainment. This group has been traced and survivors living throughout Scotland, England, and Wales were invited to a follow-up study of health and wellbeing in old age. The study investigators were keen to obtain multiple markers of physical health, which, due to the geographical spread of participants, their age and the potential burden of travelling to Edinburgh for testing, needed to be conducted by participants themselves at home.

Choosing what (and what not) to measure and devising a testing kit.

The decision as to which measures to include should be informed by the study's research questions and hypotheses. These choices are often made by principal investigators well in advance of applying for research funding or ethical approval.

Implementing their suggestions and selecting a suitable set of tests for inclusion in the study protocol can require tact and diplomacy. Consideration needs to be given to practicalities, with only the most accurate, effective and least burdensome tests chosen. There is little point devising a complex and ingenious testing kit if participants will take one look and throw it away.

The 6-Day Sample study consists of eight workstreams each with unique research questions and hypotheses. These included genetics, stress reactivity, and general health. The first two required the collection of saliva samples for DNA and cortisol analysis (Heaney, Phillips & Carroll, 2010). A range of biomarkers were chosen to measure general health, all of which have been related to morbidity and mortality in older adults: BMI (Rantanen et al., 2000), waist-hip ratio (Price, Uauy, Breeze, Bulpitt & Fletcher, 2006; Srikanthan, Seeman & Karlamangla, 2009), leg length (Gunnell, Davey Smith, Holly & Frankel, 1998), balance (Berkman et al., 1993; Klein, Klein, Knudtson & Lee, 2005) function (Cook et al., 1993; Cook et al., 1995; Knudtson, Klein & Klein, 2009), and arm strength (Doherty, 2003; Manor, Topp & Page, 2006).

#### Sourcing instructions and equipment

It is essential that all participants complete the tests in the same way. This ensures the validity of the data and protects the study's scientific integrity. The physical testing 'kit' should be designed to maximise the consistency and reliability of results across participants of varying levels of functional and cognitive ability. As participants will complete these tests without the presence of a researcher, it is essential that the tests are easy to use, with clear and accurate instructions, and that participants are provided with everything they need to complete the tests correctly.



The methods sections of relevant papers can be a useful source of instructions, and equipment manufacturers will often be willing to provide sample equipment alongside accurate instructions. The internet can be a useful source if used with caution and a well-thought-out search strategy. Ideally, all instructions used should be replicated across multiple sources.

When devising the kit, it is good practice to be prepared for every eventuality. Simple things can make the difference between success and failure. For example, ensuring correct postage and addresses are on all return envelopes, packaging the kit carefully to minimise damage in transit, providing suitable packaging for the safe (and legal) return of biological samples, ensuring study contact details are clearly visible in case participants have questions, designing a user-friendly answer sheet that allows flexibility while minimising error, and making sure that all items returned from each participant can be identified.

Trial all equipment and instructions – on yourself, colleagues, and age-appropriate individuals – before finalising the testing kit and committing to bulk purchases. In the 6-Day Sample study, peak flow meters from two manufacturers were purchased and their reliability compared. The whole testing kit was trialled by willing age-appropriate volunteers, who were encouraged to give honest and detailed feedback.

The contents of the 6-Day Sample testing kit are shown in Table B18.

#### Creating an instructional video

One way of facilitating the correct completion of physical tests is to demonstrate them in a video. This should not be undertaken lightly. The costs of producing a video

professionally may be beyond the reach of many research studies, and completing the task in-house – as was done for the 6-Day Sample study – is time-consuming. However, the benefits in terms of participation and consistency are plentiful.

Table B18

Contents of the 6-Day Sample physical testing kit

Measure	Test	Equipment provided
BMI	Height / Weight	Pencil 3m flexible tape measure
Body morphometry	Waist, hip & calf circumference Leg length	Tape measure
Arm strength	Elbow flexions	1.5m low resistance TheraBand Countdown timer
Balance	One leg stand	Countdown timer
Lung function	Peak expiratory flow	Peak flow meter
Genetics	Saliva sample	Oragene testing kit
Stress reactivity	Salivary cortisol	3 x Salivette cortisol tubes
General	N/A	Branded pen & badge, 3 x postage paid return envelopes, 12-page A5 instruction booklet, DVD

The video should cover each and every aspect of the physical testing measurements, preferably demonstrated by someone close to the participants' age. Creating a storyboard and script in advance facilitates this process and ensures that sufficient and appropriate footage is shot. The script should be economical and match the written instructions. The footage itself should be shot against a plain background to reduce distraction, using the same testing kit that participants will receive. If editing the video

yourself, allow plenty of time – especially if inexperienced. The 6-Day Sample video took 2 weeks to edit 30 minutes of footage. Still shots or pictures are useful in instances when the narrative outruns the video footage.

### Quality control

Participants may still make mistakes while completing the physical testing. Documented quality control measures are needed to check the integrity of the data received. If samples are being collected, these will often be processed at a laboratory with their own, robust, quality control checks in place. For other measures, a simple check involves looking for, and possibly removing, impossible values or extreme outliers.

### Results

The 6-Day Sample study achieved a return rate of 27.3%. Comparison of childhood intelligence data revealed a one standard deviation difference in intelligence between responders and refusals (IQ = 115.59 vs 99.87,  $F=15.037$ ,  $p<.001$ ). Most participants completed all the physical measures, with very few impossible values, and the vast majority of genetic and cortisol samples received were of sufficient quality for analysis. Ten participants were also members of the Lothian Birth Cohort (LBC) 1936 (Deary et al., 2007), and had undergone extensive physical and cognitive testing within a year of our study. Their results from the equivalent measures within the two studies were compared (Table B19).

Table B19

Comparison of LBC and 6-Day Sample measures.

Measure	LBC Wave 3	6-Day Sample	Correlation	p
Height (cm)	165.95	169.44	.841	.002
Weight (kg)	78.00	78.85	.761	.011
Peak expiratory flow	320.83	381.93	.703	.023

Note. N = 10.

Consistent with previous research, height was overestimated and weight underestimated.

### Conclusion and implications

Collecting objective measures of current health status is important for large-scale studies. The experience of the 6-Day Sample study has shown that valid measures can be obtained at a distance. Despite our best efforts, the observed difference in intelligence between participants and non-participants suggests that some potential participants may have been put off by the cognitive complexity of completing these tests (and a lengthy questionnaire) at home (Bowling, 2005). Additionally, the discrepancies noted in a small group between the self-administered and clinic-administered measures suggest that further validation of the physical tests may be required.

### Acknowledgements

The 6-Day Sample study and CEB are supported by a UK cross council Lifelong Health and Wellbeing Initiative grant (MRCG1001401). Both authors are members of the Centre for Cognitive Ageing and Cognitive Epidemiology at the University of Edinburgh, part of the cross council Lifelong Health and Wellbeing Initiative

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**Section C –  
Professional practice**



## **Generic professional competency case study**

### **Background**

In this case study I will describe and reflect upon my professional development as an independent health psychologist through the stage 2 professional doctorate training in health psychology. I commenced both the training and my research position in October 2011.

My main placement during the DPsych was as a research associate employed by the University of Edinburgh to set up and co-ordinate a cross-disciplinary research study funded by the cross-council Lifelong Health and Wellbeing initiative and entitled “Lifelong health and wellbeing of the ‘Scotland in Miniature’ cohort: the 6-Day Sample of the Scottish Mental Survey 1947”. This study aimed to investigate the lifecourse influences on health and wellbeing in old age using a unique cohort of 1208 individuals born on 6 days of 1936 and were followed up for 16 years between the ages of 11 and 27. They formed part of the Scottish Mental Survey 1947, in which 70,805 schoolchildren were given a written intelligence test at age 11 (Deary, Whalley & Starr, 2009). The study aimed to locate the 6-Day Sample using the NHS Central Register and then to: a) invite survivors to take part in a follow-up study and b) obtain mortality and morbidity data for the entire sample from national databases of deaths, cancers and hospital records and link this to data obtained during childhood and early adulthood. The study quickly evolved to include the remaining members of the Scottish Mental Survey and the younger siblings of the 6-Day Sample. In particular, surviving members of the 5000-strong 36-Day Sample were also invited to a follow-up study. Although initially funded for 3 years to September 2014, the study was extended to March 2016.

In early 2014 I was offered and accepted a part-time, maternity cover position as scientific administrator for the Centre for Cognitive Ageing and Cognitive Epidemiology (CCACE) at the University of Edinburgh, which I completed on two days a week from May 2014 to March 2015.

### **1.1: Implement and maintain systems for legal, ethical and professional standards in applied psychology.**

It is a researcher's duty to maintain the confidentiality of the information obtained from research participants. Therefore, I instigated practices such as storing paper copies of data in locked filing cabinets, restricting access to servers on which data is stored, ensuring participants' contact details are stored separately from their research data, ensuring no unencrypted data is stored on portable devices, and ensuring any data shared with other researchers is fully anonymised. The Data Protection Act (1998) outlines 8 principles governing the use and storage of personal (identifiable) data. These cover the fair and lawful processing of personal data, which must be kept up to date, and not kept longer or in more excessive quantities or detail than necessary for the purposes for which it is collected. A key element of my role was to create and maintain databases to hold follow-up study data, and I was mindful of these principles throughout this process and my interactions with participants – particularly those declining to take part in our study.

Health professionals are subject to a common law duty of confidentiality whereby patients' information must be treated with care and respect, and only used or shared to further their treatment. In the broader context of health care provision this extends to the use of their information for the development of treatment options and health care. Over the last few decades, data on hospital admissions and cancer diagnoses has been

routinely collected by the NHS in Scotland and in England and Wales. This enables the NHS to monitor health service use and the incidence and prevalence of illness and diseases. The government-commissioned Caldicott Report (The Caldicott Committee, 1997) highlighted principles and recommendations for the flow and handling of patient information within the NHS, both at local and national levels. Although the main purpose of this data is to assist policy makers in health service planning and in setting and monitoring targets, a secondary use is for medical research. Matarazzo (1980) suggested that a key role of health psychology is in understanding the aetiology of illness and disease and improving health care systems. Routinely collected health data is a valuable resource enabling the use of population level data to identify emerging patterns in disease aetiology and health service use, thereby informing interventions or recommendations to improve the health care system. In the vast majority of cases, data is used in an anonymous form without patients' explicit consent. Specific legislation governs the use of health data in this way. For example, in England and Wales, section 251 of the Health and Social Care Act 2006 allows for the use of patient data without consent for medical research in the wider public interest. Access to data held in national databases in the UK is governed by committees made up of a mixture of health professionals, researchers and members of the public.

The 6-Day Sample study raised a large number of legal, ethical and professional issues. When I started the role I knew that a large part of my duties over the first few months would be to ensure that the study obtained the necessary approvals. However, nothing could have prepared me for the Herculean task ahead.

As the main aim of the study was to trace specific individuals using national databases and to link information on vital status and health outcomes to existing data, this

constituted a use of patients' information without their consent. Besides the impracticalities of obtaining consent from 70,000+ individuals, many of whom had died, it was essential to obtain health data on as many of the SMS1947 as possible in order to maintain the representativeness of the sample. The study therefore required permission from the bodies responsible for controlling access to routinely collected health data (the Privacy Advisory Committee in Scotland, and the Confidentiality Advisory Group of the Health Research Authority in England/Wales) in addition to NHS research ethics approval and approval from the local NHS Research & Development department. In total, seven separate regulatory bodies or organisations were applied to. It was my responsibility to draft applications, data requests, and supporting documents (including study protocols, consent form, information sheets, and invitation letters). I co-ordinated input from the study director and 7 other Principal Investigators and developed good working relationships with individuals within the organisations, representing the study and obtaining and following advice as necessary.

Throughout this process, I developed a high level of competency in research and information governance. In the short term, this enabled me to answer study participants' questions and concerns and to offer advice and assistance to colleagues. I produced a summary narrative of the process of obtaining permission, which was shared with policy makers developing a more streamlined data linkage service in Scotland as evidence of the value and difficulties of data linkage for research purposes in the UK. I presented this summary at an international conference on data linkage organised by the Scottish Informatics Programme (SHIP) and was invited to repeat the presentation at a CPD event for members of the Public Health Directorate of the Scottish Government. I wrote an article based on these experiences and summarising the issues and



controversies surrounding data linkage and consent in research, which was published in the journal *Longitudinal and Life Course Studies* (Brett & Deary, 2014).

In the longer term, the skills and knowledge I acquired during this process will enhance my professional practice as a health psychologist. There were a number of specific issues raised by the study that are of particular relevance to health psychology. The first relates to consent. There was the possibility that some of our participants might have dementia or similar illnesses that reduced their capacity to give consent for the follow-up study. Resolving this to the satisfaction of the various organisations involved my becoming familiar with the legislation surrounding Adults With Incapacity in Scotland and Adults Lacking Capacity in England/Wales. I put this learning into practice when speaking to the relatives of participants lacking capacity, some of whom were able to participate in the study. It is important that both research participants and patients are able to give informed consent before any research, treatment or intervention and understanding the issue of capacity is particularly relevant to older adults. I attended training on Good Clinical Practice and the EU Directive and put this into practice when obtaining consent from participants in person.

The second issue was around information governance. In order to obtain permission to access health data from England and Wales, the study had to pass the NHS's Information Governance Toolkit (IGT). This is designed to ensure that all NHS bodies are adhering to the same strict standards of information governance. IGT submissions are generally completed at the level of the NHS Trust and encompass storage and handling of patient information. I was advised that our IGT should be completed by senior information governance staff at the University of Edinburgh on our behalf.

However, the University's existing information governance policies related to student

information and not research, and the University's research community is so heterogeneous that it was impossible to encompass all permutations of storage and handling in one submission. As a result, I had to complete the IGT for just our study and two other equivalent studies within our Centre. Although I had instigated systems and practices for the secure storage and use of our data, this all had to be formalised into policy documents. I completed online training in information governance provided by the NHS, read up on legislation, and liaised with senior information services staff at the University and our local data manager. In total I drafted 19 documents and our IGT submission passed with no amendments. In recognition of this considerable piece of work, my line manager successfully nominated me for an Exceptional Contribution Award, bestowed by the Head of School. My expertise has recently been requested by senior staff within Information Technology, who are planning an IGT submission on behalf of another College in Edinburgh University.

Throughout the professional doctorate, I experienced many other opportunities to develop my professional competency and understanding of professional boundaries. Creating and maintaining good working relationships with participants and with colleagues both locally and within external organisations has been a core aspect of my training, enabling me to grow in confidence as an independent health psychologist. It has emphasised the importance of approaching all encounters professionally with respect and courtesy, and accepting and offering advice where appropriate. Often when conducting cognitive testing with participants they express concerns about their declining memory and ask for advice. This highlighted the importance of acknowledging my professional limitations and resisting the urge to act outside my competency as a health psychologist.

I developed my supervision skills through the day-to-day supervision of four undergraduate psychology students working on the study under the department's voluntary research assistant scheme, hosting several work experience students, and coordinating assistance from colleagues when help was desperately needed on the study.

### **1.2 Contribute to the continuing development of self as a professional applied psychologist.**

Throughout my training, I have actively pursued opportunities for continuing professional development. Working as a researcher in a large academic psychology department with a very traditional approach and no health psychology input posed challenges in terms of developing my own professional identity as a health psychologist. The academic environment provided opportunities to develop academic and research skills and I sought to identify additional opportunities outside of this environment to develop my professional skills. These included professional memberships and attendance at health psychology-focussed workshops, conferences and networking events.

I have benefitted from membership of and engagement with organisations including the British Psychological Society's Division of Health Psychology (DHP), UK Society for Behavioural Medicine (UKSBM), European Health Psychology Society (EHPS), Society for Longitudinal and Life Course Studies, a Scottish postgraduate health psychologists' network, and the Advanced Quantitative MEthods Network (AQMeN). I presented my work and that of the study at conferences, including those organised by the UKSBM (2011), DHP (2012 and 2014), SHIP (2013), and EHPS (2014). These experiences have been invaluable for honing my presentation skills and for networking with other health psychologists and trainees, and learning more about the field. The

academic environment offers many events such as journal clubs, seminars and conferences, and I took advantage of these opportunities to expand my knowledge of research in ageing and beyond.

During the first year of my training, I attended workshops of each of the competencies organised by City University, including on ethical issues, supervising others, consultancy, teaching and training, CBT skills for health psychologists, Motivational Interviewing, quantitative and qualitative research skills and systematic reviews. I found these workshops extremely helpful in directing my training and developing my professional skills. I have sought out further opportunities throughout my training.

Behaviour change is a particular interest of mine and underpins my enthusiasm for health psychology, while clinical skills are an important aspect of an independent health psychologist's repertoire. To this end, I have attended training in designing and evaluating behaviour change interventions, a workshop on the behaviour change taxonomy, a workshop on mindfulness, and training in Acceptance and Commitment Therapy for health and communication skills for Motivational Interviewing, all facilitated by experts in the field.

I have always had an enthusiasm for teaching and sharing psychological knowledge. As my research position offered few opportunities for teaching, I sought out opportunities to develop my teaching competency. In addition to those described in the teaching and training case studies, I was invited to give a lecture on methodology in my research area to MSc Health Psychology students at City University three years running (the second of which formed my consultancy case study). I repeated my 10-week introductory health psychology course to adult learners twice more, using the lessons learnt from the first delivery and subsequent reflection to vastly improve the course. Attendance

increased, and students were enabled to contribute a great deal of their own experience. Due to my experience writing a systematic review, I was invited to give a presentation on ‘hints and tips’ at the Centre’s systematic review course in 2013 and 2014.

I took advantage of all opportunities to develop my quantitative research skills, attending workshops on Structural Equation Modelling, longitudinal data analysis, and item response theory. These skills were vital for completion of my research thesis, and will benefit my future career as a health psychologist.

I honed my writing skills through the publication of the two first author papers included in the DPpsych portfolio – one on the permissions process and the other on the physical testing kit used in our study. I also submitted my systematic review for publication and have received favourable comments back from reviewers. I have also contributed to a large number of papers by other researchers on the 6-Day Sample study, and during a days’ writing retreat managed to write up my MSc thesis for publication.

### **1.3 Provide psychological advice and guidance to others.**

A key aspect of my research assistant role was to co-ordinate the design of the study materials to best answer research questions from the 8 interdisciplinary workstreams. I provided guidance to ensure that the study encapsulated relevant aspects of successful ageing based on health psychology theory and research with robust, well-validated and theoretically-based measures. These included measures of well-being, sense of coherence, optimism and health behaviours. I applied similar advice and guidance to peer reviewing a number of journal articles and grant applications in the fields of gerontology and quality of life.

Outside of the working environment, I have been called upon to assist with a funding application for a community garden project, contributing expertise on research methods and wellbeing. I was also asked to present a workshop on the psychology of climate change, into which I incorporated a great deal of health psychology theory, for another community group.

I am frequently approached by colleagues seeking advice and guidance on data linkage and study design, enabling me to further develop my consultancy skills, and I look forward to the opportunities these collaborations may bring.

#### **1.4 Provide feedback to clients.**

Researchers working on UK Research Council-funded projects are obliged to feed back the progress and results of their work to funding bodies at regular intervals, and are encouraged to engage in knowledge exchange and public engagement activities. Each year since 2012 I have co-ordinate the 6-Day Sample study's report to the Medical Research Council. In 2014 this work was extended, through my scientific administrator position, to include reporting back on all grants held by my line manager and particularly the outputs and activities of the Centre for Cognitive Ageing and Cognitive Epidemiology (CCACE). This involved compiling reports of the publications, presentations, public engagement and other activities of the Centre's 70+ members, and describing them in a way that was understandable to all. This was a considerable task but nevertheless achieved in advance of the deadline.

Participant engagement and retention is vital to the success of any longitudinal cohort study. To this end, I produced an annual newsletter summarising the progress and results of the 6-Day Sample and 36-Day Sample studies to send to participants. This

newsletter had to be engaging and interesting, and involved eliciting, briefing and editing contributions from other researchers. I also contributed to the CCACE newsletter and in my scientific administrator role wrote articles for the CCACE website, and tweets for the Centre's Twitter page.

In all my teaching experiences, I provided feedback to the organiser of the course, whether this be the subject co-ordinator for the Office of Lifelong Learning, the MSc module organiser for my City University teaching, or the seminar organiser for my small teaching case study. As scientific administrator for CCACE I organised an MSc module, including obtaining feedback from students and lecturers, and as well as regular verbal reports I produced a written report which was presented to the Head of School as evidence of the module's success.

In my scientific administrator position I was asked to provide feedback on applications to a competitive fund for researchers, and to advise on the quality of applicants for the Centre's PhD studentships. I have also been asked to provide job references for two of the voluntary research assistants who have worked on this or previous studies.

### **General reflection**

Completing the stage 2 professional doctorate in health psychology has been as challenging as it has been rewarding. I have, for the most part, had to seek out opportunities to develop my competency as a health psychologist outside of my working environment. Although challenging, this has enabled me to maintain control of my training and develop my own areas of interest. Many of the opportunities I created have continued to be fruitful beyond the necessary work for the DPsych. I co-ordinated our School's participation in the Step Count Challenge – which formed the bulk of my

behaviour change intervention – on three further occasions, and several of the participants have reported continuing to wear their pedometers and/or increase their walking activity to this day. All my teaching – the Open Studies course, the MSc lecture, and the systematic review course – has been repeated, enabling me to further develop my teaching competency and develop my own identity as a health psychologist.

During this process I have built on my research experience and interests and developed expertise in research study design and methodology and information governance that has been utilised by colleagues within Edinburgh University. Through my research thesis, publications and peer reviewing, I have developed expertise in the determinants of subjective wellbeing in older adults, and in understanding the mechanisms underlying associations observed in cross-sectional and longitudinal research. I plan to use these skills and the lessons learnt throughout my training to enrich my future career as a health psychologist.

I began the DPsych after spending many years working as part of a research team under close supervision and with a specific remit. Completing the DPsych has not only enabled me to develop the specific competencies required by the qualification, but also has given me the confidence to ‘stand on my own two feet’, to advocate for myself and my own abilities, to find my own niche within health psychology, and to apply the theory and practice of health psychology within this academic environment. I look forward to the next chapter!



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## **Teaching and training competency case study: CPD seminar to health professionals in Geriatric Medicine**

### **4.1 Plan and design training programmes that enable students to learn about psychological knowledge, skills, and practices.**

Working as a Research Associate within academic psychology necessitated my actively seeking out opportunities to offer teaching and/or training to health professionals. It came to my attention that colleagues based in Geriatric Medicine within a large acute hospital in Edinburgh held a monthly seminar series covering a wide range of topics. I approached the series organizers in February 2012, offering to present my research into determinants of subjective wellbeing in older adults (Appendix C1: email communication). This offer was accepted and my talk scheduled for 14/05/2012. I was subsequently requested to repeat this talk by the organizers of a similar seminar series elsewhere in Edinburgh. I took this opportunity to respond to feedback and improve the talk, which was scheduled for 19/07/2012.

The series organiser confirmed that the seminar, attended by 20-25 health professionals from different disciplines, generally comprised a 30-minute talk plus questions. This type of didactic educational meeting is popular amongst health professionals, particularly within medicine. Proponents of the didactic teaching method argue that it is an efficient method of delivering a large amount of information in a limited timeframe, stimulating reflection and suggesting further individual reading and research. This is particularly effective for learners who are motivated and interested with well-developed, self-directed learning styles (Vaughn & Baker, 2001; Jarvis, 2006; McKimm & Jollie, 2007; Blakely, Skirton, Cooper, Allum & Nelmes, 2008). However, the constructivist

theory of learning – proposing that adult learners construct knowledge and understanding through everyday activities – has led to a proliferation of more interactive, problem-based learning techniques within medical education. Studies suggest these techniques are more enjoyable for students and promote critical thinking (Costa, Rensburg & Rushton, 2007; Blakely et al., 2008). However, the efficacy of either teaching method in improving knowledge, professional practice or health outcomes has received little rigorous empirical investigation (Davies, 2000; O'Brien et al., 2007). Indeed, reviews of the literature suggest that a complimentary mixture of interactive and didactic teaching methods is likely to be most effective in improving knowledge and professional practice.

Consequently, I elected to employ a combination of didactic and interactive teaching methods. I planned to deliver a 20-minute Powerpoint presentation followed by 5-10 minutes' worth of discussion and questions. The didactic method was likely most effective for this group; they chose to attend the seminar, suggesting motivation and interest, and were accustomed to this type of research seminar, suggesting a well-developed self-directed learning style (Vaughn & Baker, 2001; McKimm & Jollie, 2007). This format would meet the attendees' expectations, which has been shown to be important amongst medical students (Thomas & Lancaster, 2007). Having verified its feasibility and appropriateness with the series organizer, I was keen to incorporate a facilitated discussion focusing on the relationships between the subject matter and attendees' clinical practice. I hoped the discussion might embed the information presented in attendees' own everyday practice, thereby aiding retention.

A large body of research exists around individual differences in learning ‘styles’. Kolb’s Learning Styles Inventory (Kolb, 1984, 1985) is a popular tool, particularly within medical education. Kolb postulates that individuals’ learning processes differ along two dimensions: preferred mode of perception (concrete to abstract) and preferred mode of processing (active experimentation to reflective observations). Research seminars tend towards the abstract and reflective, describing theoretical concepts in broad terms. The discussion element here aimed to encompass the concrete and active by encouraging attendees to relate the research to their own day-to-day practice.

I identified four main learning objectives for the seminar (Appendix C2): to introduce health psychology and its contribution to geriatric medicine, to describe two cohort studies of healthy ageing on which I work, to present the results of my own research on subjective wellbeing and to encourage attendees to relate the material to clinical practice.

Research into effective learning has suggested that teaching methods are less important than teaching style and the personal characteristics of the teacher, with well-structured teaching delivered by an enthusiastic, empathic individual producing the best results regardless of learning style (Jarvis, 2000; McKimm & Jollie, 2007). I chose, therefore, to focus the content of the presentation on my own research. I incorporated both new and existing material that had previously been positively received by academic colleagues, as evidenced by their insightful and enthusiastic comments and questions. I tailored the talk to my understanding of the audience’s needs, presenting the main messages clearly and concisely, and using figures rather than text to present complex information such as statistical analyses (Appendix C3). I modified the talk in response

to implicit and explicit feedback received during the May seminar. For example, reducing time spent on areas that elicited negative body language and increasing time spent on explaining statistical analyses.

## **Reflection**

I enjoyed tailoring this presentation to the audience. After careful consideration, I elected to present the results of multiple regression analyses using a wheel-and-spokes *diagram, the thickness of the spokes directly representing each variable's contribution* to the model. After a comment following the May talk suggesting I had provided insufficient explanation of the multivariate statistical techniques employed, I retained this diagram but adjusted my explanation to provide more detail.

## **4.2 Deliver such training programmes.**

The seminar took place in the hospital's dedicated seminar room. The 14 attendees were predominantly doctors and clinical psychologists. I arrived in plenty of time, having already emailed my presentation to the series organizer. There was a slight delay in beginning the seminar while we waited for the organizer to arrive and log onto the computer. After a brief introduction by the organizer, I reintroduced myself, explaining my research background and why I was there before presenting an introductory slide of seminar aims and intended outcomes. The presentation appeared to be well received, with attendees' body language becoming increasingly open throughout.

The discussion started slowly but developed. Although it was dominated by a senior clinical psychologist she frequently invited comments from members of other professions. The discussion centred on attendees' observations of the effects of personality on recovery and the impact of moving from shared wards to single bed rooms.

### **Reflection**

Having arrived later and therefore more flustered than hoped before the May seminar, I made sure to arrive in plenty of time on this occasion. The subsequent delay felt slightly awkward, however the setting was sufficiently informal for this not to impact on the talk itself. I was mindful of feeling slightly uneasy after noticing a senior colleague in the audience, but was able to put this aside.

From past experience I am aware that my presentation style is clear, informal and flexible. This style encouraged participation in the discussion. Being sensitive to non-verbal audience signals, I constantly adjusted the material according to its reception. One attendee sitting at the front appeared to fall asleep during my talk; this was likely due to tiredness and I did not take this personally.

I was pleased that the discussion was successful. Indeed, several of the clinical psychologists remained to continue a discussion of potential research into the impact of moving from shared to single rooms. Some attendees contributed little, perhaps influenced by their expectations of research seminars, which are generally delivered as

a lecture. Most of the non-contributors were junior doctors who may have lacked confidence, or been otherwise reluctant to speak up in the presence of more senior staff.

**4.3 Plan and implement assessment procedures for such training programmes and 4.4 Evaluate such training programmes.**

As this was part of a research seminar series, no assessment was required or appropriate. However, the questions asked during the discussion related to specific aspects of the research, suggesting that attendees had attended to and understood the information.

Before the seminar, the series organizer confirmed that attendees would be willing to provide feedback if they understood its purpose. I designed a feedback form (Appendix C4) to fit on an A5 sheet. Given my limited experience in presenting to health professionals, I wanted to know how interesting and relevant they found the material, and how it had increased their understanding. I also included questions relating to the presentation content and delivery. At the end of the seminar I explained why I was requesting feedback before distributing the forms and some pens. I encouraged attendees to leave the forms on a table as they left to retain anonymity. Thirteen forms were returned with largely positive responses (Appendix C5). Only three additional comments were made, all of which were positive.

**Reflection**

I was nervous of obtaining feedback as I tend to take comments personally. However, I took a step back and viewed the feedback objectively as a useful tool for developing my



skills. The positive comments were encouraging; they validated my choices of style and content and increased my confidence and self-efficacy.

Overall, this was a very positive experience. I appreciated the opportunity to present my work while also developing key links with health professionals within my research field.

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## **Teaching and training competency case study: Teaching MSc students**

### **Background and initial approach**

On 5<sup>th</sup> September 2013 I received an email invitation from Dr Kalsi, module co-ordinator, inviting me to deliver a guest lecture as part of the Research in Action module on the MSc Health Psychology programme at City University, London. The module aims to provide students with the opportunity to hear health psychology researchers speak about their work, placing emphasis on the selection of methodological approaches to answer specific research questions. The invitation detailed the timing of the lecture and proposed dates (Appendix C6).

### **Reflection**

I was delighted to receive this invitation, which gave me the opportunity to draw on my *many years' research experience* as well as my teaching expertise. Having delivered a similar lecture on this module the previous year, I viewed this invitation as confirmation of my teaching competency.

### **4.1 Plan and design training programmes that enable students to learn about psychological knowledge, skills and practices**

I was provided with a document outlining the module aims and objectives, and providing notes to speakers (Appendix C7). Dr Kalsi requested that the lecture material be broken up into 20 minute chunks interspersed with activities to enhance students' concentration and engagement with the topic.

Given the module aims, I first assessed whether my research area could suggest topics that would be of interest and usefulness to MSc students taking this module. Having spent many years working on longitudinal cohort studies of healthy ageing, I felt it appropriate to draw on this experience, relating it to the principles, theory and practice of health psychology. My most recent research experience has involved linkage of research data with national databases of health and mortality outcomes. Following Matarazzo's (1982) depiction of health psychology, large-scale longitudinal studies, especially when combined with linkage to health records, offer the potential to address research questions from all four areas of health psychology. Following a group of individuals over time allows researchers to investigate the biological, psychological, social and environmental influences on health and wellbeing over a lifetime and offer suggestions for improving and maintaining good health. The large numbers involved in these studies enables investigation of the aetiology of health and disease, increases the possibility of influencing policy, and allows for the investigation of rarer health outcomes (Kuh, Ben-Shlomo, Lynch, Hallqvist & Power, 2003; Lynch & Davey Smith, 2005; Blane, Netuveli & Stone, 2007; Cooper et al., 2012; Richter & Blane, 2013). In ageing research, health psychology contributes by providing a theoretical framework for understanding the interrelationships between bio-psycho-social and environmental factors, and suggesting mechanisms that might influence the ageing process.

I elected, therefore, to focus the lecture on longitudinal cohort studies and data linkage and their importance as methodological tools in health psychology research. I devised learning outcomes based on the module objectives and developed the lecture to meet them, as detailed in Table C1 below.

Table C1

Module objectives, learning outcomes, and where met in lecture

Module objective	Learning outcome	Where met
To develop an awareness of a range of methodological approaches currently in use within health psychology research	To critically evaluate the purpose and value of longitudinal cohort studies and data linkage in health research	Lecture material Research questions snowballing exercise
To foster an appreciation of the issues involved in the selection of particular approaches in relation to different types of research question	To understand the process and ethical implications of data linkage	Lecture material Discussion on ethical implications
To enable students to evaluate and compare the methodological approaches in terms of their ability to further understanding of topics of relevance to health psychology	To develop an appreciation of the importance of information governance in health research To understand the complexities of designing a longitudinal cohort study.	Research questions snowballing exercise “Ready Steady Research” exercise

I divided the lecture into two parts. The first half was a general introduction to longitudinal cohort studies, data linkage and information governance while the second focused in on the cohort studies I have worked on over the last 8 years. I chose this approach in order to broaden the lecture’s appeal, introduce students to this type of research, and to ‘ground’ the more theoretical material from the first half in real-life examples. Given the module’s focus on methodology, I included a description of the process of choosing appropriate methods for collecting data on the 6-Day Sample study on which I currently work (Deary, Whalley & Starr, 2009; Brett & Deary, 2015). I

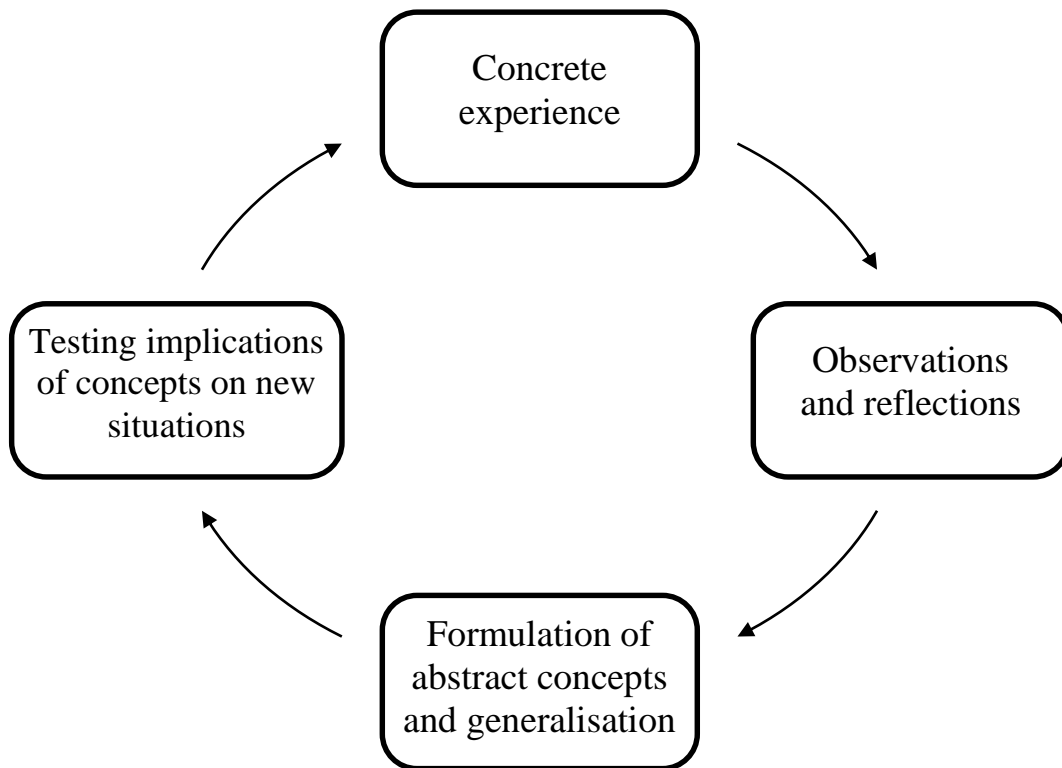
attempted to relate everything back to research questions relevant to health psychology, using the exercises to encourage students to consider suitable research questions and explore the value of longitudinal studies.

Adult learning is most productive when students are given the opportunity to participate and structure their own learning, with the teacher's role more facilitative than didactic and students actively engaging with the material (Dewey, 1933; James, 1983; Manley, 1984; Brookfield, 1986; Rogers, 1986; Jarvis, 2010). Group work enhances student participation; co-operative action throughout the learning process facilitates the involvement of all group members and helps prevent over-domination by the tutor (Rogers, 1986; Mowatt & Siann, 1997).

I structured the lecture to incorporate a presentation on each topic, followed by a group exercise or discussion to encourage students to critically engage with the material and, specifically, to evaluate the relevance of the methodological approaches to health psychology and their own research experience. This pattern – presenting ideas, describing their application, and encouraging students to reflect on these ideas and apply them to their own experience – approximates Kolb's experiential learning cycle (Figure C1; Kolb & Fry, 1975; Kolb, 1984) and aimed to appeal to many different learning styles. On a practical level, alternating between exposition and interaction should enhance students' concentration, which has been shown to fluctuate during lectures (Legge, 1971).

Figure C1

*Kolb's experiential learning cycle (Source: Kolb and Fry, 1975; reproduced from Jarvis, 2010).*



### **Reflection**

I enjoyed the opportunity this teaching gave me to think about my research in terms of health psychology theory and practice. Having given this lecture the previous year, it would have been easy to simply repeat it. However, changes to the module aims gave *me the opportunity use my own reflections on the previous years' lecture to modify and improve my teaching. Modifying one's teaching in order to best meet students' needs is* an essential aspect of teaching competency and one which I was grateful to be able to develop in this case study.

## **4.2 Deliver training programmes encompassing psychological knowledge, skills and practices.**

The lecture was to be delivered from 9-11.50 on Thursday 5<sup>th</sup> December 2015. I sent the final version of the slides (Appendix C8) to the admin assistant on Monday 2<sup>nd</sup> December but received no response.

On the day of the lecture, I travelled from my accommodation outside London to arrive at City University by 8.30am. Unfortunately, due to transport delays, I was forced to change my route and did not arrive until 9.20am. I arrived flustered and began the process of setting up the slides, setting the students a small discussion task while the projector warmed up and I caught my breath.

Despite the late start, the lecture itself went smoothly and I was able to cover all the material, although I did have to omit a couple of the shorter discussions, the showing of DVD footage and the general discussion of ethical issues in health research. It transpired that students had not received the slides I had sent in advance; however this was not essential for the lecture and in some cases – for example answers to discussion questions – might have impeded group activities and exploratory learning. After experiencing the negative consequences of an elongated break the previous year, I ensured that the break was kept to 15-20 minutes.

The lecture was attended by 15 students; fewer than expected. The students appeared engaged and participated in all the group activities and a small number asked questions during the lecture. The first activity – a ‘snowballing’ exercise around research



questions – was elongated by the late arrival of a couple of students (again due to transport delays) and the module co-ordinator, who made an announcement to students that their afternoon lecture had been cancelled due to illness. Otherwise, this exercise – in which students work in pairs to reach a consensus, before joining with another pair, and so on (Jarvis, 2010) – was very successful, enabling even the quietest students to contribute and engage with the material at hand. The second activity encouraged students to formulate research questions using existing longitudinal cohort study data in groups of 3-4. Again, the students appeared to engage well and all groups contributed during the plenary session.

### **Reflection**

I was very disappointed to be late for the lecture as I had allowed plenty of time for travelling and was concerned that arriving late would be viewed as unprofessional. It transpired afterwards that students had contacted the admin assistant as neither I nor the module co-ordinator had arrived by 9.15; however I arrived shortly afterwards and the module co-ordinator and admin assistant confirmed that this was acceptable given the frequent transport delays experienced in London.

I enjoyed the lecture itself and found it less exhausting than the previous year owing to the higher proportion of group activities and a greater familiarity with the material. It was unfortunate that a couple of the shorter interactive discussions were omitted due to time constraints. However, these were less engaging than the other interactive elements as they involved the whole group; large group discussions have a tendency to be dominated by one or two individuals and do not necessarily enable full participation.

### **4.3 Plan and implement assessment procedures for such training programmes and**

### **4.4 Evaluate such training programmes.**

As this course formed part of an MSc module with pre-defined assessments in place, it was neither required nor appropriate for me to plan or implement my own assessment procedures.

Although student evaluation of the module teaching is conducted as a matter of course, this covered the entire module and would not evaluate my lecture specifically.

Therefore, I designed a simple one-page feedback form for students to complete at the end of the lecture (Appendix C9). I designed the form to assess the effectiveness of the lecture in meeting its learning outcomes and module objectives. In order to evaluate students' understanding of the methodological approaches covered – longitudinal cohort studies and data linkage – I assessed their knowledge before and after the lecture. I invited students to assess the lecture in terms of content and delivery and relevance of material to themselves and the module. In order to assess the success and relevance of each aspect of the lecture, I asked students to state the one thing they would take away from the lecture and to give suggestions for improvement.

All 15 students present completed the evaluation form (Appendix C10). All students indicated that their knowledge of both topics had increased after the lecture, and all strongly agreed that my knowledge of the material was good. Responses to the remaining questions were more varied but generally positive. The information on longitudinal cohort studies was most successful, with most students citing this in

response to the first open question. This is not surprising as it formed the majority of the lecture and was perhaps more interesting and relevant to students than the topics of data linkage or information governance, both of which are quite ‘dry’. Only 4 students gave suggestions for improvement, one of which was for the slides to have been made available in advance.

Overall, the lecture went well. Students appeared to engage with the topic and several spoke to me informally afterwards, asking questions about my role and experience. However, I am aware that I tend to approach teaching in terms of the information I feel students ought to know, rather than adopting a more student-led approach. This can lead to an overuse of didactic methods, which is good for transmitting information but less effective in encouraging learning than active participation (Bligh, 1971; Jarvis, 2010). After the late start, I experienced what Rogers (1986) terms ‘internal pressures’ to cover the material within the time available, resulting in the omission of several interactive elements which were designed to encourage critical reflection. In future, I need to reduce the amount of material presented and ensure that students have access to information in advance, thereby rendering my teaching more facilitative and flexible, enabling students to actively engage with the topic and structure their own learning.

### **Reflection**

I was slightly apprehensive of receiving student feedback as this was a new topic for the majority of them and I was unsure how well it would be received. I was delighted, therefore, with the positive nature of the feedback – the only suggestions for

improvement were minor and helpful. I found it empowering to answer the *students'* informal questions on health psychology and my role.

I was pleased with this piece of work and enjoyed the process of identifying suitable topics and methodology from my research and their broader relevance to health psychology. I was delighted to be able to draw on my research and teaching experience and felt that this piece of work developed my teaching competence.

*I learnt a great deal about myself and my teaching style, which is informal, friendly and approachable. However, I tend towards an over-use of didactic methods and run the risk of rushing through material without sufficient space for students to absorb and reflect. Adult learners – including students – benefit from a more participative approach; identifying one or two ideas or examples that will open up a topic and enable students to explore and engage with the material is a valuable skill that I have only just begun to develop. It will be challenging to curb my tendency towards information-heavy didactic teaching and adopt a more process- and student-oriented approach.*

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## **Consultancy competency case study: Teaching adults within a lifelong learning programme**

**Setting:** Office of Lifelong Learning (OLL), University of Edinburgh

**Client:** Mr James (Jim) Mooney, subject co-ordinator, Personal Development, Philosophy and Religion, Psychology and Society and Politics, Open Studies, acting on behalf of the Office of Lifelong Learning.

**Target Group:** Adult learners

**Aims of consultancy:** To deliver a 10-week, 20-hour introductory course in health psychology as part of the Open Studies programme.

### **Background and initial approach**

Edinburgh University's Office of Lifelong Learning's Open Studies programme offers adult education classes. Their 2011/2012 psychology programme was varied, including introductory courses in a range of core and applied psychology topics. However, I noted the programme did not include health psychology. In October 2011 I emailed the course organiser, Mr Mooney, to enquire about the possibilities of my tutoring a course on health psychology, which is a broad topic of interest to the majority of people (Appendix C11). We arranged a meeting and had a productive discussion about the purposes of adult education in general, the ethos of the OLL Open Studies programme, the subject of health psychology and my teaching experience. He agreed that health psychology would make a good addition to the programme and invited me to submit a course proposal (Appendix C12). This was accepted and I was interviewed and my suitability for tutoring adults assessed in February 2012. My course was added to the

2012/13 programme, and I was issued with a contract by the University of Edinburgh (Appendix C13).

### **3.1 Assessment of requests for consultancy**

The timeline and requirements for this consultancy were very well defined, with the course proposal required by early 2012 and the 20 hours of teaching taking place over 10 weeks in early 2013. Schein (1999) emphasizes the importance of ‘accessing your ignorance’ in consultancy. I realised that teaching health psychology to adult learners would require a considerably different presentation style to that which I had myself experienced as an MSc student. Therefore, I took every opportunity to liaise with the client and enhance my understanding of what was required and expected of me as an OLL tutor. In particular, the client confirmed that OLL expected a ratio of around 50:50 in terms of didactic, information-giving teaching versus group or individual interaction.

Self-awareness of competency and the maintenance of professional boundaries are essential to the professional psychologist. Arrendondo, Shealy, Neale and Winfrey (2004) suggest the competencies necessary for successful consultation in psychology. They outline specific skills in time and resource management, process planning, execution and evaluation, and relationship management. Before committing to conducting this consultancy, I assessed my competency in these terms. Having previously attended training in group work facilitation, and successfully facilitated several groups of adult learners, I perceived my competence in teaching adults to be sufficient, while also acknowledging the benefit of constant reflection and evaluation of my teaching proficiency. In terms of knowledge of health psychology, my recent completion of the MSc course meant that this was fresh in my mind, as were my own



reflections and experiences of learning. Time is an important consideration when assessing consultancy requests outside of one's main job, and I perceived that my time-management and organisational skills were sufficient to allow me to complete this consultancy alongside my full-time job without compromising my contribution to either.

I identified the expert (purchase of information or expertise) model as being the most appropriate for the majority of this consultancy (Schein, 1999; Arrendondo et al., 2004). In this model, the client, having accurately assessed their organisation's needs, seeks the services of a suitable consultant to meet those specific needs. The success of this mode of helping largely depends on the client's role in correctly identifying both needs and consultant (Schein, 1999). Given that I would be using my knowledge and experience of health psychology to enhance the OLL's existing Open Studies psychology programme, I felt this model was likely to be successful.

### **Reflection**

I felt competent to deliver this piece of work and found the detailed objectives to be helpful in assessing what would be required. I felt empowered to use my previous teaching experience and recently acquired knowledge and enthusiasm for health psychology to ensure the consultancy went smoothly. The confirmation of my competency following the formal interview with the client and another representative of the OLL further enhanced my confidence. I was aware that session planning would be time-consuming and set aside time during the Christmas vacation to undertake this task,

while also managing the remainder of my DPpsych workload throughout the consultancy.

### **3.2 Plan consultancy**

It is common – indeed preferable – for consultants to move between different helping modes through a consultancy (Schein, 1999). In planning the consultancy, I felt a collaborative approach was required to ensure I met the brief and the expectations of the client and stakeholders. To this end, I liaised with the client when designing the course proposal and when planning individual sessions in order to ensure the correct mix of didactic and interactive teaching styles. This more closely mirrors the process consultation model, in which the client and consultant collaborate in the diagnosis of the problem and the consultant plays a facilitative role, offering suggestions and skills that the client might apply to their situation (Schein, 1987; Schein, 1999; Arrendondo et al., 2004).

I identified two stakeholders whose needs required to be met in this consultancy: the Office of Lifelong Learning (on whose behalf the client, Mr Mooney, was acting), and the adult learners themselves. My responsibilities towards the former were largely outlined in the employment contract: to deliver the teaching as required, and associated administrative tasks. Anticipation of the students' needs and expectations was essential in designing the teaching itself. As far as possible, I based this on my previous facilitation experience, conversations with the client, and knowledge of the broader field of adult education. However, I incorporated flexibility into my planning in recognition that session planning would largely be an iterative process based on students' emerging knowledge and engagement.

Key characteristics of adult education are the varied experiences, knowledge and agendas that adult learners bring, and the fact that learning is voluntary (Smith, 1982; Brookfield, 1986; Rogers, 1986; Knowles, 1990). Research suggests that learning is most effective when the learning activity has direct relevance or utility to individual learners' circumstances and experiences (Brookfield, 1986; Lieb, 1991; Jarvis, 2010). In designing the course outline, I brainstormed the topics that I felt best embodied Matarazzo's (1980) conceptualisation of health psychology and the biopsychosocial approach (Engel, 1977) and were likely to be of relevance to most people. I evaluated a broad range of health-related topics featuring in the media and my recent MSc course, and sought opinions from non-psychology family members. The ordering of sessions (Table C2 and Appendix C12) was designed to systematically develop students' knowledge of health psychology. Sessions 1-5 covered the biological, psychological and social influences on health, 6-7 covered four key health behaviours – diet, exercise, smoking and alcohol – and sessions 8-9 covered behaviour change and improving healthcare. I elected to leave the final session open and invite students to suggest topics.

Table C2

*Course outline*

1.	What is health psychology?
2.	Cognition and health
3.	Stress and health
4.	Coping with illness
5.	Individual and cultural differences and health
6.	Cigarettes, alcohol and drugs
7.	Diet and exercise
8.	Health promotion and behaviour change
9.	Improving health care
10.	Open session (health and age)

Detailed descriptions of the content, learning objectives, attendance and reading for all 10 sessions are in Appendix C14. I structured most sessions to explore students' existing knowledge and experience of the topic before presenting an exposition of health psychology theory, including applied case studies. I aimed to encourage critical reflection of the material through students' questions and group activities utilising and applying it to real-life situations. Following the client's brief, I intended each session to comprise equal amounts of lecture and interaction.

For the session content, I drew on material from introductory textbooks (Kaptein & Weinman, 2004; Albery & Munafò, 2007; Ogden, 2007; Morrison & Bennett, 2012), more specific texts (Connor & Norman, 2005; Sapolsky, 2008; Thaler & Sunstein, 2009), and notes from my MSc course, seminars and conference presentations.

Although synthesising information from such a wide variety of sources was challenging, the end result was a broader, more comprehensive coverage of each topic, enabling me to delve more deeply into topics I was less familiar with. I planned the session outlines in advance, but prepared the majority of each Powerpoint presentation weekly. This allowed me to adjust the sessions' level and content in response to students' feedback, engagement, salient learning styles and emerging group dynamics, and to increase the material's relevance by including current news stories. For example, following comments from students I reduced the amount of material on the slides and increased the time dedicated to group exercises based around students' own experiences. Adapting teaching to students' needs and learning styles is a key aspect of effective facilitation (James, 1983; Manley, 1984; Brookfield, 1986; Jarvis, 2010).

### ***Reflection***

*I enjoyed putting the course together, but found it extremely time-consuming. I tended to fixate on covering as much ground as possible on each topic, greatly increasing my workload and resulting in an imbalance between lecture and interaction in most sessions. Following advice in supervision to focus on one or two aspects of a topic, I reduced the content of subsequent sessions. This better enabled me to meet the clients' brief by allowing more space for student engagement.*

### **3.3 Establish, developing and maintain working relationships with clients**

The helping relationship is the key to any successful consultancy. In this case, it was essential to ensure that my teaching was in keeping with OLL's ethos and met the expectations of both client and stakeholders. Fostering a good working relationship with the client was important to enable a collaborative approach and allow the client, stakeholders and myself to communicate freely about any problems. This was achieved by meeting in person to discuss the course proposal, and through regular communication by email and phone throughout the consultancy. The success of this relationship was evidenced by the swift and respectful way in which potential problems were dealt with, such as an issue arising from my requirement to record a portion of my teaching (Appendix C15).

### **Reflection**

I always endeavour to develop good working relationships and enjoyed the opportunity to do so here. I found our working relationship to be positive, respectful and professional, even when problems were encountered. The relationship was greatly

enhanced by being able to meet in person and discuss matters over the telephone where necessary.

### **3.4 Conduct consultancy**

The course was held at 6.30-8.30pm on Tuesdays from 15<sup>th</sup> January to 19<sup>th</sup> March 2013 in a University building. The course commenced with 12 registrations; this rose by 2 but 2 students dropped out (Appendix C16).

I aimed to create a warm, open and non-threatening environment, in which students felt free to question and share experiences. I facilitated this process by devoting time in the first session to setting ‘groundrules’. These encapsulated mutual respect, confidentiality and openness, aiming to build self-confidence and self-worth, and encourage participation, all of which contribute to effective learning (Brookfield, 1986; Jarvis, 2010).

In order to ensure the course’s relevance to students’ learning needs and experiences, in accordance with the brief, I began by inviting students to share their name, previous experience of psychology and reasons for taking the course. I was delighted and surprised to discover that around half the students were health professionals. It was clear that for several students English was not their first language. Given the apparent educational level of the students, I deduced that a late undergraduate level would be suitable, with additional explanation of psychological terms using clear and concise language.

Appendix C17 contains the Powerpoint presentations from three of the 10 sessions: 1 (What is health psychology?), 5 (Individual and cultural differences and health) and 9 (Improving health care). These provide good examples of the course content, including how the content and delivery of later sessions were modified in response to client and stakeholder feedback.

### ***Reflection***

*Due to a late room change that had not been communicated to me, I arrived at the first session rather flustered and experienced a number of 'false starts' as several students also arrived late. Consequently, I forgot to discuss, as intended, the format of the course, and gauge students' feelings towards participation versus lecturing. However, I managed to cover this in a subsequent session. This was important in enabling students – as stakeholders – to guide the remainder of the consultancy.*

### **3.5 Monitor the implementation of consultancy**

The OLL have in place a number of procedures for monitoring the delivery of new courses and these were helpful for ensuring that I was meeting their brief. The client attended the start of the first session to ensure the room was available and suitable, that all students present had registered for the course, and to introduce me. He then maintained regular contact to ensure that things were going smoothly. I contacted the client immediately when problems arose – for example, students' queries about studying for credit, or requesting evidence of course completion – and provided regular updates on how the course was progressing.

The client attended the fifth session – halfway through the course – to observe my teaching and provide feedback (Appendix 18). The OLL encouraged me to facilitate an informal discussion with students in week 6 on course progress and whether they felt their needs were being met. After each session I reflected on what had or hadn't worked and used these reflections (Appendix C14), along with the client's and students' feedback, to modify the content and delivery of subsequent sessions. I will here describe the main problems and modifications, particularly those involving barriers to interaction, encountered throughout the consultancy.

The room layout consisted of chairs around a central bank of tables, with the computer in one corner. I sat alongside the students in order to create an informal, relaxed atmosphere conducive to discussion and interaction (Rogers, 1986). Attempts to facilitate exercises using two groups were unsuccessful as students chose to divide into groups across the middle of the room, meaning they had to speak across the table. This and the fact that certain students tended to dominate in larger or whole group discussions, meant that I used pair work or smaller groups of 3-4 students for subsequent activities. This facilitated wider participation and enabled quieter students to contribute more fully. On the whole, students' participation was reticent at first but improved as relationships developed. The most successful discussions – even those involving the whole group – were those initiated by students themselves, where students shared past experiences, or on topics that were particularly relevant or provocative, confirming others' findings (Dewey, 1933; Brookfield, 1986; Rogers, 1986; Mowatt & Siann, 1997; Jarvis, 2010).

To further enhance interaction, I ended each session with a 'go-round', encouraging students, if they wished, to state one thing they would take away from the session. This



not only ensured that all students felt included and valued, but also allowed me to gauge students' understanding of the topic and which aspects of the session had been particularly relevant. I attempted, with limited success, to elicit critical reflection during the presentations by encouraging students to interject with questions and invited them to evaluate the material.

Both the students and course organiser commented on a preponderance of text on my Powerpoint slides and a tendency for me to simply read material from the screen.

Indeed, in several of the earlier sessions I noticed myself rushing through the presentation in order to cover all the material, with the result that I often overran and had to curtail some of the interactive exercises, including the final go-round. In subsequent sessions I attempted to overcome this by presenting more material verbally and break up the text with relevant visual material, to allow me to engage directly with students.

I gave students copies of the Powerpoint slides and some further reading at each session, hoping that this would free students from note-taking and enhance concentration and interaction. I adjusted the further reading according to students' feedback. After comments that time and access restricted their library use, I provided predominantly Open Access journal articles, encouraging students to learn independently by visiting the journal websites.

### **Reflection**

*Although I was nervous to be observed by the client, I respected his and the students' opinions and found their feedback to be extremely useful in planning the remainder of*

*the course and modifying my teaching style to better meet the brief and students' needs.*

I enjoyed the process of reflecting on progress throughout the consultancy and modifying subsequent sessions in response to client and stakeholder feedback.

*Domination in group work by selected individuals is common in adult learning and can be useful for initiating group discussion where other students are more reticent. I had a tendency to interject in discussions in an attempt to encourage student participation. As the course progressed students were more relaxed and talkative, resulting in enhanced group work. I need to develop my facilitation skills in order to allow students more space, embrace silence, and respect the learning process. This consultancy enhanced my ability to identify suitably relevant topics that provoke discussion within a given group.*

*My tendency to read slides from the screen stemmed from unfamiliarity with the presentation content – which were often finalised earlier that day – and my own lack of self-esteem and resulting need for a “security blanket”. I addressed this unfamiliarity in later sessions by including less unfamiliar material, and allowing more space for discussion and reflection. Additionally, as the course progressed my confidence grew, enabling me to engage more directly with students. I was disappointed that students did not respond to invitations to evaluate the information presented, but on reflection this mainly occurred in session 2, when students had yet to build a relationship of trust, respect and openness.*

### **3.6 Evaluate the impact of consultancy**

The OLL requests feedback from students at the completion of each course, covering the course outline, content and teaching, and I requested that the client forward this on to me. After discussion with the course organiser, I designed my own feedback form to evaluate the success of the consultancy (Appendix C19). I evaluated students' increase in knowledge and experience of health psychology during the course, whether their interest was personal, professional or both, and the course content and delivery. Being concerned about the balance between lecture and interaction, I asked students to rate this themselves. I invited students to highlight sessions that had particularly stood out for them, providing space for additional comments. I devoted 15-20 minutes of session 10 to feedback, allowing students time to complete the forms. I encouraged students unable to attend session 10 to complete it via email/post.

I received 10 completed feedback forms (Appendix C20). All students indicated their knowledge of the topic had increased (mean increase = 3). Three students took the course for mainly professional reasons, 4 personal and 3 both equally. Ratings of content and delivery are shown in Figures C2/C3 and were generally high. Students rated the content as either just right or towards the lecture end (mean = 4.3/10).

Figure C2

*Feedback ratings relating to content*

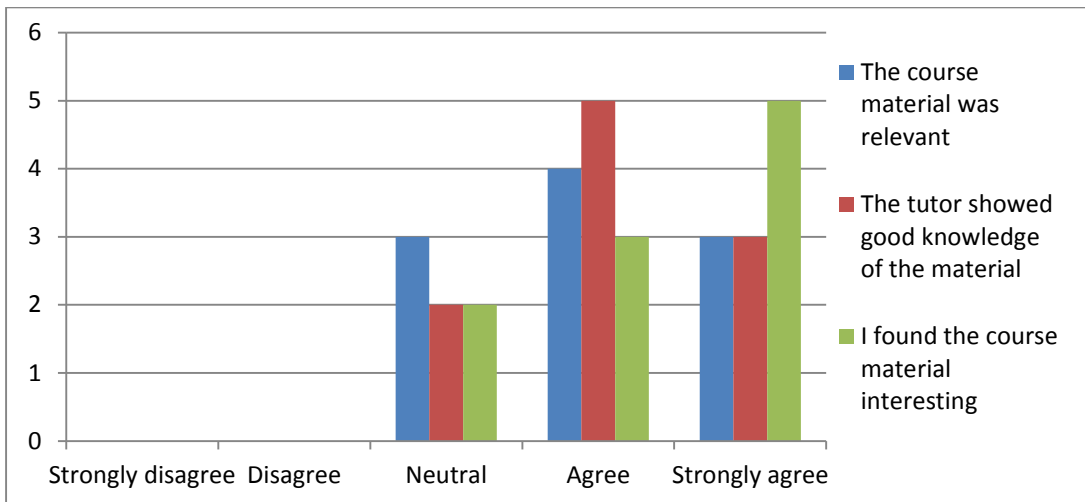
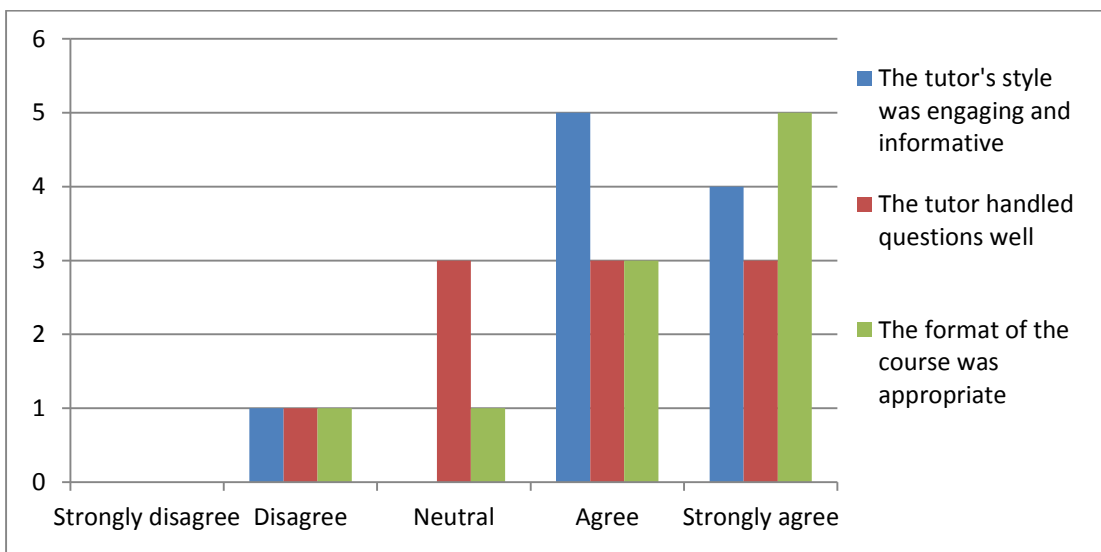


Figure C3

*Feedback ratings relating to delivery*



The sessions which were most often cited as standing out positively for students were those I had deemed most relevant: i.e. diet & exercise, and smoking & alcohol. Stress, behaviour change, illness, personality and ageing were also mentioned. This confirms the idea that adults learn best where the material is of relevance and utility to their experience (Brookfield, 1986; Rogers, 1986; Jarvis, 2010). The general comments from

students confirmed my own reflections that there was too much material in the lectures, that the information was perhaps too jargonistic for a non-psychology audience, and that the most successful elements involved students sharing their own experiences and ideas.

Three students provided feedback to the OLL (Appendix C21). This was overwhelmingly positive, complementing the course content, structure and delivery, and suggesting improvements in the form of increased group interaction.

This consultancy marked the beginning of a long-term arrangement. I utilised feedback from the client and students, alongside my own reflections, to modify the course structure and content in order to better meet the clients' brief. Specifically, I reduced the didactic content of several sessions to allow more space for students to contribute and discuss their own experiences and ideas, and to encourage critical reflection.

### ***Reflection***

*The feedback I received was challenging, but largely confirmed my own reflections on the course. Students' comments offered excellent suggestions for content and delivery. In future deliveries, I intend to adopt a more process- and student-oriented approach, allowing sessions to be guided by students' own experiences and input but with sufficient material to facilitate a suitable level of understanding.*

*I was particularly pleased with one student's comment that I valued students' contributions and views, suggesting that I had successfully created an open, non-threatening, respectful learning environment.*

### ***Overall reflection***

*Although conducting this consultancy while working full-time was very challenging, I enjoyed the opportunity to use my expertise in health psychology, and my teaching skills and experience, to meet the client's brief. I relished the opportunity to get to know the students and witness their engagement, both personally and professionally, with health psychology. This consultancy enabled me to develop my own understanding and competency of the consultancy process, alongside valuable participative teaching skills. My confidence grew throughout and I look forward to applying the lessons learned in the future.*

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## **Implement interventions to change health-related behaviour**

**Setting:** School of Philosophy, Psychology and Language Sciences, University of Edinburgh

**Target Group:** University staff

**Description of work:** Instigating a lunchtime walking group for staff, and facilitating participation in a national Step Count Challenge.

### **Background**

Physical inactivity is currently the most common risk factor for coronary heart disease in Scotland, affecting two-thirds of the adult population, and is a major target for policy makers (Physical Activity Task Force, 2003). Increasing physical activity brings a number of health benefits, including lowering blood pressure, increasing psychological wellbeing, and reducing the risk of heart disease, diabetes and other causes of chronic ill health (Department of Health, 2004; Penedo & Dahn, 2006; Warburton, Nicol & Bredin, 2006; Tully et al., 2007). The Health Education Board for Scotland (HEBS)'s recommendation that adults accumulate at least 30 minutes of moderate physical activity on most days of the week (HEBS, 1994) is currently not achieved by 72% of women and 59% of men (PATF, 1998). Lack of time due to other commitments is a significant barrier to physical activity, reported by 71% of 25-44-year-olds (HEBS, 1998). Evidence suggests that many adults are unclear how the recommendations can best be achieved and what level of activity is required to give the maximum health benefit. Walking has been described as ideal exercise. Walking at a moderate pace meets the HEBS's definition of 'moderate physical activity', and is free, sociable and

easily incorporated into everyday life (Morris & Hardman, 1997; Mutrie & Hannah, 2004; Reger-Nash, Bauman, Cooper, Chey & Simon, 2006; Ogilvie et al., 2007).

Beattie's model of health promotion characterises health-related interventions as occurring at the collective or individual level, and developed using either a 'top down' (authoritative) or 'bottom up' (negotiated) approach (Beattie, 1991). Most walking interventions are conducted at a community (collective) level using a negotiated approach, whereby participants are empowered to make healthier behavioural choices. Ogilvie et al. (2007) reviewed walking interventions and concluded that the most effective interventions are both targeted towards specific populations and tailored to participants' needs. Workplace interventions –promoting 'active commuting' (e.g. Mutrie et al., 2002) or walking while at work (e.g. Gilson, McKenna & Cooke, 2007; Gilson, McKenna, Cooke & Brown, 2007) – can be particularly effective in increasing physical activity, given the proportion of time most people spend at work (Department of Health, 2004b; Dugdill, Brettle, Hulme, McCluskey & Long, 2007). However, interventions need to be based on sound theory and be adapted to fit the cultural, educational and environmental needs of the audience (Canadian Cancer Society, 2011). University staff represent a promising target for walking interventions as most are in relatively sedentary occupations (Tudor-Locke & Bassett, 2004; Gilson, McKenna, Cooke & Brown, 2007; Gilson et al., 2009).

Pedometers are commonly used in walking interventions as a motivational tool and a practical and inexpensive means of measuring step counts. Pedometer-based interventions motivate and enable participants to monitor their own walking behaviour. They are often effective in increasing walking in the short term by around 2000 steps per day (Bravata et al., 2007; Kang, Marshall, Barreira & Lee, 2009), even among

sedentary individuals (Dugdill et al., 2008; Morabia & Costanza, 2012), and particularly when accompanied by facilitated goal setting (Chan, Ryan & Tudor-Locke, 2004; Thomas & Williams, 2006; Warren, Maley, Sugarwala, Wells & Devine, 2010), diaries and self monitoring (Chan et al., 2004; Murphy, Murtagh, Boreham, Hare & Nevill, 2006; Thomas & Williams, 2006) and walking routes (Gilson, McKenna, Cooke & Brown, 2007). However, these changes may not be sustained (Ogilvie et al. 2007; De Greef, Deforche, Tudor-Locke & De Bourdeaudhuij, 2010) and their impact on objective measures of health (e.g. weight loss) require further study (Richardson et al., 2008; De Greef et al., 2010; Shaw et al., 2011).

Health psychology models and principles provide a basis for understanding the causal processes and mechanisms underlying human behaviour (Abraham, Sheeran, & Johnston, 1998; Michie & Abraham, 2004). Behaviour change interventions need to be based on well-specified, empirically-supported techniques in order to evaluate their success in terms of psychological principles (Michie & Abraham, 2004; Abraham & Michie, 2008). The majority of papers describing walking interventions fail to delineate the behaviour change techniques (BCTs) used. The taxonomy of BCTs developed by Michie, Abraham and colleagues is a useful tool for describing and evaluating interventions (Michie, Hyder, Walia & West, 2011; Michie et al., 2013).

### **Initial assessment**

This intervention aimed to increase walking behaviour amongst staff within the School of Philosophy, Psychology and Language Sciences (PPLS) at Edinburgh University. The target population comprises around 160 staff in a mixture of support (41) and academic teaching (84) and research (35) roles with the vast majority in sedentary office-based positions. Staff members are based across two buildings: a converted

Victorian school spread over four floors with no lift, and a modern fully accessible 7-storey building. Most individuals work solely within their own building and socialise only with their close colleagues. Both buildings are located a couple of minutes' walk from a large flat area of parkland. Having been a member of the target population for several years, I had a good insight into the impact of the working environment on walking behaviour. Informal discussions with colleagues suggested that many wanted to walk more but felt they didn't have time. Many academics frequently eat lunch at their desks and get little exercise during the working day.

A lunchtime walking group seemed an ideal way of enabling people to fit walking into their busy daily schedules. I discovered that two walking groups were already being facilitated within the University, organised through a government-funded 'Walk at Work' scheme under the auspices of 'Paths for All' (Paths for All, 2012). However, these groups were poorly attended, possibly because they were poorly publicised and based within small University departments. I felt a similar group within PPLS might be more successful due to its large cohort of staff. I identified 'Paths for All's annual Step Count Challenge as a potentially useful motivator to increase engagement and participation in this intervention.

## **Detailed needs assessment and formulation**

### **2.1a Design and implement health psychology baseline assessment of behaviour related to health outcomes**

As most PPLS staff are office-based, I decided that email was the best means of communication. On 21<sup>st</sup> January 2012, I sent an invitation via an 'all staff' email list, describing the walking group and Step Count Challenge and listing the potential benefits of joining a walking group (Appendix C24). Staff were encouraged to sign up

to one, the other, or both. Eight staff, mostly academics, responded positively to this email. Most expressed a desire to increase their walking and many felt the intervention would motivate them to do so. Based on these and informal responses, I designed an online survey, which all respondents were invited to complete, assessing their current walking and other physical exercise, and the barriers and motivators influencing their walking behaviour (Appendix C25). After informal feedback from colleagues, I sent a second invitation reiterating that staff could sign up to the Challenge without attending the walking group. Ten additional staff – mostly support staff – responded positively to this invitation.

**2.1b Evaluate the pattern of behaviour and formulate working hypotheses about the target behaviour based on the assessment and**

**2.1c Provide detailed feedback formulation on the outcome of the assessment and working hypotheses**

The respondents to the invitation emails appeared to fall into two groups. The first group, who responded to the first invitation, consisted primarily of academic staff who walked little, were motivated to walk more and felt a lunchtime walking group would encourage them to do so. The second group responded to the second invitation and consisted primarily of support staff who already walked quite a lot but felt the Challenge would provide a focus for their walking behaviour. Most participants expressed a desire to increase their walking, although a few simply wanted a means of quantifying and validating their walking. The full results of the needs assessment, including the environmental, social/cultural, cognitive and biological influences on walking behaviour in this population, are in Appendix C24.

The Transtheoretical stages of change model (Prochaska & DiClemente, 1982) is a useful tool for considering changes in health-related behaviour and has been successfully used in the design of physical activity interventions (Callaghan, Khalil & Morres, 2010; Kirk, MacMillan & Webster, 2010). It utilises four key concepts: stage of change (how ready the individual is to change their behaviour), decisional balance (the weighing up of the pros and cons of changing behaviour), self-efficacy (how able the individual feels to enact a change) and processes of change (the means by which changes occurs). The Physical Activity Task Force's report (PATF, 1998) suggests that three conditions are necessary to enable behaviour change: high self-efficacy, a strong intention and readiness to change, and a supportive social network and environment with no barriers, echoing the stages of change model.

The needs assessment suggested that most participants were either at the preparation (walking a little and hoping to increase this) or action (walking a lot and hoping to improve and maintain this) stage of change. The intervention needed to address both groups. I hypothesised that individuals at the preparation stage could be enabled to achieve their goals and move towards action by minimising the barriers and maximising the benefits of walking, thus tipping the decisional balance in favour of increased walking. Individuals at the action stage could be enabled to move towards maintenance by encouraging and supporting their efforts and embedding walking into their working environment.

## **The intervention**

### **2.1d Design, plan and implement health psychology interventions based on the assessment and formulation**

The intervention consisted of two interrelated components: a lunchtime walking group and participation in the Step Count Challenge. Having developed in direct response to the needs assessment and feedback from participants, the intervention fulfils the criteria of being targeted and tailored to the needs of a specific population (Ogilvie et al., 2007; Canadian Cancer Society, 2011), and Beattie's characterisation of a collective, negotiated intervention (Beattie, 1991). The walking group component minimised the barriers of lack of time, lack of motivation and unpredictable weather by encouraging participants to commit to walking regularly during working hours. This would increase participants' self-efficacy for walking while maximising the benefits of walking by providing a cost-free means of improving fitness, health and getting fresh air – all of which improve psychological wellbeing. Walking with others facilitates social support and has been positively associated with walking behaviour (Wendel-Vos, Droomers, Kremers, Brug & van Lenthe, 2007). It may also enhance the psychological benefits (reduction in anxiety/depression and increased revitalisation) of walking along busy streets (Staats & Hartig, 2004; Staats, van Gemerden & Hartig, 2010; Johansson, Hartig & Staats, 2011). Facilitating the walking group involved setting an at least weekly meeting time and location before walking a pre-determined route for 25-30 minutes. Several routes were identified and tested for length, ease and potential hazards.

The Challenge involved teams of up to 5 from workplaces across Scotland. Pedometers were provided for participants to measure their daily step counts for 8 weeks from 5/3/12 to 29/4/12. Reviews of pedometer-based interventions have shown equivalent effect sizes regardless of intervention length (Bravata et al., 2007; Kang et al., 2009).

Eight weeks was chosen by Paths for All as 12 weeks had been reported to be too long (Paths for All, 2011). Participation was encouraged through weekly emails, blogs and occasional prizes. The benefits for PPLS of participating in this Challenge were threefold: it would engender a sense of community within PPLS and encourage cross-site communication, it would encourage participants to increase their walking and, most importantly, it provided a means by which participants could monitor their own walking behaviour. I envisaged that the Challenge's competitive element would increase motivation in already active participants and the regular self-monitoring of walking behaviour would increase self-efficacy in all participants.

Four teams of 5 were formed from the email respondents and two PhD students recruited by team leaders. Where possible teams contained individuals with a range of baseline walking levels, with participants placed in a team with at least one colleague to enhance natural social support. Two teams consisted of staff from both PPLS sites. Social support within teams was facilitated by encouraging them to choose team names and to submit their step counts to team leaders rather than myself as co-ordinator. Both natural and created social support have been shown to lead to increased and sustained weight loss (Wing & Jeffery, 1999).

I felt a non-didactic, collaborative approach would work best with this population. Therefore, I tried to minimise the number of emails sent to the whole group. Each week I emailed participants reminding them to submit their step counts, offering encouragement and tips for increasing their step count, and providing details of that week's walking group (Appendix C25). Participants were encouraged to set themselves specific step count goals. Goal-setting is an effective technique for increasing physical activity (Shilts, Horowitz & Townsend, 2004; Bravata et al., 2007; Kang et al., 2009;



Warren et al., 2010), particularly when the goal is specific, proximal in attainment and realistic (Bandura, 1980; Artinian et al., 2010). The reminder email acted as an antecedent cue or prompt, which can be particularly effective in increasing physical activity in an ecological setting (e.g. Olander & Eves, 2011; Lewis & Eves, 2012).

I entered step counts into a spreadsheet, forwarded them to 'Paths for All' and sent a second email to participants reporting the weekly counts for each team and overall. To increase social cohesion and maintain motivation I encouraged participants to set a collective goal of a virtual destination we could 'walk' towards, and provided weekly updates on our progress towards this goal. Towards the end of the intervention the reminder and results emails were combined.

To obtain an objective baseline measure of walking behaviour, I distributed the pedometers 3 weeks before the start of the Challenge and invited everyone to start recording their steps straight away. In total, 12 participants provided baseline step counts. For the remainder, the baseline consisted of the first week's step counts.

I designed two further surveys to which participants were invited to respond in weeks 4 and 7 of the Challenge. These coincided with social events to mark the halfway and finish points of the Challenge. The surveys measured participants' motivation, self-efficacy, and use of goals and strategies. The final survey assessed participants' intentions to walk more after the intervention. The social events, held in a communal space, were an opportunity for participants to meet and share stories and tips. This kind of communal event has been suggested to contribute to experiential knowledge and facilitate long-term behaviour change (Gilson et al., 2009). At the week 5 event (attended by 5 participants), I offered participants a small gift to say thank you and offer

encouragement. At the post-Challenge event (attended by 8), I distributed prizes to the team and individual with the highest step count, and to the individuals showing the biggest improvement in a single week and overall, and who had achieved 100,000 steps in any week. Additionally, Paths for All entered all teams completing the Challenge into a prize draw. The principal aim of the prizes was to encourage participation. Incentives have been shown to be effective in increasing adherence to exercise programmes by enhancing the positive consequences of exercise (Jeffery, Wing, Thorson & Burton, 1998; Harland et al., 1999; Herman et al., 2006), but have little impact on long-term behaviour change (Jochelson, 2007).

A number of behaviour change techniques were incorporated into the intervention, primarily the regular self-monitoring of walking behaviour and the support and encouragement inherent to being part of the Challenge. The specific techniques used, based on Michie's CALO-RE taxonomy of behaviour change techniques in physical activity interventions (Michie et al., 2011), are shown in Table C3.

Table C3

Behaviour change techniques included in the intervention (after Michie et al, 2011).

<b>Intervention element</b>	<b>Behaviour change technique</b>
Pre-Challenge survey. Participants asked to specify barriers to walking from a list	8. Barrier identification / problem solving
Invitation email listing benefits of walking group, plus documentation from Paths for All	1. Provide information on consequences of behaviour in general
Weekly emails offering encouragement to all participants, offering tips for increasing step counts, details of the walking group and providing anecdotes from my own experiences with the Challenge.	12. Provide rewards contingent on effort or progress towards behaviour 20. Provide information on where and when to perform the behaviour 22. Model/demonstrate the behaviour
Participants were encouraged to set individual and group behavioural goals.	5. Goal setting (behaviour)
Weekly results emails giving step counts for all teams.	4. Provide normative information about others' behaviour
Informal comparison between team members.	28. Facilitate social comparison
Participants were provided with a pedometer to record their daily step counts	10. Prompt review of behavioural goals 16. Prompt self-monitoring of behaviour

## **Evaluation**

### **2.1e Evaluate and communicate the outcomes of health psychology interventions.**

The walking group was scheduled every week of the intervention including for two weeks prior to the Challenge, initially twice but latterly once weekly. Other than during the first week and a later week when the weather was unusually sunny, and despite several people expressing an intention to attend, nobody attended.

In contrast, the Step Count Challenge was a great success. Participation was high with all participants submitting weekly step counts. In cases of holiday or equipment failure,

step counts were calculated pro rata using previous step counts for reporting to Paths for All. Where possible an accurate count was substituted later.

The step counts, survey results and participants' comments are presented in Appendix C26. Step counts increased over the course of the intervention; this difference was only significant when comparing baseline walking to average daily step counts throughout the Challenge as opposed to counts from week 8. This reflects the slightly lower step counts reported during week 8 of the Challenge compared to previous weeks and is more representative of the intervention as a whole. The largest increases were evident during the first four weeks of the Challenge, which likely reflects both a dip in motivation as the novelty of taking part wore off, and the impact of fine weather during this period. Academic and support staff differed significantly in the actual steps taken, but not in the percentage increases, indicating that the intervention was equally effective for all participants.

Motivation, confidence and control were all high at the halfway point and remained so for walking behaviour after the Challenge, suggesting that the intervention had increased both intention and self-efficacy for walking behaviour. Only three participants reported post-intervention step counts, offering little opportunity to directly measure its longer-term impact.

The participants who most increased their step counts during the intervention were those who set themselves specific goals, and incorporated walking into their daily routines. Several participants reported having changed their commuting behaviour to include more walking, which has environmental as well as health benefits. Other successful strategies included giving up using the lift for Lent, attending 'Zumba'

classes and taking long walks with family or dogs at weekends. Participants' comments during the intervention suggested that it had succeeded in increasing motivation and self-efficacy, as well as actual walking behaviour, and was largely a positive experience for participants.

Some participants felt they were unable to fulfil their goals or increase their step counts. Based on survey results and participants' comments, it would appear that work commitments were a major factor, particularly within the academic group. It is possible that the unpredictability of the workload for academic staff – e.g. students requiring attention from teaching staff, lunchtime meetings, urgent deadlines for journal articles/reports or the availability of research participants – makes regular daytime walking difficult to maintain. In contrast, support staff may be more able to plan their workload, or to spend their lunchtimes away from their desks. Although time pressure as a barrier to walking mirrors Gilson, McKenna and Cooke's (2007) findings, in their study academic staff were more able to integrate walking into their working lives than administrative staff.

In terms of the 'active ingredients' of the intervention – those aspects of the intervention that drove the change – a number of elements were involved, reflecting the techniques shown in Table C3. Recording daily step counts enabled participants to closely monitor and understand their own walking behaviour. Many participants set specific goals – e.g. 10,000 steps a day – and monitoring enabled them to adjust their behaviour in order to achieve those goals. Recording steps and goal setting have both been identified as key aspects of successful interventions (Bravata et al., 2007; Kang et al., 2009; Artinian et al., 2010). Being part of a team introduced accountability and support while providing feedback about others' behaviour. Interestingly, participants' comments suggest that

any competitiveness was largely restricted to an individual level – ‘beating’ their own previous step counts was a greater motivation than ‘beating’ other teams.

Several modifications might improve this intervention’s effectiveness. Firstly, the walking group might benefit from running during the summer months. However, this would not coincide with the nationally-organised Step Count Challenge, and might suffer from poor attendance due to summer holidays and the tendency for academic teaching staff to work from home during this period. Secondly, cohesion and support could be encouraged by organising social events for each Challenge team, or group walking activities for all participants. Introducing a ‘buddy’ system whereby participants are teamed up with their teammates might facilitate social support.

### **Reflection**

When I initially considered the idea of a walking intervention, I had envisaged that this would take place on a small scale within my own department. Broadening the invitation to all staff within PPLS increased participation, encouraged inter-disciplinary communication and enabled relationship building. I myself participated in the *intervention, which enabled me to empathise with participants’ experiences. I enjoyed* facilitating and participating in the intervention, and hope to use this experience to guide future interventions.

The failure of the walking group was disappointing. The main reasons for this failure were the unusually wet weather in April, and the unpredictability of the academic workload. Several participants expressed interest in attending a walking group during the summer, when both factors are reduced. Lunchtime walking itself proved popular, with several participants arranging spontaneous walks themselves. On a personal level,

I found it disheartening to stand for 10 minutes in the rain waiting for fellow walkers, particularly after discovering that two of my teammates were regularly walking together on the same days but at slightly different times.

The inclusion of the Step Count Challenge, however, was a success. For me the Challenge was crucial as it gave the intervention some credibility. Health psychology as a discipline is not represented within PPLS and the intervention was completely novel within this environment. I was not confident that people would participate without this nationally-organised Challenge as a 'hook'. *As the intervention proved successful my confidence grew, boosted by participants' positive feedback. The pedometers provided through the Challenge were also essential in obtaining objective measures of walking behaviour. I was delighted that participation and enthusiasm remained high throughout the Challenge. I adopted a 'hands off' approach to this intervention in response to the needs and expectations of the population and my own inexperience in facilitating interventions. This worked well, enabling participants to engage at the level they felt happy with. I organised the two social events in acknowledgement that some people might benefit from the social support offered by face-to-face engagement.*

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# **Section D – Systematic Review**



## **Interventions to increase engagement with rehabilitation in adults with acquired brain injury: a systematic review.**

### Background

Acquired brain injury (ABI) affects an estimated 200 per 100,000 of the global population (Hyder et al., 2007). All ABI, even mild injuries, have the potential to cause complex physical, cognitive, communicative, emotional and behavioural problems which have profound and long-lasting consequences for the client and their families. Recent estimates suggest that over 100 per 100,000 people experience persistent difficulties beyond one year post injury (Whitnall, McMillan, Murray & Teasdale, 2006; Scottish Intercollegiate Guidelines Network (SIGN), 2013). Specialist assessment and rehabilitation, commencing early after injury, can have a positive impact on outcome (Headway, 2013; SIGN, 2013).

Rehabilitation of adults with ABI is often hampered by a lack of client engagement (Medley & Powell, 2010). Client involvement in the planning and evaluation of rehabilitation is a core value of the person-centred approach, which empowers clients to actively participate in their own care and is recommended in brain injury rehabilitation (Headway, 2013; SIGN, 2013). Goal setting – in which rehabilitation staff and clients work collaboratively to identify, monitor and evaluate personally relevant and meaningful rehabilitation goals – is widely considered to be best practice in facilitating client involvement and engagement with rehabilitation (Siegert, McPherson & Taylor, 2004; Hart & Evans, 2006; Playford, Siegert, Levack & Freeman, 2009; Scobbie, Wyke & Dixon, 2009).

Although considerable research has targeted improving the effectiveness of goal setting, this has largely focussed on its pragmatic aspects such as goal characteristics (Barnes & Ward, 2000; Locke & Latham, 2002; Hart & Evans, 2006; Levack, Dean, McPherson & Siegert, 2006; Wade, 2009; Levack et al., 2012), with little consideration of theory (Siegert & Taylor, 2004). Researchers (e.g. Siegert et al., 2004; Scobbie et al., 2009; Lane-Brown & Tate, 2010) have identified several theories underpinning goal setting in rehabilitation, including the importance of internal factors (such as motivation) in goal-directed behaviour proposed by Goal Setting Theory (Locke & Latham, 1990), the self-efficacy components of Social Cognitive Theory (Bandura, 1986), and the Health Action Process Approach (Schwarzer, 1992). Self-regulation, which is “a systematic process involving conscious efforts to modulate thoughts, emotions and behaviours in order to achieve goals within a changing environment” (Cameron & Leventhal, 2003), is a particularly useful theoretical approach to goal setting, invoking the meta-cognitive skills required for goal-directed activity (Hart & Evans, 2006; McPherson, Kayes & Weatherall, 2009). Carver & Scheier’s (1998) control-process model of self-regulation posits goal-directed behaviour as the output of a negative feedback loop, in which clients reduce the discrepancy between their perception of their current (progress towards goals) and desired situation (the rehabilitation goal).

Evidence for the utility of goal setting in neuro-rehabilitation is mixed (Siegert & Taylor, 2004). Some suggest that goal setting increases rehabilitation effectiveness (Wade, 2009; Leach, Cornwell, Fleming & Haines, 2010). Others suggest that its usefulness is limited by clients’ ability and willingness to set goals (Playford et al., 2000; Levack, Dean, McPherson & Siegert, 2006; Levack, Taylor, et al., 2006). This, they argue, is influenced by two key factors: insight/awareness and metacognitive skills. Adults with ABI frequently lack awareness of their abilities and/or deficits, which can

lead to disengagement from neuro-rehabilitation, which they perceive as unnecessary (Hufford, Williams, Malec & Cravotta, 2012). They may also lack the insight necessary to evaluate their capabilities and set realistic goals (Conneeley, 2004; Levack, Dean, McPherson & Siegert, 2006). Metacognitive skills – of which goal setting is one – reflect the ability of an individual to self-regulate and self-monitor the learning process and are essential for planning, monitoring and evaluating goals and goal-directed behaviour. They are largely synonymous with executive function, which is frequently impaired after brain injury. Playford et al. (2000) and Levack, Taylor et al. (2006) argue for more research into interventions to support client involvement in the goal setting process.

Another common problem following ABI is a lack of motivation. This can lead to disengagement from everyday life and from rehabilitation (Holloway, 2012), resulting in a withdrawal of rehabilitation services, frustration for clients, relatives and rehabilitation staff, and a poorer recovery (Holloway, 2012). Although poorly defined for measurement purposes (Maclean & Pound, 2000; Siegert & Taylor, 2004), client motivation has been found to be a good predictor of rehabilitation outcome.

Motivational Interviewing (MI, Miller & Rollnick, 1991; Miller & Rollnick, 2009) is a useful tool for assessing and increasing motivation, and has been shown to be effective in improving treatment outcomes in a wide variety of physical health settings (Rubak, Sandbæk, Lauritzen & Christensen, 2005; Knight, McGowan, Dickens & Bundy, 2006; Lundahl, Kunz, Brownell, Tollefson & Burke, 2010; Chilton, Pires-Yfantouda & Wylie, 2012). Medley and Powell (2010) suggest that MI adds value to neuro-rehabilitation by enhancing the therapeutic relationship and enabling effective case formulation; by facilitating collaborative and realistic goal-setting and by promoting constructive engagement in rehabilitation interventions. Despite the potential usefulness of this

technique amongst adults with ABI, few empirical studies of its effectiveness exist (Knight et al., 2006; Holloway, 2012).

There is currently little clarity within the literature regarding potential techniques to increase rehabilitation engagement in adults with ABI. A recent systematic review of interventions to reduce apathy amongst adults with acquired brain injury identified only one study (Lane-Brown & Tate, 2009). Although a recent literature review described a broad range of interventions to increase awareness in this group, the authors emphasised the need for a more systematic, empirical evidence base and noted that although many interventions were, by necessity, tailored to the individual client, the description of this process was often lacking (Fleming & Onsworth, 2006).

## **Objectives**

A systematic review of the research literature was carried out in order to draw together and evaluate empirical evidence on the broad topic of interventions specifically designed to increase engagement with rehabilitation in adults with ABI. A secondary aim was to summarise the theoretical basis behind the interventions studied.

## **Methods**

### **Inclusion criteria**

#### Population

Adults (aged 16 years +) with acquired brain injury who are currently undergoing rehabilitation in any setting.

#### Intervention

Any intervention with the explicit aim of increasing engagement with rehabilitation.

### Comparator

Engagement or adherence with rehabilitation outside of the intervention, either in a control group or participants pre-intervention.

### Setting

No restrictions were placed on rehabilitation setting.

### Outcome

Any objective measure of engagement or adherence with rehabilitation.

### Study design

No restrictions were placed on study design.

### **Exclusion criteria**

Studies where participants were predominantly children or young adolescents, or where participants had been diagnosed with a neurological disorder only, such as Multiple Sclerosis, were excluded. Any studies where the intervention was targeted at overcoming physical or cognitive barriers to rehabilitation without targeting engagement were excluded. Studies reporting only subjective or self-report outcome measures were also excluded.

### **Search strategy**

#### Electronic searches

The following search terms, including exact terms and all relevant subject headings, were used: brain injury AND rehabilitation AND “engagement” OR “adherence” OR

“compliance”. Searches were conducted, without language restrictions, on 13<sup>th</sup> May 2013 of the following databases: Ovid PsycINFO (1987-May 2013), Medline (1946-May 2013), Cumulative Index to Nursing and Allied Health Literature (CINAHL Plus, 1937-May 2013), Embase (1980-May 2013), Allied and Complementary Medicine (AMED, 1985-May 2013), Web of Knowledge – Social Science & Science citation indexes (1970-May 2013), Cochrane Central Register of Controlled Trials, Clinicaltrials.org, and Psychological Database for Brain Impairment Treatment Efficacy (PsycBITE). The databases searched and the search terms and subject headings used are included in Appendix A.

In the absence of any similar published reviews, search sensitivity was confirmed using a relevant article previously found using an Internet search.

The search identified an article describing the design of a questionnaire to measure motivation in adults with ABI. Therefore, the Web of Knowledge Citation Index was used to identify additional published articles citing this measure.

#### Hand searches

The reference lists of articles included in the review, and several relevant review articles, were hand-searched. The contents lists of three journals identified as being of particular relevance – Brain Injury, Neuropsychological Rehabilitation and Disability and Rehabilitation – between January 2012 and May 2013, and in press articles available online before 13<sup>th</sup> May 2013, were searched for further relevant articles.

Where results consisted of conference abstracts, Internet searches were conducted to attempt to identify resulting published articles.



### **Quality assessment**

The quality of the studies selected for the review was assessed using a quality assessment checklist developed for this review (Table D1). As randomised controlled trials are exceptionally difficult in this diverse client group (Turner-Stokes, Nair, Disler & Wade, 2005; Holloway, 2012), it was anticipated that many of the studies would utilise single case experimental designs. Therefore, study design was evaluated considering the recommendations of Perdices and Tate (2009) and included study design, sample size, description of participants and intervention and relevance of the outcome measure. Owing to the lack of clarity over the theoretical processes involved in rehabilitation engagement in this client group, studies were also evaluated for their theoretical explanation for the intervention in terms of engagement. All studies were assessed independently by two reviewers, both experienced researchers with knowledge of neuropsychological theory. The ratings were compared and any discrepancies in quality assessment discussed and a consensus reached in all cases.

### **Data extraction and synthesis**

Information was extracted from each study and tabulated to enable comparison.

As many of the articles consisted of single case studies, meta-analytic techniques were not appropriate.

Table D1

## Quality assessment criteria

Category	Description
A	Study design (1 = Case studies; 2 = Observational studies without control group; 3 = Controlled observation studies (no manipulation of variable); 4 = Quasi-experimental studies (without randomisation) – e.g. pre-test & post test of treated and comparison group (usual treatment); 5 = RCTs)
B	Sample size
C	Description of participants' demographics and co-morbidities
D	Description of participants' function (this might include type, timing and location of injury, and any functional 'deficits' experienced)
E	Description of intervention (detailed, clear, <u>replicable</u> )
F	Outcome: objective measure of engagement/adherence
G	Theoretical basis for the intervention in terms of engagement with rehabilitation.

Note. Rated 1 (poor) to 5 (good)

## Results

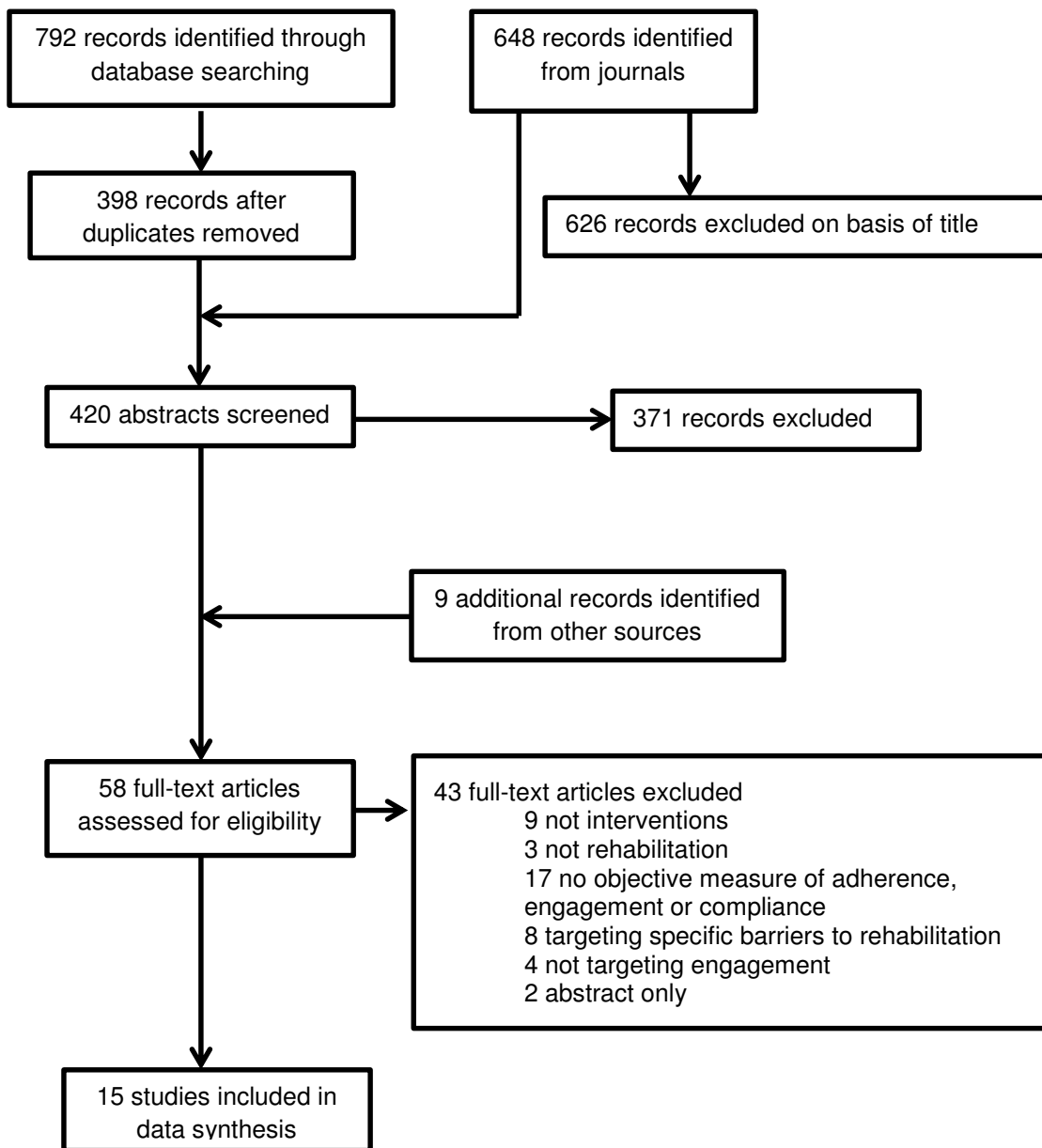
### Study selection

The results of the search are shown in Figure D1. In summary, 420 abstracts were screened, 58 full text articles were assessed for eligibility, and 15 studies were selected for review. Of the articles excluded at the screening stage, 85 described observational studies with no intervention component, 58 described interventions not targeting engagement, 38 involved children or young adolescents, 71 were commentary or review articles, 32 consisted of a service evaluation or description, 14 described qualitative studies, 20 suggested clinical guidelines, 11 described the development or validation of measures, 16 involved non-brain injured participants, 3 described drug interventions, 3 described incomplete studies and 1 was a book review.

Three of the shortlisted studies consisted of conference abstracts only. Two were subsequently excluded as no full text article was available and the abstract contained insufficient to assess eligibility and one was linked to a published paper and included in the review. 41 additional studies were excluded after further assessment: 9 did not involve interventions, 3 did not involve rehabilitation, 17 studies had no objective measure of adherence/compliance or engagement, 8 described interventions targeting specific functional or behavioural barriers to rehabilitation, and 4 described interventions not specifically targeting engagement. 11 of the excluded studies used innovative new technology to facilitate participation in rehabilitation by overcoming functional or cognitive barriers to client-initiated rehabilitation programmes.

Figure D1

Flow diagram of articles selected for systematic review



### **Study characteristics**

The characteristics of the 15 articles (14 studies) included in the review are presented in Table D2. Nine articles reported the results of single case studies using a range of experimental and non-experimental designs. Four reported Randomised Controlled Trials. Effect sizes are given where these were reported by the study authors, or Cohen's  $d$  could be calculated.

Although the studies varied in the number and type of participants, settings and intervention delivery, there were similarities in the type of techniques used. 8 studies reported interventions using predominantly behavioural modification techniques (Hegel, 1988, Zencius, Wesolowski & Burke, 1989; Zencius, Wesolowski, Burke & McQuade, 1989; Yuen, 1996; Manchester, Hodgkinson, Pfaff & Nguyan, 1997; Newell, 1997; Sohlberg, Lemoncello & Lee, 2011; Hufford et al., 2012), 5 studies primarily cognitive techniques (Pegg et al., 2005; Lane-Brown & Tate, 2010; McPherson et al., 2009; Skidmore et al., 2011; Hsieh, Ponsford, Wong, Schönberger, Taffe & Mckay, 2012; Hsieh, Ponsford, Wong, Schönberger, Mckay & Haines, 2012) and 2 studies reported a mixture of the two (Corrigan, Bogner, Lamb-Hart, Heinemann & Moore, 2005; Corrigan & Bogner, 2007).

### **Behavioural interventions**

Based on the principles and practice of behaviour therapy, behavioural interventions often involve an environmental manipulation in order to promote desirable and/or reduce problem behaviour. They are particularly relevant to adults with ABI who, despite experiencing often severe and debilitating cognitive deficits, are generally able to learn new associations and skills that might significantly alter their behaviour (McGlynn, 1990). By targeting behaviour, these interventions circumvent problems

arising from a lack of awareness and consequent disengagement from ‘unnecessary’ rehabilitation often seen in this client group and can be an effective way of increasing adherence with rehabilitation (Wood, 1987; McGlynn, 1990; Hufford et al., 2012).

Interventions focus on altering the environment before (antecedents) or after (consequences) the target behaviour.

### Antecedent management

#### Barrier reduction

This technique identifies barriers to rehabilitation and aims to address them using practical solutions. Corrigan and colleagues (Corrigan et al., 2005; Corrigan & Bogner, 2007) found that a barrier reduction condition in their RCTs was as effective as financial incentives in increasing initial attendance and engagement and reducing premature termination of substance abuse treatment in adults with ABI. The most commonly-requested barrier reduction was a reminder call, which they argue is an effective, low-cost intervention.

Table D2

## Characteristics of included studies

Study / Setting / Target	Participants	Functional weaknesses	Study design	Intervention Who / How / Techniques used Length of intervention (d = days)	Comparator	Outcome measure	Results ES = Effect Size (from article). d = Cohen's d
<b>Behavioural interventions</b>							
1. Zencius, Wesolowski & Burke, 1989 / Inpatient / Attendance at therapy sessions	N=2 Male, 16 Female, 16 MVA	Impulse control problems Refusal of therapy	Reversal design	Rehabilitation staff, in person Behavioural contracting (5d), baseline (4d/6d), contingency reward points system (20d/13d), baseline (7d), points plus response costs (male, 35d), financial incentive (13d/20d).	Baseline alternating with intervention phases	% of therapy sessions attended.	Baseline: 41 / 45 Contract: 95 / 93 Contingent reward: 88 / 92 Baseline: 51 / 68 + response costs: 94 Financial incentive: 100 / 100 Maintained at 2 month follow-up
2. Zencius, Wesolowski, Burke & McQuade, 1989 / Inpatient / 1. Unauthorised breaks, 2. Use of cane, 3. Therapy attendance	N=2 Male, 24 [1] 6 yrs post MVA Female, 24 [2-3] 2 yrs post MVA	Male: vision, memory & cognition, impulse control. Female: balance & co-ordination, cognition.	Single case study / Reversal design	Rehabilitation staff, in person 1. Verbal contract (10d) + written behavioural prompts (6d). 2. Praise (7d), staff prompts (12d), antecedent control (10d), baseline (4d), written contract & contingent rewards (6d). 3. Verbal prompts (baseline, 10d), written invitation (19d), daily schedule (13d), baseline (5d), verbal contract & contingent rewards (4d), daily schedules.	1. Patient behaviour pre-intervention (16d) 2. Patient pre-intervention + treatment phases + baseline 3. Patient pre-intervention + treatment phases + baseline.	1. Mean number (and length) of unauthorised breaks. 2. % of time using cane. 3. % therapy sessions attended.	1. Baseline: 4.1 Contract: 1.4 Prompts: 0.17 2. Baseline 43% Praise 61 / Prompts 72 / Antecedent control 96 / Baseline 7 / Contract 0 / Contingent rewards 100 3. Baseline 42.5 / Written invite 95 / Daily schedule 96 / Baseline 35 / Contract 56 / Daily schedules 100.

3. Manchester et al., 1997 / Inpatient / Absconding	N=1 Male, 17 8 months post MVA	Intellectual function, attention & concentration, aggression & behavioural problems	Single case study	Rehabilitation staff, in person Contingent reward / token economy with individualised rewards. Daily reminders of desirability of target behaviour 13 weeks.	Patient pre-intervention.	Number of episodes of absconding.	Baseline: 20 in 11 days (1.81 per day) Intervention: Weeks 1-5 mean 0.66 per day. Week 6 onwards: 0.
4. Hegel, 1988 / Inpatient / % attainment of goals, reduce vocalisations	N=1 Male, 18 2 months post MVA	Behavioural disinhibition & apathy, mild dysphonia, attention, concentration, memory, visual perception	Multiple baselines & reversal design	Rehabilitation staff, in person Goal setting and extinction procedure to target vocalisations (4d, baseline). Contingent phase: tokens in response to goal attainment and failure (6d, 14d) Non-contingent phase: tokens regardless of behaviour (4d).	Patient pre-intervention versus contingent phase versus non-contingent phase versus contingent phase	Number of disruptive vocalisations.  % of therapeutic goals met in physical (PT), occupational (OT) and speech (ST) therapy.	Baseline: mean 12.13. Contingent phase: 0.  PT: 9 / 76 / 28 / 88 ST: 21 / 88 / 42 / 92 OT: 33 / 78 / 17 / 96
5. Newell, 1997 / Outpatient / Rehab costs & complaining behaviour	N=1 Male, 28 9 yrs post-injury	Poor impulse control & socialisation. Verbal abuse towards therapists.	Single case study	Insurance case manager, in person. Collaborative goal setting and written behaviour contract. No timings given.	Patient pre-intervention.	Verbal abuse incidents. Patient's feelings of control over life and rehabilitation. Rehabilitation progress and costs.	Abuse decreased. Control increased. Moved to less intensive & costly setting and returned to work.
6. Hufford et al., 2012 / Inpatient / Adherence to rehabilitation & agitation	N=1 Male, 37 4-13 days post-injury, fell down stairs	Impulsivity, distractibility, perseveration, unawareness. Memory, thought & attention Visual neglect.	Single case study	Rehabilitation staff, in person. Behavioural contract listing expected positive behaviours, and providing education regarding injury & subsequent effects (3d). Motivation enhanced by letter from employer allowing return to work after completing rehabilitation.	Patient pre-intervention (10d)	Staff-rated daily adherence to contract.  Agitated Behaviour Scale (ABS).	100% adherence  ABS scores declined from 40 to 14 (below threshold).



7. Yuen, 1996 / Inpatient / Avoidance behaviour	N=1 Male, 55 1 year post cerebro-vascular accident	Abusive behaviour. Aphasia, impulsivity, perseveration, attention, apraxia	Single case study	Rehabilitation staff, in person Graded confrontation: indirect (staff discussed behaviour in patient's presence) then direct (staff role-playing behaviour, & explaining need for rehabilitation) confrontation. 4 weeks.	Patient pre-intervention and between phases.	Number of episodes of blank staring.  Staff-observed participation in therapy and rehabilitation goals.	Indirect: 0 episodes for 2 weeks, then increased. Direct: 0 episodes. Rehabilitation participation and progress improved rapidly.
8. Sohlberg et al., 2011 / Home / Exercise adherence	N=2 Female, 61 15 months post aneurysm  Female, 40 2 yrs post toxic medication reaction	Memory and attention  Executive attention and working memory	Single case alternating treatment experimental design	Student clinicians, in person + self-directed, at home Televised Assistance Program (TAP) system to administer attention-based home rehabilitation. Alternating conditions: exercises at pre-determined time ('push') versus participant initiated ('pull'). 6 weekly sessions.	Adherence between pre-intervention and two conditions, and between participants	% of exercises completed.  Goal Attainment Scale category.	Subject 1: 'Push' condition mean 55.75% 'Pull' condition: 0. Subject 2: 'Push' condition mean 63.5% 'Pull' condition: 28.3%  1: pre-intervention -1, post +1 2: pre-intervention 0 post +2
9. Corrigan & Bogner, 2007 / Outpatient / Session attendance over 1 month	N=74 62% male, 57% Caucasian Age 42.5 yrs Mean 7.5 yrs post-injury	Functional abilities. No further details given.	RCT	Research assistants, single telephone interview. Attention control: verified record. Financial incentive: \$20 reward for perfect attendance. Barrier reduction: specific barriers to attendance discussed & overcome.	Attention control (N=24) versus barrier reduction (N=26) versus financial incentive (N=24).	Number of appointments missed. % perfect attendance. Therapeutic alliance (Helping Alliance Questionnaire II). % premature termination of treatment. % goals met	1.04 / 0.73 (ES = -0.46) / 0.29 (ES = -1.69)  42% / 62% / 75%  50% / 35% / 33%  17% / 23% / 33%

### Cognitive interventions

10. McPherson et al., 2009 (& Ylvisaker et al., 2008) / Inpatient / Goal attainment	N=34 27 Male Median age 29 / 28 / 40	No detail. Inclusion criteria: moderate to severe trauma with disabling consequences	Pilot RCT Block randomisation	Key workers, weekly x6. Goal Management Training: protocol used to identify steps involved in one goal. Identity-oriented goal training: six-step process using identity mapping to identify goals & action strategies.	TAU (N=12) versus Goal Management Training (N=10) versus Identity-oriented goal training (N=5)	Goal Attainment Scale score: Baseline / Post-intervention / 3 month follow-up	TAU: 28.34 / 57.69 (d=3.14) / 51.63 (d=2.63) Goal Management: 26.38 / 47.56 (d=2.09) / 43.97 (d=1.48) Identity-oriented: 26.15 / 50.76 (d=2.51) / 48.48 (d=2.67)
11. Skidmore et al., 2011 / Inpatient / Engagement and functional ability	N = 1 31 Male 7 days post-stroke	Mild impairment attention & executive function Severe impairment to visuospatial abilities.	Single case study	Trained therapist, in person 1 daily 45-minute session; 10 sessions over 2 weeks. Cognitive Orientation to daily Occupational Performance approach: client-driven meta-cognitive strategy training. Aimed to identify, set & address goals, self-monitor & direct learning & rehabilitation.	Patient improvement from admission	Pittsburgh Rehabilitation & Participation Scale (1-6). Assistance with ADLs: Functional Independence Measure and Performance Assessment of Self-Care Skills.	Baseline: 3.2 Post-intervention: 4.9 Baseline: 68 Post-intervention: 97 Baseline: 1.1 Post-intervention: 2.9
12. Hsieh et al., 2012* / Outpatient / CBT effectiveness	N=27 21 Male 37% < 1yr, 26% 1-2 yrs, 37% 3yrs+ post injury	Cognition. Mood – depression and anxiety	RCT	Clinical (neuro)psychologist, in person. MI+CBT: 3 weekly sessions MI + 9 sessions CBT. Non-directive counselling (NDC) + CBT: 3 sessions NDC + 9 sessions CBT. Treatment As Usual (TAU).	TAU (N=8) versus NDC+CBT (N=10) versus MI+CBT (N=9)	HADS Anxiety pre- to post-treatment.	NDC+CBT: ES = .24 MI+CBT: ES = .50 TAU = non-significant

13. Pegg et al., N=28 2005 / 89% Male Inpatient / Rehabilitation effort	None	Randomise d 2x2 factorial design	Psychologists, in person. 3 x 60 min session at beginning, middle & end of inpatient stay. Personalised information: review patient's injury & rehabilitation progress. Control = generalised information provision: videotapes of general information on brain injury rehabilitation.	High vs low desire for information, and personalised vs generalised information condition (2x2)	Rehabilitation Intensity of Therapy scale – therapists' rating.  Functional Independence Measure.	Speech Therapy: mean change 0.32 Physical Therapy: mean change 0.58 (d=1.30)  Personalised group showed greater cognitive improvement.
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**Mixed interventions**

14. Lane- Brown & Tate, Male, 32 2010 / Home / 3 goals: organisational, fitness & social.	N=1 3 yrs post MVA	Planning & organisation, processing speed, memory, difficulty sustaining activity, apathy.	Multiple baseline, experiment al design  Psychologist, in person. Goal setting: 3 target behaviours identified. 2 goals (organising bedroom & increasing fitness) targeted after mastery of previous goal. Motivational interviewing: to assist in initiating and sustaining goal- directed activity. External compensation: daily reminder alert to PDA 28 x 1 hour weekly sessions 7.5 months total.	Patient pre- intervention, post- treatment & 4 week follow-up	Number of minutes dedicated to 2 target behaviours and progress towards goals (tidiness rating scale and time to run 200m).  Self, relative and clinician ratings on Apathy Evaluation Scale and Apathy subscale of Frontal Systems Behaviour Scale	Goal 1: ES = 1.44 Goal 2: ES = 1.29  AES Reliable change index: Self 2.6 / Relative 7.1 / Clinician 2.7 AFSBS: Self 4.3 / Relative NS / Clinician 2.1
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15. Corrigan et al., 2005 / Outpatient / Target: attendance, treatment adherence initial treatment engagement	N=195 138 male 57 female Age 36.6 yrs Mean 8 yrs post injury	Cognition. No further details given.	RCT	Program staff, single telephone interview. Attention control: verified record. Motivational interview: elicited expectations, reinforced goals, expressed hope of favourable outcome. Barrier reduction: barriers to attendance discussed & overcome. Financial incentive: \$20 reward for completing initial assessment.	Attention control vs motivational interview vs barrier reduction vs financial incentive	% of subjects signing agreement in 30 days. Average time to sign agreement (days). % of participants who missed any appointment. % who prematurely terminated treatment within 3 months and 6 months.	45% / 45% / 74% / 83% 34.8 / 44.0 / 32.1 / 22.8 64% / 57% / 42% / 40% 15% / 9% / 6% / 4% 47% / 34% / 16% / 21%
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Note. \* Hsieh, Ponsford, Wong, Schönberger, Taffe & Mckay (2012) and Hsieh, Ponsford, Wong, Schönberger, Mckay & Haines (2012).

Lane-Brown and Tate (2010) included external compensation as part of an intervention to decrease apathy and increase goal-directed behaviour. This consisted of a daily reminder sent to the client's electronic device, overcoming the barrier of poor memory. They suggest that this assisted in initiating goal-directed behaviour, but not necessarily in sustaining the behaviour over time.

#### Antecedent control

These interventions manipulate the environmental or social stimuli preceding the behaviour in order to evoke desirable behaviour and make competing behaviours less likely. Zencius, Wesolowski, Burke and McQuade (1989) successfully instigated three simple antecedent control procedures – a simple visual cue, daily provision of a walking cane and a written invitation to rehabilitation – to enhance adherence to rehabilitation therapies and goals. Sohlberg, Lemoncello and Lee (2011) used technology to investigate whether providing clients with control over completion of home rehabilitation exercises increased adherence. Their results suggested the opposite – clients' exercise adherence was virtually zero in the client-initiated 'pull' condition, and considerably higher in the remotely-initiated 'push' condition. They suggest that the 'push' condition provided much-needed structure which helped clients overcome memory and planning deficits.

#### Consequence management

##### Behavioural contracting

A key barrier to successful rehabilitation is a discrepancy between the expectations of clients and health professionals. Behavioural contracting involves the client and health professionals discussing expectations and agreeing on positive behaviours which both parties are expected to display in order for rehabilitation to succeed. This then forms the

basis of a written or verbal contract, which is regularly reviewed throughout the rehabilitation process.

Hufford et al.'s (2012) study successfully utilised a written contract to enhance adherence and reduce agitation. They acknowledge, however, that the mechanisms for this change are unclear as no control condition was employed or any formal measure of awareness, therapeutic alliance or neuropsychological function. Newell (1997) describes a case study in which contracting vastly improved a client's abusive behaviour, feelings of control and rehabilitation costs. Zencius, Wesolowski and Burke (1989) and Zencius, Wesolowski, Burke and McQuade (1989) compared the effectiveness of behavioural contracting with other techniques. In 4 of their studies, contracting alone increased adherence to rehabilitation but this behaviour change was not sustained without additional intervention. In another study, a verbal contract combined with a contingent financial reward was ineffective in increasing use of a walking cane (Zencius, Wesolowski, Burke & McQuade, 1989).

#### Contingency management

Several studies reported the implementation of a 'token economy' (Ayllon & Azrin, 1968) in an inpatient rehabilitation setting. This motivational system, based on operant learning theory, invokes the technique of contingency reinforcement (Skinner, 1969) by providing clients with rewards for exhibiting mutually-agreed target behaviours. In the study reported by Hegel (1988), a token economy was successfully instigated to supplement goal setting and extinction procedures to enhance rehabilitation adherence and attainment of therapeutic goals. Tokens were distributed for both positive and negative behaviours, with the percentage of potentially earned tokens exchanged for positive rewards. Manchester et al. (1997) utilised a token economy to successfully

reduce absconding from an inpatient ward and suggest that the reinforcement and reward of positive behaviours rather than punishment of negative behaviours successfully altered the client's perception of the ward as a non-aversive environment and facilitated rehabilitation.

Zencius, Wesolowski and Burke (1989) found that a contingent reward points system increased rehabilitation attendance in two adolescents; in one client this was enhanced with the addition of a response cost procedure. However, 100% attendance was only reached and sustained for both clients once financial rewards were introduced – in contrast to their Zencius, Wesolowski, Burke & McQuade (1989) study. Corrigan and colleagues (Corrigan et al., 2005; Corrigan & Bogner, 2007) conducted randomised controlled trials in adults with ABI receiving substance abuse treatment and found that financial incentives led to improved initial attendance at and engagement with treatment, which has been shown to be important in developing a therapeutic alliance and enhance subsequent retention (Newman, 1997), and reduced premature termination of treatment.

#### Graded confrontation

Yuen (1996) describes the use of graded confrontation in response to avoidant behaviour (episodes of blank staring) during rehabilitation therapy. Indirect confrontation, in which staff discussed the psychogenic nature of the episodes in front of the client, led to a reduction in the avoidant behaviour. After the behaviour returned, direct confrontation, in which staff directly discussed the behaviour with the client and role-played the behaviour, was successfully implemented to extinguish the behaviour and increase the client's engagement with rehabilitation.

### Cognitive and meta-cognitive interventions

These types of interventions aim to equip clients with the skills required for self-directed rehabilitation. In particular, meta-cognitive interventions enhance the skills required to plan, monitor and evaluate goal-directed behaviour.

#### Information provision

Providing clients with detailed information about their condition and rehabilitation can enhance feelings of control and improve rehabilitation outcome. Pegg et al. (2005) found that providing personalised information on their injury and rehabilitation progress increased clients' exerted effort in subsequent physical but not speech therapy, and their improvement in cognitive rehabilitation.

#### Motivational Interviewing (MI)

Motivational Interviewing invokes metacognitive skills by encouraging clients to consider discrepancies between their current and desired state and enhancing motivation by exploring and resolving ambivalence (Miller & Rollnick, 2002). Hsieh and colleagues (Hsieh, Ponsford, Wong, Schönberger, Taffe & Mckay, 2012; Hsieh, Ponsford, Wong, Schönberger, Mckay & Haines, 2012) developed a programme incorporating MI as a means of preparing and engaging adults with ABI for a Cognitive Behaviour Therapy (CBT) programme for anxiety. Their results suggest that MI increased the effectiveness of CBT treatment. Corrigan et al. (2005) included motivational interviewing as a condition in their RCT, but found that this did not significantly influence engagement with substance abuse treatment in adults with ABI, perhaps due to its delivery within a brief telephone interview or to limitations of MI in this client group. Lane-Brown and Tate (2010) found that a programme incorporating MI and external compensation increased goal-directed behaviour in a 32-year-old male.



## Meta-cognitive strategy training, self-regulation and goal setting

The Cognitive Orientation to daily Occupational Performance (CO-OP) approach is characterised as a client-driven meta-cognitive strategy training, enabling clients to identify, set & address goals, self-monitor goal attainment and direct their own learning and rehabilitation. It is designed specifically to equip individuals exhibiting impairment in executive function with the tools to help them engage more actively in the rehabilitation process. Skidmore et al. (2011) demonstrated the effectiveness of CO-OP training in improving rehabilitation engagement and functional ability in a client 7 days post stroke.

McPherson et al. (2009) (also described in Ylvisaker, Jacobs & Feeney, 2008) describe an intervention based on self-regulation theory, combining traditional and identity-oriented goal setting. They compared scores on the Goal Attainment Scale (GAS) – a popular technique enabling rehabilitation goals to be measured using a standardised scale while incorporating a client’s personal needs, preferences and priorities (Bouwens, van Heugten & Verhey, 2009; Turner-Stokes, 2009) – between three intervention groups: goal management training, identity-oriented goal training, and treatment as usual. They found that, while both treatment groups exhibited increased GAS scores, this was no better than the control group, suggesting that GAS alone was acting as an intervention.

### Quality assessment

The results of the quality review for each of the 17 studies is shown in Table D3. The quality scores were lowest for studies involving behavioural interventions (mean = 21.9), medium for cognitive interventions (mean = 27) and highest for mixed interventions (mean = 29).

In terms of theory, all the articles described some theoretical basis for the intervention, however the quality of this description and the direct relevance to rehabilitation engagement in this client group varied.

Table D3

Quality assessment results

Study	Type	Criteria							Total
		A	B	C	D	E	F	G	
1. Zencius, Wesolowski & Burke, 1989	Beh	3	2	1	2	4	5	4	<b>21</b>
2. Zencius, Wesolowski, Burke & McQuade, 1989	Beh	2	2	4	2	4	5	4	<b>23</b>
3. Manchester et al., 1997	Beh	1	1	1	5	5	3	3	<b>19</b>
4. Hegel, 1988	Beh	3	1	1	4	5	4	3	<b>21</b>
5. Newell, 1997	Beh	1	1	1	2	4	2	3	<b>14</b>
6. Hufford et al., 2012	Beh	1	1	5	5	5	4	5	<b>26</b>
7. Yuen, 1996	Beh	1	1	4	5	5	5	5	<b>26</b>
8. Sohlberg et al., 2011	Beh	4	2	1	4	5	5	4	<b>25</b>
9. Corrigan & Bogner, 2007	Mixed	5	5	5	2	5	4	4	<b>30</b>
10. McPherson et al., 2009 (& Ylvisaker et al., 2008)	Cog	5	4	3	1	5	4	4	<b>26</b>
11. Skidmore et al., 2011	Cog	1	1	5	5	5	5	5	<b>27</b>
12. Hsieh et al., 2012*	Cog	5	4	4	5	5	1	3	<b>27</b>
13. Pegg et al., 2005	Cog	5	4	3	2	4	5	5	<b>28</b>
14. Lane-Brown & Tate, 2010	Mixed	3	1	5	5	3	5	4	<b>26</b>
15. Corrigan et al., 2005	Mixed	5	5	5	3	5	5	3	<b>31</b>

Note. A. Study design. B. Sample size. C. Description of participants' demographics and co-morbidities. D. Description of participants' function. E. Description of intervention. F. Outcome. G. Theoretical basis for the intervention.

Beh = Behavioural; Cog = Cognitive

\* Hsieh, Ponsford, Wong, Schönberger, Taffe & Mckay (2012) and Hsieh, Ponsford, Wong, Schönberger, Mckay & Haines (2012).

## Discussion

This review identified a number of interventions which may successfully increase engagement, adherence or compliance with rehabilitation in adults with ABI. Many of the interventions employed goal setting as part of the rehabilitation process. This was not often evaluated as part of the intervention itself, illustrating its ubiquity in neuro-rehabilitation (Siegert et al., 2004; Levack, Taylor, et al., 2006; Playford et al., 2009). The intervention techniques fell into two broad categories: behavioural modification, and cognitive/meta-cognitive skills. This mirrors the suggestion of Hart and Evans (2006), who describe two types of goal interventions: those targeting the goal itself – rather like the behavioural interventions described here – and those targeting the (metacognitive) process of goal planning – akin to the (meta) cognitive interventions.

Many of the behavioural interventions described in this review comprised single case experimental designs, employing interventions tailored to individual clients' abilities and circumstances. All were successful in improving clients' adherence to rehabilitation. This supports previous research, which suggests that behavioural strategies are most effective where learning paradigms are task-specific, have clearly stated, adaptive goals, are supported by environmental modifications, and are meaningful to the individual (Sohlberg & Mateer, 2001; Ylvisaker et al., 2003; Hufford et al., 2012). However, none of the behavioural interventions measured engagement in rehabilitation over and above adherence, making conclusions about their impact on engagement or motivation impossible.

The most successful behavioural technique described in this review appears to be the use of contingent rewards, which increased rehabilitation adherence in several studies

(Hegel, 1988; Zencius, Wesolowski & Burke, 1989; Manchester et al., 1997; Corrigan et al., 2005; Corrigan & Bogner, 2007). Corrigan et al (2005) suggest that the use of a financial incentive may have created cognitive dissonance in clients that was resolved by placing a higher value on the treatment itself. The use of contingent rewards has been shown to be effective in changing behaviour in a wide range of circumstances. Barrier reduction and behavioural contracting techniques were also shown to be effective in this client group (Newell, 1997; Corrigan et al., 2005; Corrigan & Bogner, 2007; Hufford et al., 2012).

Those cognitive interventions demonstrating the greatest success were those which empowered the client to play an active role in their rehabilitation. These ranged from providing clients with tailored information about their condition (Pegg et al., 2005) through to interventions targeting broader meta-cognitive processes, equipping clients with the skills to plan, execute and evaluate their own rehabilitation (Skidmore et al., 2011) or enabling client involvement in a collaborative process of identifying, working towards and evaluating rehabilitation goals (McPherson et al., 2009; Lane-Brown & Tate, 2010).

One surprising finding of the review was the lack of evidence for the effectiveness of motivational interviewing in this client group. Of those studies utilising this technique, MI was either found not to be more effective than goal setting alone (Corrigan et al., 2005) or its effects were not sufficiently measured (Hsieh, Ponsford, Wong, Schönberger, Taffe & McKay, 2012; Hsieh, Ponsford, Wong, Schönberger, McKay & Haines, 2012). This appears to contradict the suggestion of others (Zweben & Zuckoff, 2002; Medley & Powell, 2010; Holloway, 2012). It is possible that MI is effective in increasing motivation for rehabilitation in this group, but that the design of the studies

reviewed here was insufficient for evaluation. Zweben and Zuckoff (2002) emphasise the importance of full descriptions of MI interventions and training in order to evaluate adherence to the spirit and practice of motivational interviewing. This is particularly important in large scale studies such as those reviewed here. Alternatively, it may be that MI alone is not effective in this client group owing to its reliance on concepts such as self-efficacy, requiring a higher level of self-awareness and meta-cognitive skills, both of which are impaired following ABI. Indeed, Medley and Powell (2010) suggest that MI might be most effective in this group in enhancing two core aspects of rehabilitation – the therapeutic alliance and goal setting.

In terms of rehabilitation setting, the majority of behavioural interventions described here took place in inpatient settings and evaluated adherence with rehabilitation, while the (meta)-cognitive interventions were largely set in outpatient or home settings and evaluated goal attainment or engagement. Generally, inpatient rehabilitation for adults with ABI is targeted at those who are experiencing significant functional or psychological problems and often occurs in the early post-injury stages, when awareness of difficulties is lacking and clients are unable to engage with rehabilitation in a meaningful way (Fleming & Onsworth, 2006). It is likely, therefore, that interventions to increase engagement with rehabilitation in adults with ABI operate on a continuum, reflecting clients' rehabilitation stage. Clients exhibiting difficulties with executive function or lacking in awareness might respond to basic behaviour management strategies, whereas clients further along the recovery process might be more able to grasp the complex ideas and processes of cognitive/meta-cognitive interventions.

Studies employing cognitive or mixed interventions tended to achieve higher quality scores. This was largely due to higher ratings of study design, sample size and description of participants' demographics and co-morbidities. Sample size differences reflect the dominance of single case experimental designs amongst the behavioural studies, while the latter perhaps reflects increasing methodological rigour amongst peer-reviewed journal articles over the last 10 years, during which the majority of the higher rated studies were published. Given Siegert and Taylor's (2004) claims that the literature has hitherto focussed on the pragmatic rather than the theoretical aspects of rehabilitation techniques such as goal setting, this review aimed to evaluate the studies' theoretical contributions. Although all the studies made some attempt at a theoretical explanation, the quality review suggested that this varied.

The principle limitation of this review was the methodological and measurement inconsistencies within the included studies. This problem is inherent to the field; many researchers argue that conducting any kind of rigorous evaluation of an intervention, such as an RCT, is very challenging in adults with ABI (Turner-Stokes et al., 2005; Perdices & Tate, 2009; Lane-Brown & Tate, 2010; Holloway, 2012). There are a number of reasons why this might be. First, adults with ABI are a very heterogeneous group. The most successful interventions are those that are tailored to the individual and their circumstances, as similar interventions can result in different functional manifestations in different individuals and situations (Perdices & Tate, 2009). Second, rehabilitation interventions are often very complex and target multiple outcomes, which can be difficult to evaluate independently (SIGN, 2013). Third, essential elements of rehabilitation such as goal setting and the therapeutic alliance are in themselves interventions (Schönberger, Humle & Teasdale, 2005, 2006), rendering it impossible and unethical to measure the effectiveness of the individual components of a

rehabilitation intervention (SIGN, 2013). For example, several of the interventions used Goal Attainment Scaling (GAS) as an outcome measure. GAS ensures that the principles and goals of cognitive rehabilitation take clients' personal needs and preferences into account, reflecting improvement in functional ability on a standardised scale while incorporating their own priorities (Bouwens et al., 2009; Turner-Stokes, 2009). Hart and Evans (2006) argue that, while useful in a clinical setting, GAS is itself an intervention as it facilitates client involvement in setting rehabilitation goals. This is borne out in the finding by McPherson et al. (2008) that clients in the treatment group attained equivalent or lower GAS scores to the control group.

Measurement is an acknowledged issue in this field. Often disability scales are used as an outcome measure rather than goal attainment; both reflect important aspects of the rehabilitation process but often there is a poor correlation between the two (Liu et al., 2004). Only two studies in this review utilised specific (although different) measures of rehabilitation engagement (Pegg et al., 2005; Skidmore et al, 2011). The database searches revealed a validated measure of rehabilitation engagement (Chervinsky et al., 1998). However, none of the studies included in this review utilised this measure.

In conclusion, interventions to facilitate engagement with rehabilitation interventions amongst adults with ABI are vital to increase health professionals' ability to serve this population and reduce the costs associated with delayed engagement, premature termination of rehabilitation, or ineffective interventions (Corrigan et al., 2005; Holloway, 2012). This review suggests that interventions can be successful in increasing engagement, but they should ideally be tailored to the individual's abilities and circumstances. Contingency management may be successful in increasing adherence with rehabilitation, while training in the meta-cognitive skills needed for goal

setting, monitoring and evaluation may increase rehabilitation engagement. This review found little evidence for the use of MI in increasing rehabilitation engagement in this client group. Finally, this review highlighted the methodological and measurement inconsistencies inherent to the field and the scarcity of high quality evaluation of interventions. More research is needed to identify the mechanisms by which rehabilitation elements – especially integral elements such as goal-setting – increase the effectiveness of rehabilitation interventions in this complex and heterogeneous population.

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# Appendices



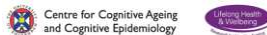
## **Appendix C2: Teaching/training 1: Learning objectives**

<b>Learning objective</b>	<b>Where and how achieved</b>
To understand what health psychology is and how it relates to ageing	Stated aim, initial slides
To be aware of the follow-up studies of the Scottish Mental Survey 1947, particularly the Lothian Birth Cohort 1936 and 6-Day Sample study	Stated aim and core of talk
To comprehend some of the influences on subjective wellbeing	Core of talk
To reflect on how this knowledge can be applied to work with older adults	Facilitated discussion

# Appendix C3: Teaching/training 1: Powerpoint presentation

**Lifecourse influences on well-being in old age: following up the Scottish Mental Survey 1947**

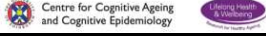
Caroline E. Brett  
Geriatric Medicine seminar series  
14<sup>th</sup> May 2012




**What is Health Psychology?**

<b>Promotion and maintenance of health</b>	<b>Prevention and treatment of illness</b>
<b>Identification of etiologic and diagnostic correlates of health, illness and related dysfunction</b>	<b>Analysis and improvement of the health care system and health policy formation</b>

after Matarazzo, 1982



**Seminar outline**



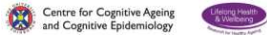
- Brief introduction to health psychology
- Subjective wellbeing in older adults
- The Scottish Mental Survey 1947
- Results from the Lothian Birth Cohort 1936
- Introduction to the 6-Day Sample
- Questions and discussion
- Feedback



**A biopsychosocial approach**

<b>Bio:</b> -Viruses -Bacteria -Lesions -Genetics	↔	<b>Psycho:</b> -Behaviour -Beliefs -Coping -Mood -Personality	↔	<b>Social:</b> -Class -Ethnicity -Social norms -Wealth
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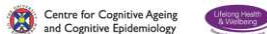
after Engel, 1977, 1980



**What is Health Psychology?**

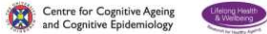
<b>Promotion and maintenance of health</b>	<b>Prevention and treatment of illness</b>
<b>Identification of etiologic and diagnostic correlates of health, illness and related dysfunction</b>	<b>Analysis and improvement of the health care system and health policy formation</b>

after Matarazzo, 1982



**What is subjective wellbeing and why does it matter?**

- Subjective wellbeing (SWB) represents the ways in which people positively evaluate their lives.
- Measures include quality of life, satisfaction with life, happiness, mood and general mental wellbeing.
- SWB in older adults has been linked to negative health outcomes, including mortality.
- Studies vary as to whether SWB improves or declines with age.



## What influences SWB?

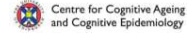
- |   |     |  |
|---|-----|--|
| Individual attributes<br>(e.g. personality, values, mood)                           | VS. | Social indicators<br>(e.g. wealth, education, socioeconomic status).               |
| Past circumstances<br>(e.g. childhood deprivation, education, occupational history) | VS. | Current circumstances<br>(e.g. physical health, social support, functional status) |

Adopting a biopsychosocial approach enables a better understanding of the processes involved.



## Scottish Mental Survey 1947

- 4th June 1947: 70,805 children born in 1936 sat a group intelligence test (SMS1947)
- Summer 1947: children born on the 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> of every month of 1936 (36-Day Sample) and all twins born in 1936 completed a sociological schedule
- 1947-1963: 1208 children born on the 1<sup>st</sup> of February, April, June, August, October & December 1936 completed individual intelligence test, school, employment, and home schedules (6-Day Sample)



## Scottish Mental Survey 1947

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## Scottish Mental Survey 1947

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## Lothian Birth Cohort (LBC) 1936



- 1091 healthy individuals living in the Lothian region, born in 1936.
- Most took part in the Scottish Mental Survey 1947 at the age of 11
- Attended two clinic assessments including background demographics, cognitive and physical tests in 2004-2007 (age 70, n = 1091) and 2007-2010 (age 73, n = 867)



## Subjective wellbeing measures

**LBC  
1936**

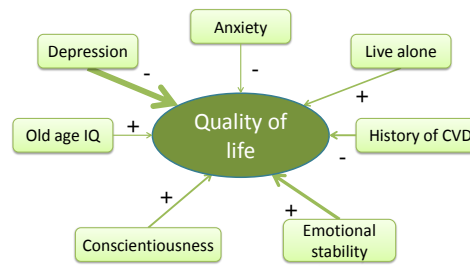
- Quality of Life (QoL, Wave 1, age 70)
  - 26 items
    - 4 domains: Physical (7), Psychological (6), Social (3), Environment (8)
    - 2 general QoL items (e.g. 'How would you rate your quality of life?')
- Satisfaction With Life Scale (Wave 2, age 73)
  - 5 items (e.g. 'In most ways my life is close to ideal')
- Warwick Edinburgh Mental Wellbeing Scale (Wave 2, age 73)
  - 14 items (e.g. 'I've been feeling good about myself')

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## LBC1936: Quality of life @ 70

**LBC  
1936**



Adjusted  $r^2 = .445^{***}$

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## Subjective wellbeing in the LBC1936

**LBC  
1936**

Measure	Age 70	Age 73	Norms
	Mean (SD)	Mean (SD)	Mean
Physical QoL (max = 20)	16.10 (2.64)		14.14
Psychological QoL (max = 20)	15.67 (1.81)		12.92
Social QoL (max = 20)	17.14 (2.39)		13.79
Environmental QoL (max = 20)	16.71 (1.84)		13.59
Satisfaction with life (max = 35)		25.53 (5.92)	24.2 (6.9)
Mental Wellbeing (max = 70)		51.41 (7.49)	51

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## LBC1936: Quality of life @ 70

**LBC  
1936**

- Quality of life is influenced by a combination of external and internal factors.
- Individuals with higher state depression and anxiety, lower emotional stability and conscientiousness, lower IQ in old age, a history of CVD and who live alone may be more likely to report a poorer quality of life.
- Early life influences including education and childhood IQ do not appear to play a part in influencing quality of life.

Brett et al, 2011, *Quality of Life Research*, 21(3), 505-516

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## Determinants of quality of life

**LBC  
1936**

- Bio-social factors:
  - Health status (history of cardiovascular disease)
  - Social support (live alone, or not)
- Internal psychological factors:
  - Current mood (Hospital Anxiety and Depression Scale depression and anxiety in last week)
  - Old age IQ (Moray House Test)
  - Personality (International Personality Item Pool Emotional Stability and Conscientiousness)

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## Determinants of subjective wellbeing

**LBC  
1936**

- Bio-social factors:
  - Gender
  - Occupational social class
  - Education (number of years of full-time education)
  - Functional status @73 (Townsend Activities of Daily Living)
  - Perceived social support @70 (availability of and satisfaction with six specified types of social support received)

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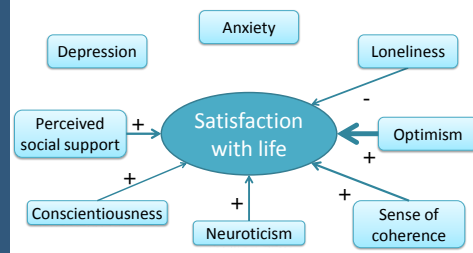
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## Determinants of subjective wellbeing **LBC 1936**

- Psychological factors:
  - Current mood @73 (HADS anxiety and depression)
  - Loneliness @73 ('How often have you felt lonely in the past week', 5-point scale)
  - Personality (Optimism from Life Orientation Test-Revised; Sense of Coherence (3-item scale); Neuroticism, Extraversion and Conscientiousness from NEO-Five Factor Inventory)



## LBC1936: Life satisfaction @ 73 **LBC 1936**



Adjusted  $r^2 = .333^{***}$



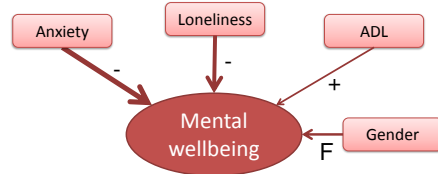
## LBC1936: Life satisfaction @ 73 **LBC 1936**



Adjusted  $r^2 = .168^{***}$



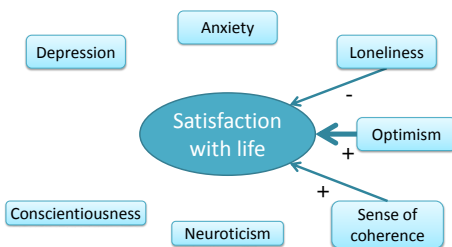
## LBC1936: mental wellbeing @ 73 **LBC 1936**



Adjusted  $r^2 = .267^{***}$



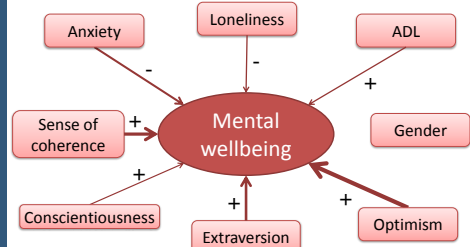
## LBC1936: Life satisfaction @ 73 **LBC 1936**



Adjusted  $r^2 = .301^{***}$



## LBC1936: mental wellbeing @ 73 **LBC 1936**



Adjusted  $r^2 = .522^{***}$



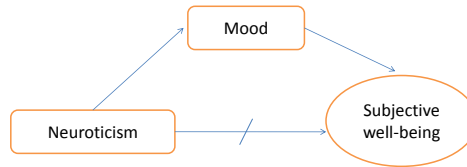
## LBC1936: Subjective wellbeing @73

LBC  
1936

- Subjective wellbeing is influenced by mostly internal factors, particularly loneliness, and personality factors including optimism, sense of coherence and conscientiousness.
- Perceived social support, extraversion and neuroticism have a smaller role.
- Supports notion of a positive psychological profile containing resources which protect against age-related decline.

## A brief word on mediation

- Personality likely influences SWB through mediators

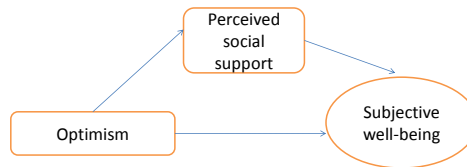


## A brief word on mediation

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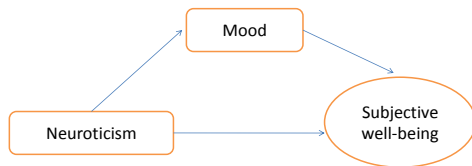
## A brief word on mediation

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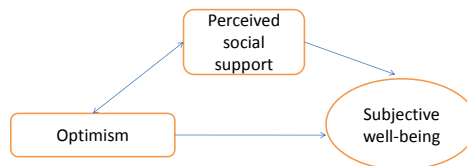
## A brief word on mediation

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## Scottish Mental Survey 1947

6-day sample  
scotland in miniature

- 4th June 1947: 70,805 children born in 1936 sat a group intelligence test (SMS1947)
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## What will it involve?

6-day sample  
scotland in miniature


- Detailed questionnaire and medical screening using home testing kit (all participants)
- Saliva samples for DNA & cortisol analysis (all participants)
- Telephone interview with cognitive testing (all participants)
- Interview (80 participants)
- 24-hour urinary cortisol (100 participants)
- Validation clinic assessment (50 participants)

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## About the 6-Day Sample

6-day sample  
scotland in miniature

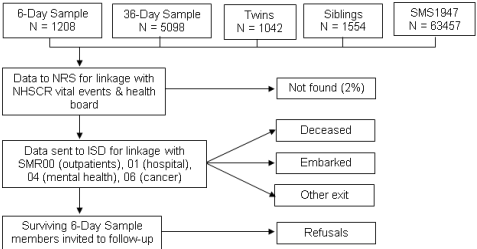
- Representative sample of the population: 'Scotland in Miniature'
- 1208 individuals (590 male, 618 female)
- 1036 complete data (11-27 years)
- Wealth of data on education, health, family, occupations, activities, attitudes & future plans



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## What it will involve: linkage

6-day sample  
scotland in miniature



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## Objectives

6-day sample  
scotland in miniature

- To use Scottish and UK national databases to trace members of the 6-Day Sample.
- To link existing data with vital events and illness episodes using the NHS Central Register and Scottish Morbidity Records.
- To recruit surviving Sample members into a follow-up study investigating lifelong influences on health and wellbeing in old age.
- To make the resource available to others.

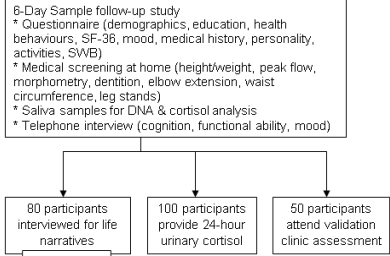
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## What it will involve: follow-up study

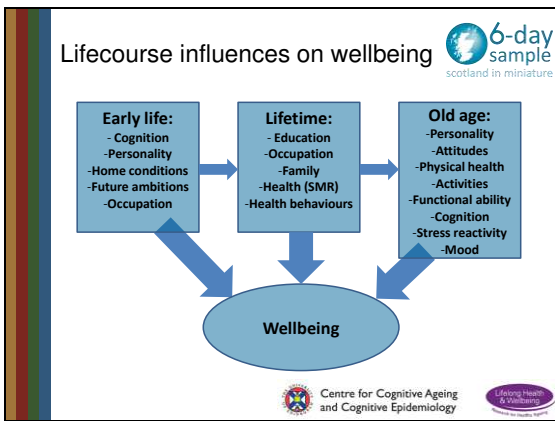
6-day sample  
scotland in miniature

6-Day Sample follow-up study

- \* Questionnaire (demographics, education, health behaviours, SF-36, mood, medical history, personality, activities, SVWB)
- \* Medical screening at home (height/weight, peak flow, morphometry, dentition, elbow extension, waist circumference, leg stands)
- \* Saliva samples for DNA & cortisol analysis
- \* Telephone interview (cognition, functional ability, mood)



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### Feedback


Your job title and profession (medicine, nursing, OT, physiotherapy, psychology, academic, etc.)

The information presented was....

The information was relevant to my work....

Any other comments


Thank you!!

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### Acknowledgements

The work was undertaken by The University of Edinburgh Centre for Cognitive Ageing and Cognitive Epidemiology, part of the cross council Lifelong Health and Wellbeing Initiative (grants G0700704/84698 and G1001401). Funding from the BBSRC, EPSRC, ESRC and MRC is gratefully acknowledged.

6-Day Sample study  
 University of Edinburgh  
 7 George Square  
 Edinburgh EH8 9JZ  
 0131 650 4005  
 caroline.brett@ed.ac.uk  
[www.6-DaySample.ed.ac.uk](http://www.6-DaySample.ed.ac.uk)


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### Summary and discussion

-Subjective wellbeing is likely to be influenced by:

- Current mood (depression and anxiety)
- Loneliness
- Personality:
  - Optimism
  - Sense of coherence
  - Conscientiousness
  - Neuroticism
  - Extraversion

-(How) does this impact on professional practice?



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## Appendix C4: Teaching/training 1: Feedback form

# FEEDBACK FORM

Please give your job title and profession (i.e. medicine, nursing, psychology, OT etc.): Job title: \_\_\_\_\_

Profession: \_\_\_\_\_

Please indicate the extent to which you agree with the following statements (1 = strongly disagree, 2 = disagree,					
The presentation was relevant to my work	1	2	3	4	5
I found the presentation interesting	1	2	3	4	5
The presenter showed good knowledge of	1	2	3	4	5
The presenter's style was engaging and	1	2	3	4	5
The format of the presentation was	1	2	3	4	5
The presenter handled questions well	1	2	3	4	5
The presentation has increased my	1	2	3	4	5

Any other comments? (Continue overleaf if necessary)

## **Appendix C5: Teaching/training 1: Feedback results**

The responses given by the 13 attendees who returned feedback tags are shown in Tables 1-3 below.

Table 1

Job titles and professions of attendees

<b>Job title</b>	<b>Profession</b>
Doctor – SHO	Medicine
Doctor – GPST 1	Medicine
Doctor – GPST (General Practice)	Medicine
Doctor – LAT STI	Medicine
Doctor – CTI	Medicine
Medicine	Medicine
Doctor – FY2	Medicine
Physiotherapist	Physiotherapy
Clinical Psychology	Psychology
Trainee clinical psychologist	Psychology
Psychologist	Psychology
Psychology trainee	Psychology

Table 2

Number of responses in each category (1-5) for all questions on feedback form

<b>Statement</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
The presentation was relevant to my work	-	1	1	4	7
I found the presentation interesting	-	-	1	4	8
The presenter showed good knowledge of the material	-	-	-	3	10
The presenter's style was engaging and informative	-	-	-	4	9
The format of the presentation was appropriate	-	-	-	6	7
The presented handled questions well	-	-	-	3	10
The presentation has increased my understanding of the topic	-	-	3	3	7

Table 3

Additional comments made on feedback tags

<b>Comments:</b>
Would have been good to have email copy of presentation
Very engaging, will definitely read up on those studies. Thanks.
Thank you! :o)

## Appendix C7: Teaching/training 2: Module outline

### **INVITED SPEAKERS' PROGRAMME: RESEARCH IN ACTION MSc HEALTH PSYCHOLOGY**

---

**MODULE CO-ORDINATOR:** [REDACTED]

**Time: 9.00 - 11.50 am**

**Date: 5<sup>th</sup> December 2013**

#### **NOTE TO SPEAKERS:**

Please provide the students with:

- An overview of your research topic/area
- Insight into carrying out research (i.e. ethical considerations, recruitment/sampling, design, mode of data collection/ procedure, methods of analysis )
- Including why you chose certain methodological approaches
- An overview of any barriers or problems you faced and how you overcame them
- Highlight how your research adds to theory development
- An overview of the research questions raised by your research
- Key references

Ideally we would like you to present information in 20 minutes slots broken up with discussion points or group activities.

#### **AIMS**

To provide students with the opportunity to hear health psychology researchers speak about their work with specific emphasis on the reasons underpinning their decisions to employ particular methodological approaches to address particular research questions. The specific aims of the module are:

- To develop an awareness of a range of methodological approaches currently in use within health psychology research
- To foster an appreciation of the issues involved in the selection of particular approaches in relation to different types of research question
- To enable students to evaluate and compare the methodological approaches in terms of their ability to further understanding of topics of relevance to health psychology

## **Skills Objectives**

In addition to the above, students will develop the following skills:

- An openness to learn about a range of different approaches to research
- Ability to identify the implications of choices regarding the use of such approaches and techniques
- Ability to evaluate individual pieces of work in terms of the degree to which the approaches and methods used are appropriate to the question being addressed

## **Module Assessment**

Students are required to:

Review the literature in your chosen area of research, summarising the major findings in qualitative and quantitative research. Compare how the identified qualitative and quantitative approaches have added to our knowledge of health psychology,

## **Appendix C8: Teaching/training 2: Lecture slides**

## Using existing data in health research: The value of longitudinal cohort studies and data linkage

Caroline E. Brett  
5<sup>th</sup> December 2013



Centre for Cognitive Ageing  
and Cognitive Epidemiology



### Brief CV

- MA(Hons) Psychology, Edinburgh University (1999)
- MSc Cognitive Neuropsychology, Essex Uni (2000)
- Admin positions in NHS (2000-1)
- Assistant clinical psychologist, State Hospital (2001-2)
- Research assistant, Edinburgh High Risk Study (2002-4)
- Research assistant, State Hospital Survey (2004-5)
- Research assistant, Lothian Birth Cohorts (2005-2010)
- MSc Health Psychology, Stirling University (2010-11)
- Research assistant, 6-Day Sample study (2011+)
- DPsych student, City University (2011+)

### Learning objectives

- By the end of the lecture, students should be able to:
- critically evaluate the purpose and value of longitudinal cohort studies and data linkage in health research
  - understand the ethical implications of data linkage
  - develop an appreciation of the importance of information governance in health research
  - understand the complexities of designing a longitudinal cohort study.

### Lecture outline

- Introduction
- Advantages of longitudinal cohort studies
- Potential research questions
- Overview of the main UK-based cohort studies
- Introduction to data linkage
- BREAK
- The Scottish Mental Surveys and follow-up studies
- Exploration of some findings
- Introduction to the 6-Day Sample study
- Summary and future steps

### What are longitudinal cohort studies?

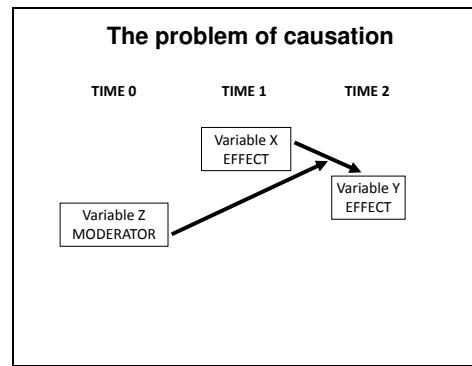
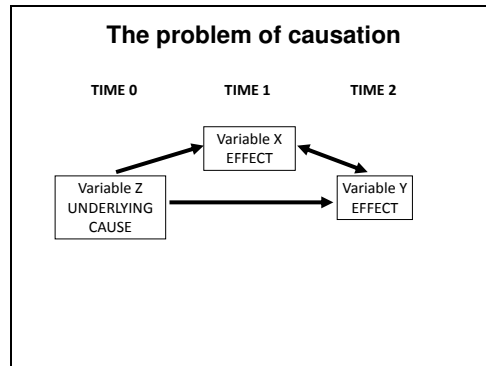
- A **longitudinal study** is a correlational research study that involves repeated observations of the same variables over long periods of time — often many decades. It is a type of observational study.

### What are longitudinal cohort studies?

- A **longitudinal study** is a correlational research study that involves repeated observations of the same variables over long periods of time — often many decades. It is a type of observational study.
- **Cohort studies** are a type of longitudinal research. By following the same groups of people throughout their lives, cohort studies show:
  - how an individual's health, wealth, family, parenting, education, employment and social attitudes are linked
  - how these aspects of life vary for different people
  - how these aspects affect outcomes and achievements in later life.







### Advantages of longitudinal cohort studies

- 1) They follow the same individuals across time so that we can observe important changes in their health or behaviour, and in their environment
  - Allows us to track individual trajectories of health over time
  - Can disentangle changes due to environment versus individual
  - Examples: Edinburgh High Risk Study / Health Surveys

### Advantages of longitudinal cohort studies

- 1) They follow the same individuals across time so that we can observe important changes in their health or behaviour, and in their environment
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BUT they are very expensive and time-consuming

### Advantages of longitudinal cohort studies

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  - Reduces the impact of key confounders such as age, geography, or illness
  - Comparison across cohorts allows us to understand the historical and social context and its impact on health
  - Examples: comparisons across countries / across time

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  - Examples: comparisons across countries / across time

BUT generalisability may be compromised

### Advantages of longitudinal cohort studies

- 3) They involve large numbers of participants so have sufficient statistical power to detect small effects

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- 3) They involve large numbers of participants so have sufficient statistical power to detect small effects
- Allows for multiple testing and complex statistical modelling techniques
  - Ideally suited for quantitative research
  - Numbers allow for rare outcomes e.g. diseases
  - Examples: genetics, UK Biobank, Million Women Study

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  - Ideally suited for quantitative research
  - Numbers allow for rare outcomes e.g. diseases
  - Examples: genetics, UK Biobank, Million Women Study

BUT still need replication

BUT drop-out rates are high

BUT need specialist knowledge of statistics

### Advantages of longitudinal cohort studies

- 4) They offer a valuable resource for researchers

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  - Encourages cross-disciplinary collaboration
  - Examples: Lothian Birth Cohorts

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BUT this gets VERY expensive; funding issues

### Advantages of longitudinal cohort studies

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  - Or if narrow focus on specific group
  - Examples: Growing Up in Scotland

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- 5) They have the potential to influence policy
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  - Or if narrow focus on specific group
  - Examples: Growing Up in Scotland

BUT need replication across cohorts; cross-cohort collaborations becoming increasingly common

### EXERCISE: Research questions

Individually, brainstorm some potential research questions that could only be addressed through longitudinal cohort studies. Choose one (5 minutes)

In pairs, share your chosen research questions and decide on one (2-3 minutes)

Join with another pair and repeat the process (2-3 minutes)

Each group will feed their question back to the rest of the group

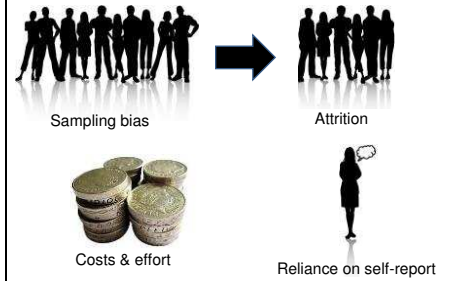
### Population-based cohorts

COHORT	SIZE	AGE	WHERE	DATES
Million Women Study	1 million	50+	UK	1996+
UK Biobank	500,000	40-69	UK	2006+
Understanding Society	100,000	10+	UK	2009+
British Household Panel Survey	20,000	10+	UK	1991-2008
Southampton Women's Survey	16,000	20-34 +babies	Southampton	1998+
Growing Up in Scotland	14,000	b.2004+	Scotland	2005+
English Longitudinal Study of Ageing	11,578	50+	England	2002+
Whitehall II	10,308	35-55	London	1985+
West of Scotland Twenty-07 study	4510	15, 35, 55	Glasgow	1987-2007

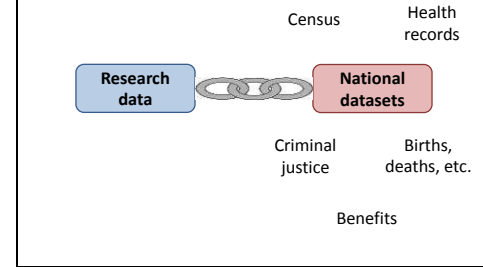
### Birth cohorts

COHORT	SIZE	AGE	WHERE	DATES
Millenium Cohort Study	19,000	b.2000-1	GB	2000+
Avon Longitudinal Study of Parents & Children	14,000	b.1991/92	Avon	1991+
Longitudinal Study of Young People in England	15,570	b.1989/90	England	2004+
British Cohort Study 1970	17,000	b.1970	GB	1975+
National Child Development Survey	17,000	b.1958	GB	1958+
National Survey of Health & Development	5362	b.1946	GB	1946+
Boyd-Orr Cohort study	4999	b.1937-9	GB	1988+
Hertfordshire Cohort study	3700	b.1920-39	Herts	1980s+

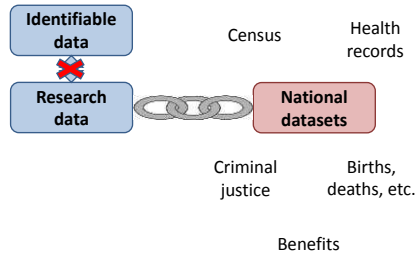
### Limitations of studies



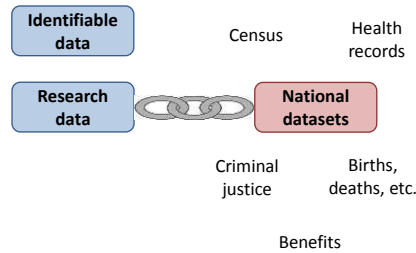
### Data linkage



### Data linkage



### Data linkage



### Information governance

- Information Governance ensures necessary safeguards for, and appropriate use of, patient and personal information.
- There are many different standards and legal rules that apply to information handling, including:
  - The Data Protection Act 1998.
  - The common law duty of confidence.
  - The Confidentiality NHS Code of Practice.
  - The NHS Care Record Guarantee for England.
  - The Social Care Record Guarantee for England.
  - The international information security standard: ISO/IEC 27002: 2005.
  - The Information Security NHS Code of Practice.
  - The Records Management NHS Code of Practice.
  - The Freedom of Information Act 2000.

**NEWS TECHNOLOGY**

Home World UK England N. Ireland Scotland Wales Business Politics Health Education **Scot**

12 July 2012 Last updated at 12:46

**NHS Surrey fined £200,000 after losing patients' records**

NHS Surrey has been fined £200,000 by data regulators over the loss of sensitive information about more than 3,000 patients.

Thousands of children's patient records were found on a second-hand NHS computer that was auctioned on eBay, the BBC understands.

Regulators said NHS Surrey failed to check that a data destruction company had properly disposed of the records.

Three further computers that had been sold on eBay contained sensitive data.

UK watchdog the Information Commissioner's Office (ICO) imposed the fine on the trust after patients across Surrey were affected by the data leak.

"The facts of this breach are truly shocking," ICO head of enforcement Stephen Eckersley said in a statement.

"NHS Surrey chose to leave an approved provider and handed over thousands of patients' details to a company without checking that the information had been securely deleted."

"The result was that patients' information was effectively being sold online."



The NHS Surrey data breach was one of the most serious the ICO has seen.

**Related Stories**

- Hospital fined after data stolen
- Five after patients' data stolen
- Consent in top of data law list

## BREAK!

## Caldicott Guardians

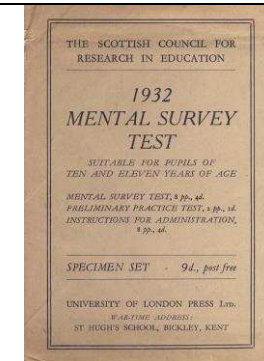
- A Caldicott Guardian is a senior person responsible for protecting the confidentiality of patient and service-user information and enabling appropriate information-sharing.
- Acting as the 'conscience' of an organisation, the Guardian actively supports work to enable information sharing where it is appropriate to share, and advises on options for lawful and ethical processing of information.
- The Caldicott Guardian also has a strategic role, which involves representing and championing Information Governance requirements and issues at Board or management team level and, where appropriate, at a range of levels within the organisation's overall governance framework.

## The Scottish Mental Surveys

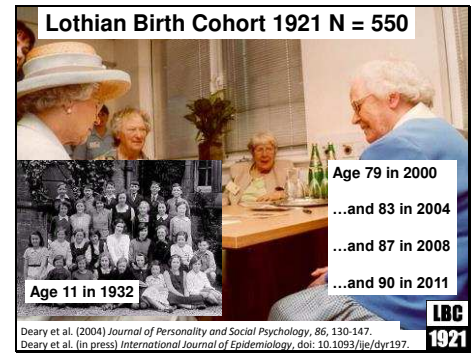
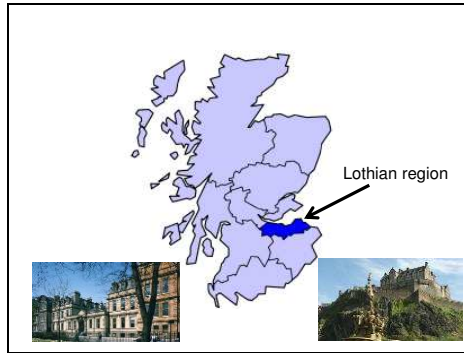
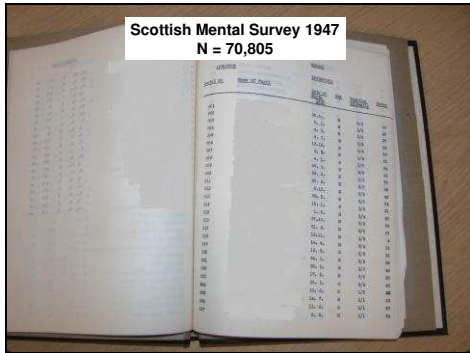
- On 1<sup>st</sup> June 1932, every child born in 1921 at school in Scotland took an intelligence test
- 87,498 children (95% of the population)
  - Moray House Test No. 12

## Information governance & data linkage

- Advisory committees and groups: senior health professionals, service users, policymakers.
- Government policy: e.g. Section 251 of the NHS Act 2006 allows the common law duty of confidentiality to be set aside in specific circumstances where anonymised health datasets are not sufficient and where patient consent is not practicable for the purposes of research.
- Safe havens
- Administrative Data Linkage Centres and services; Farr Institutes







**Lothian Birth Cohort (LBC) 1921**

- 550 healthy individuals (male = 234, 42.5%) living in the Lothian region, born in 1921
- Most took part in the Scottish Mental Survey 1932 aged 11
- Attended clinic visits (including demographic interview, cognitive tests & physical measures):
  - Wave 1 2000-1 (aged 79, n=550) – MHT repeated
  - Wave 2 2004-5 (aged 83, n=321)
  - Wave 3 2007-8 (aged 87, n=237) – MHT repeated
  - Wave 4 2011 (aged 90, n=140)
  - Wave 5 2013 (aged 92, n = 60) – MRI scan included
- Self-completion questionnaires in 2002/3 (aged 81), and at age 87 and 90; Blood samples for genetic and biomarker analysis at each wave of testing

LBC 1921

Deary et al. (2011) *International Journal of Epidemiology*, doi: 10.1093/ije/dyr197.



**Lothian Birth Cohort (LBC) 1936**

- 1091 healthy individuals (male = 548, 50.2%) living in the Lothian region, born in 1936
- Most took part in the Scottish Mental Survey 1947 aged 11
- Attended three clinic assessments
  - Wave 1 2004-2007 (age 70, n = 1091)
  - Wave 2 2007-2010 (age 73, n = 866)
  - Wave 3 2011-2013 (age 76 n = 698)
- Questionnaires at each wave; food frequency at 70
- MRI scanning at age 73 & 76
- Retinal photography age 73
- Blood samples for genetic and biomarker analysis at each wave of testing

LBC 1936

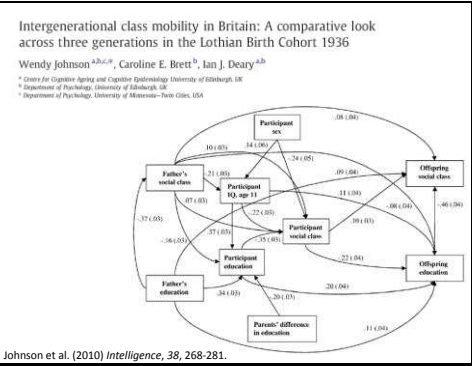
Deary et al. (2007) *BMC Geriatrics*, 7, 28.  
Deary et al. (2011) *International Journal of Epidemiology*, doi: 10.1093/ije/dyr197.





### EXERCISE: Ready, Steady, Research!

- Split into 5 groups
- Each group has 5 variables from the LBC1936 study
- 5 minutes to come up with a research hypothesis and plan
- Identify dependent / independent variables, confounders, mediators or moderators



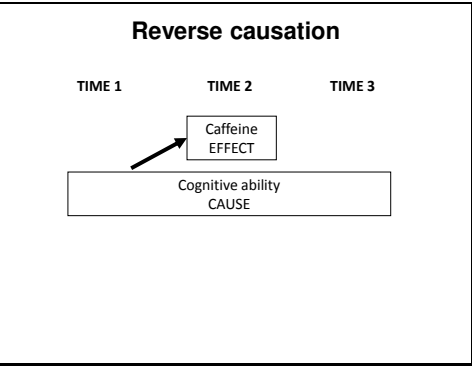
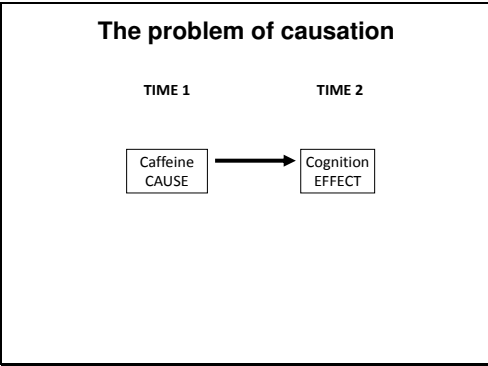
Caffeine Consumption and Cognitive Function at Age 70: The Lothian Birth Cohort 1936 Study

RAGE CORLEY, MA, PhD; JIA, PhD; JOSEY A. M. KEIL, PhD; ALAN J. COOK, PhD; CAROLINE E. BRETT, MSc; IAN J. DEARY, MA, FRACP, CHAIRMAN; MORTON, PhD; AND IAN J. DEARY, PhD, FRCP.

	Age/Sex	Social class	Age 11 IQ	All
Total caffeine	.004*	.000	.003*	.000
Tea	.014**	.010**	.001	.001
Instant coffee	.001	.002	.000	.000
Ground coffee	.017**	.003	.004	.000
Coffee	.016**	.005*	.003	.001

LBC 1936

Corley et al. (2010) *Psychosomatic Medicine*, 72(2), 206-214



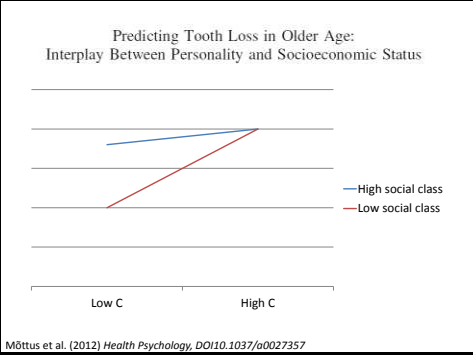
### Predicting Tooth Loss in Older Age: Interplay Between Personality and Socioeconomic Status

Rene Müntz  
University of Edinburgh, Scotland, and University of Tartu, Estonia

John M. Starr  
Royal Victoria Hospital, Edinburgh, Scotland, and University of Edinburgh, Scotland

Ian J. Deary  
University of Edinburgh, Scotland

**Objectives:** A low number of natural teeth, indicating poor oral health, is associated with various adverse outcomes in the extent that it has been proposed as a screening marker of life quality in older age. To further understand the mechanisms underlying oral health, this study investigated the associations between the number of natural teeth and personality traits in older age. **Method:** In 761 members of the Lothian Birth Cohort FFM, the number of remaining natural teeth was determined at clinical assessment at approximately twenty-nine years of age. Personality traits were measured using the 50-item International Personality Item Pool. Associations between personality traits and the number of teeth were examined with generalized additive mixed models, controlling for sex, age, educational level, occupational social class, and childhood cognitive ability. **Results:** Low conscientiousness was associated with both absence and low count of natural teeth at age 73. The latter association was mediated by socioeconomic circumstances, appearing among people with lower educational levels and occupational social class but not among people in better socioeconomic circumstances. The association over to a small extent mediated by working. **Conclusions:** People in socially less advantageous circumstances may need to make a stronger personal effort to maintain oral health compared to those in more affluent conditions and therefore lower conscientiousness might be a relative disadvantage for them. These findings can be used for identifying people at risk of poor oral health and for designing personality-targeted interventions. They can also help to explain the links between conscientiousness and various other health outcomes.



### Neuroprotective lifestyles and the aging brain

Activity, atrophy, and white matter integrity

Alan J. Gow, PhD  
Mark E. Burns, PhD  
Shana M. Baker, MSc  
Mara C. Valby  
Hannah P. Hill  
Zoe Means, MSc  
Catherine Murray, PhD  
Nicola A. Boyle, MSc  
John M. Starr, FRCPsych  
Ian J. Deary, PhD  
James M. Wardlaw, FRCS

**ABSTRACT**  
**Objective:** Increased participation in leisure and physical activities may be cognitively protective. Whether activity might protect the integrity of the brain's white matter, or reduce atrophy and white matter lesion (WML) load, was examined in the Lothian Birth Cohort (LBC) (n = 992), a longitudinal study of aging.  
**Methods:** Associations are presented between self-reported leisure and physical activity at age 72 years and structure brain function at 73 years. For white matter integrity, principal components analysis of 12 major tracts produced general factors for fractional anisotropy (FA) and mean diffusivity. Atrophy, gray and normal-appearing white matter (NAWM) volumes, and WML load were assessed using computational image processing methods, atrophy and WML were also assessed visually.  
**Results:** A higher level of physical activity was associated with higher FA, larger gray and NAWM volumes, less atrophy, and lower WML load. The physical activity associations with atrophy, gray matter, and WML remained significant after adjustment for covariates, including age, education, and health status. For example, physical activity (standardized  $\beta = -0.08$ , nonstandardized  $\beta = -0.09$ ,  $p = 0.028$ ) and stroke (standardized  $\beta = 0.18$ , nonstandardized  $\beta = 0.08$ ,  $p = 0.002$ ) each had an independent effect on total WML load. Leisure activity was associated with NAWM volume, but was nonsignificant after including covariates.  
**Conclusions:** In this large, non-age-specific sample of adults in their 70s, physical activity was associated with less atrophy and WML. Its role as a potential neuroprotective factor is supported; however, the direction of causation is unclear from this observational study. *Neurology* 2012;78:1802-1808

### Neuroprotective lifestyles and the aging brain

Activity, atrophy, and white matter integrity

	Age + Sex	+ age 11 IQ	+ social class	+ disease
Physical activity	<b>-0.11 (0.003)</b>	<b>-0.11 (0.004)</b>	<b>-0.11 (0.007)</b>	<b>-0.09 (0.017)</b>
Leisure activity	-0.04 (0.311)	-0.03 (0.446)	-0.01 (0.765)	-0.01 (0.873)

Gow et al. (2012) *Neurology*, 79, 1802-1807

### Psychosocial factors and health as determinants of quality of life in community-dwelling older adults

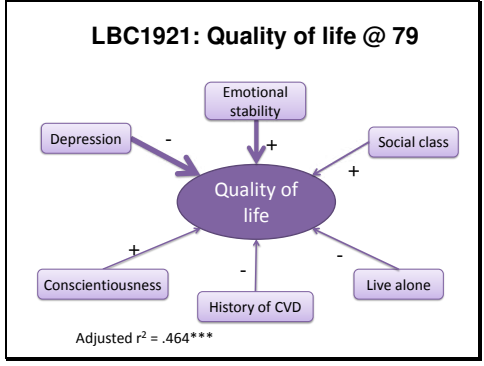
Caroline E. Brett · Alan J. Gow · Jamie Corley · Alison Pattie · John M. Starr · Ian J. Deary

*Quality of Life Research*, 21(3), 505-516

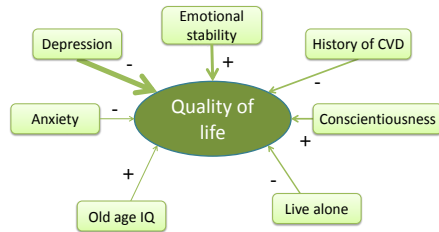
Accepted: 7 June 2011  
© Springer Science+Business Media B.V. 2011

**Abstract**  
**Purpose:** It is important to understand the determinants of differences in quality of life in old age and to include a wide range of possible predictors. The present study investigated the determinants of quality of life in two groups of older adults for whom there was an unusually informative set of possible predictive variables.  
**Method:** Participants were members of the Lothian Birth Cohorts of 1921 (n = 550) or 1936 (n = 1,091). Four facets of quality of life (QoL) and general QoL were measured using the WHOQOL-BREF. Possible determinants included personality traits, measured with the International Personality Item Pool (IPIP) scales; childhood and old-age general cognitive ability, measured with the Memory factors reflecting current life circumstances. There were differences between the two cohorts in the variables which predicted quality of life. There were different, conceptually relevant, contributions to the different QoL facets.  
**Conclusions:** Personality traits and minor depressive symptoms have an important influence on self-reported quality of life in old age. Quality of life may be influenced more by current than past circumstances, and this relationship may change with age.

**Keywords:** Quality of life · Big-Five personality traits · Depression · Older adults · Health · Sociodemographic factors · Anxiety



### LBC1936: Quality of life @ 70



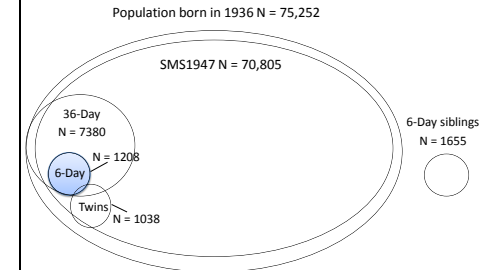
Adjusted  $r^2 = .445^{***}$

### Scottish Mental Survey 1947



- 4th June 1947: **70,805** children born in 1936 sat the Moray House Test No. 12 & completed 17-item sociological schedule (**SMS1947**)
- Summer 1947: **7380** children born on the 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> of every month of 1936 and **1050** twins born in 1936 completed a 25-item sociological schedule (**36-Day Sample and twins**)
- 1947-1963: **1208** children born on the 1<sup>st</sup> of February, April, June, August, October & December 1936 completed individual Binet intelligence test, school, employment, & home schedules (**6-Day Sample**)
- 1948-1963: **1554** younger siblings of the 6-Day Sample were given Binet intelligence test at age 11, and their education, occupation, & children recorded (**6-Day siblings**)

### The SMS1947 & its sub-groups



### The 6-Day Sample

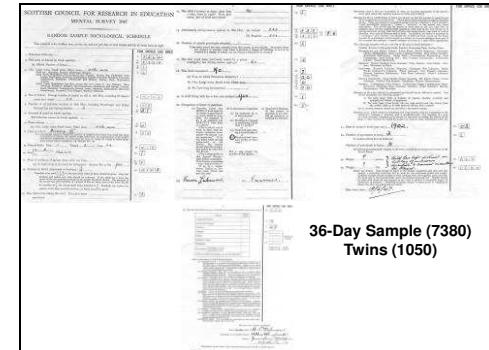
- N=1208 (590 male, 618 female)
- 1036 complete data (11-27 years)
- 379 (64%) of males & 508 (82%) of females married by 1964
- 38 (6.4%) males & 9 (1.5%) females had degrees by 1963
- 1554 younger siblings tested on reaching age 11



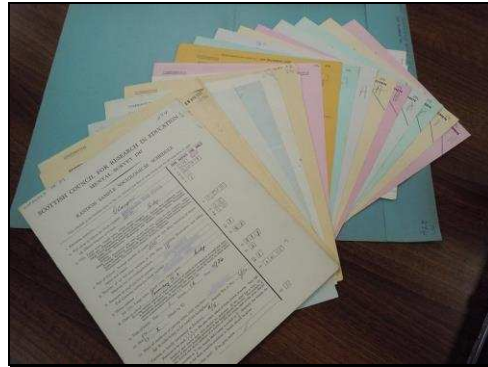
### What was measured?




- 1947: **Terman-Merrill** (Form L) Binet intelligence test
- 1947: **Sociological schedule** (teacher – demographics, family, school attendance, physical disabilities, height & weight)
- 1950-1: **School schedules** (headteacher – progress in school, personality, test scores, examinations taken, job)
- 1951-4: **Employment schedules** (local employment office – details of jobs held)
- 1951: **Home report & first home schedule** (home visitor – conditions in home, siblings, parents' personality & attitudes towards child, ambitions, activities, health)
- Late-1950s: **National service** (men only)
- 1952-63: **Home schedules** (parent/self – employment, marriage, children, further education)



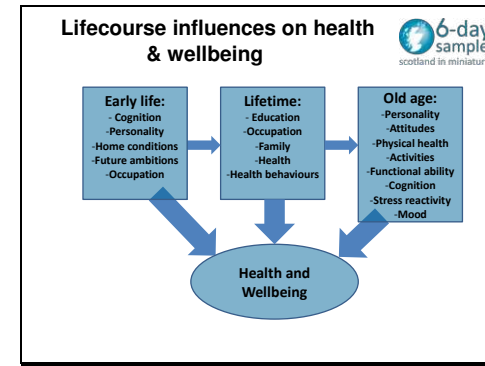
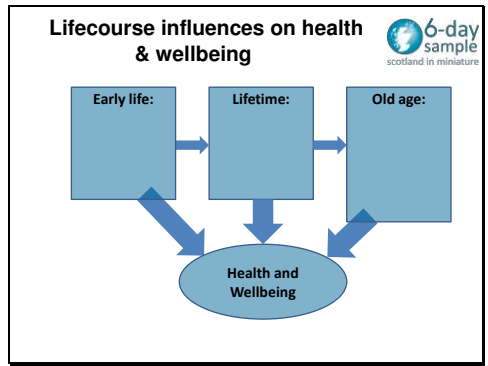
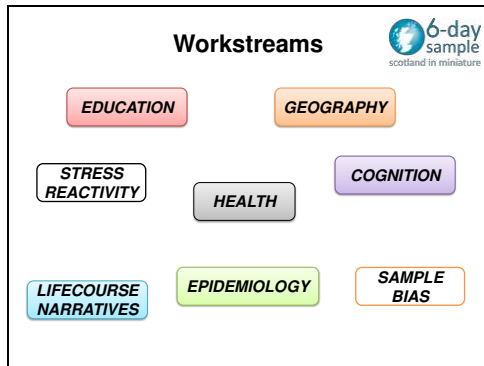
36-Day Sample (7380)  
Twins (1050)

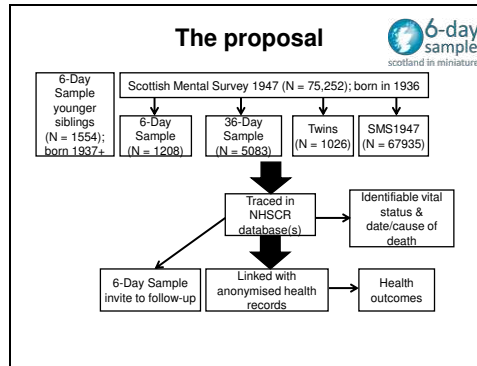


### Objectives



- To use Scottish and UK national databases to trace members of the 6-Day Sample and **link existing data with vital events** and illness episodes using the NHS Central Register and Scottish Morbidity Records.
- To recruit surviving Sample members into a **follow-up study** investigating lifelong influences on health and wellbeing in old age.
- To test specific hypotheses in a number of **interdisciplinary workstreams**
- To make the **resource available to others**





- ### Linkage
- Scotland:
    - Death certificates (identifiable)
    - Hospital admissions, cancer registrations and outpatient appointments from Scottish Morbidity Records (00, 01, 04, 06) and date & cause of death (anonymised)
  - England/Wales:
    - Death certificates (identifiable)
    - Hospital admissions and cancer registrations from Hospital Episode Statistics / Office of National Statistics and date & cause of death (anonymised)

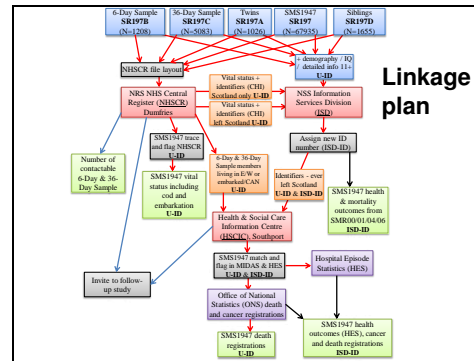
	SMS1947	36-Day	Twins	6-Day	Siblings
School	✓	✓	✓	✓	✓
Size/position in family	✓	✓	✓	✓	✓
Intelligence	✓	✓	✓	✓	✓
Birthplace		✓	✓	✓	
School attendance		✓	✓	✓	
Father's job		✓	✓	✓	
Occupancy rate		✓	✓	✓	
Mother's age		✓	✓	✓	
Physical disability		✓	✓	✓	
Marriage				✓	✓
Children				✓	✓
Occupation				✓	✓
Education				✓	✓
Life events				✓	

Are childhood IQ and personality associated independently with risk of death and hospitalisation from selected physical outcomes in older age? (**EPIDEMIOLOGY**)

Do education and childhood social circumstances contribute to cognitive change between childhood and old age and other aspects of wellbeing in old age? (**COGNITION**)

What is the relationship between cognitive ability, education, geographical movement and socio-economic position in later life? (**GEOGRAPHY**)

Does childhood intelligence contribute to variance in measured physical and mental health status? (**HEALTH**)



**6-Day Sample Follow-up Study Questionnaire**

**Follow-up study**

- Occupation
- Education
- Personality
- Wellbeing
- Activities
- Mood
- Family
- Balance
- Cortisol
- Genetics
- Health behaviours
- Attitudes to ageing
- Vision/hearing
- Medical history
- Lung function
- Height
- Weight
- Arm strength
- Body morphometry



**6-Day Sample DVD**

6-day sample  
scotland in miniature

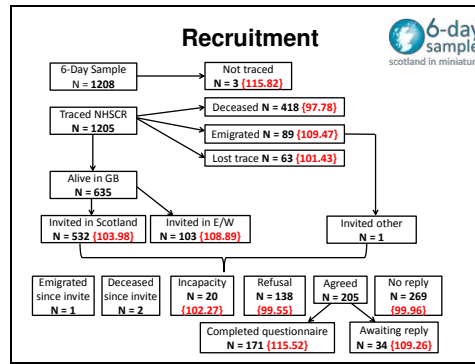
**Telephone interview**

Functional status  
Health update  
Memory  
Menopause

**Sub-studies**

- Narratives of life transitions
- Urinary cortisol
- Validation clinic visit

6-day sample  
scotland in miniature



**Summary**

Longitudinal cohort studies are a useful resource for health psychologists, allowing investigation of a wide range of research questions

BUT we still need replication; cross-cohort collaborations may provide the answer

Data linkage provides rich opportunities to enhance existing research data

### How can I get into this area?

- PhD studentship
- Research assistant posts
- Key departments:
  - Epidemiology & Public Health, UCL (Torrington Place)
  - Centre for Longitudinal Studies, IoE (Bedford Place)
  - MRC Unit for Lifelong Health & Ageing (Bedford Place)
  - MRC Epidemiology Unit, Cambridge (diabetes & obesity)
  - MRC Lifecourse Epidemiology Unit, Southampton

### Any questions?

**Please complete a feedback form**

[caroline.brett@ed.ac.uk](mailto:caroline.brett@ed.ac.uk)



Centre for Cognitive Ageing  
and Cognitive Epidemiology



## Appendix C9: Teaching/training 2: Feedback form for students

### FEEDBACK FORM

Module: Research in Action; MSc Health Psychology  
 Lecturer: Caroline E. Brett  
 Session: Thursday 5<sup>th</sup> December, 2013; "Using existing data in health research: The value of longitudinal cohort studies and data linkage."

Please answer the following questions by circling the relevant number.

Where would you rate your knowledge of **longitudinal cohort studies** before starting the course?

None									Expert
1	2	3	4	5	6	7	8	9	10

Where would you rate your knowledge of **longitudinal cohort studies** now?



None									Expert
1	2	3	4	5	6	7	8	9	10

Where would you rate your knowledge of **data linkage** before starting the course?

None									Expert
1	2	3	4	5	6	7	8	9	10

Where would you rate your knowledge of **data linkage** now?

None									Expert
1	2	3	4	5	6	7	8	9	10

Please indicate the extent to which you agree with the following statements (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)					
					
The topic was relevant to the module	1	2	3	4	5
The lecturer showed good knowledge of the material	1	2	3	4	5
I found the material interesting	1	2	3	4	5
The lecturer's style was engaging and informative	1	2	3	4	5
The exercises were appropriate to the material presented	1	2	3	4	5



What one thing (if any) will you take away from this session?

How could the session be improved?

## Appendix C10: Teaching/training 2: Summary of student feedback

### Summary of student feedback

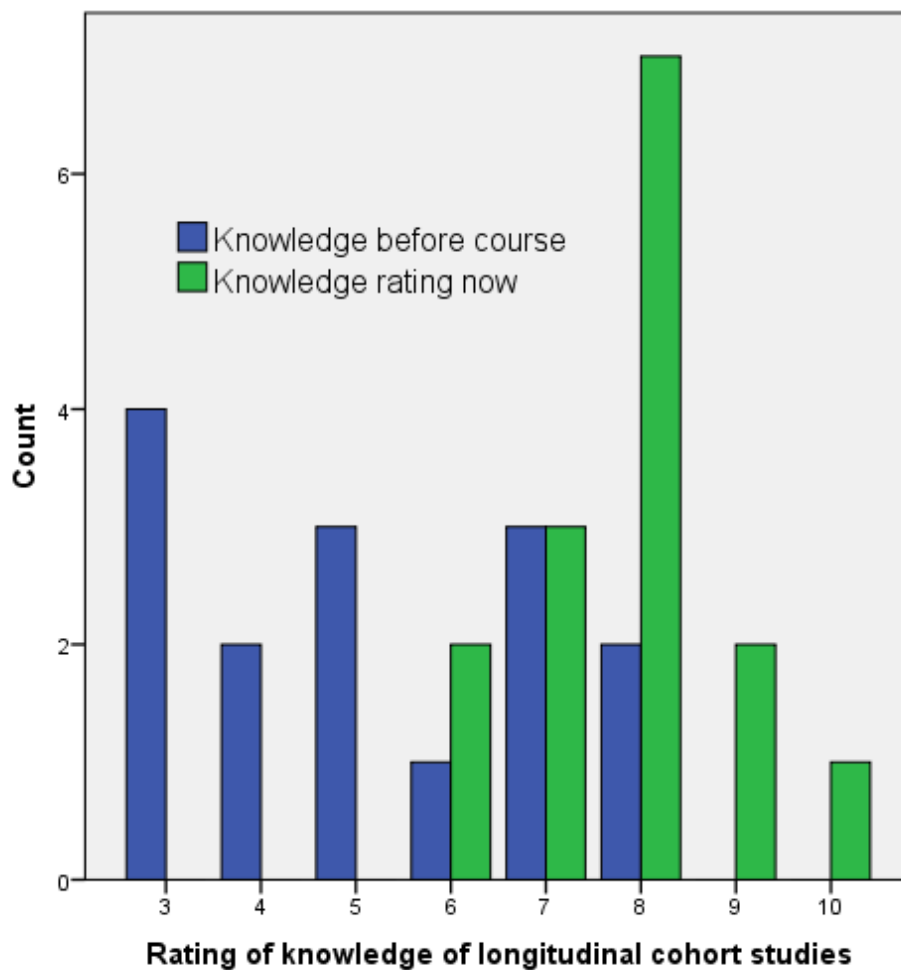
Module: Research in Action; MSc Health Psychology  
 Lecturer: Caroline E. Brett  
 Session: Thursday 5<sup>th</sup> December, 2013; “Using existing data in health research: The value of longitudinal cohort studies and data linkage.”

Where would you rate your knowledge of **longitudinal cohort studies** before starting the course?

1	2	3	4	5	6	7	8	9	10
--	--	4	2	3	1	3	2	--	--

Where would you rate your knowledge and experience of **longitudinal cohort studies** now?

1	2	3	4	5	6	7	8	9	10
--	--	--	--	--	2	3	7	2	1

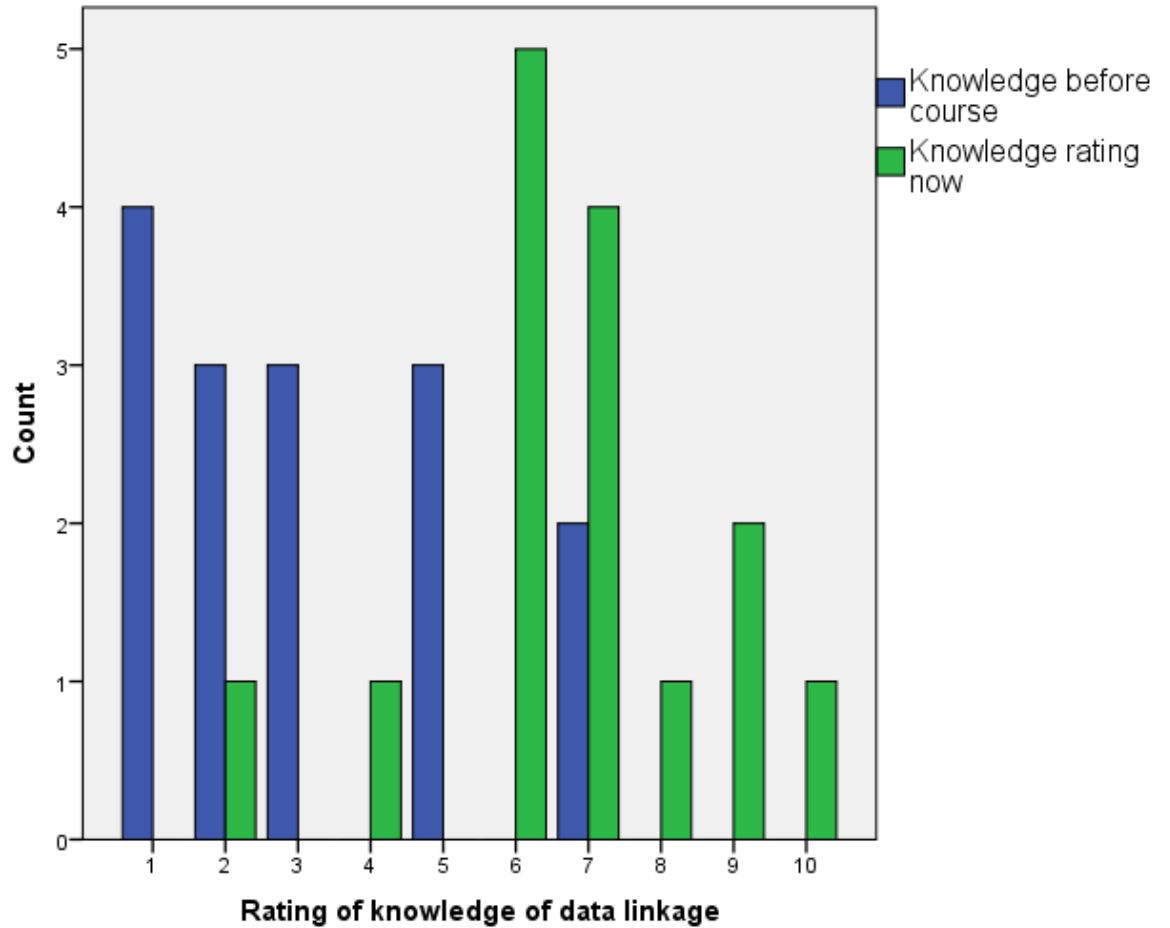


Where would you rate your knowledge of **data linkage** before starting the course?



1	2	3	4	5	6	7	8	9	10
4	3	3	--	3	--	2	--	--	--

Where would you rate your knowledge and experience of **data linkage** now?

1	2	3	4	5	6	7	8	9	10
--	1	--	1	--	5	4	1	2	1



To what extent do you agree with the following statements?

<b>Please indicate the extent to which you agree with the following statements</b> (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)	1	2	3	4	5	Mean (SD)
						
The topic was relevant to the module	--	--	--	5	10	4.67 (.488)
The lecturer showed good knowledge of the material	--	--	--	--	15	5.00 (.000)
I found the material interesting	--	1	1	6	7	4.27 (.884)
The lecturer's style was engaging and informative	--	--	1	7	7	4.40 (.632)
The exercises were appropriate to the material presented	--	--	1	3	11	4.67 (.617)

What one thing (if any) will you take away from this session?

- An understanding of the strengths & weaknesses of longitudinal cohort studies
- That although longitudinal research can be very useful in health psychology, there are a number of limitations to be mindful of
- That the 1921 and 1936 studies are very interesting and will look into them on my own time. Longitudinal is an effective way to evaluate a large population, given you have the data/sample.
- The importance of correct linkage between variables
- The information gained on longitudinal studies and data linkage
- Everything - very useful and well presented and brought so many ideas for my dissertation project
- Nothing it was all very relevant
- How this type of research can be done in real world
- Challenges associated to longitudinal study
- The benefits of engaging in longitudinal research
- Examples of studies. Advantages and disadvantages of longitudinal studies
- The relationship between variables used in a study
- An understanding of the importance and use of longitudinal cohort studies
- Many advantages of longitudinal studies, the current research situation in Scotland
- It was a good session, engaging, time went by quickly. Coming up with research ideas on the spot was not enjoyable.

How could the session be improved?

- 
- Nothing to do with the lecture itself, but as a new topic it would have been better to print off the lecture slides beforehand for us to have (nothing on Moodle yesterday)
- She was very thorough
- N/A (Be about anything other than research methods)
- N/A
- I liked the teaching method used by Caroline. Nothing I have in mind to add to be improved for her lecture.
- Caroline delivered a great lecture, she made it engaging informative and relevant and she used humour well too - really good!
- 
- Lecturer engaging with participants while students doing group work
- N/A
- 
- 
- 
- More colourful slides, slower speaking
- Explain some words used
-

## Appendix C12: Consultancy: Course proposal

**Validation Board for  
Continuing and Professional Studies  
Non-credit Course Proposal Form**



*Office use only*

<b>Date of VB Meeting</b>	
<b>Proposed by (OLL, other)</b>	
<b>Date course is to be offered</b>	
<b>New or revised?</b>	
<b>If replacement, name of course replaced</b>	
<b>Offered on recurring basis? Y/N</b>	
<b>Contact teaching hours</b>	
<b>Independent study (no of hours)</b>	
<b>Total hours</b>	
<b>SCQF level</b>	7
<b>Tutor CV held? Y/N</b>	

**1. Course title:** An Introduction to Health Psychology

**2. Tutor name(s):** Caroline Brett

**3. Tutor qualifications:** MA (Hons) Psychology (2:1) 1999

MSc (Dist) Cognitive Neuropsychology 2000

MSc (Dist) Health Psychology 2011

**4. Short description of course**

How do our beliefs and experiences affect our health? Why do some people get ill more than others? How can we persuade people to live 'healthy' lifestyles? Is Scotland really the 'sick man' of Europe, and if so, why? This introduction to Health Psychology addresses these questions and many more.

## **5. Intended learning outcomes**

By the end of this course, students should be able to:

Describe what health psychology is and what its purpose is.

Understand the links between cognitions and illness.

Critically evaluate interventions designed to influence health behaviours.

Explain the role of cognition and social factors in promoting health behaviours.

Apply the ideas explored in this course to their own health.

## **6. Transferable skills**

Critical thinking

Participation in group discussion

Participation in role playing and debate

## **7. Contents**

What is Health Psychology?

A brief history of medicine and an introduction to the bio-psychosocial approach to health and the development of health psychology.

Cognition and health

Our thoughts, beliefs and past experiences all influence our behaviour. Here we will look at some of the models of health behaviour suggested by health psychologists.

Stress and health

Why do we always seem to get ill right before an exam? In this session we will explore the ways in which stress affects our health and techniques for reducing its impact.

Coping with illness

We all get ill, but some people seem to get ill more often or more severely than others. This session will cover the role of cognitions in illness, and coping with chronic illness.

Individual and cultural differences and health

How do our personality, gender, ethnicity, culture and intelligence affect our health?

Cigarettes, alcohol and drugs

Smoking, drinking and drug use are the most common 'bad' health behaviours. Should we intervene, and if so, when?

Diet and exercise

We are on the verge of an obesity epidemic. Can simple lifestyle changes help to curb this trend?

Health promotion and behaviour change

Our health can often be greatly improved by small changes in our behaviour. Whose responsibility is it to persuade people to make those changes and what works best?

Improving health care

Poor communication can have a negative impact on patients' health. This session will explore how health psychology can help to improve communication within healthcare and guide health professionals in their work.

Open session

Health psychology is a very broad topic covering many areas. This course can only scratch the surface. Students will be given the opportunity throughout the course to suggest topics to be covered in this final session.

## **8. Student intake**

The course assumes no previous knowledge of Health Psychology.

## **9. Organisation of teaching**

The sessions will consist of a combination of taught material, discussion, and group or individual exercises. It is hoped that students will participate and this will guide the format of later sessions.

## **10. Course Readings**

Essential

Ogden, J. (2007). *Health Psychology: A Textbook* (4<sup>th</sup> edition). Singapore: Open University Press.

A collection of journal articles relevant to each of the topics covered will be provided.

Recommended

French, D., Vedhara, K., Kaptein, A. A., & Weinman, J. (2010). *Health Psychology* (2<sup>nd</sup> edition). Oxford: Wiley-Blackwell.

Sapolsky, R. M. (2004). *Why zebras don't get ulcers: The acclaimed guide to stress, stress-related diseases, and coping*. London: St Martin's Press.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth and happiness*. London: Penguin.



Web sources

None.

Class handouts

Handouts of any lecture slides will be provided at each session.

### **Course feedback & evaluation**

The following procedures are applied to all OLL non-credit courses:

Course Organiser visits newly approved class at an early stage and provides the tutor with feedback on delivery.

Tutors are encouraged to discuss the course with students (collectively and individually), and act appropriately on responses.

Formal feedback is gathered from students via an on-line student survey. Results of these are analysed and provided for Course Organisers who may take appropriate action with the tutor.

OLL CPE Co-ordinator (Quality & Validation):

Name:

Signature:

Date:

Course Organiser

Name:

Signature:

Date:

**Appendix C14: Consultancy: Session content, learning objectives, reflection and lessons learned**

<b>Session 1: What is health psychology?</b>	
Date/Time	15 <sup>th</sup> January 2013, 18:30-20:30
Attendance	12
Learning objectives	To understand the origins and usefulness of the biopsychosocial approach to health To describe the purpose and importance of health psychology
Topics covered	Housekeeping, introductions and ground rules What is good health? A brief history of medicine & the biopsychosocial approach What is health psychology? What do health psychologists do? Outline of the rest of the course
Exercises	Go-round: At beginning (why people chose this course, and what experience they have of psychology) and at end (what one thing will they take away from this session). Brainstorm: What is good health? This was annotated on the whiteboard then related back to findings presented by Radley (1994). Group work: Two groups; discussion of impact of stroke on a man aged 42 (group 1) and a man aged 72 (group 2) in terms of biopsychosocial factors. 5 minutes discussion then feedback; points annotated on whiteboard and compared between two groups. Open discussions: Ground rules; suggestions of top 10 causes of death in Scotland today.
Handout(s)	Johnston, M., Weinman, J. & Chater, A. 2011. A healthy contribution. <i>The Psychologist</i> , 24(12), 890-892.
Reflection	Due to a late room change that had not been communicated to me, I arrived in plenty of time to set up but discovered I was in the wrong room 5 minutes before the start time. This meant that I was quite flustered, and had a number of false starts as others arrived late having also gone to the wrong room. The go-round and group exercises were very successful and students appeared very engaged and made good contributions. The go-round was particularly encouraging as most students said that they found the session interesting and were looking forward to the rest of the course. The causes of death activity did not work as students had read the answers on the slides during the break. However, there was some lively discussion on this topic which made up for this error on my part. The second half was very lecture-heavy and I found I was exhausted by the end and mixing up my words. The exercises took longer than expected while the lecture parts took less time than expected.
Lessons learned	The sessions need a good mix of talk and exercises to retain students' attention and facilitate their learning. I need to make sure everyone is included in the exercises, perhaps by learning and using everyone's name.

	<p>The brainstorm was very successful but using the whiteboard was problematic as once I returned to lecture mode the screen covered it over, making it difficult to refer back to.</p> <p>When introducing group work, I should put people in groups and then explain what they will be doing and how long they have to do it in. If they are feeding back to the rest of the group, I should explain that and perhaps ask them to nominate a spokesperson.</p> <p>If I include an exercise asking students to guess answers I should not put the answers in the handouts!</p> <p>I should be aware of making assumptions about knowledge: e.g. I did not explain what a stroke is.</p>
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<b>Session 2: Cognition and health</b>	
Date/Time	22 <sup>nd</sup> January 2013, 18:30-20:30
Attendance	12
Learning objectives	To understand the influences on health behaviour. To describe and critique some of the 'models' put forward by health psychologists to explain health behaviour.
Topics covered	What influences behaviour? Key concepts in health psychology Motivational models Behavioural enaction models Stage models Problems with the models
Handout(s)	Armitage, C. J., & Conner, M. (2000). Social cognition models and health behaviour: A systematic review. <i>Psychology and Health, 15</i> , 173-189.
Exercises	Brainstorm: What influences behaviour? (example: Do more exercise) Group work: 2 groups; choose a behaviour and a population. Which element of the Theory of Planned Behaviour (i.e. background demographics/personality, attitudes/beliefs, subjective norms, internal/external factors) is most important for this behaviour/population. Feed back to rest of group. Go-round: At end. What one thing are you going to take away from this session?
Reflection	The brainstorming exercise was successful with contributions from most people, however due to a screen malfunction I wrote this on flipchart paper on the table. I then attached this to the only suitable wall space, which unfortunately was by the door and directly behind about half the students. Although I did try and refer to it none of the students turned round, and so I abandoned this idea early on. As a result, I was unable to proceed with my plan to relate each model back to the brainstorm and identify what was missing, which reduced the amount of interaction considerably. The behaviours and populations chosen by the two groups during the group work were problematic: smoking (whole population) and drug addiction (teenagers). These are very complex habitual behaviours that do not fit well with the models discussed and so the groups struggled to keep to the remit given. The 'drugs' group was dominated by one

	<p>student who has experience in the area.</p> <p>The material seemed to go down well but I felt I did a lot of talking.</p> <p>The go-round was more successful than last week as all students spoke and their comments indicated that they had listened and understood the material.</p>
Lessons learned	<p>Using the flipchart paper did allow me to refer back to the brainstorm while in lecture mode; however I should either position this so that students can see it or perhaps hold it up while referring to it.</p> <p>I should consider assigning behaviours and populations for groups to discuss rather than their choosing; although this would reduce autonomy and possibly engagement.</p> <p>Dividing the class into two groups can be problematic as they need to speak across the table within their groups, and if one student dominates it can be difficult for others to contribute. Future group work might work better in smaller groups of 3-4 students, positioned adjacent to each other, thereby allowing all to contribute.</p> <p>The students requested pointers for further reading. It transpired that OLL students have access to the University library but it is often very busy and they are not able to take books out. I am also concerned about breaching copyright guidelines, and will attempt to look for Open Access articles to give out in future sessions.</p>

<b>Session 3: Stress and health</b>	
Date/Time	29 <sup>th</sup> January 2013, 18:30-20:30
Attendance	10
Learning objectives	<p>To understand the physiological, psychological and social aspects of the stress response.</p> <p>To describe the ways in which stress impacts on our health.</p> <p>To describe how stress can be measured, both subjectively and objectively.</p>
Topics covered	<p>What is stress?</p> <p>Life events vs daily hassles</p> <p>Appraisal, coping and the transactional model of stress</p> <p>Physiological and behavioural aspects of the stress response</p> <p>Stress, health, and psychoneuroimmunology</p>
Handouts	<p>Vedhara, K. (2011). What's stress got to do with it? <i>The Psychologist</i>, 24(12), 900.</p> <p>Kiecolt-Glaser et al (1996). Chronic stress alters the immune response to influenza virus vaccine in older adults. <i>Proceedings of the National Academy of Science USA</i>, 93, 3043-3047.</p>
Exercises	<p>Pair work: Experiences of stress. Feed back to the group. Returned to examples when discussing coping strategies.</p> <p>Group discussion: Life events scale.</p> <p>Go-round: at end. As before.</p>
Reflection	<p>This session did not feel as if it had gone well.</p> <p>The pair work at the beginning was good and sparked lively discussion within the pairs. However, I had not fully planned the feeding back process; I simply opened the feedback to the floor and invited any of the</p>

	<p>pairs with a 'good' example to share it. This resulted in a stony silence. Eventually after some coercion three pairs shared one example each; the examples were very good, varied, and showed a good understanding of the task.</p> <p>The second half of the session did not include any interaction at all and students started to look fatigued by the end of the session.</p> <p>In preparing the session, I had incorporated material from several textbooks and from three separate 3-hour lectures from my MSc course. In part this was due to my own lack of expertise in the area and a desire to include as much information as possible. I was acutely aware that several students are health professionals and may know more about the biological mechanisms than me; as a result I frequently apologised for my lack of expertise which may have had the effect of reducing students' confidence in me as a teacher. I did, however, encourage them to read up further if they were interested, and provided references to reading which may help them do this. Although I had gone over aspects of the lecture about which I was less sure, I had failed to go over the entire lecture; some of the later material was lifted directly from textbooks or other sources and I was unsure of its meaning.</p> <p>I introduced some cartoons into the lecture and these, along with the real life examples, were well received and attended to.</p> <p>Overall, there was not enough interaction in this session, too much talking, and too much information. My primary aim in this session was to highlight the effects of chronic stress on health. However, the go-round suggested that I had failed to convey this to students: 2 passed, 2 indicated they wished to read up more and 2 indicated that they felt 'guilty' for stressing about small things.</p>
Lessons learned	<p>Plan all exercises carefully and give clear instructions, particularly if students are going to be asked to share with the rest of the group. Read through all slides in advance to ensure that I know and can speak about the material. If there is anything I am unsure of, I should take it out.</p> <p>The sessions need to have more interaction; the interactive aspect of this session was the most successful part.</p> <p>It is likely that I tried to cover too much ground in this session and I should probably include less material but cover it in more detail in future sessions.</p> <p>It might be useful to include space for questions towards the end of each session to encourage students to query anything they are not sure of. Questions could be answered by myself or other students. This would give me a break, enhance students' understanding and encourage peer learning.</p>

<b>Session 4: Illness (lecture aspects were recorded)</b>	
Date/Time	5 <sup>th</sup> February 2013, 18:30-20:30
Attendance	9
Learning objectives	To understand the ways in which our thoughts and perceptions influence how we respond to illness.

	<p>To understand how social, cultural and individual factors influences our response to illness.</p> <p>To describe some techniques for managing chronic illness.</p>
Topics covered	<p>Introduction to the self-regulation (common sense) model</p> <p>Symptom perception</p> <p>Mental representation of illness</p> <p>Coping</p> <p>Factors influencing help seeking</p> <p>Managing chronic illness</p>
Handouts	<p>Løchting et al (2013). Illness perceptions in patients receiving rheumatology rehabilitation: association with health and outcomes at 12 months. <i>BMC Musculoskeletal Disorders</i>, 14, 28.</p> <p>Moss-Morris, R. (2011). Are illness representations key? <i>The Psychologist</i>, 24(12), 899.</p>
Exercises	<p>Brainstorm: Headache: what's going through your mind? How do you decide what to do about it?</p> <p>Snowballing: symptom interpretation. Case study: interpret symptoms using framework. Individual – pair – group – feed back.</p> <p>Group discussion: Question and answer session at the end, which developed into a group discussion.</p> <p>Go-round: at end.</p>
Reflection	<p>This session was a little bit different as I was videoing the lecture portions. I was prohibited from recording any interaction with students, and this therefore restricted the amount of whole group discussion that I could slot into the lecture. The filming was a little disruptive but all students understood the purpose of it and signed an agreement to this effect.</p> <p>Being concerned that students did not appear to take in the message of the material from the previous session, I spent 5 minutes at the beginning going over the material on stress and health. I invited students to ask questions but none responded.</p> <p>Learning the lessons from the previous session, I ensured I read through all the slides in advance, and removed or researched any unfamiliar material. As a result, I felt the session went more smoothly.</p> <p>The brainstorm was successful and I placed the flipchart paper on the table in front of the students, ensuring they could all read it. I was then able to refer back to it throughout the session.</p> <p>The snowballing exercise was also successful. Students ignored the instruction to reach a consensus on a course of action: one group quickly agreed to disagree while the other engaged in an enthusiastic debate about the relative merits of the options, relating this to their own experiences and health beliefs. Although this was difficult to facilitate as planned, I found it encouraging as it suggested that they were combining the material with their own experience.</p> <p>I introduced a question and answer session towards the end to ensure that students had understood the topic. This was surprisingly successful as it sparked an in-depth discussion of influences on illness and help seeking.</p>

	A more detailed reflection on the lecture portions of this session is included in Appendix E.
Lessons learned	This was the first time I had attempted the 'snowballing' exercise and it was successful. However, it does not lend itself to many topics. I originally thought that this session had gone well and did not need modification, however after watching the video I feel that I covered too much material too quickly, and gave out a lot of psychological terms and concepts that assume a psychological approach. This would suit an undergraduate psychology audience but not this one, who come from a variety of backgrounds and with differing levels of education.

<b>Session 5: Individual and cultural differences and health</b>	
Date/Time	12 <sup>th</sup> February 2013, 18:30-20:30
Attendance	10 (11)
Learning objectives	To understand the ways our personality, gender, ethnicity, culture and intelligence influence our health and health behaviour. To describe the five-factor personality traits and how they influence our behaviour and response to illness.
Topics covered	Social Identity Theory and its implications for health Culture and ethnicity and health Gender and health Personality and health Intelligence and health: introduction to cognitive epidemiology
Handouts	Hagger-Johnson, G., & Whiteman, M.C.P. (2008). Personality and health – So what? <i>The Psychologist</i> , 21(7), 594-597. Williams, E. (2007). Ethnicity and health. <i>The European Health Psychologist</i> , 2, 35-37. 20 Statements Test IPIP Five Factor Personality Inventory
Exercises	20 Statements Test: Individual. Write 20 statements about yourself and your identity. No feeding back beyond asking who had written anything about their ethnicity, culture or gender. Group work: 3 groups; how might being part of an ethnic minority impact on health and healthcare in UK? Feed back to group. IPIP Personality Inventory: Individual. Answer 50 questions and score each trait in turn. Group discussion: Why might higher intelligence be associated with lower risk of mortality/morbidity? No go-round due to lack of time.
Reflection	There was a lot to cover in this session. I felt quite rushed, especially towards the end. Students participated in the individual exercises although they completed them at their own pace, meaning some finished earlier than others. The group work was very successful with some lively discussion and excellent contributions from all students. Splitting the students into three groups of 3-4 worked, enabling everyone to have a say and some students to share from their own experiences. All groups fed back and

	<p>most of the ideas they had were beyond those included in the lecture. This emphasised the value of bringing students' own experiences into the sessions, allowing them to relate the material to their own lives and build up knowledge in their own way.</p> <p>Jim, the course organiser, sat in on this session but this was less disruptive than it might have been as he joined in alongside the students. It was useful to hear his feedback after the session, which largely matched my own thoughts – i.e. that I covered too much material and relied too heavily on the slides.</p> <p>The question and answer session at the end of the session was not as successful as the previous week, perhaps due to a lack of time. The go-round was completely missing and so I was unable to gauge students' thoughts on the session.</p>
Lessons learned	<p>Students' contributions and experiences are invaluable and I need to allow more time for this.</p> <p>This session covered a great deal of ground and could profitably be split into two sessions next year.</p> <p>In response to feedback from the course organiser, I need to reduce the amount of material on the slides and include more additional material so that I am not simply reading what is written down anyway.</p>

<b>Session 6: Smoking, alcohol and drugs</b>	
Date/Time	19 <sup>th</sup> February 2013, 18:30-20:30
Attendance	11
Learning objectives	<p>To describe psychological theories as to why people smoke and how health professionals can intervene to help them stop.</p> <p>To understand the aetiology of problem drinking and describe some suitable treatments.</p>
Topics covered	<p>Feedback on how the course is going so far</p> <p>Prevalence and effects of smoking</p> <p>Why people smoke and an introduction to the PRIME model of motivation</p> <p>Smoking cessation interventions</p> <p>Prevalence and aetiology of drinking</p> <p>The role of advertising</p> <p>Treatment of problem drinking</p> <p>Illicit drug use: a brief discussion</p>
Handouts	<p>Pechey, R., Spiegelhalter, D., &amp; Marteau, T. M. (2013). Impact of plain packaging of tobacco products on smoking in adults and children: an elicitation of international experts' estimates. <i>BMC Public Health, 13</i>:18.</p> <p>Lonsdale, A. J., Hardcastle, S. J., &amp; Hagger, M. S. (2012). A minimum price per unit of alcohol: A focus group study to investigate public opinion concerning UK government proposals to introduce new price controls to curb alcohol consumption. <i>BMC Public Health, 12</i>:1023.</p>
Exercises	<p>Group discussion: How is the course going so far?</p> <p>Individual/group work: Why do people smoke? Individually 'get inside the head' of someone you know who smokes; in groups of 3-4 share case studies and decide on one example to feed back to everyone else. Later</p>



	<p>in session return to these case studies and consider what might persuade them to stop smoking.</p> <p>Videos + discussion: Group shown videos of alcohol adverts and asked to identify target population and effectiveness.</p> <p>Group work: 3 groups of 3-4; given 6 adverts and asked to decide if pro or anti-drinking, target population, message and rate them in order of effectiveness. Then feed back to group.</p> <p>Go-round: missing as ran out of time.</p>
Reflection	<p>The discussion at the beginning of the session about how the course was going was largely positive. Although students commented that there was a lot of lecturing, they agreed that this was necessary in order to cover the material and that the level was pitched correctly. They enjoyed the interactive elements.</p> <p>Following on my reflection about the value of students' contributions, I tried to include more interactive elements in this session.</p> <p>As smoking cessation and alcohol use are not areas of expertise for me, I spent longer preparing this session. Having also reflected that I had in previous sessions attempted to include too much material with the result that the sessions felt rushed and students appeared fatigued, I sought advice from my supervisor, who has expertise in the area, on what I should include. As a result, I focussed the session on the PRIME model of motivation rather than including multiple theories.</p> <p>The interaction went very well, with each group sharing excellent examples of smokers. However, due to the volume of material covered, I ran out of time to include the second part of this exercise – what might persuade these people to stop smoking – which I regretted.</p> <p>The alcohol advertising task was also well received, with students contributing enthusiastically and having good discussions within their groups. Unfortunately, this also had to be cut short due to lack of time and I was also obliged to abandon the go-round at the end.</p>
Lessons learned	<p>This session confirmed my feeling that the interactive elements are the most valuable and I should make more effort to reduce the lecture aspects of each session.</p> <p>In terms of forward planning, this session was too long although the material covered was well received. In future years, this session should be split into two, allowing a greater focus on students' own experiences and a longer time for discussion.</p>

<b>Session 7: Diet and exercise: Tackling the obesity epidemic</b>	
Date/Time	26 <sup>th</sup> February 2013, 18:30-20:30
Attendance	10
Learning objectives	<p>To understand the aetiology of obesity and its impact on health.</p> <p>To describe how changes to diet and exercise can help tackle the obesity epidemic.</p>
Topics covered	<p>Definition and prevalence of obesity &amp; its impact on health</p> <p>Causes of obesity: eating behaviour and obesogenic environments</p> <p>Healthy eating and portion sizes</p> <p>Physical activity: impact on health, and interventions</p>

Handouts	Epton et al, 2013. A theory-based online health behaviour intervention for new university students: study protocol. <i>BMC Public Health</i> , 13:107. Division of Nutrition and Physical Activity. 2006. <i>Research to Practice Series No 2: Portion Size</i> . Atlanta: Centers for Disease Control and Prevention.
Exercises	Group discussion: key questions about calorie values Group discussion: Calorie values Go-round: at end.
Reflection	I received feedback from the course organiser (who attended session 5) suggesting that I included too much material on the slides and had a tendency to just read them out. I had also felt that the previous two sessions had included too much material and both students and myself were noticeably fatigued by the end. Having found very little useful material in the textbooks for this session, I drew on the content of conference and workshop presentations I had attended on the topics of behaviour change, healthy eating and physical activity, backed up by evidence from government and World Health Organisation reports on obesity and relevant material downloaded from the internet. I identified the obesogenic environment and portion sizes as being key issues, and gathered suitable material to illustrate these points. Although time-consuming, I enjoyed preparing this session. The majority of my slides consisted of pictures and other material rather than text, and this allowed me to speak to the students rather than the slides. This session included no specific exercises, however I invited students to contribute and ask questions throughout the session and they did so. The session overall felt considerably more informal than others and a little as if I and the students were exploring the material together, rather than the more didactic approach of other sessions. The go-round reflected this, as most students contributed and indications were that they had enjoyed the session and found the material to be engaging. I was concerned that those students who did not contribute to the group discussion might have felt left out or not engaged with the topic, however they all commented positively during the go-round.
Lessons learned	Despite the lack of specific exercises, this session was very successful and students appeared to enjoy it. I should build on this and include more visual material in future sessions, allowing the material to speak for itself instead of including too much text and information. It is likely that this session was so successful because it included a topic to which all the students could relate. I could perhaps try and emulate this in future sessions by ensuring I relate the material as much as possible back to real life and students' own experiences.

<b>Session 8: Health promotion and behaviour change</b>	
Date/Time	5 <sup>th</sup> March 2013, 18:30-20:30
Attendance	7
Learning objectives	To describe some of the techniques that can be employed at the population level. To evaluate one mass media campaign in terms of effectiveness

Topics covered	<p>Health promotion</p> <p>Mass media and social marketing</p> <p>Behaviour change techniques, population level</p> <p>Nudges and choice architecture</p> <p>Ogden's 'teachable moments'</p> <p>Case study: Change4Life</p>
Handouts	<p>Croker, H., Lucas, R., &amp; Wardle, J. (2012). Cluster-randomised trial to evaluate the 'Change for Life' mass media/social marketing campaign in the UK. <i>BMC Public Health</i>, 12:404.</p> <p>Ogden, J. (2009). A psychosocial model of behaviour change and a role for life events. <i>The European Health Psychologist</i>, 11, 30-32.</p>
Exercises	<p>Pair work: Think of a behaviour you have successfully changed; share with partner and then group.</p> <p>Group discussion: Identification of nudges</p> <p>Group work: Make your own intervention; groups of 3-4, choose target population/behaviour, identify primary influences on behaviour, design an intervention.</p> <p>Group discussion: Viewing of Change4Life advertisements, discussion.</p>
Reflection	<p>The numbers were down this week, having remained at 10-12 for previous sessions. This slightly threw me as all 7 students sat on the opposite side of the table to me and it took a while for me to settle. The pair exercise seemed to go well but very few pairs shared examples; many students commented that they couldn't think of a behaviour they had tried to change &amp; definitely not successfully.</p> <p>Following on from the previous session, I designed this session to include less material on the slides and more for discussion, including many images and material from elsewhere. I incorporated material from some textbooks but mostly other sources, including a recent presentation I had attended on Jane Ogden's 'teachable moments'.</p> <p>The group discussions were dominated by one individual and I was concerned that the other students felt left out. I therefore attempted to curtail the discussion while simultaneously ensuring that the individual did not feel I was undervaluing her contribution.</p> <p>The group exercise to design an intervention did not work as well as hoped due to the mix of students. One group contained the students who tended to dominate during group discussions, while the other contained the quieter students. The first group devised an intervention quickly while the second group took a while to get going. However, the second group devised an intervention that mirrored existing interventions while the first mostly discussed the behaviour and failed to design a suitable intervention.</p> <p>The Change4Life evaluation was a good example of a population-level mass media campaign; however the students did not appear to be very engaged with this – perhaps due to fatigue.</p>
Lessons learned	<p>Small group work does go well and I need to be aware that quiet students aren't necessarily not completing the task. I need to be more flexible in allowing students to take the task in a direction of their choosing rather than sticking to the instructions given, but also to steer</p>

	discussions that are veering too far off topic. The section on 'nudges' and choice architecture seemed to go down well.
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<b>Session 9: Improving health care</b>	
Date/Time	12 <sup>th</sup> March 2013, 18:30-20:30
Attendance	5
Learning objectives	To understand how communication between patients and health professionals impacts on health. To describe interventions to improve communication. To understand factors influencing attendance for screening or immunisation.
Topics covered	Health communication: why does it matter Interventions to improve communication Screening and immunisation Genetic testing Interventions to increase uptake of screening/testing/immunisations
Handouts	Weir, K. (2012). Improving patient-physician communication. <i>Monitor on Psychology, 43(10)</i> , 36. Lu et al (2012). A systematic review of interventions to increase breast and cervical cancer screening uptake among Asian women. <i>BMC Public Health, 12</i> , 413.
Exercises	Group discussion: Discussion of a case study – what went wrong? Group discussion: Viewing of video case studies of motivational interviewing followed by discussion. Group work: Two groups, discuss implications of genetic screening in pregnancy or genetic testing for Huntington's disease. Go-round at end.
Reflection	The numbers were down once again for this session, with only 5 students attending. On reflection, this was most likely due to a lack of interest in the topic. As this was the penultimate session, I was experiencing some fatigue when planning the session. As a result I neglected to check that the session outline matched the session content and was slightly blind-sighted at the beginning of the session when showing this slide. As with the previous two sessions, I reduced the content of the presentation in order to increase the amount of time for discussion and reduce the burden on both myself and students. The videos demonstrating Motivational Interviewing were well received although the discussion was rather lacklustre due to the small numbers, and lacked direction. The small group discussion of the implications of genetic testing was good; I had to join one group due to the small numbers. Perhaps due to the fact that I joined one group, I allowed longer for this discussion than previous ones as I was less aware of time passing. Both groups covered a range of issues and contributed some excellent points. Although I provided background on Huntington's disease, I had not been able to locate any statistics relating to the genetic aspects of the disease. The

	<p>Huntington's disease group commented that this restricted their discussion somewhat as none of them knew these facts.</p> <p>As a result of allowing more time for this discussion, I ran out of time to cover immunisations and opted instead to direct students to appropriate resources, complete the go-round and explain the process of obtaining feedback during the final session. The go-round went well but, perhaps due to the low numbers, students felt able to contribute several points and discuss points raised – which I allowed in order to increase group cohesion and understanding – with the result that the session overran.</p>
Lessons learned	<p>Check summary slide is always the same as the slides content!</p> <p>For future sessions involving videos followed by discussion, I should consider preparing set questions or comments in order to facilitate discussion, particularly when numbers are down.</p> <p>The group work on genetic testing went well, although I should provide more information about the genetics of Huntington's disease in future years to facilitate discussion.</p>

<b>Session 10: Open session (health and age / summary session)</b>	
Date/Time	19 <sup>th</sup> March 2013, 18:30-20:30
Attendance	9
Learning objectives	<p>To understand the patterns of health behaviours and illness observed in adolescents.</p> <p>To understand the role of health in old age.</p> <p>To enhance knowledge gained over the remainder of the course.</p>
Topics covered	<p>Adolescence: results from the Health Behaviour in School-aged Children survey – health behaviours and policy</p> <p>Health in older adults; Scottish statistics, Nun study, attitudes</p> <p>Summary of the course</p> <p>Feedback</p>
Handouts	<p>Deary, I. J. (2008). Why do intelligent people live longer? <i>Nature</i>, 456, 175-176.</p> <p>Gow, A. J., et al (2012). Neuroprotective lifestyles and the aging brain. <i>Neurology</i>, 79, 1802-1808.</p> <p>de Looze, M., et al (2012). Early risk behaviors and adolescent injury in 25 European and North American countries: A cross-national consistent relationship. <i>Journal of Early Adolescence</i>, 32(1), 104-125.</p>
Exercises	<p>Group discussion: Any questions?</p> <p>Go-round: at end.</p>
Reflection	<p>I had emailed all students for whom I had email addresses (i.e. all those who had emailed me at some point over the 10 weeks) to remind them that this was the final session and to ask that they completed feedback forms if they were unable to attend. As a result the attendance was up considerably from the previous session.</p> <p>This session had been left open and students had suggested covering health in young people and in old people. For the former, I utilised material from the Health Behaviour in School-aged Children survey to highlight prevalence of health behaviours and illness in girls and boys across the world. For the latter, I incorporated material from the Scottish</p>

	<p>Health Survey and from several longitudinal studies of ageing.</p> <p>Given that the numbers of students attending sessions had fallen over the last couple of weeks, I decided to include a summary of the course, allowing 1-2 slides per session. The purpose of this was three-fold: to ensure that all students had covered all the topics, to allow students the chance to go over any areas about which they were unsure, and to facilitate learning of the material covered.</p> <p>Due to the limited amount of time available to cover adolescence and old age, this section felt a little rushed and no specific exercises were included. However, students commented and discussed the findings as they were presented. The material seemed to be well received and students appeared engaged with the topic.</p> <p>The summary of the course went well but felt slightly redundant as no students asked any questions or asked me to go over any information. I dedicated at least 25 minutes at the end of the session to collecting feedback on the course, first explaining the need for feedback and its format, and then giving students ample time to complete the feedback form during the class (around 10 minutes).</p> <p>I concluded the session by allowing time for questions, in which some students fed back on the course in general, and the final go-round was successful with all but one students contributing and indicating that they had enjoyed the course and had each taken useful information away from it.</p>
<p>Lessons learned</p>	<p>It is important to allow sufficient time for students to complete feedback and to ensure that this is anonymous as far as possible.</p> <p>Given that a number of earlier sessions contained too much information and will in all likelihood be split in future years, it is likely that this session will be replaced by session 9 or some version of the improving health care topic. Whether the course summary is necessary or not could be put to the students themselves.</p>



**Appendix C17: Consultancy: Powerpoint presentations from sessions  
1, 5, & 9**



## Health psychology

Session 1  
Tuesday 15<sup>th</sup> January 2013

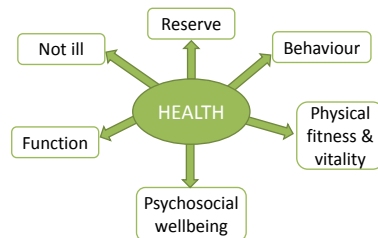
### Session outline

- Housekeeping and ground rules
- What is good health?
- A brief history of medicine
- What is health psychology?
- What do health psychologists do?
- Course outline

### Ground rules

- Respect others' opinions
- Try not to interrupt
- Confidentiality

### What is good health?



Radley, A. 1994. Making sense of illness: The social psychology of health and disease.

### World Health Organization definition

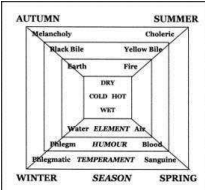
- Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

### History of medicine: Pre-history

- Mystical forces (ancestors, evil spirits) caused physical and mental illness
- Stone Age: skulls show neat hole; process of 'trephination' whereby hole releases evil spirits thought to have entered body and caused disease

### Ancient Greece - humours

- Hippocrates (c. 460-377BC) considered mind and body as one unit
- Illness attributed to the balance between four circulating bodily fluids (humours): yellow bile, phlegm, blood and black bile
- Related to personality and temperament:
  - Yellow bile: choleric (angry)
  - Black bile: melancholic (sad)
  - Blood: sanguine (optimistic)
  - Phlegm: phlegmatic (calm)



### Ancient Greece – Galen (c. AD129-199)

- Physician; four dominant temperaments contributed to experience of specific illnesses
  - E.g. melancholia (black bile) – breast cancer
- Mind and body interrelated: physical & mental disturbances both had underlying physical cause
- Descriptions of personality types still in use in 20<sup>th</sup> century

### Middle Ages (C5th-C6th)

- Health tied to faith and spirituality
- Illness = punishment for misdeeds
- Mind and body worked together
- Individuals had very little control over health; priests offered treatment
- Persisted until Renaissance (early 1600s) when scientific explanations took precedent

### Dualism and the biomedical model

- Descartes (1596-1650): mind and body separate, interacting, entities
- Illness stems from underlying pathology that can be understood and hopefully cured through medical intervention
- Mechanistic and reductionist viewpoint: all illness can be explained at cellular level

### Criticism of biomedical model

- Individuals experience illness differently
  - Inter- and intra-individual differences
  - Differing rates of illness and recovery
- Focus on illness, not health
- Placebo effect

### Psychosomatic medicine

- Developed in 1930s; Freud, Alexander
- Connected to psychoanalysis
- Mind and body act together in experience of illness
- E.g. Alexander's 'ulcer-prone personality' and Freud's 'hysterical paralysis'

## Behavioural medicine

- Developed in 1970s
- An interdisciplinary field drawing on a range of behavioural sciences, including psychology, sociology and health education, in relation to medicine and medical conditions
- Focus on treatment, prevention and intervention using behavioural techniques
- Challenged separation of mind and body

## Biopsychosocial model

- Illness can be explained by a combination of physical, social, cultural and psychological factors
- Individuals' responses to underlying disease and pathology are influenced by their personality, intelligence, beliefs, attitudes, social support and culture

Problem	Biomedical model	Biopsychosocial model
Cause?	Outside the body	Multitude of factors
Who is responsible?	Individual is a passive 'victim'	Individual's behaviour can affect health
Treatment?	Aims to change physical state of the body	Aimed at the whole person
Responsibility for treatment?	Rests with the medical profession	Individual in part responsible
Health & illness	Are different states: either healthy or ill	Are opposite ends of a continuum
Mind & body	Are independent	Interact
Role of psychology	Consequence, not cause	Consequence <i>and</i> cause

## Biopsychosocial approach



## Why bother? Mortality figures

	1900	2009
1	Influenza & pneumonia	Cancer (all)
2	Tuberculosis, all forms	Heart disease
3	Gastroenteritis	Stroke
4	Heart disease	Pneumonia / influenza
5	Stroke	Chronic lung disease
6	Kidney disease	Accidents
7	Accidents	Liver disease
8	Cancer	Diabetes
9	Diseases of infancy	Suicide

Leading (physical) causes of death, England and Wales  
 Sources: 1900 World Health Organization; 2009 ONS  
 Life expectancies: 1900 = 47; 2009 = 78(m) 82(f)

## Why bother? Mortality figures

	2009 – England/Wales	2011 – Scotland
1	Cancer (all)	Cancer (all)
2	Heart disease	Heart disease
3	Stroke	Stroke
4	Pneumonia / influenza	Chronic lung disease
5	Chronic lung disease	Pneumonia
6	Accidents	Accidents
7	Liver disease	Suicide
8	Diabetes	Liver disease
9	Suicide	Diabetes

Source: Scottish Health Survey 2011

### Scotland's Health (SHS 2011)

- 76% describe health as 'good' or 'very good'
- 15.6% men / 13.8% women reported cardiovascular disease
- 6.1% men / 4.9% women had doctor diagnosed diabetes
- 33% men / 32% women had hypertension

### Scotland's health behaviours

- 25% men / 18% women hazardous/harmful drinkers (>21 / >14 units per week)
- 45% men / 33% women met physical activity recommendations
- 20% men / 23% women consumed recommended daily intake of 5 a day
- 64.3% adults overweight or obese; 27.7% obese (stable since 2008)

### Health psychology

"Health psychology is the aggregate of the specific educational, scientific and professional contributions of the discipline of psychology to the promotion and maintenance of health, prevention and treatment of illness and the identification of aetiologic and diagnostic correlates of health, illness and related dysfunction"

Matarazzo, 1980

### Psychology and health



### Health psychology

Promotion and maintenance of health	Prevention and treatment of illness
Identification of etiologic and diagnostic correlates of health, illness and related dysfunction	Analysis and improvement of the health care system and health policy formation

Matarazzo, 1980

### What do health psychologists do?

- Practice: Developing and implementing psychological interventions with individuals, groups and communities to facilitate healthy behaviours; designing healthcare policy and practice.
- Research: designing, implementing and evaluating research on issues relevant to managing public health and health behaviour change.
- Consultancy: planning, implementing, and evaluating, healthcare projects for clients.
- Teaching and training: designing and training multi-disciplinary health professionals.

### A word on research methodology

- Quantitative methods: surveys, randomized control trials, experiments and case control studies
- Qualitative methods: interviews, focus groups

### Course outline

#### Influences on health and illness

- 22<sup>nd</sup> Jan Thoughts & beliefs
- 29<sup>th</sup> Jan Stress
- 5<sup>th</sup> Feb The psychology of illness
- 12<sup>th</sup> Feb Psycho-social factors

### Course outline

#### Key health behaviours

- 19<sup>th</sup> Feb Smoking, alcohol & drug use
- 26<sup>th</sup> Feb Diet and exercise

#### Health psychology in action

- 5<sup>th</sup> Mar Behaviour change / promotion
- 12<sup>th</sup> Mar Improving healthcare
- 19<sup>th</sup> Mar Open session

### References

- Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science*, 196, 129-136.
- Matarazzo, J. D. (1980). Behavioral health and behavioral medicine: Frontiers for a new health psychology. *American Psychologist*, 35(9), 807-817.

### Further reading

- Ogden, Jane (2007). *Health Psychology: A Textbook (4<sup>th</sup> edition)*. Singapore: Open University Press.
- French, D., Vedhara, K., Kaptein, A. A., & Weinman, J. (2010). *Health Psychology (2<sup>nd</sup> edition)*. Oxford: Wiley-Blackwell.
- Morrison, Val & Bennett, Paul. (2012). *Introduction to Health Psychology (3<sup>rd</sup> edition)*. London: Pearson.

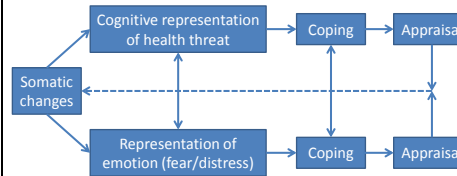
## Individual and cultural differences and health

12<sup>th</sup> February 2013  
caroline.brett@ed.ac.uk

### Self-concept

- **Self-concept** (also called **self-construction**, **self-identity** or **self-perspective**) is a multi-dimensional construct that refers to an individual's perception of "self" in relation to any number of characteristics, such as academics (and nonacademics), gender roles and sexuality, racial identity, and many others

### Recap: Illness



### Social Identity Theory (Tajfel & Turner)

- A **social identity** is the portion of an individual's self-concept derived from perceived membership in a relevant social group
- Social identity theory is best described as primarily a theory that predicts certain intergroup behaviours on the basis of perceived group status differences, the perceived legitimacy and stability of those status differences, and the perceived ability to move from one group to another

### Session outline

- Introduction to Social Identity Theory
- Cultural differences:
  - Ethnicity, culture and health
  - Gender and health
- Individual differences:
  - Personality
  - Intelligence

### Boys camp studies, Sherif, 1966

- Aim: to illustrate prejudice arising from group competition
- Method: series of studies among groups of American boys at summer camp; randomly assigned to 2 groups who then spent several days together, choosing a name and developing a sense of group cohesion. Researchers arranged a competition between groups

### Boys camp studies, Sherif, 1966

- Results: Groups quickly developed an 'us and them' way of speaking. Each group stereotyped themselves in positive ways and other group members negatively; fights broke out between the groups
- Suggested that intergroup competition was sufficient to create hostility and prejudice towards outgroup

### Minimal groups, Tajfel et al (1971)

- Minimal group experiment
- Randomly assigned schoolboys to groups
- Game in which allocated point (and win money) to own and other group
- Three strategies:
  - Maximum fairness (equal point per group)
  - Maximum gain for ingroup (most points to own)
  - Maximum difference (to favour ingroup)

### Minimal groups, Tajfel et al (1971)

- Third strategy (maximum difference) was dominant, even though first enabled them to win more points for own group
- Mere act of separating participants into groups was sufficient to create antagonism

### Social comparison

- Social comparison is the evaluation of ourselves in relation to others
  - Often, ingroup perceived to be more heterogeneous than outgroup ("they're all the same")
  - Driven by self-esteem
- SIT extends this concept to groups; we maximise out self-esteem by manipulating our own and others' perceptions of the ingroup and outgroup
- This can lead to discrimination

### Stigma, discrimination & health

- Discrimination impacts health as:
  - A) stressor – impact on psychological wellbeing
  - B) identity & behaviour – stereotypes about your ingroup might lead to thoughts such as "there's no need for me to change my behaviour; it won't make a difference"

### Culture (Corin, 1995)

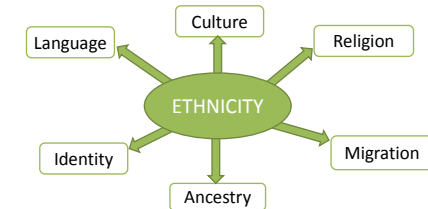
"...a system of meanings and symbols. This system shapes every area of life, defines a world view that gives meaning to personal and collective experience, and frames the way people locate themselves within the world, perceive the world, and believe in it. Every aspect of reality is seen as embedded within webs of meaning that define a certain world view and that cannot be studied or understood apart from this collective frame."

### Biopsychosocial approach



### Ethnic minorities

- In groups, discuss how being part of an ethnic minority group might impact on your experiences of health and the healthcare system in the UK



Nazroo, 1998. Genetic, cultural or socioeconomic vulnerability? Explaining ethnic inequalities in health.

### Evidence for ethnic differences?

- Rates of heart disease among British men from the Indian sub-continent 36% higher than national average
- Afro-Caribbeans have high rates of hypertension and strokes
- Asians have high levels of diabetes
- Rates of lung cancer are low among people of Caribbean or West African origin

### Is it all just down to SES?

- Health discrepancies between ethnic groups may be due to lower socioeconomic status
- Karlamanga et al (2010) concluded that in the US, excess risk for coronary heart disease among Black & Hispanic men was largely due to lower SES
- Results vary for ethnic minority groups in the UK
- Other explanations are needed

### Individualism vs collectivism

- Useful constructs in understanding cultural differences in how people view self and others
- Individualism: people are responsible for their own decisions & actions; relationships are freely chosen & easy to enter/exit; favour promotion over prevention
- Collectivism: people are relational or communal; decisions & actions influenced by social obligations & fulfilment of ingroup expectations; favour prevention over promotion in order to avoid causes of social disruption



## Interpretations of illness

- Cultural beliefs underpin interpretations of the causes and treatment of illness
  - e.g. Individualistic culture sees individual as separate from social/physical environment, so greater weight placed on physiological processes; while collectivist cultures focus on relationships with others and holistic worldview
  - e.g. In Indian culture, metaphysical beliefs (Karma, God and spirits) are determinants of many events in life, including illness and suffering: individuals have little control over their illness

## Example: Chinese medicine

- Combination of three religious philosophies:
  - Taoism: universe is a vast & indivisible entity & each being has definite function. Two basic powers, yin (female, negative force leading to darkness & emptiness) and yang (male, positive energy producing light & fullness), govern the universe
  - Confucianism: are lives are determined by Fate; our destiny or ming is governed by our horoscope (pa-tzu) and nature
  - Buddhism: good deeds are promoted; bad deeds & a lack of reciprocity in relationships are punished

	What is pain?	In practice
Taoist philosophy	Blockage in the Qi (blood circulation)	To relieve pain, blockage needs to be removed and the person needs to maintain harmony with the universe
Confucian philosophy	An essential element of life, like a 'trial' or 'sacrifice'	Since pain is a part of life, a person in pain might rather endure it & not report to a clinician until it becomes unbearable
Buddhist philosophy	A form of unwanted but existing power that came from 1) a barrier in the past life; 2) the objective world; 3) the person's own sensation; or 4) from other people, animals or materials	To end pain, the person needs to follow the 8 right ways (i.e. right view, intention, speech, action, livelihood, effort, mindfulness and concentration)

## Coping: Health behaviours

- Variations in health outcomes may be due to behavioural differences across ethnic groups
  - e.g. In the UK, Asian males of Punjabi origin consume high levels of alcohol & develop alcohol-related disorders whereas alcohol consumption low or minimal amongst Muslims
  - Bangladeshi immigrants to the UK have higher fat diet than most other ethnic groups
  - Europeans more physically active than Indians, Pakistanis or Bangladeshis
  - In the US, non-Hispanic Black men twice as likely as whites & Hispanics to engage in CHD-risk behaviours

## Coping: social support & stress

- Cultural differences in health may be due to differences in use of social support
  - e.g. Asian Americans less likely to utilise explicit social support but benefit from more implicit social support than European Americans
- Ethnic minorities may experience wider sources of stress due to discrimination, racial harassment and demands of maintaining of shifting culture
  - e.g. studies by Clarke and colleagues suggest a link between perceived racism and chronic stress activation, manifested as increased blood pressure under stress. Highest blood pressure amongst those who did not 'accept it'

## Accessing healthcare

- Disparities exist between ethnic groups in treatment received
- Some cultural norms heavily regulate gender relationships even within healthcare setting
  - e.g. availability of female doctors and likelihood of attending for screening amongst Asian women
- Discrepancy in beliefs about cause of illness
  - e.g. Somali women not accessing screening programmes due to fatalistic attitude towards cancer

### Health promotion

- Health messages more likely to be effective if congruent with a person's predominant motivational orientation
- E.g. Uksul et al (2009) showed that dental floss messages more effective if framed appropriately: i.e. focus on gains and health-promotion aspects of flossing for Western, individualistic cultures and focus on loss and costs of failing to floss for Eastern, collectivistic cultures

### Case study: PODOSA

- Prevention of Diabetes and Obesity in South Asians (funded by National Prevention Research Initiative)
- Randomised controlled trial where individuals at risk of diabetes followed up for 3 years to encourage lifestyle behaviour changes in order to achieve weight loss to prevent or delay the onset of diabetes
- 15 sessions with dietician: verbal advice and resources provided; tailored to individual/family

### Gender and health

- Sex: refers to biological and physiological differences that define men and women
- Gender: refers to the socially constructed roles, behaviours, activities, position, identity and attributes that a given society considers appropriate for men and women

### Relative mortality rates

Cause	Male/female ratio
Coronary heart disease	1.89
Cancer	1.47
Stroke	1.16
Accidents	2.04
Chronic lung disease	2.04
Pneumonia/flu	1.77
Diabetes	1.11
Suicide	3.90
Liver disease	2.32
Atherosclerosis	1.28
Renal disease	1.54
Homicide/legal intervention	3.22
Septicaemia	1.36

### Experiences of illness

- "Women get sick and men die" (Nathanson, 1977)
- Men show masculinity and power by not showing signs of weakness, even when ill. Men are independent, self-reliant, strong and tough (Courtenay, 2000)
- Women tend to report more symptoms and experience more chronic health problems than men

### Coping: Health behaviours

- Men show their masculinity and power by engaging in health-risking behaviours
- More men than women engage in health-risk behaviours such as smoking, drinking alcohol, drunk-driving, not using seatbelts, less consumption of fruit & veg, & not attending health screening
- Men more likely to work in health-risk environments
- Masculine beliefs stronger predictors of risky health behaviours than education or income
- Men do more physical exercise than women

### Coping: social support

- Women more likely to make use of social support than men (cf lay-referral)
- However, men receive greater social support from partner
  - e.g. married men have higher survival rates from many cancers than single men
- Different life experiences and expectations among younger men may enable them to resist social pressures to view illness as sign of weakness or deny symptoms that might reflect negatively on their masculinity

### Accessing healthcare

- In the UK, women are twice as likely as men to consult doctors; this difference is greater within socially disadvantaged groups
- Men make less use of screening and health checks and seek help later in an illness episode, often with fatal results

### Case study: O'Brien et al

- Aim: To investigate men's attitudes towards masculinity & help seeking
- Method: 14 focus groups consisting of diverse population of 55 Scottish men (aged 15-72 years)
- Results: men described avoiding seeking help for 'minor' symptoms; generally this changed following serious illness (e.g. heart problems) or where symptoms disrupted normal function
- Discussion: Help seeking seen as challenging conventional notions of masculinity, of 'pushing it further', especially amongst younger, 'healthy' men

### Individual differences and health

- Stable characteristics that influence our response to illness and our participation in health-promoting or health-risking behaviours

### Personality

- International Personality Item Pool (Goldberg, 2001)
  - 50 questions
  - 10 each on 5 traits
  - Answer as honestly as you can

### Extraversion

- (*outgoing/energetic vs. solitary/reserved*). Energy, positive emotions, surgency, assertiveness, sociability and the tendency to seek stimulation in the company of others, and talkativeness.

### Extraversion

- 1. I am the life of the party
- 6. I don't talk a lot (R)
- 11. I feel comfortable around people
- 16. comfortable around people (R)
- 21. I start conversations
- 26. I have little to say
- 31. I talk to a lot of different people at parties
- 36. I don't like to draw attention to myself (R)
- 41. I don't mind being the centre of attention
- 46. I am quiet around strangers (R)

### Agreeableness

- (*friendly/compassionate vs. cold/unkind*). A tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others.

### Agreeableness

- 2. I feel little concern for others (R)
- 7. I am interested in people
- 12. I insult people (R)
- 17. I sympathise with others' feelings
- 22. I am not interested in other people's problems (R)
- 27. I have a soft heart
- 32. I am not really interested in others (R)
- 37. I take time out for others
- 42. I feel others' emotions
- 47. I make people feel at ease

### Conscientiousness

- (*efficient/organized vs. easy-going/careless*). A tendency to show self-discipline, act dutifully, and aim for achievement; planned rather than spontaneous behaviour; organized, and dependable.

### Conscientiousness

- 3. I am always prepared
- 8. I leave my belongings around (R)
- 13. I pay attention to details
- 18. I make a mess of things (R)
- 23. I get chores done right away
- 28. I often forget to put things back in their proper place (R)
- 33. I like order
- 38. I shirk my duties (R)
- 43. I follow a schedule
- 48. I am exacting in my work

### Neuroticism / Emotional Stability

- (*sensitive/nervous vs. secure/confident*). The tendency to experience unpleasant emotions easily, such as anger, anxiety, depression, or vulnerability. Neuroticism also refers to the degree of emotional stability and impulse control, and is sometimes referred by its low pole – "emotional stability".

### Emotional stability

- 4. I get stressed out easily (R)
- 9. I am relaxed most of the time
- 14. I worry about things (R)
- 19. I seldom feel blue
- 24. I am easily disturbed (R)
- 29. I get upset easily (R)
- 34. I change my mood a lot (R)
- 39. I have frequent mood swings (R)
- 44. I get irritated easily (R)
- 49. I often feel blue

### Neuroticism and health

- Associated with increased symptom perception and reporting
- Related to negative affectivity
- Difficult to establish whether N / NA associated with perceived or actual symptoms; limited evidence for association with development or course of illness

### Openness / Intellect/Imagination

- (*inventive/curious vs. consistent/cautious*). Appreciation for art, emotion, adventure, unusual ideas, curiosity, and variety of experience. Openness reflects the degree of intellectual curiosity, creativity and a preference for novelty and variety. Some disagreement remains about how to interpret the openness factor, which is sometimes called "intellect" rather than openness to experience.

### Intellect / Imagination

- 5. I have a rich vocabulary
- 10. I have difficulty understanding abstract ideas (R)
- 15. I have a vivid imagination
- 20. I am not interested in abstract ideas (R)
- 25. I have excellent ideas
- 30. I do not have a good imagination (R)
- 35. I am quick to understand things
- 40. I use difficult words
- 45. I spend time reflecting on things
- 50. I am full of ideas

### Optimism

- **Optimism** is a mental attitude or world view that interprets situations and events as being best (optimized), meaning that in some way for factors that may not be fully comprehended, the present moment is in an optimum state. The concept is typically extended to include the attitude of hope for future conditions unfolding as optimal as well.

### Optimism and health

- Dispositional optimism associated with recovery from illness
- May protect against risk of coronary heart disease in older men (independent of health behaviours)
- Significant predictor of cardiovascular outcomes
- Possible mechanisms include coping and health behaviours

### Type A personality

- The theory describes a Type A individual as ambitious, rigidly organized, highly status conscious, can be sensitive, care for other people, are truthful, impatient, always try to help others, take on more than they can handle, want other people to get to the point, proactive, and obsessed with time management. People with Type A personalities are often high-achieving "workaholics" who multi-task, push themselves with deadlines, and hate both delays and ambivalence.

### Type B personality

- People with Type B personality by definition generally live at a lower stress level and typically work steadily, enjoying achievement but not becoming stressed when they are not achieved. When faced with competition, they do not mind losing and either enjoy the game or back down. They may be creative and enjoy exploring ideas and concepts. They are often reflective, thinking about the outer and inner worlds. Furthermore, Type B personalities may have a poor sense of time schedule and can be predominately right brained thinkers.

### Type A and health

- Associated with higher risk of CHD, perhaps through increased activation of stress response
- Studies have produced conflicting results
- May be 'toxic' components of Type A that relate to CHD, i.e. hostility, competitiveness
- Complex relationship
- Measurement difficulties

### Type D personality

- **Type D personality**, a concept used in the field of medical psychology, is defined as the joint tendency towards negative affectivity (e.g., worry, irritability, gloom) and social inhibition (e.g., reticence and a lack of self-assurance). The letter D stands for "distressed".
- Proposed by Denollet (1995)

### Type D and health

- Four-fold mortality risk from CHD
- Possible mechanisms:
  - Increased cardiovascular reactivity to stress
  - Health behaviours
  - Lower levels of perceived social support
  - Higher subjective levels of stress arousal
  - Illness beliefs

### Marshmallow experiment (1972)

- Classic study of delayed gratification
- Children offered a marshmallow & told if they could resist eating it for 15 minutes, they would get two
- Length of time child waited was correlated with future success
- Suggested mechanisms include self-control, effective attentional control system, inhibition of attention and behavioural responses
- Later studies suggest this may be influenced by situation

### Intelligence

- Higher intelligence is associated with a lower risk of mortality and morbidity.
- Why might this be?

### Cognitive epidemiology

- **Cognitive epidemiology** is a field of research that examines the associations between intelligence test scores (IQ scores) and health, more specifically morbidity (mental and physical) and mortality.

### Further reading

- Courtenay, W.H. (2000). Constructions of masculinity and their influence on men's well-being: A theory of gender and health. *Social Science & Medicine*, 50, 1385-1401.
- Deary, I.J., Weiss, A., & Batty, G. D. (2010). Intelligence and personality as predictors of illness and death: How researchers in differential psychology and chronic disease epidemiology are collaborating to understand and address health inequalities. *Psychological Science in the Public Interest*, 11(2), 53-79.

### Next week...

- Health behaviours: Smoking, alcohol & drugs

## Improving health care

12<sup>th</sup> March 2013  
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## Session outline

- Health communication
  - Why bother?
  - Influences on help seeking
  - Interventions to improve communication
    - Motivational interviewing
    - Shared decision making
- Screening and immunisation
  - Why bother?
  - Factors influencing attendance for screening

## Why is communication important?

- Failure to identify patients main problem
- Inaccurate diagnosis & inappropriate referral
- Poor adherence to treatment
- Patients' dissatisfaction with treatment
- Patients' anxiety and distress
- Litigation
- Better health, shorter hospital stays, quicker recovery = more efficiency

## Why does it matter? 1) Diagnosis

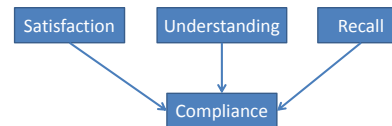
“Doctor error causes heart attack death”

- Mr Jones, who had a history of anxiety, went to his GP about a mild pain in his chest
- Doctor saw him as a ‘heart sink’ patient: i.e. lots of little complaints, no suitable treatment
- Asked closed questions to confirm symptoms were psychosomatic in nature
- Mr Jones, disappointed & unconvinced, followed Dr’s advice not to seek further medical help
- Died of a heart attack at home a few hours later

**WHAT WENT WRONG?**

## Why does it matter? 2) Compliance

- Ley suggests three factors influence compliance:



## Case study: Patient satisfaction

- Aim: to examine the effect of expert, directive consulting style versus sharing, patient-centred consulting style on patient satisfaction
- Methods: GP patients, randomly assigned to consulting style. Measured patients' rating of doctor's understanding, adequacy of explanation, and feeling helped
- Results: directive style lead to greater satisfaction, particularly when patients attended rarely, had physical problems, had no tests and receive a prescription

Savage & Armstrong, 1990. *British Medical Journal*, 301, 968-970.



### Understanding

- Boyle (1970) investigated doctors' and patients' knowledge & interpretation of wide range of health conditions; found variations in both. E.g. 85% patients correctly defined arthritis, but only 42% correctly located the heart
- Roth (1979) found that 50% of individuals thought that lung cancer caused by smoking had a good prognosis and 30% believed that hypertension could be cured by treatment

### Case study: Understanding

- Aim: To describe physicians use of jargon with diabetes patients with limited health literacy
- Methods: Audiotaped 74 outpatient encounters & coded unclarified jargon
- Results: 81% contained at least one unclarified jargon term; 37% when making recommendations & 29% providing education. Patient comprehension rates were generally low
- Implications: Physicians need to ensure patients understand everything

Castro et al, 2007. *American Journal of Health Behaviour*, 31, S85-95

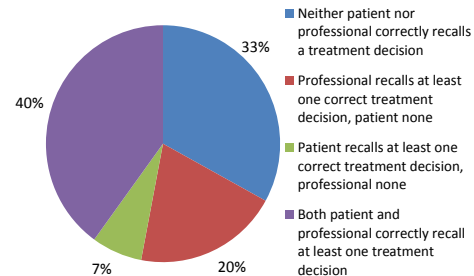
Unclarified	Clarified
Interact	Creatinine
Glucometer	Microalbuminuria
Micro-vascular complications	Symptoms
Wide range	Ophthalmology
ECG abnormalities	Angina
Haemoglobin A1c	Genetic
Kidney function	
Dialysis	
System of nerves	
Weight is stable	
Immunisations	
Risk factor	

### Case study: recall

- Aim: To test the accuracy of patient and professionals recall of treatment decisions
- Methods: 134 outpatient consultations between diabetes specialists & patients were audiotaped. Patients & professionals asked to recall treatment decisions made immediately afterwards
- Results: 2.5 (patients) vs 3.2 (profs) decisions recalled; 2.2 identified on audiotapes
- Implications: Both are poor! Professionals slightly better but both recall unmade decisions

Skinner et al, 2007. *Diabetic Medicine*, 24, 557-560.

### Case study: recall



### Why does it matter? 3) Prevention

- Many chronic illnesses are preventable through lifestyle changes patients can make themselves: i.e. health behaviours
- Health professionals (especially GPs) have an opportunity to try and encourage behaviour change

### The 'ineffective physician'

- <http://www.youtube.com/watch?v=80XyNE89eCs>

### The 'effective physician'

- <http://www.youtube.com/watch?v=URiKA7CKtfc>

### Motivational interviewing

- Method of augmenting an individual's motivation to change problematic behaviours
- Directive, client-centred counselling style that seeks to help clients explore & resolve ambivalence about behaviour change
- Identifies how 'ready, willing and able' a person is to change (rather than simply telling them they need to change)

### Effective consultation

1. Explore patient's ideas about the nature of the problem & potential treatments
2. Identify how much information the patient would prefer, & tailor information to meet these needs
3. Check the patient's understanding of potential treatment options & their expectations & concerns in relation to them
4. Assess the patient's decision-making preference (joint, doctor, or patient-led) and adopt their preferred mode
5. Make, discuss or defer decisions
6. Arrange follow-up

Elwyn et al, 2000. *British Journal of General Practice*, 50, 892-899.

### Shared decision making

- Process by which patients and health professionals review treatment options available & decide on a suitable treatment programme
- Involves ensuring patients understand the pros and cons of all treatment options
- Not just 'doctor knows best'

### SDM in action: Decision navigation

- Intervention for early stage prostate cancer patients in Edinburgh
- Patient meets with 'navigator' prior to specialist treatment consultation; identify & frame key questions and concerns; create draft consultation plan that's forwarded to consultant
- Navigators accompany patient to consultation & use plan to take notes & audio recording
- Patient received recording & notes
- Increased decision self-efficacy and reduced decision conflict and regret up to 6 months later

Hacking et al, 2012. *Psycho-oncology*, DOI: 10.1002/pon.3093

## Screening

- Types of screening:
  - 1) Screening for disease detection
    - Detecting illness at asymptomatic stage to slow progression
    - E.g. Cervical, breast, bowel, colon, testicular cancer
  - 2) Screening for risk factors
    - General health screening for CVD risk factors
    - Antenatal screening
    - Genetic testing
  - 3) Self-examination

## Criteria for screening

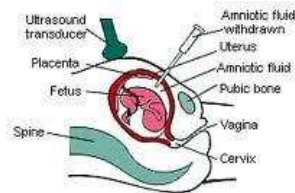
- The disease must be sufficiently prevalent and/or serious to make early detection appropriate
- The disease must be sufficiently well defined to permit accurate diagnosis
- There must be a possibility (or probability) that the disease exists undiagnosed in many cases
- There must be a beneficial outcome from early diagnosis in terms of disease treatment or prevention of complications
- There must be a screening test that has good sensitivity and specificity and a reasonably positive predictive value in the population to be screened

## Jargon buster

- **Sensitivity:** degree to which a test correctly identifies people who do have the disease; i.e. reduces false negatives
- **Specificity:** degree to which a test correctly identifies people who don't have the disease; i.e. reduces false positives

## Genetic screening in pregnancy

- **Amniocentesis** is a diagnostic test to detect a serious or potentially serious disorder in an unborn baby (foetus)



## Genetic screening in pregnancy

- **Used if:**
  - a **previous pregnancy with foetal problems**, such as a baby born with a chromosome abnormality
  - a **family history of a condition**, such as muscular dystrophy (an inherited condition that causes increasing muscle weakness)
  - **over 35 years of age**, which means that you have an increased risk of your child having Down's syndrome
  - **an earlier antenatal screening test has suggested there may be a problem**

## Genetic screening in pregnancy

- **Tests for:**
  - Chromosomal conditions (Down's syndrome, Edward's syndrome, Patau's syndrome)
  - Blood disorders (sickle cell anaemia, thalassaemia, haemophilia)
  - Neural tube defects
  - Musculoskeletal disorders
  - Other genetic conditions

## Results

- Negative test results:
  - Suggests the baby will not have any disorders that were tested for (but may have others)
- Positive test results:
  - Baby has the disorder tested for. Implications will be discussed. No cure for the majority of chromosomal disorders
- **What are the implications?**

## Immunisations

- Vaccinations against infectious diseases have been credited with virtual eradication of life-threatening/changing diseases such as smallpox, diphtheria & polio
- Recent advances include influenza vaccination to subgroups of population and HPV
- Media campaigns and negative coverage influences uptake: e.g. MMR vaccine aiming for 95%, only now achieving close to this

## HPV vaccine

- Human papillomavirus (HPV) is a family of over 100 viruses, some of which can cause abnormal tissue & cell growth implicated in development of genital warts & 70% of cervical cancers
- Vaccination is 90% effective in uninfected
- Involves 3 injections over 6 months
- Since Sept 2008 offered to all girls aged 12-13 (prior to sexual activity), with 'catch-up' programme offered to 15-17 year-olds
- Parental consent required; mixed reaction

## Factors influencing uptake

- Psycho-social factors:
  - Demography: age, socioeconomic status
  - Health beliefs (esp. re: severity, susceptibility)
  - Emotions: fear, anxiety, feelings of indecency
  - Contextual factors: family history, prevalence etc.
- Health professional factors:
  - HPs own beliefs and training; how presented
- Organisational factors:
  - Mode of invitation; opt out vs opt in; media



## Interventions to increase uptake

- Mode of invitation: fixed or open appointments, telephone calls, letters, prompts and reminders/follow-up letters
- Psychoeducation: increase knowledge of screening and disease
- Message framing: positive or negative
- Counselling
- Procedures: making screening easier or more acceptable (e.g. combining tests, reducing time)
- Economic: removing financial barriers or offering incentives (e.g. free postage)

## Appendix C18: Consultancy: Feedback from course visit in week 5



Open Studies  
Class visit

Course	Health Psychology
Tutor	Caroline Brett
Course Organiser	James Mooney
Session & Year	2, 2012/13

### COURSE ORGANISER'S COMMENTS

Hi Caroline,

Thanks for the class, which I really enjoyed. I thought it was informative, and that the group exercises really helped to engage everyone.

The only real issue I found was that it seems that you are attempting to cover far too much material. Perhaps this was for this session only but it may be better to try to do more with less – if you see what I mean. This could also be reflected in your slides, which perhaps contained too much detail and, as such, can become a script. Far better to have fewer slides, which can then be employed as a springboard for further detail, explanation.

I would appreciate it if you could take a few minutes to consider these comments and offer a few lines below in response.

Best,  
Jim

Signature J.Mooney

Date 20/2/13

### TUTOR'S COMMENTS

Many thanks for your comments. I'm pleased that you enjoyed the class and that the group exercises in your opinion engaged everyone (I think so too).

I completely agree with your comments about the material – I have felt this myself on many an occasion. In previous sessions I have managed to cover everything in the time available but the last couple have felt quite rushed. Being a new course, I have a tendency to feel that I have to cover every aspect of the topic when in fact I should try and focus down on the key points and encourage students to read around the topic for further information. I hope to try and do this for the remaining sessions, and will revisit

the course outline at the end of the course and make some changes (for example, splitting some sessions in two). In a way this was my rationale for including an 'open session' in week 10; in order that anything that I felt wasn't covered in enough detail during previous sessions could be covered there, or to provide a bit of leeway in future years. I will definitely be using that session next year to divide the material up a bit more evenly.

I will definitely adjust the material to make 'more of less' as you say – the group are now gelling quite well and so the interactive sections are becoming more and more productive each week. I would like to be able to allow more time for the exercises so this will inevitably mean reducing the presented material.

With regards the slides, I am aware that they contain a lot of information. This is partly because I am designing the sessions as I go along (in reaction to how previous sessions have gone), and am therefore, I'm afraid to admit, not that familiar with the material and use the slides exactly as you say as a bit of a script. Once I'm more familiar with the material I should be able to include less detail on the slides and more in my presentation. The other reason is so that students have all the information available to them – many of them are not taking notes (possibly because they have got used to having the slides!) – I know when I was a student on my MSc that it was very useful having a lot of information on the slides to guide my learning and to ensure that any lapses of concentration during the lecture (they were 3 hours long so concentration did wane!) didn't mean I didn't have the information I needed. Somewhere inbetween would, therefore, be ideal – the main points on a slide but with enough familiarity on my part that I can speak to the slides without having to sit and read them off the screen.

On the plus side, I led a short discussion of how the participants felt the course was going, whether the level was OK, and how they felt the mix of presentation vs interaction was, and they were all very positive. I mentioned that I was concerned that I was talking too much and they responded that if I didn't their contributions might lack structure and meaning and be less productive. This was a relief!

Signature \_\_\_C. Brett\_\_\_\_\_

Date \_\_20.02.2013\_\_\_\_\_



## Appendix C20: Consultancy: Feedback results

Where would you rate your knowledge and experience of the topic before starting the course?

1	2	3	4	5	6	7	8	9	10
--	1	3	5	--	1	---	--	--	--

Where would you rate your knowledge and experience of the topic now?

1	2	3	4	5	6	7	8	9	10
--	--	--	--	--	3	7	--	--	--

What was your main reason for choosing to take this course?

<b>Professional</b>	3
<b>Personal</b>	4
<b>Both</b>	3

To what extent do you agree with the following statements?

	1	2	3	4	5	Mean (SD)
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
<b>The course material was relevant to me</b>	--	--	3	4	3	4.0 (.816)
<b>The tutor showed good knowledge of the material</b>	--	--	2	5	3	4.1 (.738)
<b>I found the course material interesting</b>	--	--	2	3	5	4.3 (.823)
<b>The tutor's style was engaging and informative</b>	--		--	5	4	4.2 (.919)
<b>The tutor handled questions well</b>	--		3	3	3	3.8 (1.033)
<b>The format of the course was appropriate</b>	--			3	5	4.2 (1.033)

Lecture – interaction

5	3	5	3.5	3.5	5	4.5	5	3.5	5
---	---	---	-----	-----	---	-----	---	-----	---

Comments: individual sessions

1. I really enjoyed the sessions on Diet & Exercise/Health promotion & behaviour change/& Stress and health. For me, the course content was well balanced and a very good general introduction to a coverage of Health Psychology for this level of course.
2. Any interactions, exercises which are involving student's attention are really useful and make classes more interesting.
3. Good: - advertisement exercise (nudge) - Video and cartoon clips to reinforce the concept - Real life example/personal experience sharing



4. Session on different models in health psychology was too complex for people who did not know about it before. Sessions on personality/diet and exercise/alcohol and smoking were good as practical and it was easy to refer to life example.
5. The sessions about healthy eating and exercising were good and helpful for me.
6. Especially impressive regarding the importance of psychological elements when cancer patients experience treatments (knowledge, choice of treatment, communication with consultants etc.). Overall, I really enjoy the course.
7. The session on smoking/alcohol and the session on obesity. The session on stress got me interested in the book zebras with ulcers, I felt like reading more about the subject and increasing my understanding/knowledge.
8. Ageing – young people – people’s attitudes to ill health – peoples’ perceptions and disability (?)
9. It all made sense. Anything to do with diet, addictions, successful ageing all relevant. It hung together well.
10. For me, was very interesting all diagrams of behaviours/intentions.... Specially, about stop smoking.

Comments: general about the course

1. A very enjoyable, friendly and relaxed course with a pleasant and easy-going tutor. I enjoyed all of the sessions but was unable to attend several due to the 6.30pm start time (7pm-9pm would be ideal....But maybe not for others!).
2. Overall course was really interesting with all variety of topics. The diversity is which I appreciate.
3. Good range of activities/teaching styles to match the content of the lesson. Suggestion: If time permits, could consider letting the participants do group discussion and then follow by a short group presentation. We enjoy having short chat with other participants, as well as to share on the topic. Some participants might have personal experience or professional knowledge that can enhance the learning.
4. The slides were too heavy so hard to follow and lecturer more likely to read the slides’ content rather than explaining which made it difficult to understand. It would have been good to have more interaction/exercises. As it is a general HP course, maybe would need to be less focus on ageing.
5. The course was good but I was just expecting to learn more about psychological diseases and their cures. But overall it managed to get all the things in the course.
6. Honestly, it took me some time to ‘understand’ what exactly health psychology means, what it is about etc. I think it’s related to how a person understands the idea of ‘health’ as I, personally, strongly believe that both mental and physical aspects are important as regard to ‘health’. <u>Maybe</u> emphasising psychological elements will be helpful in the future 😊
7. Some of the first lectures/sessions were maybe a bit too lecture based, with too many slides which demanded previous knowledge. Was a bit hard to do interactive exercises without this knowledge. This goes for stress, personality etc – could be better with less material taken directly from the books (statistics, models etc.).
8. (next year) Attitudes to disability from disabled themselves (will this be forever) and able-bodied attitude to the disabled – are they really ill.
9. Enjoyed it, very many leads into other topics that are personally relevant and ‘socially’ relevant. Have got a big collection of articles and books now. Must be

leading to something!! The next stage.

. 10. Interesting course and good information. I think that the course need more thinks (sic) about how to change behaviours.

### **Appendix C21: Consultancy: OLL post-course feedback**

College of Humanities and Social Science

Office of Lifelong Learning

#### **Course Monitoring Form-Non Credit Courses**

Subject Area	Psychology	Course length	10 wks
Course Title	Health Psychology	Offer code	P216
Course Organiser	J Mooney	Year & Session	2012/13 S2

#### **Statistics**

Number of students attending at start of course	
Number of students attending on final week	
Number of students returning feedback	<b>3</b>

#### **Summary of Student Feedback**

Three students returned feedback for this course: all three were 'very satisfied' with the course. Two students strongly agreed with the statement that the course was well taught, the other agreed; all strongly agreed that the published information and course materials were useful.

Some additional comments from the student were:

The tutor was very knowledgeable and innovative in her delivery. Excellent tutor and very engaging.

Easy and relaxed environment and no pressure to do anything that made the participants uncomfortable in any way. A good mix of listening, discussion and group work. The tutor valued and asked for participant views and the presentations were well prepared.

Overall the course was well structured and paced and everything was relevant. Sometimes I would have liked to discuss issues more with other students, however, there was the need to get through a large amount of material. The tutor was sometimes a bit too 'apologetic' about her tutoring – she was very good!

In response to the question 'How could the course be improved?' one student commented:

A few more group exercises? Discussion? The group were a bit reluctant to talk, could we have been made to get a bit better my icebreakers at the start?

### **Tutor comments**

I am delighted with the feedback and appreciate the comments made. I agree that the group was quite reluctant to talk to begin with, but they had warmed to each other by the end and the discussions become more fruitful and engaging. I will take on board the suggestion of more icebreakers, which is an excellent idea.

This was my first time tutoring and I found it to be an exhausting but rewarding process. I felt at times that the sessions may have included too much lecture and not enough interaction, which was a shame as the students really engaged with the topics when given the chance, particularly when they were able to bring in their own experiences.

Some of the sessions did not work as well as hoped and contained too much information – I have therefore adjusted the course outline for subsequent years in order to give more space to topics which students found particularly useful (e.g. smoking, alcohol, addiction, diet and exercise) and to allow them more time to explore these topics from their own perspectives. I will also re-write most sessions to incorporate more group/pair discussion and exercises and less presentation; this will be a challenge but judging by students' comments it will be well worth it.

### **Course Organiser comments**

This seems to have been a very successful delivery. A class visit was conducted (see separate repost) and the tutor was very open to constructive comments and suggestions.

### **Action taken/required**

Some slight changes in course contents for next delivery.

**Course Organisers signature**                      **James Mooney**                      **Date** 12/6/2013

## **Appendix C24: Behaviour change intervention: Needs assessment**

### Baseline walking behaviour

The majority of participants reported low to moderate levels of walking behaviour at the start of the intervention, with similar levels of walking required by their working conditions (Table A1).

Table A1

Baseline walking and walking within job amongst survey respondents

	<b>N (%)</b>
<b>Baseline walking level</b>	
Bare minimum	2 (20.0)
A little	4 (40.0)
A moderate amount	4 (40.0)
A great deal	0 (0)
<b>Walking within job</b>	
Minimal	5 (45.5)
Medium	4 (36.4)
Quite a bit	1 (9.1)
A lot	1 (9.1)

All but one of the baseline survey respondents reported doing some other form of physical activity in addition to walking, although two of these involved walking (Table A2).

Table A2

Other physical activities reported by the baseline survey respondents

<b>Activity</b>	<b>N (%)</b>
Running/jogging	1 (11.1)
Cycling	2 (22.2)
Exercise classes	2 (22.2)
Badminton	1 (11.1)
Swimming	2 (22.2)
Wii Fit	1 (11.1)
Horse riding	1 (11.1)
Hillwalking	1 (11.1)
Dog walks	1 (11.1)

### Motivators

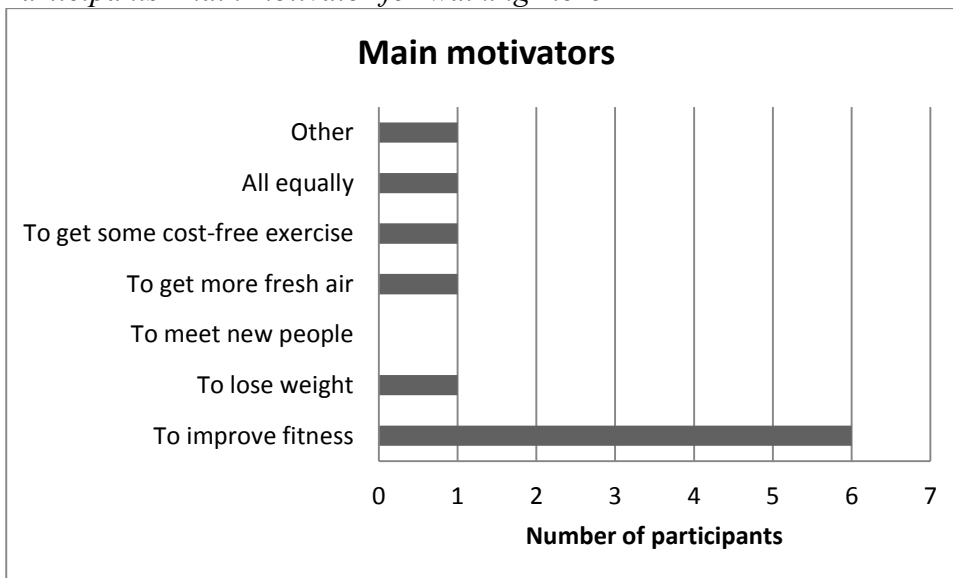
The survey results (Figure A1) suggested that health was an important source of motivation, with 78.6%, 64.3% and 57.1% of respondents wanting to improve their fitness, get some exercise without cost and lose weight respectively. Meeting new people and getting more fresh air were also important motivators (42.9% and 57.1%).

Figure A1  
*Participants' motivators for walking more*



The final survey asked participants to identify their chief reason for taking part in the intervention. The majority of respondents to this survey reported improved fitness as their main motivator (54.55%), with the remaining respondents spread equally between most of the other options (Figure A2).

Figure A2  
*Participants' main motivator for walking more*



Participants' responses to the email invitations reflected these motivators:

I'm thinking I should to try to get away from my desk once in a while so having a group to join might apply the pressure needed!

No problem – as I am also overweight I thought it might be a good goal to healthy eat for the 8 weeks and see if I can lose some weight! The steps will hopefully help me to focus - after all its only 8 weeks!

It will be an incentive to walk the long way round to work.

I'm really interested in the program and this is a competitive way to move forward. I might walk to the station more from home if I have a goal to aim for.

The comments also suggested that many participants were motivated by a desire to quantify their walking behaviour:

I actually already wear a pedometer, and can tighten up my regular recording of steps walked.

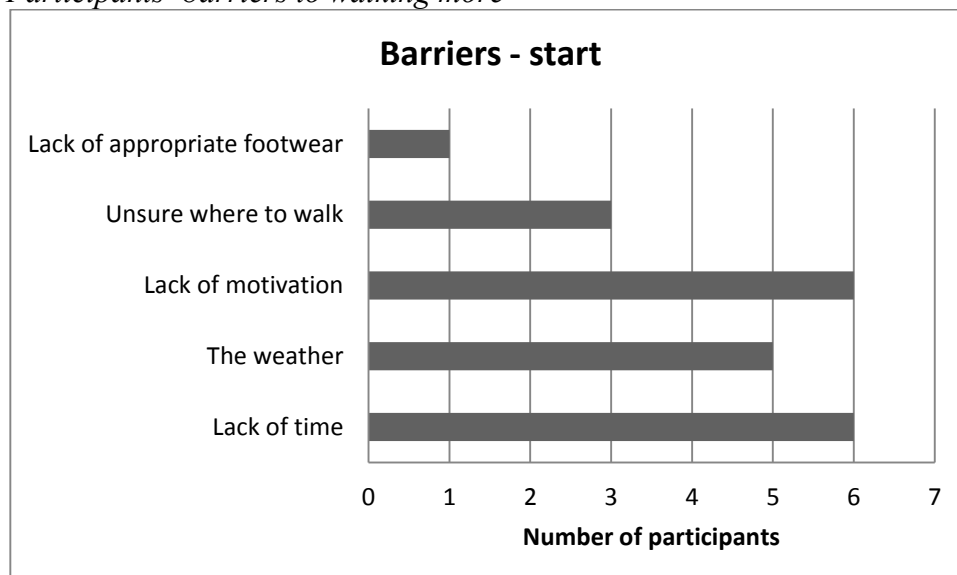
I'm happy to wear the pedometer - it would be interesting to see how much I walk a week anyway - and hopefully I can ratchet up a good amount of steps for the challenge!

I would be interested in getting the pedometer and measuring my steps.

### Barriers

In terms of barriers, participants' responses (Figure A3) echoed those of the HEBS (1998) survey of physical activity in that lack of time was a major barrier, reported by 60% of respondents, but this was equalled by lack of motivation (60%) and the weather (50%).

Figure A3  
*Participants' barriers to walking more*



Only one participant commented on lack of time as a barrier in their email response:

...as a keen hillwalker I love the idea of lunchtime walks, not sure yet how much I will be able to fit into my timetable.

## Influences on walking behaviour in this population

Although this is a large, heterogeneous population based within a variety of roles within one workplace, the needs assessment identified a number of common environmental, social/cultural, cognitive and biological influences on walking behaviour. These will be address in turn.

### Environmental influences

- The layout of the buildings exerts a key influence on walking. The Psychology building is spread over multiple levels and has no lift. Staff are required to walk some distance to reach crucial facilities including toilets, water, pigeon holes and lecture theatres/meeting rooms. There is a large, light and airy communal space on the ground floor, which is often used as a meeting place by students and staff alike. The main PPLS building is modern and fully accessible, with toilets and lifts on each floor. Staff are never more than a few steps from the nearest toilets, and have lift and staircase access to all other floors. There is a large common room on the top floor, which is well used by both staff and students.
- The location of the buildings within Edinburgh is very conducive to walking, being close to a large area of flat parkland and many reasonably priced eateries. Despite this, most staff tend to bring lunch in from home and eat it within their building, often at their desks. Edinburgh as a whole is a pleasant city within which to walk, although is currently undergoing major tram works, meaning that walking within the city centre is currently a less than pleasant experience.
- Many staff commute into work as the School is based centrally in Edinburgh where property prices are relatively high and parking is at a premium. This has both positive and negative influences on walking. Public transport links in Edinburgh are excellent with good, frequent buses and trains from Waverly station approximately one mile from PPLS. Many staff use public transport for their commute, which involves walking to/from bus stops or train stations. However, some staff may need to commute across long distances, restricting the time available for walking outside of work.

### Social/cultural influences

- As University staff, this population are subject to role-specific pressures resulting from others' expectations. Academic teaching staff are subject to the expectations of students that they will be available whenever needed, often during lunchtime. Academic research staff experience pressure resulting from the deadlines and requirements imposed by funding bodies. Support staff are subject to the expectations of both staff and students that they will be available to offer support when required and often at short notice. All three groups may experience pressure from their workload or colleagues to work during their lunch break, hence restricting the opportunities to fit walking into their working day.
- Research seminars and departmental meetings are often held at lunchtime to avoid coinciding with teaching, again putting pressure on staff not to take a proper break and restricting the opportunities for workday walking.
- The Health & Safety department within the University have put in place policies for increasing physical activity amongst staff and have successfully achieved a

Gold Healthy Workplace Award in recognition of their efforts. However, this has had minimal impact on PPLS staff, many of whom are unaware of this work.

#### Cognitive influences

- The needs assessment suggests that many staff believe that they lack the time to increase their walking and report a lack of motivation. It seems likely that many staff lack self-efficacy – i.e. they do not believe they are able to increase their walking – which is a crucial element of any behaviour change (e.g. PATF, 2003).
- The Physical Activity Task Force report (2003) suggests that many adults in Scotland are not clear how to achieve the government's recommendation of 30 minutes of moderate physical exercise. Walking at a moderate pace in itself meets this criteria, however anecdotal evidence suggests that most PPLS staff are not aware of this or the health benefits that walking can bring in and of itself.

#### Biological influences

- Many PPLS staff are in high pressure jobs with busy workloads. This may lead to lower energy levels by the end of the day and a decreased likelihood that they will have sufficient energy to walk in the evenings.
- The needs assessment suggests that staff are already quite physically active, and may therefore be quite physically fit. Physical fitness exerts an important influence on walking behaviour as individuals who are more fit are less likely to experience any negative consequences from increased walking (e.g. shortness of breath or tiredness), and may therefore be more likely to choose walking over alternative means of transport, or to walk for leisure.
- In terms of health, no participants reported health as being a barrier to walking. Levels of obesity amongst PPLS staff are low. Obesity is a major problem within Scotland, placing a large proportion of the population at risk of heart disease, diabetes and other causes of chronic ill health.



## **Baseline survey (pre-intervention)**

### PPLS lunchtime walking group

Many thanks for showing interest in the new PPLS lunchtime walking group. In order to plan suitable walks it would be helpful to first get an idea of your current walking behaviour. This will also help to evaluate the effectiveness of the group. I would be very grateful if you could answer the following questions.

#### Your current exercise

1. Firstly, how much walking do you currently do

1) The bare minimum (<30 mins a day average: walking short distances to/from the car/bus/train), shopping, housework, etc.)

2) A little (30 mins-1 hour a day average: popping to the shops at lunchtime, medium distances to/from the car/bus/train, walking to different sites as part of work, etc.)

3) A moderate amount (1-2 hours a day average: walking 1-2 miles as part of daily commute, short dog walks, etc.)

4) A great deal (>2 hours a day average: walking 2+ miles to/from work, hillwalking at weekends, long dog walks, etc.)

2. Do you do any physical activity other than walking?

Football

Running/jogging

Cycling

Working out at the gym

Exercise classes

Dancing

Racquet sports

Swimming

Wii Fit

Golf

Other

3. If you selected 'Other' above, please specify what other physical activity you do.

### Motivators and barriers to walking

4. What are your reasons for wanting to walk more?

I am happy with my current level of walking and don't want to walk more

To improve my fitness

To lose weight

To meet new people

To get more fresh air

To get some exercise without cost

Other

5. If you selected 'Other' above, please provide more details.

6. What do you perceive to be the main barriers preventing you from walking more?

There are no barriers preventing me from walking more

Lack of time

The Scottish weather

Lack of motivation

Unsure where to walk

Lack of appropriate footwear

Safety concerns

Health problems (e.g. shortness of breath)

Other

7. If you selected 'Other' above, please provide more details.

### Lunchtime walking

8. How long would you be able to walk for at lunchtime?

< 15 minutes

15-20 minutes

8. How long would you be able to walk for at lunchtime?

20-25 minutes

25-30 minutes

> 30 minutes

9. What time would be most convenient for you to start the lunchtime walking group?

12:00

12:15

12:30

12:45

13:00

13:15

13:30

13:45

10. Which days of the week are most convenient for you to take part in a lunchtime walking group? Please rank the days in order of preference (1=most preferred, 5=least preferred).

Monday

Tuesday

Wednesday

Thursday

Friday

11. Are there any days on which you would be unable to take part in a lunchtime walking group?

Contact details

12. Please provide your name, location and email address. This will help with planning the walking group. Please note that your responses will be stored confidentially.

13. Are you taking part in the Walk at Work Step Count Challenge 2012?

Yes

No

12. Please provide your name, location and email address. This will help with planning the walking group. Please note that your responses will be stored confidentially.

13. Are you taking part in the Walk at Work Step Count Challenge 2012?

Not yet, but I'm interested!

Thank you!

Thank you for filling out this survey. I look forward to walking with you soon!

## **Appendix C25: Behaviour change intervention: Implementing the intervention**

### Group email communications sent during the intervention

30/01/2012

Dear all,

Many thanks for expressing an interest in a lunchtime walking group, Walk at Work Step Count Challenge 2012, or both.

So far we have one Challenge team from the Dugald Stewart Building, one from Psychology and a few extra challengers.

It would be great if we could get a third team together – perhaps even a cross-department one! So please do mention it to your colleagues and if you've heard anyone mentioning that they might be interested do give them a gentle nudge in my direction :o) There's absolutely no need to be a champion walker, it's mostly meant to be a fun challenge. The only obligation is to wear the pedometer (which will be provided, and which you can keep) for as much of the 8 weeks as possible and let your team leader know your steps on a weekly basis. No need to rush off hillwalking every weekend (although obviously you're welcome to do so, we do have some glorious hills nearby).

The lunchtime walking group will not require any commitment; just turn up when you can, and there's no expectation that everyone who is taking part in the Challenge will come along to the lunchtime group and vice versa.

In the meantime, so that I am able to plan (and evaluate) the walking group, I would be very grateful if you could fill in the following survey:

<http://www.smart-survey.co.uk/v.asp?i=46399vuvor>

Thanks again – I'm looking forward to some lovely lunchtime walks!

Best wishes,

Caroline

01/02/2012

Dear all,

Many thanks for your interest in the Step Count Challenge. We now have enough for four teams – 3 teams of 5 and one of 4 (we're working on that) across PPLS :o)

The teams will be as follows:

Team 1 (Psychology): CB (leader), DD, GD, AZ, CC

Team 2 (DSB) The Reekie Ramblers: FA (leader), JA, KD, ED, SF

Team 3 (PPLS): BR (leader), AS, TN, CS, RM

Team 4 (PPLS): TB (leader), KM, CH, GP (and hopefully A.N.Other)

I have tried to organise the teams so that everyone will know at least one other person in their team, officemates aren't in competition with each other, and with a mix of people interested in coming along to the walking group and not.

I'll submit the registration form this afternoon and ask for 20 pedometers. I'll be in touch again once I've heard from the Challenge folks.

We desperately need team names! Please let me know any suggestions, otherwise your team will be arbitrarily assigned one of the cheesy suggestions I have come up with ;o)

Thanks again,

Caroline

On 13 Feb 2012, at 13:39, Caroline Brett wrote:

Dear all,

Good news! The pedometers arrived on Friday and are sitting on my desk raring to go.

I decided to try mine out over the weekend. Unlike many pedometers, the Silva Ex-step grips your clothes so there is little chance of it falling off – however if you have particularly thin clothing or are prone to acrobatics there is a clip which can be attached to both pedometer and clothing in case it becomes detached. I found it took a bit of effort to attach to thicker clothing (e.g. tracksuit bottoms). It's not too noisy and counts steps more accurately than other models I've tried in the past (although it does still miss the occasional step). Pedometers generally aren't great at recording steps taken while running/jogging but as I'm not a runner myself I can't test this one out. It does however cope admirably with stairs. I think it would be a good idea for everyone to try the pedometer for a few days (or a week) before starting the Challenge, just to make sure there aren't any problems with it and to get a baseline step count. I will purchase some spare pedometers and batteries just in case.

The groups for the Challenge are as follows:

- 1: Step-wisers - Psychology
- 2: The Reekie Ramblers – DSB
- 3: PPLS Steppers – both
- 4: Flying Tongues – both

I apologise for the latter two team names – I had to decide in a rush. CH suggested 'Talkers and Walkers' for team 4, which I think is an excellent idea – I'll change it with the Challenge folks unless anyone has any objections. I can also change team 3's name if people suggest suitable alternatives :o)

In addition to being a keen walker myself (and needing the fresh air/exercise/company), I am hoping to evaluate this Challenge/walking group as part of my health psychology training. Therefore I would be extremely grateful if those who haven't already done so could complete the following survey (many thanks to those who have :o) ):

<http://www.smart-survey.co.uk/v.asp?i=46399vuvor>

If you're not interested in coming along to the walking group (i.e. those who signed up for the Challenge only), please just ignore the questions about the walking group. Obviously.

I have attached an Excel file for people to add in their step counts. This includes a space for the baseline count – the Walk at Work folks recommend that people who are trying to increase their step count (which may apply to some but not all of you) use this baseline to set weekly goals (e.g. baseline + 10%). I've left the date for this blank as you are free to measure the baseline whenever you wish between now and the Challenge – if you're not able to measure for a whole week just note down a few days' worth and input the average daily count for the rest of the week. I would appreciate it if you could let me know your baseline step counts as, again, this will be part of the evaluation process.

For those interested in joining the walking group, I'm hoping to start this in the week of 27<sup>th</sup> Feb. It's looking like Tues/Wed/Thurs are the best days at the moment. I'm planning on going for a few 'test' walks in the next couple of weeks and if anyone wishes to join me (or suggest routes) you're welcome to do so – just let me know!

I will try and distribute the pedometers today and tomorrow – either directly to you or into your pigeonholes. There will be a participant information pack coming shortly from Walk at Work, and they have their own survey for evaluation purposes (this is a funded project).

Thanks for reading this far!

Best wishes

Caroline

17/02/2012

Dear all,

Hopefully you now all have your pedometers. A few of us in Psychology gleefully ripped open the packet and started using the pedometers straight away which is encouraging.

It's always difficult to put all the relevant information in a clear and concise manner and I've had a few people asking questions about the Challenge. It's all clear in my head but sometimes that doesn't translate too well onto the computer. I have, therefore, put together a list of frequently asked questions about the Challenge which I'm hoping you'll find useful. Do let me know if you have any other queries.

I've not yet been sent the participant packs and survey link from Paths for All, but when I was considering whether to pursue this I downloaded all the relevant information from their website, so please find attached the participant information pack from January. I can't imagine they will have changed this at all since then. The website is <http://www.pathsforall.org.uk/pfa/walk-at->

[work/walk-at-work-step-count-challenge.html](http://work/walk-at-work-step-count-challenge.html). There's a blog, which will be regularly updated with information about the Challenge and stories from participants.

It's up to each team to choose how best to collate their step counts but I'll be sending an email with ready-made spreadsheets for each team to the team leaders. Stepwisers have the spreadsheet as a Google doc which everyone can update and this has proved helpful for some people and not others so we'll play it by ear!

Many thanks and happy stepping! I'll be sending a further email about the walking group once I've tried out a few routes but it'll be starting during the week of Monday 27<sup>th</sup> Feb. All are welcome, steppers or not.

Caroline

### Step Count Challenge Frequently Asked Questions

Q: When can I start using my pedometer?

A: Whenever you like!

Q: When is the Challenge starting?

A: Monday 5<sup>th</sup> March.

Q: Why does the spreadsheet you sent start two weeks before that?

A: This is to allow you to record your steps before the Challenge starts. For those intending to come along to the walking group, this will start on the week of Monday 27<sup>th</sup> Feb and so there is space for you to record your steps before the walking group starts and during that first week.

Q: What is the point of recording steps before the Challenge begins?

A: It's probably a good idea to use it for at least a few days so that you can iron out any problems, and so that you can have an idea of your current walking amount – your baseline. A baseline is useful if you are hoping to increase your walking as it enables you to set goals (e.g. +1000 steps per day). It's also very helpful for me as I'll be evaluating the walking group and Step Count Challenge as an 'intervention' to increase walking behaviour as part of my health psychology training. The more objective information I can gather about peoples' walking before the Challenge the better, especially among those who will be coming along to the lunchtime walking group.

Q: How should I record my steps?

A: Simply attach the pedometer to your clothes, using the safety clip provided if you wish. The best location is on or near your hip as this provides the most accurate reading. Remember to take the pedometer off when changing clothes or at the end of the day so that it doesn't end up forgotten, lost or in the washing machine. My top tip for recording your steps is to keep a copy of the spreadsheet and a pen at your bedside, and at the end of each day note down your steps for the day, reset the pedometer and leave it on the bedside table ready to be put on again the next day.

Q: Do I need to record my steps every day?

A: You can record your steps as often or as little as you like as long as you're able to send a weekly total to your team leader. It's probably a good idea to get



into the habit of recording them every day where possible. Recording them every day means that if you are unable to record your steps (e.g. you forget to wear the pedometer, the pedometer fails, you're off sick or on holiday), you can just write in the number of steps taken on the equivalent day from another week (as long as it's roughly equivalent in terms of walking behaviour). It would also be helpful to me if those doing the walking group were able to record their steps every day so that we can compare steps taken on walking group days versus non-walking group days.

Q: How do I let me team leader know my steps?

A: Paths for All, who are running the Challenge, ask each team leader to send them their teams' step counts by 5pm on Tuesday of each week. Therefore, please let your team leader know your counts for the week on Monday morning. It is up to each team how they wish to do this: email, phone, text message, Google document, Dropbox, noticeboard, etc. If you're going on holiday during the Challenge (which many of us may do, given that it includes the Easter break), try and let your team leader know or, if you don't want to count steps while away let them know and they'll use an average for you from previous weeks.

Q: Do I need to set my stride length before I start measuring my steps?

A: No. The pedometer that we've been given is the basic model and can only count steps. The more advanced Silva models allow you to record your stride length and this is the model to which the instructions refer.

Q: So how will I know how far I've walked?

A: Paths for All estimate that a mile takes around 2000 steps, which will give you a crude measure of how far you've walked. Alternatively, if you're out and about you can use a website such as [www.walkit.com](http://www.walkit.com) or [www.mapmywalk.com](http://www.mapmywalk.com) to calculate distance, or the old fashioned method of a map and a piece of string!

Q: What if I forget to wear my pedometer?

A: Just input an average for the day(s) you missed: either the average number of steps taken on that day (e.g. Monday) or the daily average from the last weeks' worth of counts.

Q: I'm going to a wedding and will be wearing a dress. Do I still have to wear the pedometer?

A: I will defer to your better judgement here. There's no need to spoil a lovely outfit.

Q: What if I lose my pedometer?

A: I have a couple of spare pedometers in my office so just let me know. But do look after your pedometer if at all possible!

Q: What if my battery goes flat?

A: I have spare batteries in my office so just let me know.

Q: Who is running the Challenge?

A: Paths for All. Further information is contained here (there's also a blog for the Challenge): <http://www.pathsforall.org.uk/pfa/walk-at-work/walk-at-work-step-count-challenge.html>.

Q: What if I have further questions?

A: Just ask! I'm on [REDACTED] or 504005, and am based in S6 in the Psychology building at 7 George Square.

17/02/2012

Dear team leaders,

Many thanks for volunteering (or agreeing to be volunteered!) to lead your team in the Step Count Challenge. Please find attached a spreadsheet for each group, which you can use to input each member's step counts over the 8/9 weeks of the Challenge. You can of course adapt it in any way you want, or not use it at all.

It's completely up to you how you collect your team's step counts, the only stipulation for the purposes of the Challenge is that someone needs to let Paths for all know by 5pm on Tuesday of each week. I'm perfectly happy to send in the step counts for any number of teams – just let me know what you'd prefer. Obviously for the Reekie Ramblers it might be easier for Frankie to collect the counts herself as you're all located in roughly the same area, but again it's up to you.

For the purposes of my evaluation I would be very grateful if team leaders could forward the weekly step counts to me – I suppose this could happen weekly if I'm then going to forward them on to Paths for All on your behalf, or simply at the end. I'd be grateful if you could encourage your team members to complete their individual spreadsheets with the daily counts (or averages, as appropriate) as I'm hoping to use this as a semi-objective measure of walking behaviour over the course of the 'intervention'.

If you're likely to be on holiday or away from the office on a Monday/Tuesday during the Challenge then again I'm perfectly happy to collect the step counts on your behalf – just let me know.

I'm hoping this will be an enjoyable challenge and won't take up too much of your time – if it's becoming burdensome do let me know and I'll happily help out.

Thanks again,

Caroline

On 24 Feb 2012, at 14:19, week 0

Dear all,

Welcome to the first of my weekly Step Count Challenge emails – I'll generally be sending them on a Monday to remind you to send your weekly step counts to your team leaders (the weeks will run from Monday to Sunday), offer encouragement and suggest tips for increasing your step count. This week's email is slightly early to give advance notice of the walking group, which will be starting next week. You will also probably be receiving similar emails from Paths for All, who are organising the Challenge.

I hope you're all raring to get going with the Step Count Challenge, which officially starts a week on Monday. A few of us have already been counting our steps for over a week now and the results have been fascinating – it's amazing how quickly the steps mount up! For example, walking between Psychology and DSB takes around 200 steps, walking down (or up) the stairs in DSB 200 and walking round George Square takes around 600 steps. Paths for All encourage teams to set themselves challenges – e.g. walking a set distance (using their approximate value of 2000 steps per mile), increasing your steps by 10% per week, etc. I'd encourage each team to consider setting a challenge, or perhaps mapping out the distance covered.

Hopefully most of you have been able to measure a few days' worth of steps for your baseline – if not, try and do that over the next week. It's a good chance to check out the pedometer and find the best position for it, the best way to attach it to awkward clothes, etc. I'd also really appreciate it if you were able to take at least 3 days' worth of counts before the Challenge begins, and let me know your step counts so that I can evaluate its impact (if any) on your walking behaviour.

The best days for the lunchtime walking group were without doubt Tuesday, Wednesday or Thursday and the most popular time was 1pm. Next week I'm out of the office on Thursday and it's probably a good idea if I'm there for the first couple of walks at least! We'll meet at the corner of the Informatics building (opposite Neuroscience at 1 George Square) and then take one of several walks I've devised (these are subject to alteration and I'm completely open to new suggestions).

This week the walking group will meet on:

Tuesday 28<sup>th</sup> February at 1pm

Wednesday 29<sup>th</sup> February at 1pm.

Everyone's welcome to attend the walking group – I know that several people are not able to make it, or are just interested in the Challenge, but I'll include the details in the weekly email so that everyone is kept in the loop. I'd appreciate it if in the first week at least you could let me know if you're intending to come along so that I know how many people to expect and so that we don't head off without anyone.

If anyone has any questions, suggestions or problems with the pedometer then do let me know.

Many thanks,

Caroline

05/03/2012 – week 1

Good morning

You'll hopefully have all already received an email from Carl Greenwood announcing the official start of the Step Count Challenge 2012!!

Most of us have already been recording our steps for a few days if not more to get into the habit. If you have any step counts from the last few days/weeks, do pass them on to me as this 'baseline' data will be vital for my evaluation.

For those of you who haven't yet got into the habit of recording your steps, now's the time to start! I've found it helpful to have the chart or a piece of paper by my bedside, and at the end of each day when I take off the pedometer I note down my steps for the day and reset the pedometer. I'm sure others have similar techniques for jogging their memories. I have to admit that I forgot to wear the pedometer on one day so far, in which case I just put in the step count from a similar day the previous week.

Carl already offered some great suggestions for increasing your step count, but just to add that simply walking to Tesco (or other shops along Clerk Street) and back at lunchtime takes me 1200 steps – it all adds up! Occasionally on a Sunday I spend most of the day indoors (this is something I need to change now that the weather is getting nicer and the days longer), so have resorted to walking up and down the living room or using my Wii Fit balance board to up my step count. Goodness knows what the neighbours must think!

Thanks to everyone who came along to the walking group last week – it was great to meet new people and make new friends. This week I am away on Tuesday and Thursday so the walking group will take place on Wednesday. We've discovered that 1pm can be a bit of a struggle for staff involved in teaching, so the walking group will meet at 1.05pm this week. It's likely that we'll be walking round the Meadows so if anyone is running late or can't make it for 1.05 then feel free to take a walk around the Meadows yourself – you might even catch us up!

For those who may have mislaid the step count sheet, I have attached it again here. Feel free to use your own version if you'd prefer. I'm looking forward to receiving the first update from team leaders next Monday!

Thanks again and happy stepping!

Caroline

12/03/2012 – week 2

Dear Step Count Challengers,

I trust that you are all getting on OK with your pedometers and remembering to note down your step counts on most, if not all days. If anyone is having any problems with their pedometer – e.g. battery failing, it decided to make a bid for freedom, etc. – just let me know. I have spare batteries and a couple of spare pedometers.

This is just a gentle reminder to let your team leaders know your step counts for Week 1 (5<sup>th</sup>-11<sup>th</sup> March) today or tomorrow morning at the latest.

Team leaders, please let me know your teams' step counts as soon as possible so that I can pass them on to Carl at Walk at Work tomorrow.

I'd also really appreciate it if anyone who has any baseline step counts could let me have these so that I can use them for my evaluation – I'm happy to accept these either individually or from team leaders on behalf of their teams.

Having read the Challenge blog I notice that many teams/workplaces are selecting specific distance-related challenges for themselves. I've had a few suggestions forwarded to me for places we, as PPLS, could aim for (using 2000 steps/mile):

- Walk from Edinburgh, Scotland, to Edinburgh, Illinois, USA (3771 miles, 47000+ steps average per person per week), or to Edinburgh, Zimbabwe (9384 miles, 117000+ steps/week), or to Edinburgh, Mpumalanga, South Africa (9990 miles, 124000 steps/week)
- Walk from Edinburgh Castle to Edinburg Castle bar in San Francisco, California (5047 miles, 63000+ steps/week)
- Walk along the Great Wall of China (5500 miles, 68000+ steps/week, or 3900 miles, 48000+ steps/week)
- Walk in a set direction from Edinburgh and see how far we get! (This could also form the basis of a competition between the four teams, although it would be nice to have a shared goal too)

Let me know what you think or if you have any other suggestions

I'll email round the step counts for each team once I have them as I know a few of us are dying to know how we're all getting on!

The walking group this week will meet on Wednesday, at 1:05pm, and we'll walk up to the castle and round.

Cheers

Caroline

13/03/2012 – week 1 results

Dear steppers,

Congratulations on completing your first week of the step count challenge!!

The results for this week are as follows:

4. Talkers and Walkers 296144 (148.1 miles)

3. Step-wisers 311689 (155.8 miles)

2. PPLS Steppers 342750 (171.4 miles)

1. Reekie Ramblers 471689 (235.8 miles)

Congratulations to Reekie Ramblers on an amazing first week!

Overall, we've walked 1,422,272 steps and covered 711 miles (assuming 2000 steps/mile). If we're heading west to San Francisco, we're somewhere in the Atlantic just off the coast of Ireland, and if we're heading south to Africa we're roughly level with Limoges in France.

Keep up the good work!

I've not decided on local prizes yet, but it would be nice to celebrate everyone's participation so I'm hoping to have a get-together, possibly even with nibbles (gasp!), around halfway through the Challenge. I'll keep you posted :o)

Thanks!

Caroline

19/03/2012 – week 3

Good morning

I hope you all had the chance to enjoy the lovely weather in Edinburgh over the weekend. My step count was fairly low for Sunday so I persuaded my husband to accompany me on a circular walk along the canal and back along the Water of Leith – sadly tramworks curtailed our walk but I was able to rack up an extra 11,000 steps before returning home for a well-earned cup of tea. It's amazing how quickly the steps add up – a quick shop round Sainsburys added an extra 1000 steps while on Saturday I walked into town and round the shops and managed 12,000 in one go.

I've already had the weekly step count from one team this morning so just a quick reminder to make sure you send your step counts to your team leaders asap. I look forward to seeing how far we've collectively walked so far!

The walking group this week will be on Tuesday, at 1:05pm, and we will walk up to the castle. Anyone interested in coming along to the walking group please do let me know so I know who to expect. I'm also going to come clean and admit that last week I was a bit late for the walking group and may have missed people, so it's always worth waiting about 5 minutes after the allotted time just in case of stragglers!

Best wishes,

Caroline

21/03/2012 – week 2 results

Dear steppers,

Congratulations on completing your second week of the step count challenge!!

The results for this week are as follows:

4. Talkers and Walkers 286459 (143.2 miles)
3. Step-wisers 323776 (161.9 miles)
2. PPLS Steppers 390811 (195.4 miles)
1. Reekie Ramblers 530337 (265.2 miles)

Congratulations to PPLS Steppers for the biggest improvement since week 1 – 48061 extra steps or 14% of their total!

Overall, we've walked 2,953,544 steps and covered 1477 miles (assuming 2000 steps/mile). If we're heading west to San Francisco, we're halfway across the Atlantic, and if we're heading south to Africa we're roughly level with Khenchela in Algeria. An alternative destination of Dunedin in New Zealand has been suggested, and if we're heading there we're about level with Chisinau in Moldova.

Keep up the good work!

I'm hoping to organise a get-together for the middle of the challenge and will put together a survey for folks to indicate which dates they're free on – I may also slip in a couple of questions about walking as part of the evaluation but the main point will be arranging a suitable time for the get-together.

Thanks!

Caroline

26/03/2012 10:52, week 4

Good morning!

And what a beautiful morning it is, too. I hope you are all well and had the chance to enjoy the lovely weather yesterday.

This is just a friendly reminder to submit your step counts for week 3 (w/b 19<sup>th</sup> March) to your team leaders just as soon as you're able.

I had planned on sending out a short survey with this email to see when you all were available for a short get-together over the next couple of weeks. However, having carefully designed the questions I wanted to ask and writing it on the back of a journal article reporting the results of a pedometer-based walking study amongst university employees (see, evidence-based and everything) I promptly left it at home. So I will be in touch again tomorrow with a link to the survey.

The walking group has sadly suffered from low attendance the last couple of weeks but I'm hoping the improved weather will inspire you all so the walking group will be on two days this week – Tuesday and Wednesday – again at around 1.05pm and again meeting outside the Informatics building (specifically at the concrete block on the corner there). I'm thinking a lovely walk around the Meadows to admire the daffodils would be a great antidote to sitting at my desk all day! It's amazing how much a 25-minute walk can add to your step count total for the day (generally I add around 3-4000).

If anyone has any pedometer-related problems do let me know. I've just managed to source a spare pedometer on eBay and I have a lot of spare batteries (one each, in fact).

Thanks and enjoy the sunshine!

Caroline

27/03/2012 – week 3 results

Hello

Well, the results for week 3 are in and there's been some movement in our results table. Two members of Talkers and Walkers tackled munros over the weekend, which boosted their total and their position for the week

4. Step-wisers 333914 (167.0 miles)
3. Talkers and Walkers 335785 (167.9 miles)
2. PPLS Steppers 412180 (206.1 miles)
1. Reekie Ramblers 574947 (287.5 miles)

Congratulations to everyone as all teams' step counts are increasing week on week! We've now walked 4,610,481 steps and covered 2305.2 miles!! That's not bad going for just three weeks.

Heading to New Zealand, we're about level with Tbilisi in Georgia; heading south we're in Libya and heading west we're most of the way across Newfoundland.

As promised (or threatened?), here is a link to a survey asking a few questions about how you're getting on with the Challenge so far and when you might be free next week for a small get-together. As we're so close to Easter, I imagine that a few people might be away, but never fear, I hope to arrange a bigger 'do' to celebrate the end of the Challenge so hopefully most people can make it to at least one. If you have any ideas for locations (I had been thinking the DSB common room, but I'm not sure of its availability) or activities then do let me know. I'd be grateful if as many people as possible could complete the survey as it will be very useful for my evaluation. I've asked people to indicate their initials in the survey – this is just so that I can link any responses to your step counts (in a purely objective way)

<http://www.smart-survey.co.uk/v.asp?i=49603clrlv>

Many thanks,

Caroline

01/04/12 – week 5  
Dear Challengers,

This week's email comes to you a little early and from a train somewhere in the Cambridgeshire countryside (I hope ? I've not tried sending it yet). I'm on my way to London for a flying visit to attend a workshop tomorrow. I hope you're all still enjoying the Challenge!  
I'm expecting a bumper crop of step counts for week 4 as we all rushed out to enjoy the unseasonably warm weather!

This is just a quick reminder to send your step counts for week 3 to your team leader as soon as you can. PPLS Steppers should send their counts for this week and next to me as Beverly is enjoying a well-earned break over Easter. Many of you will no doubt also be away over Easter but do keep on recording your daily step counts if you can. It would be shame to miss out a few days as we often walk more on holiday, especially if we're out and about rather than sitting at our desks all day.

Thank you to everyone who has completed the survey so far. At the moment it's looking as if Thursday lunchtime might be the best time for our 'get-together' but I'd encourage as many people as possible to complete the survey just in case. I should be able to check responses while in London and if it's looking like Tuesday might be a better day (it's currently a close second) I'll try and let you all know tomorrow.

Here is the link to the survey:

<http://www.smart-survey.co.uk/v.asp?i=49603clrlv>



I'd be very grateful if folks could complete this ? there's only a few questions and one respondent so far managed to complete it in 40 seconds! So it shouldn't take up too much of your time.

Walking group attendance was boosted last week by the glorious sunshine. This week the group will meet on Wednesday at 1.05pm at the usual place. Do let me know if you're coming just so we don't leave without you; however you're welcome to just turn up too as I appreciate that circumstances can change.

Thanks again and I hope to see many of you this week!

Caroline

03/04/2012 – week 4 results

Dear Challengers,

I hope you are still enjoying the Challenge.

Here are the results for week 4, which will go down in history as being the week when summer arrived early in Edinburgh! Once again there has been a wee bit of movement in the league table.

4. Talkers and Walkers: 345651 (172.8 miles)

3. Step-wisers: 391152 (195.6 miles)

2. PPLS Steppers: 483089 (241.54 miles)

1. Reekie Ramblers: 530169 (265.1 miles)

Watch out Reekie Ramblers, the PPLS Steppers are catching up! I'm so impressed with us all as we've walked 6,360,542 steps so far and covered 3180 miles!! Amazing. I suspect the weather may cause some problems this week but hopefully we'll all still keep up the good work!

Thanks to everyone who completed the survey – the most popular time was Thursday lunchtime. So, the get-together will be from 1pm on Thursday in the DSB common room. For those of you who I've not met yet, I'll be the one surrounded by nibbles (mostly of the chocolate variety). ;o) Do come and help me eat them! I'll probably try and be there from around 12.45. Anyone who isn't able to make it on Thursday may find a small something in their pigeonhole instead :o)

For those of you who have a spare moment (not many of us, I know!), do please complete the online questionnaire. It's only a few questions. It's been pointed out to me that one of the questions (about strategies to increase your step count) that I thought was multiple choice is in fact single choice – apologies for that. I'm not able to change it without losing everyone's responses so far which would be a real shame. If you are using more than one strategy (as most of us are, I suspect), please select the main one. In true health psychology style I'll be asking the same questions again at the end of the Challenge and will try and get it right that time!

<http://www.smart-survey.co.uk/v.asp?i=49603clrlv>

Thanks and hopefully see many of you on Thursday!

Caroline

09/04/2012 – week 6

Dear all,

I hope this finds you well and not too full of chocolate eggs! It was lovely to meet a few of you at the get-together last week and to share hints and tips on increasing step counts. I'm seriously considering trying to attend a Zumba class before the end of the Challenge (and beyond) after hearing what a difference it can make.

It's been great to see how everyone's step counts have improved over the weeks, and to hear the different ways people have managed to fit extra bits of walking into their already busy lives. I really hope we can all keep it up (as far as possible) after the Challenge has finished. I'm certainly going to try and fit more exercise in, particularly while watching TV at home.

Anyway do try and get your step counts to your team leaders (and PPLS Steppers to me) as soon as you can. I know many of you may be off work today or on holiday this week but it would be great if we could have a complete record again this week :o)

Having been inspired by other Challengers' stories, I've decided to run the walking group twice this week: on Tuesday and Thursday (I'm out of the office on Wednesday). On at least one day we'll walk up to the castle as I need to collect some tickets from the Hub and it's quite a nice walk, and on another day we'll walk round the Meadows. Do let me know if you plan on coming along on either day – I will wait about 5 minutes after the allotted time though so if people decide to come at the last minute (e.g. waiting to see what the weather is doing!) that's fine too. We'll meet at 1.05 at the usual location.

Cheers,

Caroline

16/04/2012 – week 7

Good morning

Welcome back to those of you who have been away (quite a few of you, judging by the number of out of office replies I received in response to last week's email!), I hope you all had a restful holiday. This is just a gentle reminder to send in your step counts for week 6 (week beginning 9<sup>th</sup> April) to your team leaders. I'm collecting Talkers and Walkers step counts this week as Thomas is out of the office today :o)

Last week's results are a bit patchy as a few people's counts were pro-rated to fill in some gaps. However, the results are in:

4. Step-wisers 327741 (163.9 miles)
3. Talkers and Walkers 349004 (805.6 miles)
2. PPLS Steppers 395168 (197.6 miles)
1. Reekie Ramblers 539221 (269.6 miles)

Totals are slightly down from last week but this is mostly due to people being on holiday or otherwise away from their normal routines.

So far we have walked 7,967,257 steps and covered approximately 3983 miles. If we are heading to California, we are just near the border between Iowa and Nebraska, if we're heading south we're into the Democratic Republic of the Congo, and if we're heading east towards New Zealand we're somewhere in the Arabian Sea.

It would be great to reach 10,000,000 steps by the end of the challenge – I'm sure we'll make it as we've been covering at least 1.5million steps most weeks! Phenomenal!

I've still not managed to reach my own personal goal of 100,000 steps in a week but am hoping that I will manage this in the last two weeks of the Challenge. I know a few people, myself included, are keen to carry on using the pedometer and trying to increase our steps after the Challenge ends – if you'd be interested in being part of this please do let me know – kind of like a mini Challenge. I'm not expecting everyone to do the same (although the pedometers are now yours so you're welcome to do so informally).

The walking group will meet on Tuesday and Thursday again this week. Where we walk will depend on who comes along and where they'd like to go! It would be helpful if people could let me know if they plan on coming along, but as always anyone is welcome to turn up after checking out the weather! It'll be at 1.05 as normal.

I need to start thinking about an event to mark the end of the Challenge - the midway get-together suffered from being so close to Easter and a lot of people weren't able to make it. I will keep you all posted – it will probably be after the end of the Challenge, possibly in the first week of May.

Keep on stepping!

Caroline

23/04/2012 – week 8

Dear Challengers,

This email is a little late this week as I've been putting together a final survey which I'd be very grateful if you could all fill in when you get the chance. Apart from anything, I'm hoping to organise a final get-together to celebrate our achievements and it would be good for as many of you as possible to come along. The survey is a bit longer than the previous ones but will hopefully not take you too long to fill in - somebody managed to fill in the last survey in just under a minute so hopefully this one won't be too much longer!

The survey link is:

<http://www.smart-survey.co.uk/v.asp?i=51087enufj>

We've all done brilliantly during the Challenge and definitely deserve a collective pat on the back. I'm personally aiming for 100,000 steps (whether I'll make it or not is another matter!) as a final push in this last week. The walking group will be on Tuesday this week although where we'll go will really depend on the weather!

The results from Week 6 are looking good:

4. Talkers and Walkers 316,313 (158.2 miles - an accurate calculation this week!) 3. Step-wisers 319,663 (159.8 miles) 2. PPLS Steppers 395,717 (197.9 miles) 1. Reekie Ramblers 538,267 (269.1 miles)

We are nearly at 10,000,000 steps between us and have probably already long past that after week 7's efforts: 9,549,039. We've covered 4774.5 miles! Well on our way to all our potential destinations.

Well done to Frankie from the Reekie Ramblers, whose photo of Gullane Beach appeared on the Step Count Challenge blog. My own efforts did not :o(

Fingers crossed that one of our teams will win something in the prize draw, although of course we're all winners just for having taken part :o)

Do send your step counts to your team leaders as soon as you can, and enjoy the final week of the Challenge! A few of us in Psychology are keen to continue counting our steps and possibly have a mini-competition, so if anyone would like to join us do let me know!

Right, I'm off to think about what prizes I'll be giving out at the get-together... ;o)

Thanks!

Caroline

01/05/2012 – week 7 results

Dear Challengers,

Congratulations for making it to the end of the Step Count Challenge 2012! You've all done an amazing job in measuring your steps and passing them on to your team leaders each week, for which I'm very grateful!

We've all also made great progress in increasing our step counts so definitely deserve a metaphorical pat on the back.

Apologies that this email is a day late this week - I was out of the office yesterday and away over the weekend.

The results from Week 7 are as follows:

Step-wisers 336,115 (168.1 miles)  
Talkers and Walkers 386,860 (193.4 miles) PPLS Steppers 429,675 (214.8 miles) Reekie Ramblers 584,646 (292.3 miles)

In total we have walked 11,286,335 steps or 5643.2 miles. I will work out where we've got to after I have the week 8 totals too (which reminds me, please send your step counts to your team leaders asap if you haven't already done so)...

I'd be very grateful if as many of you as possible could fill in the survey below - not least so that I can have an idea of when people are free for a final get-together. It's likely that this will be held next week now as this week is already upon us!

<http://www.smart-survey.co.uk/v.asp?i=51087enufj>

The survey has been taking around 3-5 minutes to fill in but I would be extremely grateful if you could fill it in as this will be very helpful to me in evaluating the Challenge and how it has impacted on our walking behaviour (if at all!)

I will be handing out spare batteries for the pedometers at the get-together (mine died last week so I imagine that most of them will be needing new batteries shortly). If you're not able to get to the get-together and would like a new battery, let me know - obviously you may never want to wear the pedometer again but it's always useful to have the option)

Thanks again for your sterling efforts and I'll be in touch soon with our final total and details of the get-together

:o)

Caroline

25/05/2012 – post-Challenge

Dear Challengers (or ex-Challengers, perhaps),

I hope you are all well and enjoying the lovely weather. Shame it wasn't like this during the Challenge - I know my count would have increased, that's for sure!

This is just a wee email to remind those who agreed, and ask those who haven't as yet, that I'd be very grateful if we could all wear our pedometers just for one more week, and let me know the results. In the last survey I suggested starting on Monday 28th May but there's no need to start on Monday. I'm going for a walk tomorrow so I might start then, for example! If you're not able to complete a full week, just do what you can and let me know your daily counts - I'll be calculating an average daily count for us all anyway.

This is purely for my evaluation purposes, as it would be good to see whether we've all been able to keep up the good work we started during the Challenge in terms of walking more, etc. I'm hoping to write up in the next week or so and it would be very helpful if the counts could be in by Wednesday 6th June (earlier if you can manage it, although I appreciate that a lot of people might be off over the Jubilee weekend).

If anyone needs a spare battery, do let me know (even if you're not doing this last count).

Now, the moment you've all been waiting for, the results!

The final counts are as follows:

Reekie Ramblers 4,290,070 (2145 miles)  
PPLS Steppers 3,259,301 (1629.7 miles)  
Step-wisers 2,647,533 (1323.8 miles)  
Talkers and Walkers 2,623,933 (1312 miles)

Total = 12,820,837 or 6410.42 miles. My Google programme let me down, so I've had to go to a different website to calculate how far we've travelled. If we're heading towards San Francisco we made it a while ago and are now either in the middle of the Pacific Ocean (not far from Hawaii), or lounging in the Edinburgh bar. If we're heading south we've made it to the bottom of South Africa and are paddling in the Indian Ocean. If we're heading towards New Zealand we have made it as far as Georgetown, Malaysia. I've always wanted to go to Malaysia so I'm especially pleased about this one. :o)

Sadly, none of us won any of the prizes offered by Paths for All. However, to make up for this disappointment I have some prizes of my own:

Highest step count (team): Reekie Ramblers Highest step count (individual): ED, Reekie Ramblers: 1,193,544 (average 21313 steps a day) Biggest improvement in a single week: GP (Talkers and Walkers): 185.54% from weeks 3-4 Biggest improvement overall: CS (PPLS Steppers): 165.02% from week 1 to week 8 and a whopping 203.80% from baseline to week 8. 7 people achieved the milestone of 100,000 steps in a single week: TB (T&W), TN, AS & CS (PPLS Steppers) and FA, SF, & ED (Reekie Ramblers).

Most of the prizes were handed out at the get together back in May, however a few people weren't able to make it so I will try and get your prizes to you asap.

Thanks again for all your hard work and I hope we're all able to continue walking more, especially now that the weather is nicer.

If anyone is interested in carrying on with a mini-challenge, do let me know as a few people were keen on having another go during the summer when the weather is more pleasant and the workload less pressing :o)

Thanks!

Caroline

## **Appendix C26: Behaviour change intervention: Evaluation of the intervention**

### Walking behaviour

The mean daily step counts and percentage increases for all participants at baseline and for all 8 weeks of the Step Count Challenge are shown in Table 1 and background demographics and individual step counts for all participants are shown in Table 2. Although step counts increased from 9933 per day at baseline to 10961 per day in week 8, this difference was not significant ( $t(19) = -1.561, p = .135$ ). However, the average daily step count across the whole Challenge was significantly higher than at baseline (9933 vs. 11397,  $t(19) = -2.444, p < 0.05$ ), suggesting that participation in the Challenge in itself increased walking behaviour. The average percentage increase was 104.69%. The weekly increases during the first half of the Challenge were significantly greater than during the second half (110.48% vs. 100.08%,  $t(19) = 2.758, p < 0.05$ ). The average daily step counts were significantly higher amongst support staff than academic staff (9312 vs. 13481,  $t(18) = -3.125, p < 0.01$ ), but there were no significant differences in the percentage increase between the two groups in any individual week or overall.

Table 1

Mean (SD) step counts and percentage increase for all participants across the 8 weeks of the Step Count Challenge

Week	Mean (SD) step counts	Mean (SD) % increase
Baseline	9933.69 (3215.99)	-----
Week 1	10159.09 (3360.04)	107.48 (30.66)
Week 2	10938.45 (3629.48)	111.29 (25.22)
Week 3	11834.47 (3965.89)	111.16 (29.55)
Week 4	12468.87 (3852.54)	109.75 (29.28)
Week 5	11274.95 (4487.25)	92.01 (28.27)
Week 6	11129.80 (4041.31)	104.08 (32.88)
Week 7	12409.26 (4640.57)	114.08 (27.00)
Week 8	10960.73 (3993.09)	90.13 (17.56)
Challenge	11396.95 (3605.34)	104.59 (4.87)
Weeks 1-4	-----	110.48 (12.45)
Weeks 5-8	-----	100.08 (6.77)

Participants' comments indicated that the intervention had been successful in motivating and enabling them to increase their walking behaviour:

...if I think that I started with 39 000 steps or so a week, I think the challenge really made a difference...

I don't want my achievement to go unmemorialized: I got up to 59,727 steps last week, about double what I did the previous week!

I hope you have enjoyed all the walking and found it inspiring for future - I certainly did.

Many participants described the intervention as 'inspiring' and suggested that it had made a lasting impact on their lives:

I noticed last week that I am beginning to lose a bit of weight so I must have reached the level that is beginning to burn off the fat – *so that's my incentive*.

Thanks again for inspiring me to take up walking again - I have rediscovered my love of this pastime! I am really enjoying the challenge too and it is encouraging me to move more. Can we keep it going even when the "official" programme ends.

It is fantastic and so inspirational and motivating.

It has made me more aware of the amount of walking I was doing and it has made me want to walk more to keep up with the rest of my team. I would be keen to carry it on for longer in to the summer when the weather will be nicer and I can get out more frequently and will start my walks after dinner which we often do as a family in the summer.



Table 2

*Individual participants' step counts at baseline and for the 8 weeks of the Challenge*

Participant	A/S	Sex	Age	Base- line	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Average	
Team 1	CB	A	F	30-39	9877	9755	11253	11097	12031	12374	12270	10741	11677	11400
					98.77	115.35	98.62	108.42	102.95	99.16	87.54	108.71	102.43	
	DD	A	F	20-29	6810	11930	10222	10315	11802	7428	6379	11467	10655	10025
					175.19	85.68	100.91	114.41	62.94	85.87	179.76	92.92	112.21	
	GD	A	F	30-39	7894	8546	8623	9344	10459	8632	9527	9367	7988	9061
					108.25	100.90	108.37	111.93	82.53	110.37	98.32	85.27	100.74	
CC	A	F	30-39	6934	8077	8491	8680	9568	8566	9050	8737	7044	8527	
				116.49	105.12	102.23	110.23	89.53	105.66	96.54	80.63	100.80		
AZ	A	F	20-29	12167	6218	7665	8254	11387	8172	8483	7704	8271	8271	
				51.11	123.27	107.83	137.77	71.76	103.81	90.83	107.35	99.21		
Team 2	FA	S	F	30-39	15683	18010	18744	20045	20045	15932	22918	19792	18896	
					114.84	104.07	106.94	100.00	79.48	143.85	86.36	105.08		
	JA	S	F	30-39	9609	13251	10938	12621	11908	12445	11220	11408	11675	
					137.91	82.54	115.39	94.35	104.50	90.16	101.67	103.79		
	SF	S	F	20-29	13157	14076	15619	15289	14621	14630	11302	14462	14395	
					106.99	110.96	97.89	95.63	100.06	90.92	108.72	101.60		
ED	S	M	30-39	16405	20124	23148	21702	21373	23475	24637	20069	21367		
				122.66	115.03	93.75	98.48	109.84	104.95	81.46	103.74			
KD	S	M	30-39	12529	10300	13686	6081	9085	10413	11443	8667	10276		
				82.21	132.88	44.43	149.41	114.61	109.90	75.74	101.31			
Team 3	BR	S	F	30-39	8078	7301	7276	11167	12131	7691	11061	9328	9118	9384
					68.08	99.67	153.47	108.63	63.40	143.81	84.34	97.75	105.18	
	AS	S	F	50-59	8394	9277	10991	9611	15195	6448	6090	8663	8298	9322
					101.48	118.47	87.45	158.10	42.44	94.45	142.25	95.79	106.18	
	TN	S	F	30-39	10436	13800	15469	15305	16932	15725	12461	14861	14936	14936
					106.16	112.09	98.94	110.63	92.87	79.24	119.26	100.51	105.72	
CS	S	F	50-59	6237	7703	10881	11155	12634	14131	14029	15438	12711	12335	
				121.36	141.26	102.52	113.26	111.85	99.28	110.05	82.34	110.51		
RM	S	M	40-49	10350	10883	11213	11645	12121	12457	12890	13091	13495	12224	
				105.15	103.03	103.85	104.09	102.77	103.48	101.56	103.08	103.38		
Team 4	TB	A	M	50-59	5709	6227	12953	10016	15144	9488	15251	8665	10432	
					109.07	208.02	77.33	151.19	62.65	160.73	56.82	117.97		
	KM	A	F	30-39	13156	13938	9394	8854	9226	11617	7850	11797	10447	10390
					105.93	67.40	94.26	104.20	125.92	67.57	150.29	88.56	100.52	
	CH	A	F	50-59	9355	6759	8686	10143	7275	5201	11553	13280	6304	8650
					72.25	128.52	116.77	71.72	71.49	222.12	114.95	47.47	101.31	
GP	A	M	50-59	4777	8532	5498	10201	6965	6700	7074	5772	6940		
				178.60	64.44	185.54	68.27	96.20	105.58	81.60	111.46			
PR	A	F	20-29	11123	8083	10521	12660	7916	7870	7864	9434	9434		
				72.67	130.15	120.33	62.53	99.42	99.93	119.96	100.71			

Motivation and self-efficacy

Participants' motivation and self-efficacy at the midpoint of the Challenge element of the intervention and post-intervention are shown in Figures 1 and 2. Motivation to walk more decreased slightly across the two time points but the two self-efficacy measures remained high.

Figure 1  
*Participants' motivation and self-efficacy in week 4/5*

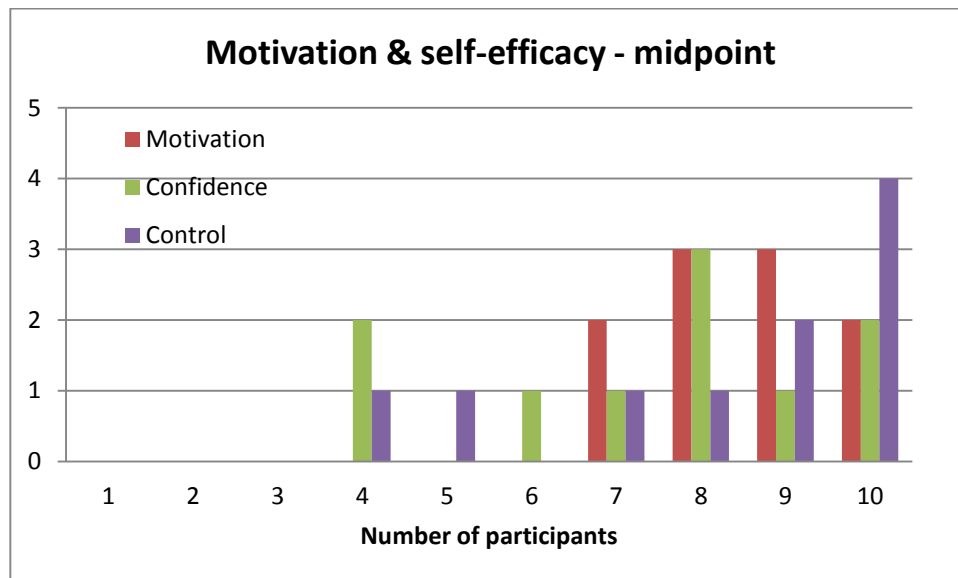
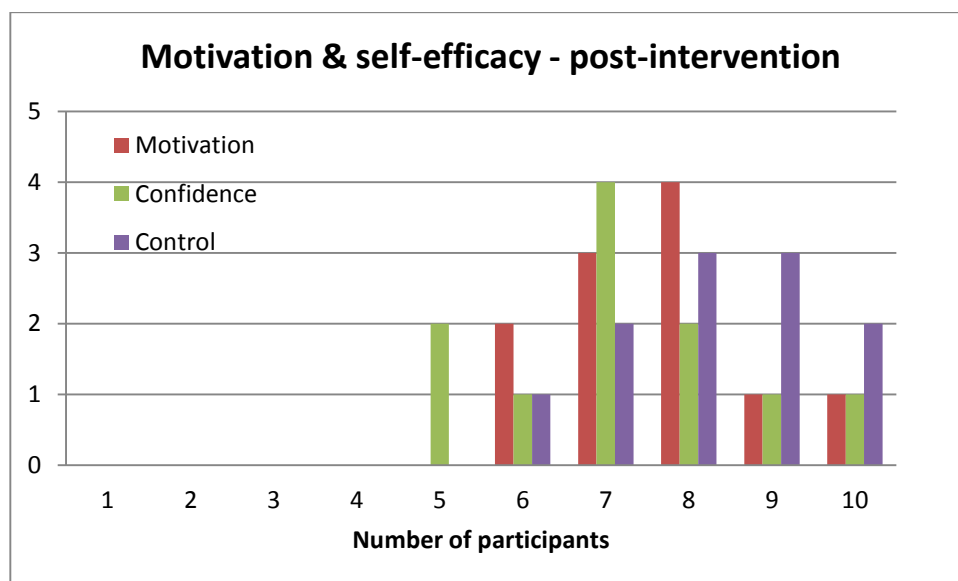


Figure 2  
*Participants' motivation and self-efficacy to walk more post-intervention*



Nine participants completed both the second and third surveys. At the midpoint of the intervention, motivation to walk more was high (mean = 8.33), with 80% indicating this had increased since starting the intervention, and did not significantly reduce by the end (mean = 7.67,  $t(8) = 2.000$ ,  $p = .081$ ). Confidence and control also remained high (confidence: mean = 7.11 vs 7.22,  $t(8) = -.147$ ,  $p = .886$ ; control: mean = 8.00 vs 7.44,  $t(8) = .618$ ,  $p = .554$ ). These two measures were significantly correlated at both time points, suggesting they represent a coherent measure of self-efficacy.

#### Goal setting and use of strategies

Participants were encouraged to set individual walking-related goals throughout the Challenge. Table 3 summarises the goal setting reported by survey respondents at the midpoint and endpoint of the Challenge portion of the intervention.

Table 3  
*Participants' reported goal setting*

	<b>Midpoint</b>	<b>Endpoint</b>	<b>Post</b>
Any goals set (N/% Yes)	5 (50.0)	7 (63.6)	1 (9.1)
Goals achieved? (N/% Yes)	N/A	5 (45.5)	N/A
<b>Specific goals (N):</b>			
Increase steps generally	0	2	0
Increase steps by specific amount	1	1	0
Achieve >10,000 steps/day	2	0	0
Achieve >15,000 steps/day	1	1	0
Achieve >100,000 steps/week	0	1	0
Other goal	0	1	1

Participants reported using a number of strategies to increase their walking, many of which were very successful at increasing step counts. A summary of the strategies reportedly used by survey respondents during the intervention is in Figure 3, while Figure 4 shows those strategies which respondents intended to continue to use to maintain their walking behaviour after the intervention.

Figure 3  
 Strategies employed by participants during the intervention

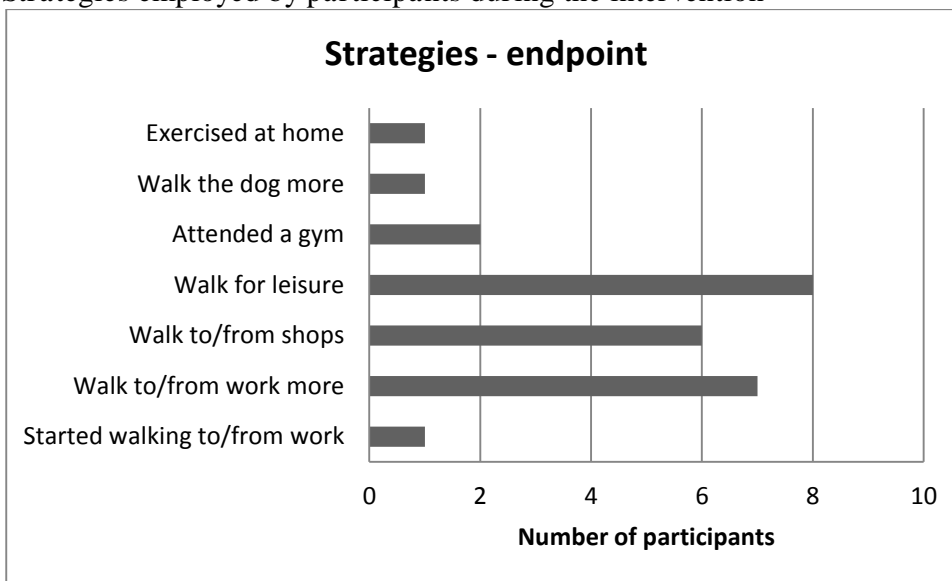
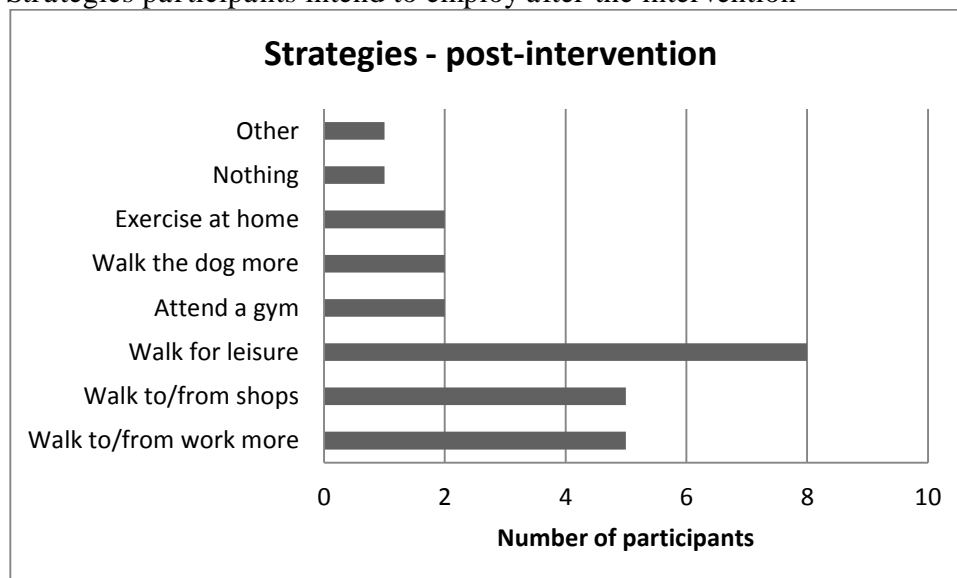


Figure 4  
Strategies participants intend to employ after the intervention



The most popular strategy reported in the surveys was walking for leisure (rather than just to get somewhere), which could include lunchtime walking, walking with family at the weekends, or hillwalking. One participant reported taking long walks at the weekends around her home town.

Once again, participants' comments revealed more detail about the strategies they had employed to increase their walking at various points throughout the intervention:

I went out for walks with colleagues when I wouldn't have thought to suggest it before, so that was an added benefit!

Was great, I was walking up to 90 mins for my late night dog walk (strong torch was required!). Lost a bit of sleep as a result but lost half a stone!

Thanks again for all your help with this - *it's been good fun! I haven't stepped in the lift since I started which can only lead to a healthier me! Actually that hasn't be that much fun at all....;-)*

I have recorded my individual steps for the past 2 weeks and set a goal for this week so here we go and let's hope I can see an improvement by end of week 8!

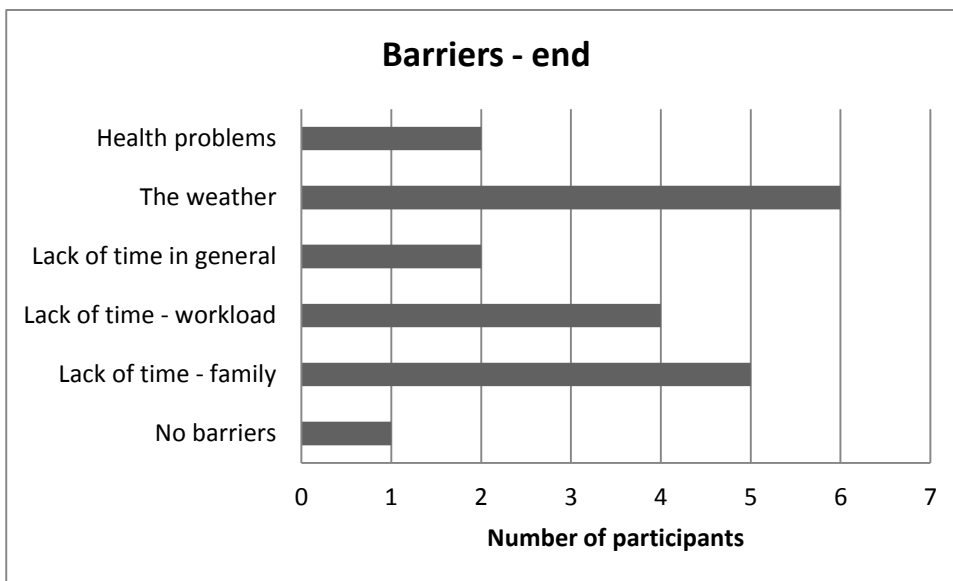
Well, its approx 5000 steps to work and then again on the way back - plus I make myself do some detours rather than going straight home so that takes me a little bit over. Once at home I use my cross trainer or just walk about loads putting the wash up, making dinner etc to get me over. 15000 is my target for *each day, didn't do well last week, I blame the weather!*

### Barriers to walking

A number of participants reported, either during the survey or more informally, that they had not succeeded in achieving the increases in walking that they had hoped or planned. None of the survey respondents reported definitely not having achieved their goals, however only 4 (36.36%) reported having definitely achieved their main goal and

2 (18.18%) their secondary goals during the intervention. The specific barriers reported by survey respondents are shown in Figure 5.

Figure 5  
*Participants' barriers to walking more during the intervention*



Participants' comments suggested specific barriers to walking, including the weather and workload pressures:

...the weather hasn't been too walking-friendly recently, I fear...

Fortunately, the term is coming to an end, so from now on there will be hopefully more walking and not only talking - from next week on I hope to do regular lunchtime walks.

It has coincided with a big deadline that is preventing me from getting out more, otherwise I feel I could be making a better success of it!

## Survey 2 (week 4)

### Step Count Challenge Week 4 survey

I hope you have enjoyed taking part in the Step Count Challenge so far. As we are nearing the half-way point of the Challenge, I'd like to try and organise a get-together for everyone: a chance to meet new people, share stories and swap top tips. Drinks and nibbles will be provided.

I'm also interested in how everyone is getting on with the Challenge and how this has affected your walking behaviour (or not). I'd be very grateful if you could answer all the questions, but only two are compulsory: name (so that if you have answered the rest of the questions I can link this to your step count, and also know who to expect at the get-together) and availability.

#### Motivation

1. At the moment, how motivated are you to walk more?

1 - Not at all motivated

2

3

4

5

6

7

8

9

10 - Highly motivated

2. Has this changed since starting the Challenge?

1 - Yes, my motivation has increased

2 - No

3 - Yes, my motivation has decreased

3. How confident are you that you can walk more?

1 - Not at all confident

2

3. How confident are you that you can walk more?

3

4

5

6

7

8

9

10 - Extremely confident

4. How much control do you have over walking more?

1 - No control

2

3

4

5

6

7

8

9

10 - Complete control

### Walking behaviour

5. Have you set yourself any specific goals to increase your step count? (e.g. to increase your steps generally, to achieve a set number of steps per day/week, or to increase by a certain percentage each week)

Yes

No

If yes, please give details:

6. Have you done any of the following in order to increase your step count? Please only select those that you weren't already doing before the Challenge.

None

6. Have you done any of the following in order to increase your step count? Please only select those that you weren't already doing before the Challenge.

Started walking to work

Started walking home from work

Walked to/from work more often

Walked to/from the shops instead of taking the bus/car

Joined a gym

Increased attendance at the gym

Gone for walks purely for leisure (and not just to get somewhere)

Taken the dog for longer walks than normal

Exercised at home (e.g. using an exercise DVD, stepping, etc.)

Other, please specify:

7. Do you have any comments on the Challenge so far?

### Social event

8. On which day(s) would you be available to attend a social event/get-together for Challenge participants?

Tuesday 3rd April

Wednesday 4th April

Thursday 5th April

None of these

9. What times are best for you to be able to attend a social event/get-together? Please answer even if you are not available on the dates suggested.

Morning (10am-12pm)

Lunchtime (12-2pm)

Afternoon (2-5pm)

After work (5pm+)

If there is a specific time that is best for you, please indicate here:

10. Please give your initials. This will enable me to link your answers to your step counts - purely for the purposes of evaluating the effectiveness of the Challenge.



## Survey 3 (week 7)

# Step Count Challenge week 8

## The Challenge

Many thanks for taking part in the Step Count Challenge. I hope you have all enjoyed taking part. As we are nearing the end of the Challenge, I'm interested in how you feel about walking and whether you hope to continue the good work you've all put into the Challenge. I'd be very grateful if you could answer all the questions, however as before only two are compulsory: initials (so that I can compare your answers to your step counts) and availability for a final step count get-together, which I hope to hold in the next couple of weeks. Thanks!

1. What were your main reasons for taking part in the Challenge and for wanting to walk more?

To improve my fitness

To lose weight

To meet new people

To get more fresh air

To get some exercise without cost

Other, please specify:

2. What would you say was your main aim in taking part in the Challenge?

To improve my fitness

To lose weight

To meet new people

To get more fresh air

To get some exercise without cost

All equally

Other, please specify:

3. To what extent do you feel you have achieved this main goal during the Challenge?

1 - I have definitely not achieved this goal

2

3. To what extent do you feel you have achieved this main goal during the Challenge?

3

4

5 - I have definitely achieved this goal

4. To what extent do you feel you have achieved your other goals during the Challenge?

1 - I have definitely not achieved these goals

2

3

4

5 - I have definitely achieved these goals

5. Did you set yourself any specific goals to increase your step count during the Challenge? (e.g. to increase your steps generally, to achieve a set number of steps per day/week, or to increase by a certain percentage each week)

Yes

No

If yes, please give details:

6. Did you do any of the following in order to increase your step count during the Challenge? Please only select those that you weren't already doing before the Challenge.

Nothing

Started walking to work

Started walking home from work

Walked to/from work more often

Walked to/from the shops instead of taking the bus/car

Joined a gym

Increased attendance at the gym

Taken walks purely for leisure (and not just to get somewhere)

Taken the dog for longer or more frequent walks

Exercised at home (e.g. using an exercise DVD, stepping, Wii Fit etc.)

7. Did you succeed in increasing your step count during the Challenge as much as you'd hoped?

Yes

No

N/A - I wasn't specifically trying to increase my step count

8. What barriers did you encounter which prevented you from walking more?

There were no barriers preventing me from walking more

Lack of time due to family commitments

Lack of time due to workload

Lack of time in general

The weather

Lack of motivation

Unsure where to walk

Lack of appropriate footwear

Health problems (e.g. being off sick from work)

Other, please specify:

9. Is there anything else you'd like to add about the Challenge? E.g. comments about the Challenge, unexpected benefits, etc.

## After the Challenge

10. How motivated are you to continue walking more after the Challenge?

1 - Not at all motivated

2

3

4

5

6

7

8

9

10. How motivated are you to continue walking more after the Challenge?

10 - Highly motivated

11. How confident are you that you will be able to walk more after the Challenge?

1 - Not at all confident

2

3

4

5

6

7

8

9

10 - Extremely confident

12. How much control do you feel you have over walking more after the Challenge?

1 - No control

2

3

4

5

6

7

8

9

10 - Complete control

13. Which of the following do you think you will do to increase or maintain your walking after the Challenge?

Nothing

Start walking to work

Start walking home from work

13. Which of the following do you think you will do to increase or maintain your walking after the Challenge?

Walk to/from work more often

Walk to/from the shops instead of taking the bus/car

Join a gym

Increase attendance at the gym

Go for walks purely for leisure (and not just to get somewhere)

Take the dog for longer or more frequent walks

Exercise at home (e.g. using an exercise DVD, stepping, Wii Fit etc.)

Other:

14. Do you have a specific walking goal for after the Challenge?

Yes

No

If yes, please give details

15. Would you be interested in carrying on the Challenge on a smaller scale? If so, please give your email address below

16. Would you be willing and able to count your steps for a further week in about 4 weeks' time (most likely the week beginning 28/5/12)

Yes

No

Maybe

### The get-together

17. When would you be free for a get-together?

Tues 1st May

Wed 2nd May

Thurs 3rd May

Fri 4th May

Mon 7th May

Tues 8th May

17. When would you be free for a get-together?

Wed 9th May

Thurs 10th May

Fri 11th May

None of the above

18. What time would be easiest for you to attend a get-together?

10-12pm

12-2pm

2-4pm

4pm+

### About you

19. Which age group are you in?

20-29

30-39

40-49

50-59

60+

20. How much walking does your job require on average?

Minimal - almost entirely desk-based with occasional meetings within the building; you eat lunch at your desk most days

Medium - mostly office-based with occasional meetings or lectures within nearby buildings; you go out at lunchtimes a couple of times a week

Quite a bit - frequent meetings or lectures in other parts of the university; you go out at lunchtime most days

A lot - much of your job involves visiting different sites within the university or further afield; you go out at lunchtime and walk over a mile most days

21. Please give your initials - this is primarily so that I can link any other answers you have given to your step count

## Appendix D: Search strategies used for each database

PsychINFO (1987 – May 2013, Ovid)

1	rehabilitation/ or cognitive rehabilitation/ or drug rehabilitation/ or exp neuropsychological rehabilitation/ or exp neurorehabilitation/ or occupational therapy/ or physical therapy/ or psychosocial rehabilitation/
2	exp traumatic brain injury/ or brain damage/ or brain concussion/ or head injuries/ or neuropsychological assessment/
3	exp treatment compliance/
4	engagement.mp.
5	rehabilitation.mp.
6	adherence.mp.
7	brain injury.mp.
8	compliance.mp.
9	4 or 6 or 8
10	5 and 7 and 9
11	2 or 7
12	1 or 5
13	12 not 5
14	9 and 11 and 12

Medline (1946 – May 2013)

1	Rehabilitation/
2	rehabilitation.mp.
3	1 or 2
4	brain injuries/ or brain concussion/ or brain hemorrhage, traumatic/ or brain injury, chronic/ or diffuse axonal injury/ or epilepsy, post-traumatic/ or pneumocephalus/ or hypoxia, brain/

5	brain injury.mp.
6	4 or 5
7	adherence.mp.
8	engagement.mp.
9	Patient Compliance/
10	compliance.mp.
11	7 or 8 or 10
12	3 and 6 and 11

CINAHL Plus (1937 – May 2013, EBSCO Host)

1	(MH "Rehabilitation") OR (MH "Rehabilitation, Cognitive") OR (MH "Occupational Therapy") OR (MH "Rehabilitation, Speech and Language") OR (MH "Rehabilitation, Vocational") OR (MH "Rehabilitation, Community-Based")
2	rehabilitation
3	1 or 2
4	(MH "Brain Injuries") OR (MH "Head Injuries") OR (MH "Brain Concussion") OR (MH "Postconcussion Syndrome") OR (MH "Epilepsy, Post-Traumatic") OR (MH "Left Hemisphere Injuries") OR (MH "Right Hemisphere Injuries") OR (MH "Pneumocephalus") OR (MH "Hypoxia, Brain") OR (MH "Hypoxia-Ischemia, Brain")
5	brain injury
6	4 or 5
7	(MH "Patient Compliance") OR (MH "Treatment Refusal")
8	engagement
9	adherence
10	compliance
11	8 or 9 or 10
12	7 not 11
13	7 or 11
14	3 and 6 and 13



EMBASE (1980 – May 2013)

1	Topic = (rehabilitation) AND Topic = (brain injury) AND Topic = (adherence OR engagement OR compliance)
2	rehabilitation/ or cognitive rehabilitation/ or community based rehabilitation/ or home rehabilitation/ or psychosocial rehabilitation/ or speech rehabilitation/ or vocational rehabilitation/
3	rehabilitation.mp.
4	2 or 3
5	adherence.mp.
6	engagement.mp.
7	compliance.mp.
8	5 or 6 or 7
9	exp brain injury/ or acquired brain injury/ or brain concussion/ or brain damage/ or brain stem injury/ or cerebellum injury/ or diffuse axonal injury/ or postconcussion syndrome/ or shaken baby syndrome/ or traumatic brain injury/
10	brain injury.mp.
11	9 or 10
12	3 and 8 and 11

AMED (1985 – May 2013, Ovid)

1	Rehabilitation/
2	rehabilitation.mp.
3	1 or 2
4	adherence.mp.

5	engagement.mp.
6	compliance.mp.
7	4 or 5 or 6
8	brain injury.mp.
9	brain injuries/ or brain concussion/
10	8 or 9
11	9 not 8
12	2 and 7 and 10

Cochrane Central Register of Controlled Trials

Rehabilitation AND brain injury AND adherence OR compliance OR engagement

Web of Knowledge – Social Science & Science citation indexes (1970 – May 2013)

Rehabilitation AND brain injury AND adherence OR compliance OR engagement

Clinicaltrials.org

Rehabilitation AND brain injury AND adherence OR compliance OR engagement

PsycBITE

Rehabilitation AND adherence

Rehabilitation AND compliance

Rehabilitation AND engagement