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Ageing, Work-Related Stress and Health

Reviewing the evidence

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A report for Age Concern and Help the Aged,
and TAEN - The Age and Employment Network

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Foreword

Age Concern and Help the Aged (the new single charity formed in April 2009) and TAEN – The Age and Employment Network share a belief that maintaining good health and the ability to work is fundamental to giving people a better life in retirement. TAEN and Help the Aged worked together previously to commission two evidence reviews on *Older Women, Work and Health* (2006) and *Older Men, Work and Health* (2008). We wanted to better understand the health benefits and risks of work and to identify significant age and gender differences. However, neither report was able to cover work-related stress and its impact on health in depth. We felt it was important to complement the findings of our earlier reviews with this work on *Ageing, Work-Related Stress and Health*.

Demographic change and ageing populations have made extending working life a priority for government policy in the UK and beyond. Stress has become increasingly implicated in triggering ill health and for some people the development of long term absence from the workplace or early retirement. But very little of the existing research on work-related stress that we were able to identify concentrated on older workers. We hope that this review helps inform the policies and practices of Government, employers and the unions and that it will be of interest to older workers too.

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Executive summary

In Britain, work-related stress is thought to be responsible for more lost working days than any other cause. It is becoming clear that it is also one factor affecting older workers' willingness and ability to remain in the labour force, as well as early ill-health retirement. With an ageing population, declining dependency ratios (the number of working people per retired person), and an increasing imperative to extend working lives, it is useful to review what is known about older people's experience of stress at work. Work-related stress is best understood as a negative emotional state which, if persistent, can lead to the development of both mental and physical illness. In particular, anxiety, depression, cardiovascular disease and musculoskeletal disorders have been associated with the report of stress and associated poor working conditions. To date however, the majority of reviews of research on work-related stress, its causes and its effects have been based on large groups of workers very rarely distinguished by age. This report aims to address that gap.

Several large-scale studies reveal that reports of work-related stress increase with age, peaking at about 50-55, and then decrease towards retirement. The reasons for this drop off towards retirement are not clear but possible explanations include (a) workers may leave a job or profession they find stressful and seek more congenial employment, (b) unhealthy workers are more likely to have retired early, either voluntarily or on the grounds of ill-health, (c) with increasing seniority, workers may have greater control over their working lives and be better supported (both situations associated with less stress), (d) where health is measured both objectively and subjectively, older people tend to report more positively about their health than younger people, using their peer group as a reference point, and (e) people adapt to difficult experiences with time. Thus, older workers may be healthy 'survivors'. The evidence suggests some gender differences, with women aged 45-54 reporting more stress and than men, perhaps as a result of the demands of occupying multiple roles (worker as well as carers, and often taking on the greater share of domestic responsibilities) and occupying work roles characterised by lower status and less control then men.

Research has identified several aspects of work that might be problematic for older workers and recommendations have been made as to how employers might improve working conditions such that their skill set is not lost to the labour force. Many recommendations revolve around increased flexibility, recognising that a significant proportion of older workers have caring and domestic responsibilities, and many manage long term health conditions themselves. Examples include: give older workers more choice about the level and type of work they do, including the scheduling of rest breaks and involvement in shift work, if shift work is required, to allow older workers to work day shifts rather than night shifts, to have early starts and to work rapid forward rotating systems; increase the flexibility of work arrangements, allowing flexible working hours, special leave arrangements and part-time work if required; promote an age aware and tolerant organisational culture; educate managers and workers about ageing and its implications for work and health; and to promote physical exercise. More general recommendations, such as increasing the amount of control older workers have over the work that they do and how they do it, and increasing social support at work would be likely to benefit workers of all ages. An important target for attention should be those in mid-working life (45-55) since research suggests that some of the health effects of poor working conditions take many years to become apparent. Protecting tomorrow's older workers, as well as today's, would be likely to pay dividends, particularly since it is now becoming clear that working conditions can impact on health and well-being after retirement.

1. Introduction to the report

Work-related stress is thought to be responsible for more lost working days in the UK today than any other single cause [1]. It is increasingly implicated in the development of mental ill-health, heart disease, and musculoskeletal disorders [2], as well as an increasing number of other conditions, and early ill-health retirement. While there has been a considerable amount of research published on the subject of work-related stress [3], very little has focused on the situation of older workers. The majority of research on work-related stress, its causes and its effects, has been based on large groups of workers very rarely distinguished by age. Such research may be limited in assuming that work that is reported as stressful for one age group may be the same for another [4]. There currently are good reasons to support further consideration of this issue.

A significant demographic change, known as population ageing, can be observed in many western countries. A combination of factors is responsible, although increasing life expectancy and declining birth rates are the primary drivers. Within the EU15 it is estimated that by the year 2025, the proportion of 50 to 64-year-old workers will double in size as compared to workers under the age of 25 years [5 6]. The UK is no exception; many organisations will see parallel changes in the age profile of their workforce.

In addition, over the coming decades increasing numbers of older people will need or want to extend their working lives, and to postpone retirement for longer than has been the norm in recent decades. Recent and proposed changes in UK legislation have been designed to facilitate later retirement. There are both 'push' and 'pull' factors affecting people's willingness or ability to remain in the labour force. Major factors include physical and mental health, financial circumstances, domestic circumstances, caring responsibilities and type of employment. In the UK, where pension remuneration is low compared to other industrialised countries, it has been suggested that financial circumstances may be a more important factor in retirement decisions than elsewhere [7]. Research has shown that other factors relevant in such decisions include opportunities for flexible working arrangements, access to training, job opportunities, attitudes towards work and leisure, social networks and future expectations [8 9]. But more recently, it is becoming clear that a major 'push' factor is work-related stress, alongside associated concerns such as dissatisfaction with work, long working hours and demanding working practices, together with worries that stress may exacerbate existing health conditions [10-13]. Evidence is also emerging to suggest that the quality of working life has negative effects on quality of life after retirement [14].

Help the Aged and TAEN have published previous reviews on older women, work and health [15] and older men, work and health [16]. These provided an overview of health issues from an age and gendered perspective but did not deal in depth with the issue of work-related stress. This report aims to explore and close this gap in our understanding, by reviewing the scientific literature on work-related stress and addressing several questions. Do older workers experience more or less stress than younger workers? To what extent does it affect their health? What aspects of work are experienced as stressful by older workers? Could the work situation of older workers be better designed and managed, both for their benefit and that of their employing organisations? We hope that this report will contribute to the promotion of appropriate age management policies and practices, and enable older people and employers to make more informed choices about working in later life.

2. Outline of the review

The review begins by defining the major topics of the report – age, work and stress. It then explores the relationship between age and reported work-related stress, and proceeds to outline the physical health outcomes associated with reported stress in older workers. Separate consideration of gender differences is provided. The specific characteristics of work that might be stressful for older workers are then explored. The issue of retirement and its association with stress is also examined. The report concludes with a discussion of the gaps and shortcomings in the published research and offers some tentative suggestions for employers on how to promote the successful management of an older workforce. Information about how the review was conducted is given in the Appendix.

3. Concepts and definitions

The terms 'age', 'work' and 'stress' are used and understood very differently. For example, when used by a layperson, "a stressful day" might simply mean "a busy day". A researcher might understand this to refer to a particular set of circumstances or outcomes that research has shown to be associated with certain negative health outcomes. This report begins by considering these defining concepts.

Age and the older worker

There are no agreed criteria used by researchers as to what constitutes an 'older worker'. Much of the lack of agreement reflects the different employment and social welfare practices across countries. However, most research on older workers has focused on those aged 45–65 years. There is a notable lack of information on workers who are

over 65. This relatively restricted age range for research into older workers may change as people work longer, and as statutory retirement ages continue to rise. In the UK, for example, the State Pension Age for women will rise from 60 to 65 from 2010 to 2020, making it equal to that of men. Subsequently, from 2024 to 2046 it will increase from 65 to 68 for both men and women (Pensions Act, 2007). Similar changes have already occurred or will occur in many other countries over the next few decades.

All research studies on older workers refer to chronological age, but few provide measures of seniority or occupational grade. Generally, people rise through employment grades to a higher level with increasing age, and frequently take on greater management or supervisory responsibilities. They often gain more control over their working life and environment. Thus, the nature of work itself can change with age. It is difficult to find data that compare older and younger workers doing the same type of work, and that explore whether any particular aspect of the work is differentially stressful for either group. So, when research compares the experience of work for younger and older workers, it is rarely comparing like with like. This is one source of bias. In addition, as workers become older they are more likely to take ill-health retirement. This may be related to the nature of their work in that those with 'healthy' jobs may be less likely to take ill-health early retirement. A second source of bias therefore exists in the data when younger and older workers are compared. The older workers studied may be 'healthy survivors'.

People tend to change jobs, organisations and even careers over the course of their working lives. The likelihood that a person will have had several jobs increases with age. This can change the amount of exposure to causes of work-related stress. It is also possible that after many years in an organisation, more experienced workers 'know the system' and work it to their advantage. Thus, how long a person has been in a particular job, or in a particular organisation (tenure), also becomes a relevant consideration. However, research studies rarely include measures of tenure. It is clear that the role of tenure in relation to workers' age, their experience of stress and health is not a simple one.

There are other ways of thinking about the role of age when exploring older peoples' experience of work, but these are very rare in the published literature. Managers' and co-workers' personal definitions of an older worker, for example (as opposed to researchers' definitions), may drive their attitudes and behaviour towards older workers. Workers who report high levels of stress and burnout are more likely to report 'feeling older' than their chronological age [17 18]. Further, research can consider functional or physiological age (somewhat similar to the concept of frailty), since chronological age on its own may not be a reliable indicator of a person's ability to perform certain types of work task. In fact, although it might be generally true that older workers are less able to do certain tasks than younger workers [19], the variance in ability between workers increases with age [20 21]. Although recognising its limitations, this review focuses solely on chronological age.

Work

There are a wide variety of perspectives that can be taken on the meaning of 'work' and 'working'. This review concerns people in paid employment. However, as will be discussed later, it is illuminating to compare reports of stress by older people in paid employment, those in unpaid employment and those who are not employed.

The vast majority of participants in research studies on work-related stress are in paid employment in medium or large organisations. However, it should be borne in mind that the majority of workers throughout the European Union are self-employed or employed in small or micro companies (1-49 employees), and a substantial proportion of these are older workers [22]. People working in small and micro companies are not well represented in the general scientific literature on work-related stress, nor in that relating to older workers.

Work-related stress

Recognition of the importance of workplace practices and management styles for worker health, both mental and physical, began to emerge in the mid-19th century, particularly after the Industrial Revolution. One of the first to voice concern was Friedrich Engels in *The Condition of the Working Class in England*, first published in German in 1845. He described in detail the physical and psychological health problems suffered by workers from many different trades. He believed the origins of these problems lay in the organisation of work and its social and physical environments. The strange and dehumanising world of factories and offices began to appear in such commentaries and in novels throughout Europe in the late 19th and early 20th centuries, for example, in the works of authors such as Kafka and Zola. However, a considerable period of time elapsed before the effects of the organisation of work and management style on health (as opposed to the effects of the physical work environment on health) were subject to serious scientific scrutiny. This largely began in Northern Europe and the United States in the mid-20th century [23]. Nonetheless, it was not until the impact of such working conditions on physical (as opposed to mental) health became recognised, and some of the physiological systems involved in such 'mind-body' interactions were identified [24], that the concept of 'stress' has been taken seriously.

Definition of work-related stress

The concept 'stress' has often been confused with that of 'challenge' [25]. Challenge can motivate people to master novel situations and learn new skills. It can be motivating and energising - both psychologically and physiologically - and is often an important ingredient in productive and enjoyable work. This is probably the origin of the expression "a little bit of stress is good for you". However, challenge is not the same as stress.

Stress is currently defined by the British Government's Health and Safety Executive (HSE) as "an adverse reaction" and "the process that arises where work demands of various types and combinations exceed the person's

capacity and capability to cope" [1]. The HSE consider that "work-related stress is a significant cause of illness and disease, and is known to be linked with high levels of sickness absence, staff turnover and other indicators of organisational underperformance - including human error". In other words, stress is proposed as a process or linking mechanism between exposure to certain aspects of work, on the one hand, and ill-health outcomes on the other [3]. One important factor may be a perceived imbalance between the requirements of the job and the ability to carry it out. Thus, 'stress' begins as a psychological mechanism involving people's personal appraisals of their working conditions. These psychological processes are fundamental in understanding the relationships between work and health [25 26] and thus most research uses self-report measures of working conditions.

To assist employers, there are many guides to what 'healthy' or 'good' work should look like. A large body of published research from the past 25 years has identified in broad terms the characteristics of work design and management that can be detrimental for many people and are associated with the experience of stress. Reviews suggest that they traditionally concern difficulties with workload, work pace, working hours, organisational culture, participation and control, interpersonal relationships, career development, role-related issues and the home-work interface [3 27]. To date, not much of this research has focused on age.

The scientific literature on work-related stress refers to chronic rather than acute stress: to the experience of long-term, potentially adverse working conditions rather than to unusual, acute or dramatic events such as a violent incident at work that might be better described as potentially traumatic.

Effects of work-related stress

Stress is understood to manifest itself in many ways, but it is particularly obvious when there are changes in the way people feel, think and behave both at work and outside work. For example, they may experience emotional symptoms (irritability, loss of motivation, increased sensitivity and tearfulness, feeling anxious or depressed) or demonstrate cognitive changes (indecision, confusion, poor memory and lack of concentration). Further, when people experience stress their behaviour often changes: their diet, sleep patterns and exercise habits change, usually in ways that are detrimental to health. They may also be less likely to adhere to medical regimes.

When workers are stressed they may show changes in work-related behaviour, including lack of confidence, poor relationships with colleagues, poor quality work, susceptibility to accidents, social withdrawal, and poor time management. They may also smoke, drink or take recreational drugs more than usual. At the organisational level, increases in disputes, complaints and grievances, sickness absence, staff turnover and customer dissatisfaction may also be indicative of work-related stress.

Among the most well documented outcomes of work-related stress in research studies are anxiety and depression. These are common mental health problems, experienced by one in four people in the UK at some point in their life, often as a reaction to difficult events like divorce, bereavement, physical disease as well as problems at work. These 'minor psychiatric' problems are wrapped into the definition of stress in regular surveys of work-related ill health [28]. Such conditions tend to be treated by general practitioners, particularly if long-lasting or severe, with medication or psychological therapies such as cognitive behavioural therapy. But they may resolve themselves.

The experience of work-related stress may trigger mental health problems, or exacerbate existing mental health problems that people may otherwise have managed successfully [1]. The research literature on the subject of work-related stress uses many terms to refer to its associated precursors, psychological states or consequences: for example, stressors, psychosocial hazards, stress, anxiety, depression, depressive mood, distress, strain, mental ill-health, psychological ill-health, emotional exhaustion, burnout or minor psychiatric morbidity. Some literature tends not to use the term 'stress' at all, and prefers to refer to direct associations between a limited set of broad work characteristics and established diagnoses such as depression or heart disease. It notable that there is considerable overlap in terminology, as well as a lack of clarity as to whether a term refers to causes, processes or outcomes. The relationship between work characteristics and the report of stress or poor mental health outcomes is discussed in more detail in Section 7.

As well as these well-known associations with common mental health problems, there are established links between the experience of chronic stress (both work-related and non work-related) and the development of cardiovascular and other diseases. Evidence for disease progression is stronger than for disease causation. The evidence is summarised in Section 5. Most of the research on the role of stress in physical disease (with the notable exception of heart disease) has not been done with reference to working populations, but rather with reference to specific illnesses. However, there is no reason to suppose that the psychophysiological and behavioural mechanisms are different.

In summary, work-related stress is probably best understood as an unpleasant emotional state that results from an unhealthy transaction between the environment and the person that, if persistent, can lead to the development of both psychological and physical illness. Matters tend to be worse when people are put under prolonged pressure, have little control or flexibility over what they do and are not well supported or resourced [3]. Research has also shown that the effort people put into their work can be seen as part of a social contract, and if not rewarded appropriately (for example, by means of money, esteem, job security or opportunities for advancement) is associated with poor mental and physical health outcomes [29 30]. Contrary to the view widely held some years ago, it is not just senior

managers and those in positions of responsibility who are likely to experience stress. Stress and its associated ill-health outcomes are more likely to be reported by people in jobs with little autonomy. Whether or not people experience a situation as stressful is partly determined by how they appraise the demands placed on them, the effectiveness of their coping strategies, and how important coping is for them [25]. Anyone, in any occupation, can suffer from work-related stress, but it has been commonly reported among teachers, nurses, medical practitioners, public administration and public sector security based occupations such as police officers, prison officers, and UK armed forces personnel [28 31].

It is clear that the experience of stress is not a process that results from a person being mentally 'weak', as was commonly thought some years ago. However, it is likely that differences in knowledge, personality and preferred coping styles when faced with demanding situations will partly determine whether or not situations are experienced as 'stressful'. For example, the role of beliefs about disease and coping strategies are becoming the focus of research that attempts to explain why some patients recover better than others from demanding experiences such as surgery [32]. It follows from this contemporary understanding of work-related stress that there are several possible ways of preventing and managing it. One approach would be to provide support, treatment and rehabilitation for those workers affected. Another would be to strengthen workers' abilities to cope with the demands placed upon them, perhaps by means of training for the job, or by coaching them to cope with demands in more effective ways. However, European and British legislation dictate that it is an employer's duty to avoid risks to worker health and to combat risks at source [33]. Therefore, the focus for change should be on work, not exclusively on workers.

4. The age-work-stress link

Do older workers report more or less stress than their younger colleagues? This question, and its answer, are partly determined by the way in which older and younger workers are defined in research, and partly determined by how stress is conceptualised and measured. It is also complicated by the sample of workers chosen for study.

Taken at face value, there appears to be much evidence suggesting that older people in general, and older workers specifically, report less stress and better mental health than their younger counterparts [34-54]. However, some evidence exists to suggest the contrary: that older workers experience more stress than their younger counterparts [55-60]. A small amount of evidence exists suggesting that there is no difference in reports of stress between younger and older workers [61 62]. Several substantive studies, such as the surveys carried out periodically by the Health and Safety Executive, suggest that the relationship between age and stress is curvilinear (inverse U-shaped) [28 63 64]. Data provided for this report by the Health and Occupational Reporting Network (THOR), in particular by psychiatrists to the Surveillance of Occupational Stress and Mental Illness (SOSMI) between 2002-2008 also demonstrate this pattern, with the incidence of anxiety and depression, as well as work-related stress, peaking at about the age of 50. (Supplier: THOR, Occupational and Environmental Health Research Group, University of Manchester, Source: SOSMI 2002-2008). Although the exact relationship between sickness absence due to psychiatric disorders is not clear, the data do suggest that older workers who are absent from work because of mental ill health are off work for relatively long periods, and are also likely to leave the workforce through ill health or disability retirement [65 66].

Data have also been made available for this report by the HSE, which combine information on age and work-related stress and associated mental ill health (anxiety and depression) from the Labour Force Surveys of 2004/2005 through to 2007/2008. For the combined sample of men and women, there is a flat inverted U shaped relationship between age and the self report of stress, anxiety and depression. Younger workers, 34 years and less, report less stress, anxiety and depression than workers between 35 and 54 years while those above 55 years report even less stress, anxiety and depression. Further examination of these data reveals that the lower levels of report in the group aged 55 years and over are largely due to levels of report for those aged 60 and older. This pattern remains obvious when broken down by gender although it is less marked for women than for men (Supplier: HSE, Source: Labour Force Surveys).

There are two important findings which emerge from these data. First, the relationship between age and the report of stress, anxiety and depression is a flat inverted U shaped function and, second, there is little difference in levels of report between the ages of 35 years and 60 years. The latter supports the contention that arbitrarily defining the older worker in research as somebody over 45 years may not be sound and may have led to research being insensitive or even misleading.

Several interesting processes may contribute to older workers reporting less stress and mental ill health than younger workers: the 'healthy worker' or 'survivor' effect, and the 'frame of reference' effect or 'age-reporting bias'. Few published studies have made allowance for these.

The 'healthy worker' or 'survivor' effect suggests that stressed, burned-out workers are likely to have left a job or profession they find stressful and moved into one that find more congenial before reaching an older working age, or even retire early on grounds of ill-health. This is supported by evidence that workers who reported high levels of stress at the beginning of a study were more likely to have moved out of those jobs four years later than those who reported low levels of stress [67]. It is very possible that older workers who participate in research studies are therefore 'survivors'. Research from the large-scale 'Whitehall II' study of civil servants in the UK found that stronger correlations between work stress and heart disease have been found

in workers aged less than 50 than in those aged over 50: again suggesting a healthy survivor bias. It is also theoretically possible that those workers over 50 remaining in employment have different coping strategies or have become 'hardened' to potentially stressful work situations. These 'survivors' may be psychologically well adapted to deal with stressful situations, may be of a somewhat 'hardier' disposition with more adaptive personality traits [58] [64] [68], or may have made their way into a more senior position where they are more in control of their working life and are better supported [69]. These older workers are also likely to benefit from higher average incomes and better intrinsic rewards than younger, less senior workers [63]. Certainly data from the 'Whitehall II' study would support this possible conclusion, in that employees with poor mental health are more likely to retire early than their colleagues with good mental health [7]. The same study also reports an inverse-U relationship between mental health and age, with the oldest workers reporting better mental health [34]. There is evidence that stress may play a part in this since data made available for this report from the 'Whitehall II' study show that employees who report less control are more likely to retire earlier than those who report greater control (Source – personal communication, Jenny Head, University College London). The fact that both the Health and Safety Executive's Self-Reported Work-Related Illness surveys and the Whitehall studies of civil servants have also shown workers' mental health to improve after retirement, suggests that there may still be a negative effect of work on mental health even in the oldest groups of workers, even though the older workers in the Whitehall study report control to increase with age and job demands to decrease. So, although there are self-selection effects into early retirement (the healthy worker effect) this does not account for all the age-related improvement in mental health seen across this sample. Clearly, other factors are operative.

In addition to the healthy worker (or 'survivor') effect, there are two other possible sources of bias that should be borne in mind when thinking about the reasons for the apparent report of less stress and related mental health problems by older workers. Social scientists often use 'subjective' health measures as they are not satisfied with simple 'objective' (biomedical) measures of health and sickness. There is evidence from studies where health is measured both objectively and subjectively (via self-report), that older people report more positively about their health than younger people [70-72] [73]. This has been explained in terms of peer-referenced decision making on one's state of health [74] [75]: a process whereby older people may contextualise their ratings of health with regard to their age and peers [76] [77]. In addition, people adapt to difficult experiences with time [78]. For whatever reason, this finding has been supported using data from the British Household Panel Survey 1995 [79] where, when people are asked about their health 'compared to others of their age', responses show age-norming. Cohort effects (variations arising from the different societies and environmental factors to which birth cohorts are exposed to over time) may also play a role in how people report their health.

In relation to the hypothesised curvilinear relationship between age and the report of stress, it is interesting to consider the role of job satisfaction. Evidence suggests that workers who are more satisfied with their job are less likely report stress [80] and this also holds true for older workers [81]. In a sample of workers over 50, low job satisfaction was associated with poor physical and mental health [82] [83]. Additional evidence suggests that older workers are more alert to organisational politics and that this impacts negatively on job satisfaction [84]. Exploring the specific relationship between age and job satisfaction reveals a curvilinear relationship (U-shaped) precisely opposite to that between age and stress (inverse U-shaped). Two large-scale studies [63] [85] found that high stress, low job satisfaction and poor mental health all peaked in mid-life workers. Older workers tended to report higher job satisfaction, lower stress and better mental health. The power of these studies is the suggestion that such relationships may not simply increase or decrease with age, but rise and fall over working life.

Overall, the weight of evidence suggest that older workers report less stress and mental ill-heath than their younger colleagues but that this finding is not as straight forward as it might appear since older workers may represent a healthy survivor population who also frame their perceptions and expectations about health more positively.

5. Effects of work-related stress on the physical health of older workers

Although increasing age is associated with a greater likelihood of physical illness, it is possible that work may play a part in explaining some of this increased risk. It is known that certain physical health conditions can be precipitated or exacerbated by stressful work environments. Evidence suggests that stress is linked to chronic disease amongst older workers [62] [86] [87] and has largely focused on the link between stress and two categories of physical health conditions: (i) cardiovascular conditions such as heart disease and hypertension [88-97] and (ii) musculoskeletal disorders like lower-back pain [2] [98-100]. Generally, strong evidence exists to support the notion that work-related stress is associated with increased likelihood of developing cardiovascular or musculoskeletal disorders [2] [67] [87] [90-94] [96-100] although evidence for its role in the development of other conditions [87] also exists. For example, one study reported that tumours were more common among older workers who had been employed in stressful jobs than among older workers employed in less stressful jobs [86]. However, the small numbers involved and the heterogeneity of tumours makes it difficult to draw firm conclusions.

Various mechanisms to account for the relationship between stress and physical ill-health have been proposed. It is known that stress affects the neural, endocrine and immune systems, and inflammatory processes [101] [102] and thus has the potential to affect a wide range of functions. Evidence for the role of stress is beginning to emerge with

regard to the onset of upper respiratory tract infections and the progression or reactivation of conditions such as asthma, herpes viral infections, autoimmune diseases, and wound healing as well as cancer and HIV progression [24]. The experience of stress has been shown to have a negative effect on older workers' sleeping patterns and on their ability to recover from fatigue to a greater extent than for younger workers [103 104]. Most researchers agree that disturbed sleep and increased need for recovery from fatigue may lead to adverse health outcomes for older workers and may exacerbate other ailments [105-107].

It is possible that the size of the negative effect of stress on older workers' physical health may have been underestimated due to the fact that workers with severe physical health problems often leave the workforce before retirement. The remaining older workers, therefore, represent those not affected by physical ill health to such an extent that they can no longer work. In other words, as discussed above, they are healthy 'survivors'.

It is informative to explore predictors of early retirement on grounds of physical health conditions. Evidence suggests that musculoskeletal disorders, cardiovascular disease and psychiatric disorders are the most common reasons for early ill-health retirement [108 109]. Of course, all clearly have causes that extend beyond work, but work stress can make a significant and independent contribution to these conditions.

6. Gender differences in older workers' experience of stress

The most consistent finding among the research studies reviewed for this report is that older women seem to report more work-related stress than older men [28 36 40 45 46 53 63 69 80 110-114] with few exceptions [54 59 62]. For example, a large-scale survey on self-reported work-related illness reported by the HSE has repeatedly found the prevalence of work-related stress, anxiety and depression to be higher among women than men across most age groups. Women aged 45-54 years of age consistently report higher levels of work-related stress, anxiety and depression than any other age group [28]. A population-based (as opposed to work-based) survey in Britain also found women were more likely to report common mental health disorders compared than men (19.7 per cent to 12.5 per cent, respectively), with women aged 45-54 years demonstrating the highest prevalence; approximately a quarter of this group reported at least one common mental health disorder [115]. And a population-based study of Finnish working adults aged 30-64 years found, using a measure of 'burnout', that it increased with age among women but remained stable in men [116].

Interpreting reported gender differences in work-related stress is not straightforward. Women may be more prepared to report stress than men and it is known that women have a different physiological response to stressful work situations than men [117]. A number of other explanations can be offered to explain the increased reporting of work-related stress among older women. First, research demonstrates that older women report markedly greater domestic responsibilities than older men, and more stress from personal and family responsibilities. Working women on average conduct an additional 20 hours of domestic activity [118 119]. Many middle-aged women have the additional responsibility of caring for teenage children, disabled partners or frail and elderly parents [120]. Multiple roles are thought to involve greater physical and emotional strain and to result in poorer mental health [64 49 88 111 121].

Second, women and men may have different responses to potentially difficult situations. Women, in comparison to men, are more likely to use coping strategies involving verbal expression, to seek emotional support, ruminate about problems, cope with problems by talking with others, and to use positive self-talk [122 123]. Social support may be particularly important for women. In a large study of nearly 48,000 older working women, those with strong social networks demonstrated better mental health than those who were more isolated. This association was even stronger for those women who reported high levels of work and home stressors [124]. Further, a large-scale, prospective study of women and men in their mid-50s in Sweden revealed that low social support at work was an important predictor of future cardiovascular disease (the likelihood of having a heart attack or stroke). On the other hand, two large-scale studies showed that high job strain predicted subsequent hypertension in men but not in women [93 96] (although a further study did not find clear-cut gender differences [90]). The particular health consequences women and men experience as a result of various stressors may be different [90], although the picture is as yet far from clear.

Third, women tend to work in different occupations and under different working conditions from men [125-128]. Work that is poorly paid, of low status and that makes high demands but offers little opportunity for control is thought to be more stressful than work that does not have such characteristics. And such conditions describe the work of women more often that that of men [15].

Fourth, a factor, which may be relevant when considering higher reported rates of work-related stress and poorer mental health among older women, may be the contributory role of the hormonal changes associated with menopause. The majority of women experience menopausal transition between the ages of 45-55, with the average age at menopause in Western countries being 51. For many this experience is associated, among other symptoms, with sleep disturbance and fatigue. One study suggested that those women who reported having stressful jobs were more likely to experience an earlier menopause [129], and that this was due to the effects of stress on the autonomic nervous system, neuroendocrine activity and thus reproductive function. In another study, levels of stress hormones were lower in postmenopausal women taking HRT than women of the same age who were not taking HRT. The authors proposed that hormone replacement might be influential in reducing the stress response [130].

7. Psychosocial work characteristics, stress and mental ill health

It is now well recognised in the general scientific literature and in government policy that certain aspects of work, often referred to as 'psychosocial' factors, are associated not just with poor physical health but also with poor mental health. The term 'psychosocial' is often used as a short hand to refer to the design and management of work and work organisations. The evidence is clear that aspects of the design and management of work and work organisations can contribute to poor mental health and this relationship is usually explained in terms of the experience of stress [3].

A considerable amount of research on older workers has been carried out in Finland, where Ilmarinen and his colleagues [131 132] have reviewed the early research evidence and identified three categories of risk factors that are likely to be detrimental to the work ability (and health) of older workers. Two categories (high physical demands and adverse work environment) relate to the physical demands of work and are primarily associated with negative physical health outcomes, although negative mental health outcomes have also been reported. The third category (poorly organised work) refers to the organisational and psychological demands of work. These are the focus of this section of the report.

The categories of risk factors identified by Ilmarinen and his colleagues are also broadly consistent with the risk factors identified in reviews by several other researchers. Walker and Taylor [133] identified, among other things, two sets of risk factors relating to flexible working practices (flexible working hours, age related leave, part-time work, and self regulation of pace), and to job design (workload, organisation of tasks, shift labour). Similarly, Boyes and McCormick [134] highlighted lack of flexibility as an issue likely to affect the work ability of older workers, as well as the balance between work contributions (effort) and rewards, work-life balance, and holiday and sick leave entitlements. The review by Costa [135] focused on the detrimental effect of high workload and non standard working patterns on older workers' physical ability, and on older workers' particular need for rest pauses, frequent health checks and training on coping strategies. Finally, Silverstein reported that policies relating to older workers and stress should consider the work environment, work arrangements and work-life balance, health promotion and disease prevention, and social support [136].

Methodological issues

It is important to note that many of the available studies of the impact of psychosocial factors on health are cross-sectional. On the basis of this evidence, it is difficult to disentangle whether, over time, psychosocial work characteristics influence mental health, or, vice versa, poor mental health influences the positioning of people with respect to such aspects of work. Poor mental health could predispose people to self-select into jobs with poor psychosocial characteristics. Equally, it could negatively influence people's ability to maintain healthy working relationships and discharge work tasks and responsibilities. A combination of such mechanisms might drive this relationship. At the same time, the evidence suggests that exposure to poor psychosocial work characteristics increases the risk of future mental health problems such as depression and anxiety [137]. Research has also found that mental ill health resulting from stress may not occur instantaneously and there is evidence that it may appear as much as 10 years later [86 138]. It is likely that both mechanisms operate: there is a two way relationship between poor mental health and exposure to poor psychosocial work characteristics. Despite this, most researchers focus on the effects of poor psychosocial work characteristics on mental health.

Many research studies on older workers' experience of work-related stress focus on a particular occupation, often in the public sector, such as nursing or teaching. Psychosocial work characteristics and related sources of stress may differ significantly between such groups. This fact might help explain some of the apparently contradictory research findings relating to age, stress and work. On the other hand, since broad contextual factors such as organisational culture and management style are also known to be potential sources of stress, it is possible to find groups of workers in the same occupation but in different organisations reporting quite different levels of work stress and related ill-health [4]. A further complicating factor is that experience may help older workers in one occupation to cope more effectively with the challenging aspects of their job whereas in another, continued exposure may lead them to 'burn out'. Therefore, concluding that specific occupations or particular psychosocial work characteristics have predictable effects with regard to stress and health in older workers can be unsafe.

A further criticism of this research has been that much of it is based on self-report, and should include a measure of 'negative affectivity' (a measure of the general tendency some people may have to report negatively on self-reported questionnaire items). However, even when this is taken into account, its effects are not always systematic nor straightforward to interpret [139].

Despite these caveats and uncertainties, the evidence suggests that jobs which involve a particular combination of psychosocial characteristics are more likely to be experienced as stressful and be associated with the report of negative mental health outcomes such as anxiety and depression. These include: high job demands, low control, and low social support [137]. Other factors may also be involved including the balance of effort and reward. These particular psychosocial characteristics are discussed below.

Job demands

There is a large amount of indirect evidence on the job demands that older workers report as stressful. It is known that ageing is associated with declines in physical abilities

such as muscle strength, sight, hearing and reaction time [140-143]. It follows that any job with tasks that make specific demands in these areas may be more easily managed by younger workers in general. However, it should also be noted that there is a wide variety of ability in older workers, as in younger workers. Therefore, it is sensible to approach such issues on a case-by-case basis rather than treat individuals as representatives of an age category. Furthermore, only a small proportion of tasks make specific physical demands on workers, and it is often the responsibility of the employer to make work adjustments where appropriate to accommodate those with reduced ability.

Ilmarinen and colleagues suggest that work demands should change with age and work should not be designed to be conducted exclusively by healthy people [132]. In addition, Ilmarinen and colleagues suggest that physical exercise should be promoted to improve older workers' work ability, and that employers should conduct regular work ability checks with special attention to stress.

Evidence suggests that older workers are particularly sensitive to organisational issues such as poor management systems and procedures, and to any associated impact on work-life balance. In particular, devaluing behaviours of supervisors and disappointment with management have been reported as particular challenges that trouble older workers [144]. Another study suggested that role conflict, fear of making mistakes, lack of influence over one's work, lack of professional development and a lack of feedback are all job characteristics that may be associated with increased stress among older workers [145]. Worry about unemployment and becoming unemployed have also been shown to have significant negative effects on the mental health of older workers [137 146-149].

One of the challenges in exploring the demands of work that are particularly problematic for older workers in comparison with their younger counterparts, is that it is unusual to find a group of workers with a wide age range who are all doing the same type of work. Both age and tenure are usually associated with seniority (itself in turn associated with different working conditions). Research on such groups is therefore rare. However, there are a few exceptions. In one study, older fire fighters reported significantly more emotional and mental demands from their work than did their younger counterparts [150]. And in jobs involving computer work, older and younger workers reported different tasks to be stressful [151]; older workers were more stressed than younger workers doing a problem solving task involving a graphical user interface, whereas younger workers were more stressed than older workers on an information retrieval task that involved a socially-interactive telephone component. The evidence suggests that the speed with which we process information declines from the age of 25 [152]. For example, there are known age-related declines in activities such as selecting target information from complex displays, visual and auditory abilities, working memory capacity, attentional capacity, novel problem-solving and information processing speed [153 154]. It is established that older workers usually have more expertise and are reported as being more 'agreeable' than younger workers [155], which together might suggest they would be better at 'customer relations' and find such a role easier than their younger colleagues.

Working hours and time pressures

A recent review concluded that time pressure is particularly demanding for older workers, and has a negative impact on their health, well-being and efficiency [156]. With specific reference to working overtime, Grosch and colleagues suggested that interventions should aim to reduce workload and time pressures to prevent fatigue and manage work-family conflict [56]. One study, for example, suggested that the experience of stress could be reduced among older veterinarians by, among other things, reducing on-call duty and cutting down working hours [45]. These suggestions are consistent with evidence that older workers have a higher need for physical and mental recovery than younger workers [105]. The evidence suggests that good work-rest schedules and a flexible approach to taking breaks from work (as well as physical activity and relaxation techniques) may all be beneficial for older workers [94 156].

Shift work

There is a commonly held assumption that shift working is stressful and is bad for the health of older workers and should therefore be avoided. However, the available scientific literature does not support such a simple conclusion [157]. It seems likely that it is the cumulative effect of the number of years spent shift working that is important in predicting ill-health effects [135 158-160], some would say even more powerfully than chronological age [161]. Some evidence suggests that older workers may not adjust as well as younger workers to night and afternoon shifts, and are more likely to report themselves as morning types [160].

As well as length of exposure to shift work, there may be at least three other factors that determine the expressed effects of shift work in relation to older workers. First, there is the healthy worker effect. Workers who are less able to adapt to shift work may not select themselves into such work or, if so employed, may select themselves out as they experience difficulty [162]. The 'survivor' population may therefore be able to cope with shift work better and be less affected by it than the general working population of comparable age. Experimental studies are more powerful than studies based in organisations, because of this tendency for workers to self-select out of jobs that require shift work if they find it challenging; but such studies are less common. One study compared workers who had stopped shift working for health reasons with those who had stopped shift working for other reasons, and with non shift workers. Those who had selected out for health reasons were less healthy than both the other groups but there were no age related effects [163]. The healthy worker effect may not be age-related in relation to shift work. Second, the design of shift working is also important: the system of rotation, the nature of the tasks, and the worker's control over those tasks. Experts tend to recommend, as age appropriate, systems which involve

flexibility, rapid forward rotation and earlier start and end times [159 164]. Third, overarching organisational factors, such as the possibility of promotion to day shifts with increased seniority, are often age related.

Control and flexibility

There is evidence to suggest that older workers are vulnerable to particular work stressors especially those relating to 'control' at work and similar factors variously called autonomy, decision latitude, influence and so on. These have been the subject of much study. Low control is associated with reduced job satisfaction [165] and various negative mental and physical health outcomes [62 166 167 137 168 169 145]. There is evidence to suggest that perceived job control increases with age (Source: personal communication, Jenny Head, University College London, 'Whitehall II' study) although another study in France reported it to decrease [170].

Research has suggested that flexibility in work arrangements can beneficially affect the functional capacity and reduce the experience of stress in older workers, particularly those with chronic illnesses [62]. In similar vein, continued good health is more likely among older workers if provided with choice to engage with the level and type of work that they prefer [171]. The European Foundation for the Improvement of Living and Working Conditions conducts periodic surveys of working conditions across Europe and, in the most recent analysis, concluded that work autonomy (control) was positively associated with higher employment rates among older workers [22].

Flexibility is particularly important for older workers since a large number are carers. More people in their 50s than any other group are unpaid carers [172] for older relations and for grandchildren. One in three people are grandparents by the age of 50, and may give up work to care for grandchildren [173]. Such roles tend not be recognised by employers. Many people work part-time rather than full time because of caring responsibilities and many give up work to become full-time carers. Care giving affects work in the sense that it affects the types of job working carers do [174]. Many report lack of flexibility at work can be problematic. But pertinent to this report is the fact that caring is frequently reported as a stressful experience that impacts negatively on the physical and psychological health of the carer [175 176], particularly where the care receiver demonstrates behaviour problems (as opposed to physical and cognitive impairments). The proportion of carers reporting poor health increases as weekly hours of caring rise. Combining work and caring often results in stress, tiredness, lack of personal leisure time and ill-health [172]. Many workers are highly committed to both jobs and to their informal caring responsibilities. Because of population trends there is likely to be an increasing need for care for older people and young children [177] while at the same time the Government is encouraging as many people as possible to enter and to remain in work for as long as possible. This means there will be fewer people available to provide informal care. Clearly there is need for family-friendly and flexible organisational policies that recognise the needs of carers, many of whom are older workers.

Social support

Social networks are the structures through which practical and emotional support and advice can be exchanged. This is often referred to as social support which has long been linked to better health and psychological well-being in the wider population [115 178 105]. It is thought that a strong social environment and good social networks at work may provide a buffer against the potentially negative influence of stressful situations. Several studies have suggested this is also the case for older workers [179-181]. Where older workers report good relationships with their supervisors or line managers, where managers are knowledgeable about ageing, and where workers are managed in an age appropriate manner, the evidence suggest that those workers are less likely to suffer poor health and are less likely to retire early [132 181]. Relationships with colleagues are believed to be particularly important for older workers [180]. It has been suggested that interventions that improve social support at work may improve working conditions for older workers' [179 180], particularly, as has been presented in Section 6 of this report, for women.

The actual mechanisms by which support protects people's health at work have not been widely researched, but outside work have received more attention. Social networks outside paid work usually include partners or spouses, relatives, close friends, religious and voluntary group participation. Research has suggested that such networks provide reference groups and a sense of belonging, as well as opportunities for support, assistance and companionship. They may help people cope better with difficult situations and thereby increase their sense of control. In fact some have viewed social support and solidarity as a form of collective control [182].

Effort and reward

Where older workers experience an imbalance between effort and reward, there is strong evidence for associated mental ill health including depression [183]. However, while these psychosocial work characteristics have been found to have a significant association with older workers' reported experience of stress and mental health, it would not be true to say that the effects of these stressors are unique to older workers. Such characteristics have frequently been shown to have a detrimental effect on the mental and physical health of workers of all ages. Lack of recognition (reward) and the devaluing behaviours of supervisors have been shown to be a problematic for older workers and a potential cause of stress [144].

Differences between jobs

The nature of the person's job, along with other facts about an individual related to education and income, combine to form a measure referred to as socioeconomic status. Research with older workers has concluded that lower socioeconomic status is associated with higher levels of stress and depression [184 185]. Lower employment grade is associated with poorer mental health in all age groups, but one study noted this effect was particularly strong for older

workers [34], although this is not always the case [55]. Older workers involved in manual work are more likely to exhibit negative mental health outcomes than older workers involved in non-manual work [112 186 187 67].

In conclusion, there appear to be a number of themes emerging in relation to psychosocial work characteristics, age and stress which might offer suggestions for interventions. There may be task differences related to older workers' profile of abilities but these effects do not stand alone and may be reduced or eliminated by attention to other factors such as the appropriate design or allocation of work and work equipment, the amount of control that the person has over their work, the support that they receive at work (and outside work) and the recognition that they receive for their efforts.

The literature review yielded no reports, within the specified time frame, of high-quality interventions on stress reduction for older workers. This is an area for further research. However, by reducing exposure to possible damaging work characteristics it may be possible to minimise the experience of stress and thus protect older workers' health. Reducing such exposure early on in working life may be a contributory factor in prolonging working life [188 172].

8. Stress and retirement

The two key themes of the literature on retirement and stress among older workers relate to (a) the causal link between stressful work and workforce exit, and (b) whether or not an older worker ceases work voluntarily; this seems to determine whether retirement is beneficial or detrimental to subsequent mental health. There are a variety of patterns of retirement among older workers. They may move from employment to retirement as a result of involuntary (push) factors such as poor health, disability, redundancy or mandatory retirement, or voluntary (pull) factors such as voluntary early retirement, a healthy financial situation or normal retirement age [8 11 13 189]. Retirement may be a gradual transition or it may be an abrupt cessation of work. Overall, there is strong evidence that stress is an important factor in all forms of workforce exit, including retirement [13 190-197]. Higher stress is associated in a consistent and predictable way with increased likelihood to retire [191]. Early retiring men in particular are more likely than their contemporaries in the workforce to have stress-related mental disorders like generalised anxiety disorders and depressive disorders [198 199]. In addition, several characteristics of work that are related to work-stress are also known to be associated with early exit from the workforce, such as low job autonomy, poor quality of work, long and inflexible working hours, and effort-reward imbalance [12 200 201].

Whether an individual's mental health will improve, decrease, or remain the same after retirement is dependent on other factors including access to finances, personal health and relationships [202], whether the individual would prefer to be employed or retired [203 204], and whether the choice to retire was made voluntarily or whether it was imposed as a result of health or organisational pressures [202 205-207]. Therefore, retirement itself probably does not categorically harm or benefit the mental health of older workers [208 209] but can have a positive, negative or no effect, depending on personal circumstances and preferences. Voluntary retirement is associated with a positive effect on stress and mental health of retiring older workers, particularly among those of higher socioeconomic status who are in good health, financially secure and who are in a personal relationship [202 205-207 209]. Overall, most research has concluded that voluntary retirement or retirement at the normal retirement age is associated with an improvement in the mental health of older workers [199 210-214], although some evidence suggests that retirement has a negative effect or no effect on older workers' mental health [114 215 216].

9. Recommendations

This review of the literature yielded no reports, within the specific time frame, of high-quality interventions on stress reduction for older workers. Nevertheless, there have been a number of studies and earlier literature reviews on working conditions and work characteristics that might suggest how the design and management of work and work organisations might be more positive for older workers' health [45 56 60 62 94 105 110 131-136 156 171 173 179-181 217 218]. There have also been several in-depth reviews in the grey literature regarding the future of work for older workers, some of which is relevant to the reduction of stress [14 132 173 219 220]. It is important to note that such changes will be context dependent and their efficacy remains to be tested. Given the likely time lag between the implementation of change and any measurable reduction in reported stress or health effect, long term initiatives may be needed. It should also be noted that many of the suggested proposals made in Table 1 below to improve the quality of working life for older workers, and to reduce their experience of stress, may have a similarly positive effect on their younger counterparts.

Table 1

Making work more positive for older workers

Control over work

- Give older workers more control over how they do their work
- Give older workers the choice of engaging with the level and type of work that they prefer including any involvement in shift work
- Allow older workers control over the pace of work
- Allow older workers more control over work-rest schedules

Job demands

- Work tasks and demands should be adapted to be age appropriate where necessary in order to maximise the contribution of older workers
- Allow older shift workers to work day shifts rather than night or afternoon shifts, if they wish, to have early starts and to work rapid forward rotating systems where possible
- Reduce the need for on-call duties
- Reduce the need for overtime

Recognition at work

- Improve the balance between work effort and rewards
- Recognise the contribution of older workers

Working hours and flexibility

- Increase the flexibility of work arrangements including making working hours and breaks flexible
- Allow part-time work or daily working hours to be reduced where required
- Allow more flexible task organisation
- Allow extra time for mental and physical recovery where necessary
- Recognise the need for older workers to balance work and home life by offering special leave arrangements where necessary

Social support at work

- Improve management understanding of ageing in the context of work
- Encourage supportive relationships between line managers and older workers
- Encourage a supportive social context to work

The recommendations presented in Table 1 do not cover three important areas which have been addressed elsewhere outside of the current empirical literature on ageing and work-related stress and especially in the policy literature. These areas are: organisational culture, education and training and health promotion. There is a separate literature on the benefits of physical exercise for mental and physical health, and for the continuing work ability of older workers. These are presented in Table 2. In many ways, these three areas might be viewed as providing the context for working.

Table 2

Improving the context of work for older workers

Organisational culture

- Promote an age aware and age tolerant organisational culture
- Promote the unacceptability of both direct and indirect age discrimination

Education and Training

- Educate managers and workers about ageing and its implications for work and health
- Challenge stereotypes about age in the workplace
- Continue to offer job training to older workers ensuring that training methods are age appropriate: criterion based and self paced

Health promotion

- Encourage and support older workers engaging in physical activity and relaxation
- Conduct regular work ability checks and discuss supportive development programmes

In conclusion, older workers form a major part of tomorrow's workforce. Employers are obliged to carry out a sufficient assessment of known risks to their workers' health and safety. The Management of Health and Safety at Work Regulations 1992 and 1999 state quite specifically that employers have a responsibility for developing a coherent overall prevention policy which covers technology, organisation of work, working conditions, social relationships and the influence of factors relating to the working environment. This way they can reduce the likelihood of work causing stress and related ill-health.

In the UK, the Health and Safety Executive's recommended way of tackling stress focuses attention on causes of work-related stress. Their 'Management Standards' describe the characteristics of an organisation where the well known risks for work-related stress are being effectively managed and controlled. They cover six areas of work design that, if not properly managed, are associated with poor health and well-being, lower productivity and increased sickness absence [1]: (a) *Demands* (e.g. workload, work patterns, work environment); (b) *Control* (how much say the person has in the way they do their work); (c) *Support* (encouragement, sponsorship and resources provided by the organisation, line management and colleagues); (d) *Relationships* (this includes promoting positive working to avoid conflict and dealing with unacceptable behaviour); (e) *Role* (whether people understand their role within the organisation and whether the organisation ensures that they do not have conflicting roles); and (f) *Change* (how organisational change is managed and communicated in the organisation). There are numerous equivalent ways of addressing these issues. The European Commission has also published similar guidance [221]. By and large, these approaches to the management of work stress have not advocated paying particular attention to any age group, but focus on large-scale risk assessments of groups of workers. Such assessments might be more age-sensitive than have typically been the case to date. However, the reviewed scientific literature in this report would suggest that the issues covered in such general assessments already cover a large proportion of work characteristics that have been shown to be problematic and potentially stressful for older workers.

10. Discussion

Clearly there is something to be learned about older workers' health by exploring the literature on work-related stress, as this review set out to do. But there are other areas of research that might inform the relationship between working conditions and older workers health that are not represented in this review since they do not explicitly deal with the concept of 'stress'. A considerable amount of research also exists that explores variables that might co-vary with stress, and that might use other outcome variables such as employment rates or at how long people are able to work. Three areas of research are relevant and are presented in this final section: (a) the series of studies on 'work ability' from Finland, (b) age discrimination, and (c) worklessness. Finally some areas for future research are suggested.

Probably the most impressive set of research studies with older workers originated in Finland, not ostensibly on stress, but using the concept of 'work ability' [14]. The aim of this work was to establish how long workers are able to work and what predicted their ability to continue working. The concept and measurement of 'work ability' includes individual dimensions such as attitudes, motivation and health, as well as organisational variables such as work demands, organisation and management: factors known to be associated with the experience of stress. All seem to play a role, but at work, management behaviour emerges as a strong predictor of continued working ability [222]. Other important features of work that seem to mitigate against early retirement are being in a higher occupational grade, having high job control and working in a supportive climate [223]. The implications for employers from this research, as well as from the research on work-related stress reviewed earlier, would be to focus particularly on the working conditions of workers in lower occupational grades, to maximise the amount of flexibility older workers have over their work and how they carry it out, and to provide as supportive a work environment as possible. However, within such a model, both employer and employee share responsibility for the promotion of work ability, albeit set within wider support systems such as their communities and healthcare providers. It is a combination of lifestyle and work characteristics, together with traditional biomedical factors, that may offer an explanation as to why some people are able work longer than others. In research

emerging from the Finnish work ability model, evidence is also emerging to confirm that the quality of working life has effects *beyond* retirement. Findings from the British 'Whitehall II' study of civil servants also suggest that health and well-being during retirement are determined largely by circumstances during working life [2]. Such findings would suggest that investments in the length and quality of people's active period in their 'third age' might be made *during* their working life, not just afterwards [14].

This review did not identify papers on the effects of age discrimination. The experience of discrimination at work is known to be stressful, and to have various negative psychological consequences. However, most research has focused on racial or gender discrimination. Much less is known about the effects of age discrimination, although the research that does exist suggests that perceived discrimination on the basis of age is stressful and can lead to decreases in self-efficacy, organisational commitment, job involvement, job satisfaction and work performance [224]. It is thought that this process begins with stereotypes, defined as the set of characteristics a person believes are possessed by a particular social group. Age stereotypes are largely negative, such beliefs are associated with discriminatory attitudes, and those attitudes, in turn, may translate into employment decisions [225-227]. The way older workers are perceived and treated in organisations are important factors in making workplaces supportive and attractive for them [228]. Since anti-age discrimination legislation took effect in the UK in 2006, and the consequences for employers might include litigation, more research on this topic may be forthcoming.

It has been established for many years that work is, in general, associated with greater life satisfaction and well-being. This is not simply a question of employed persons being healthier and having greater financial security. Even when such variables are taken into account, the relationship between work and well-being remains. Although most research has focused on paid employment, there have also been studies that show those people engaged in voluntary work demonstrate better mental health. It is thought that one possible mechanism might be the social support and companionship offered by work. Studies show that both paid and unpaid work are associated with increased life satisfaction, and that social support is a key factor in explaining this relationship [229]. It is important to note that although there is evidence that work can be harmful to health and that stress may be one linking mechanism, the better alternative may not be *no* work, but rather *better* work. The deleterious effects of worklessness have been well documented [230]. One large-scale study tracked 55-66 year olds over time and found that full-time employment and low-level volunteering had independent protective effects against decline in psychological well-being [218]. The author suggests that full-time workers may enjoy certain advantages in comparison with their part-time counterparts, such as better compensation, better health and retirement insurance packages, more social support, and relatively higher control at work, which may explain their mental health preservation compared to part-time workers. The beneficial effects of even a modest amount of volunteering on mental health are established. Several longitudinal studies have shown it to protect against depression or decline in self-reported health in post retirement groups and this is not simply because it is a substitute for paid work [231 232]. Volunteers have reported they find voluntary work less stressful than paid work [233]. More recently researchers have begun to explore the positive aspects of work and its health promoting properties [230 234] in addition to the immediately obvious advantages of financial reward. A counterbalance might be provided in future by exploring not just the conditions that deter older workers from work and might harm them at work, but also those that provide them with satisfaction, that enable them to remain productively in work, and that promote an active and healthy third age.

A possible important target for future research should be those in mid-working life: in other words, future older workers. This group seem to report *more* work-related stress than other age groups. Research might focus on further exploration of the reasons for such a finding. This would facilitate the design of interventions to improve this group's working life, to reduce the likelihood of their premature exit from the labour force [22] and to improve their quality of life during retirement. It is established that the health effects of stress may be demonstrated many years after the report of adverse working conditions, suggesting an important role for time and chronicity in the development of stress-related health outcomes [86].

As discussed earlier in this report, older women may arguably be a particular focus for more research. The group of workers currently reporting most work-related stress is women aged 45-54 [28]: a time of life that coincides with potential significant personal changes such as the menopause and a greater probability of shouldering more domestic and caring responsibilities than men. Women often report more work-related stress than men [235], and are over represented in low status jobs with little autonomy: work characteristics associated with the development of stress and associated illness. There are known gender differences in the biochemical response to stressors; a better understanding of these and their implications may be helpful in unpacking the relationship between stress and illness in both men and women [117].

Another focus for future work might be the use of a broader array of measures. Much of the more methodologically robust work on the relationship between work and stress has involved very limited measures of work and the working environment – largely 'control' and 'demands'. It might be argued that the rapidly changing world of work requires that we be aware of the possibilities of new risk factors: lack of feedback, unsuitable or non-existent appraisal mechanisms, not feeling 'valued', poor communication with senior management, inappropriate target-setting, a lack of dignity, organisational justice or fairness, and a lack of resources may reflect more contemporary concerns.

Most of the research reviewed in this report has been carried out with older people working in large

organisations. It is widely thought that work-related stress is more common in large organisations than small enterprises. There could be many reasons for this. However, pertinent to our current concerns for older workers, one important factor could be that in small organisations managers may be more in touch with their staff, better acquainted with their personal situations, and more alert to their long standing health conditions than would be managers in large organisations. Such awareness makes providing support more straightforward, and facilitates the flexibility that is required in adapting jobs to accommodate people's changing needs and abilities. A scientific examination of the situation of older workers in small and medium sized enterprises would be helpful.

It is increasingly recognised that a biopsychosocial model accounts for a larger amount of variance in the development of illness than a biomedical model. This is helping to unravel the hitherto intangible processes, the mediating mechanisms which will eventually explain the relationship between work demands and personal characteristics and resources on the one hand, and psychological and physical ill-health on the other. The mechanisms involved in the development of well established stress-related ill-health outcomes such as heart disease, for example, are becoming clearer. Direct activation of neuroendocrine stress pathways and the indirect effects on health behaviours (low physical activity and poor diet in particular) are key factors [102]. It is likely that as relevant fields of study evolve, such an understanding will become clearer. This will help to persuade healthcare practitioners, employers and policy-makers of the importance of 'healthy work' to the quality of people's lives, and of the importance of initiatives to reduce stress at work.

It should also be noted that the concept of an 'older worker' as presented in much of the research literature may be inappropriate. First, it certainly varies considerably from mid-40s to mid-60s. Second, it by implication simply refers to such workers as a group who have lived longer than a younger reference group. But third, such research is based entirely on chronological age, rather than on the usual focus of such interest (the real subtext) which is on *health* and *function*. A 45 year old may be functionally just as healthy as a 35 year-old. Research tends to refer to older workers as if they are a homogenous group. In fact, the scientific literature notes an *increase* in variability with age [236] both in health and in performance. Thus, much research on ageing and work, simply by measuring chronological age, may include a lot of 'noise', may obscure matters, and may not be as helpful in determining policy and practice than it could be. Legislation and policy may not reflect this increased diversity in decisions about suitable retirement ages. History would suggest that such decisions are political and economic, rather than based on the science relating to older workers' health and performance.

In conclusion, it is clearly important to alter expectations of the nature of work towards the end of working life in order to avoid work-related stress and the associated ill-health outcomes. Older workers may still make a very valuable contribution very late in life, but that contribution, and associated responsibilities, may be different from that undertaken earlier [236]. More research is needed to describe the type of work (and the way that work is organised) that is particularly suitable for older people, that does not overtax their mental or physical health and that in particular affords them a healthy work-life balance [228]. This review has highlighted some of the aspects of work that may be particularly harmful for older workers. It tells us less about the type of work that is particularly suitable and enjoyable and that would make it easier for older workers to stay on at work if they wished to do so. There are many different forms of work that may offer the flexibility older workers need and these should be explored further: part-time work, job shares, flexible working hours, transfer to a les demanding job, special leave options, time off in lieu, career breaks, as well as self-employment and consultancy options. All might be explored in a move forward where the talents and skills of older workers are no longer unnecessarily lost to the labour pool because of work-related or other pressures and stress.

But perhaps the most important message is that as well as focusing on designing and managing work that is suitable for workers aged 60 and over, employers might do well to focus on workers in their 40s and 50s, as workers in this age group often report the highest levels of work-related stress. Investing time in making work more attractive and enjoyable for tomorrow's older workers, and to explore their particular difficulties at work, may well pay dividends by protecting their health and extending working life. This should be a priority, particularly since it is clear that the quality of working life can also impact on the health and well-being after retirement. Investments in the length and quality of people's active period in their 'third age' might be made *during* their working life, not just afterwards.

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Appendix: Literature review methodology

The system for producing this review followed three principles to ensure that it was comprehensive, incorporating established knowledge as well as recent, high-quality evidence. First, a systematic approach was adopted to reviewing the literature. This involves a formal, replicable approach to literature searching and reviewing. As specified by Help the Aged and TAEN, the literature review was restricted to the last 20 years (January 1990-March 2009). Second, the quality of the research evidence was appraised formally and independently by the research team. This process allowed the review to give greater emphasis to evidence that warranted attention, and ensured that that anomalous and poor quality findings did not contaminate the review. Third, recent studies were reviewed and interpreted in light of the established body of knowledge. Authoritative research is not confined to the last two decades; it may have been conducted several decades ago, be well established in the area, and researchers simply may not have attempted to replicate that research since. It is important that relevant evidence be incorporated into this type of review regardless of its date of publication, or the resulting review may be give an inaccurate impression of the state of scientific knowledge, biased by recent trends in research. To maintain the rigour of the systematic approach, while avoiding the pitfall of neglecting established knowledge, this review combines the critical elements of the systematic review process with an interpretive process based in our wider body of knowledge on ageing, work-related stress and health.

A systematic approach

Traditional narrative or 'expert' reviews of scientific literature are subject to bias by their authors. Such biases can be minimised by adopting a structured, systematic approach with appropriate search criteria. The systematic approach extrapolates the scientific rigour employed in experimental research to the field of reviewing the current state of scientific evidence. The approach requires that all publications relating to a specific research question that are identified in a literature search are appraised and synthesised where they meet the inclusion criteria of the review. This process also aims to convert otherwise unmanageable quantities of material into reliable and robust summaries of the literature. The benefits of the systematic approach are that it is inherently rigorous and objective, and allows other researchers to repeat the review in future using an identical research strategy.

The search strategy

Eleven scientific literature databases and six 'grey' literature databases were interrogated to assure the breadth and depth of coverage. The scientific literature searches were restricted to peer-reviewed publications and primary sources of data found in scientific journals. The grey literature provides summaries, facts, statistics, government reports, theses, conference papers, committee reports, and other materials that are not controlled by commercial publishers. The grey literature is regarded by many as an important indicator of public interest, reflecting current priorities and providing signposts towards future concerns [237]. Grey literature materials can be a source of ideas about current problems and their possible solutions, and can help to expose the disparity between what researchers have published, and what policymakers, employers and employees want to know. Such reports are often commissioned by government departments to address current or future policy imperatives. Their disadvantage is that they are not always subject to peer review in the same way as publications in scientific journals, and their methodological quality can vary considerably as a result. They may also be driven by political perceptions of areas of interest rather than real, practical or theoretical need. In this way the areas covered by grey literature materials may be biased.

Literature search parameters

The search was restricted to human studies (animal studies and computer modelling studies were excluded) published between January 1990 and March 2009. The review was also restricted to English language publications. The search terms were designed to be as wide as possible, and were organised into three clusters. The first cluster contained terms relating to age (e.g. age, ageing, older, middle-aged, elderly). The second cluster contained terms relating to work (e.g. work, worker, employee, occupation). The third cluster contained terms relating to stress (e.g. stress, depression, anxiety, burnout, mental health, psychological health, work-life balance). This strategy produced a very large number of papers that subsequently proved not to be relevant, but it was decided that it was better to be over-inclusive than under-inclusive during the initial literature search.

Search results

Over 20,000 articles from the scientific literature and 3,500 articles from the grey literature were identified. Approximately 90 per cent of the scientific articles were excluded on examination of titles and abstracts. Reasons for excluding these articles included (but were not limited to): (a) age being partialled out statistically as a confounding or nuisance variable; (b) search terms being used in divergent contexts (e.g. "employed" as a synonym for "used" rather than the occupational sense; (c) "stress" as a physical force rather than a mental state; (d) "worked" as an indicator of successful function rather than occupation; (e) studies focusing age groups younger than 45 or 50; and (f) studies focusing on older people rather than older workers. Of the remaining articles, those with abstracts or summaries of insufficient scientific quality were also excluded. Where the titles or abstracts of articles were ambiguous, full copies of the publications were collected and reviewed. Further exclusions were then made on examination of the full article for reasons similar to those given above.

Around 200 scientific papers and 50 publications from the grey literature then remained for detailed inspection. Of these, some were excluded from the final review if it became apparent that the titles or abstracts had been misleading, if they could be criticised on the grounds of serious methodological weakness, or where there was insufficient description of the research method to allow for any judgement of methodological rigour.

Interpretation of results

The information identified through the systematic review process was interpreted within the framework of our existing knowledge of ageing, work-related stress and health. This framework was constructed not only from earlier studies on ageing, work and older workers but also from relevant studies on gender, organisations, employment, retirement and occupational health psychology. The interpretative process allowed some of the shortcomings of the date-restricted review to be overcome and a working model of ageing, work-related stress and health to be developed.

TAEN's aim is to help create an effective labour market which works for people in mid and later life, for employers and for the economy. TAEN is supported by Age Concern and Help the Aged.

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Age Concern and Help the Aged have joined together to form Age UK, a single charity dedicated to improving the lives of older people. We are a new charity with a clear vision: a world in which older people flourish. We work with a range of partners to ensure that together we can improve the lives of older people.

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Age Concern England (charity number 261794) has merged with Help the Aged (charity number 272786) to form Age UK, a charitable company limited by guarantee and registered in England: registered office address 207-221 Pentonville Road, London N1 9UZ, company number 6825798, registered charity number 1128267. Age Concern and Help the Aged are brands of Age UK. The three national Age Concerns in Scotland, Northern Ireland and Wales have also merged with Help the Aged in these nations to form three registered charities: Age Scotland, Age NI, Age Cymru.