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# 1 Introduction: History of Work and Health

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## GENERAL BACKGROUND AND AIM

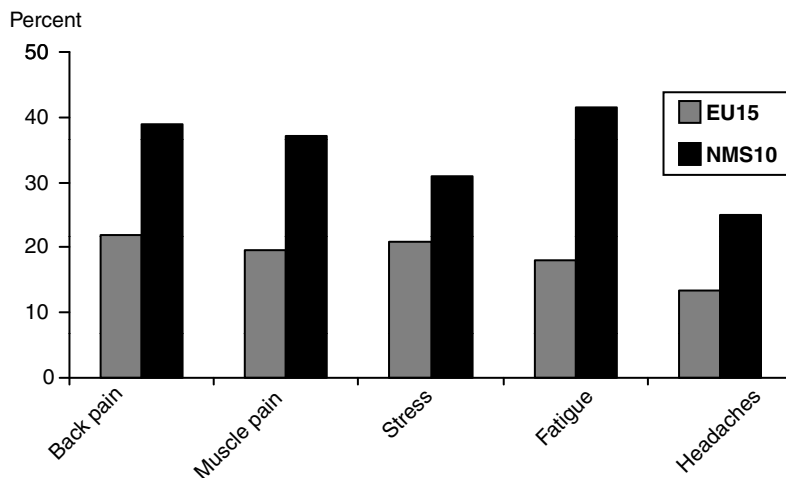
Having a paid job is, for most people and in most cases, a source of economic security, status, well-being and health. It gives meaning to lives, but it can sometimes be a mental and physical burden and a source of frustration, conflict, disappointment, mental and physical illness and even death. This dualism has been caught elegantly in the title of an article by Lennart Levi (1990): 'Occupational stress. Spice of life or kiss of death?'. Dr Levi is a Swedish pioneer in occupational stress research, and presently, at the age of 80, an active Member of Parliament. His article describes how work-related psychosocial stressors affect human health through emotional, cognitive, behavioural and physiological processes, as modified by situational and individual factors. He presents evidence for a causal relationship between work-related psychosocial stressors and the incidence and prevalence of occupational morbidity and mortality, and emphasises the need for a better understanding of work environment–stress–health relationships. In this book we will follow up on his aspirations in order to learn more about stress and health in modern work life in a rapidly changing world.

We will identify and describe ongoing trends in the modern workforce from a stress–health perspective, and will also speculate on health consequences of future workforce developments. On the basis of recent scientific evidence, positive as well as negative aspects of modern workforce conditions will be outlined and will be related to health outcomes. We will also describe the psychobiological mechanisms linking stressful work conditions to morbidity and mortality. Work-related health problems comprise subjective health complaints as well as more serious disorders such as burnout syndromes, depression, musculoskeletal and cardiovascular disorders, diabetes, metabolic syndromes, cognitive impairment, susceptibility to infections and sudden death. The concept of 'stress' is used in a broad sense, similar to its popular usage. However, different forms and aspects of stress, and some influential models of occupational stress, will be described and applied to specific occupational conditions.

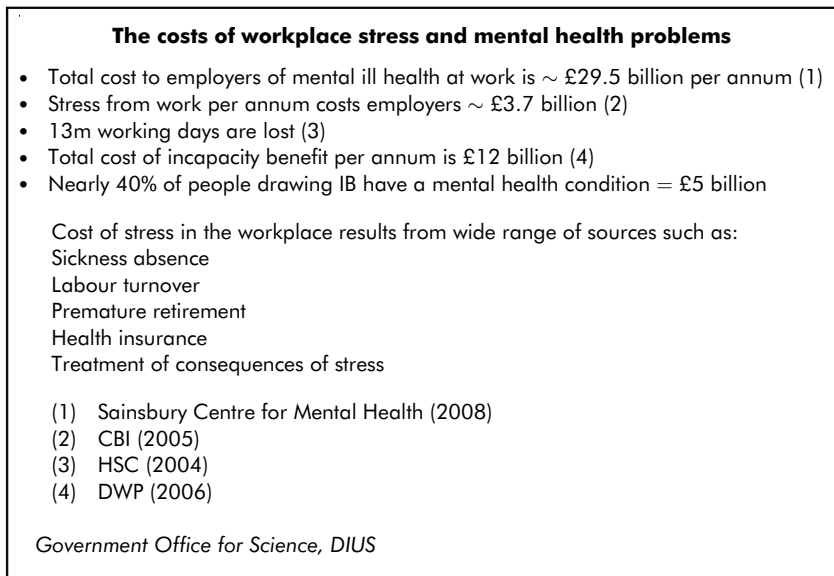
During the last couple of decades, the workplace in the USA, Europe and some highly developed Asian countries has undergone major changes involving introduction of 'downsizing and outsourcing', 'lean and just-in-time' production, longer working hours and temporary and part-time employment (NIOSH, 2002; Peña-Casas & Pochet, 2009). These changes started as a result of the recession in the early years of the 1990s and increased

business globalisation. The impact on the psychosocial work environment has been higher workloads and greater time pressures ('fewer people doing more'), increased speed of change, less predictability, decreased job security and job loss, but also, more positively, some control over work pace and work methods, increased flexibility and responsibility, and more learning opportunities. There has also been a continuous increase in the number of women in the workforce, and more and more dual-earner and single-parent families have emerged (Lewis & Cooper, 2005). In addition, changed family structures and increased care responsibilities for both children and older relatives have added to the pressures on large groups of workers in the industrialised and emerging world.

A consistent trend in a large part of the globe is that stress-related disorders are becoming more prevalent and severe (Cooper *et al.*, 2009). Stress may exert its health effects in different ways. It affects bodily functions and organs, such as the cardiovascular, metabolic and immune systems. Stress also influences people's lifestyles, for example their dietary habits, physical activity, and alcohol and tobacco consumption. In addition, stress can increase risk-taking behaviour, causing accidents at work and in people's private lives. Stress is also known to have negative effects on people's compliance with treatment regimens, such as taking prescribed medication to reduce high blood pressure or follow-up dietary recommendations for diabetics. Another indirect consequence is that stress can make workers less likely to use protective devices on the job, such as helmets, hearing protection and seat belts, or to follow instructions about how to use dangerous equipment in a safe way. The World Health Organization (2001) identified mental health problems and stress-related disorders as 'the biggest overall cause of early death in Europe'. According to the European Working Conditions Survey 2006 (Parent-Thirion *et al.*, 2007), 30–40% of workers reported such problems, with the highest figures in the new member states (Fig. 1.1). In the UK, stress has been estimated to cost the economy between 5 and 10% of GNP per annum (Fig. 1.2; Cooper, 2005). Mental illnesses (e.g. depression, chronic fatigue syndrome, anxiety, personality disorders, drug abuse problems, schizophrenia) and pain problems are the most common reasons for individuals describing their state of health as 'poor'. In Sweden these disorders are



**Fig. 1.1** Work-related health problems within the EU, 2006 (Parent-Thirion *et al.*, 2007). EU15 = Old 15 EU members. NMS10 = 10 new EU member states, 2006.

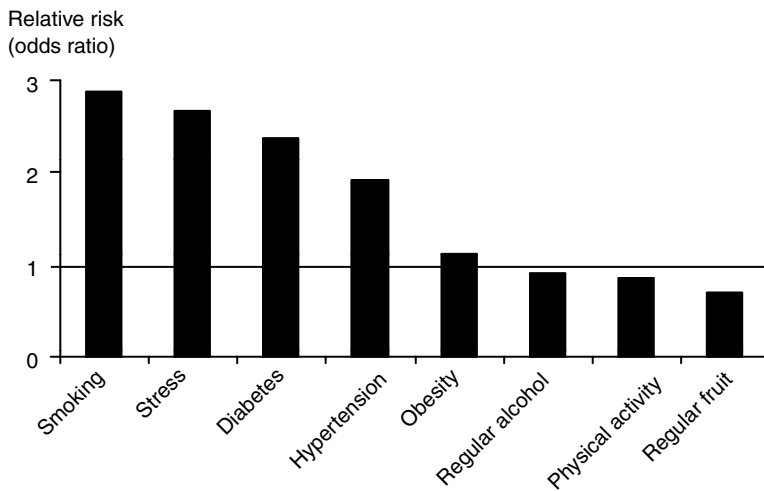


**Fig. 1.2** The costs of workplace stress and mental health problems in the UK.

responsible for 76% of sick-leave pay in women and 65% in men. In recent years it has been shown that psychosocial factors play an important role not only in mental, cardiovascular and metabolic disorders, but also in infectious diseases and in pain-related problems such as neck, shoulder and back pain, headache and stomach ache (as will be described in the following chapters). Recent research has revealed some of the psychobiological mechanisms involved in these relationships, although there is still a need for more research (Sapolsky, 1998; McEwen & Lasley, 2002).

Researchers from University College London have monitored workers' feelings about their job, recorded their heart rate and its variability, measured the stress hormone cortisol (see Chapter 5), and studied diet, exercise, smoking and drinking habits. They found that chronic work stress was associated with coronary heart disease, particularly in men and women under 50. This is consistent with results from the Inter-Heart Study (Yusuf *et al.*, 2004), a large investigation comprising 52 countries with about 15 000 cardiac patients and 14 000 controls in which the roles of different risk factors for chronic heart disease were evaluated. Next to cigarette smoking, psychosocial stress was found to be the most important risk factor for heart disease, increasing the risk almost three times (Fig. 1.3).

A deeper understanding of the processes involved in these trends and relationships is necessary in order to take measures to prevent work-related stress and ill health. The overarching goal of this book is therefore to present evidence on the ongoing trends and expected future developments in the workforce, and to describe the consequences for employees' mental and physical health. The aim is to highlight the new workplace in a modern and changing society, its various stress-related aspects and health consequences, future perspectives and possible preventive strategies. Empirical investigations, and theoretical and methodological developments in psychobiological stress research during the last decades, have provided new information on how mental processes affect various bodily functions such as the cardiovascular, immune and metabolic systems, the brain and the muscles (Sapolsky, 1998; McEwen & Lasley, 2002). However, it is important to keep in mind that physical occupational health risks are still a major health problem in a large part of the



**Fig. 1.3** Psychosocial stress (depression, locus of control, perceived stress, life events) and other risk (and protective) factors for myocardial infarction. INTERHEART case-control study (52 countries: 15 152 patients, 14 820 controls). Based on Yusuf *et al.* (2004) with permission.

world. According to the International Labour Organization (2005) about 2.3 million men and women, mostly in the developing world, die from work-related accidents and diseases each year, including an estimated 650 000 deaths caused by hazardous substances. These numbers are likely to be underestimated owing to the inadequate reporting and notification systems in many countries.

## WORK AND HEALTH FROM AN EVOLUTIONARY PERSPECTIVE

It is now more than 200 years since the birth of Charles Darwin and over 150 years since the publication of his *On the Origin of Species*. It is therefore appropriate to look back on the role of 'work' in human history. The first modern human beings, *Homo sapiens*, appeared about 150 000–200 000 years ago. Their main 'job' was to gather edible plants, nuts, fruit and roots, and to hunt animals for food in order to survive and to be able to mate and multiply. It has been estimated that the first humans spent 2–3 days a week on finding food. This means an average daily 'workload' of 2 to 3 hours, which can be compared with about 8 hours or more of work as the norm today. As no artificial light was available, humans could not do anything else other than rest and sleep during the dark part of the day. Even after starting to use fire for heating and to create some light in the evening and during the night, a discovery that probably occurred about a million years ago in Africa among the ancestors of *Homo sapiens*, moving around in the darkness was difficult with a burning torch and, as a consequence, people tended not to move around much. As the only means of transportation was walking and running, the possibilities of moving longer distances were also limited by the nature of the landscape and because of threats from dangerous animals and hostile human beings. Today, however, humans can be more active, and move and travel around 24 hours a day thanks to electric lighting and more efficient means of transportation that can take travellers to almost any part of the world within a day or so.

Among animals the amount of time spent on their 'job' of finding food varies a great deal. Some birds spend almost all the time awake on finding food, whereas predators such as lions and tigers spend most of their time relaxing in the shade and only seek prey when they are hungry. Koalas are famous for spending most of the day asleep and only about 5 hours a day munching eucalyptus leaves. A large snake such as a boa constrictor can swallow a large animal and survive on this for months. Thus, from an evolutionary perspective, working 8 hours or more a day for survival is not genetically 'natural'.

Humans eventually found that farming and domestication of animals were more efficient means to guarantee a constant supply of food that made it possible for more people to live together and not have to move constantly to new places to find food. This meant that the workload increased considerably. Sowing seed, caring for crops and animals and harvesting made it necessary for people to work actively on a daily basis. Until the beginning of the 20th century and industrialisation, life as a farmer was the most typical job, and involved both women and men. Also children had to be mentally and physically active on a daily basis from an early age. Technological advances in the late 19th and early 20th centuries, such as the development of more productive seeds and of machinery for seeding and harvesting, combined with the introduction of more efficient methods including the use of fertilisers, reduced the need for manpower and decreased the physical demands to some extent. This did not, however, reduce the workload as more and more people moved into other jobs and activities, for example industrialised manufacturing.

Living close together with other people and with livestock increased the risk for transmitting infectious diseases such as upper respiratory infections, pneumonia and tuberculosis. The accumulation of waste in highly populated areas also contributed to health risks. As a consequence, health began to decline in humans in Europe about 3000 years ago. This was reflected in, for example, changing height in humans, which in men was reduced from about 173 cm around 400 BC to 166 cm in the 17th century. Not until the mid 19th century did health begin to improve. In recent decades lifestyle factors such as cigarette smoking, lack of physical activity and increasing overweight in affluent societies have caused worse health in large groups of people. Examples are lung cancer (due to cigarette smoking), which increased in men 20–30 years after starting to smoke and which is still increasing in women who started to smoke later, and Type 2 diabetes (due to overweight, stress, and lack of physical exercise), which is presently increasing in a large part of the developed and developing world. So far, however, life expectancy has continued to increase in most parts of the world thanks to better nutrition, sanitary improvements, better maternal and infant care, medical advances and improved treatments. For example, lowering blood pressure and blood lipids by medication combined with lifestyle changes have helped reduce the prevalence of cardiovascular disease (e.g. heart attacks, stroke) in the working population during recent decades. An exception to this trend of increasing life expectancy is Russia, where life expectancy decreased after the collapse of the Soviet Union.

For thousands of years, humans spread from Africa to other parts of the world. This process was very slow, and generation after generation lived under relatively similar and stable conditions. Around a thousand years ago, however, human cultures started to appear that were founded on more advanced methods and tools, specialisation in work techniques and the formation of larger and more organised societies. During the last two millennia, the speed of change has increased at an accelerating pace. For the last 100 years, societies and living conditions have changed dramatically and the speed of change appears to be continuing to accelerate, yet human beings as biological organisms have remained the same for a hundred millennia.

Humans are very flexible and are usually able to adjust to new demands and conditions with no, or only minor, short-term health problems. Within moderate limits, exposure to new conditions is likely to promote individual development, strength, health and well-being. However, there are limits to adaptation. In the late 1960s science journalist Alvin Toffler wrote *Future Shock* (Toffler, 1970) in which he described the accelerating speed of change and the pace of daily life in modern society. Toffler identified how changing lifestyles, and technological developments such as advances in transport and communication, were giving rise to new products, the rebuilding of city centres, the construction of shopping malls, and ever-larger streets and highways. Travelling within countries and abroad, moving home and changing jobs were all occurring more and more frequently. In addition, social relationships changed dramatically, with the extended family structure gradually disappearing. Toffler's aim was to analyse the personal and psychological, social and health consequences of accelerating change in society. He stressed that humans were about to reach a critical point at which they would be overwhelmed by change and would face a massive adaptational breakdown.

Toffler's fear of adaptational breakdown was based partly on research findings at that time by two psychiatrists, Thomas Holmes and Richard Rahe (1967). They constructed the Social Readjustment Rating Scale in order to measure the time and effort necessary to adjust to various life changes: 'the cost of adaptation'. Positive as well as negative events were included. This scale was based on normative ratings from a panel of individuals, giving weight to various possible events in an individual's life. Marriage was used as a standard and given a value of 50 (Fig. 1.4). Death of a spouse was rated as one of the most stressful events and given a value close to 100. By adding the weightings associated with each event during a specific period in life, a total life-change score could be calculated for single individuals. In several studies this score was related to cardiovascular events and it was found that an accumulation of life changes often preceded heart attacks and sudden deaths. The assumption behind this scale was that not only did negative events, such as death and sickness in the family, divorce and job loss, contribute to the 'cost of adaptation', but also positive events, such as marriage, having a new child, moving to a new home or starting a new job, would tax the individual's coping resources and take a toll that could be reflected in increased vulnerability and health problems. The new notion that positive changes can tax an individual's coping resources is supported by anecdotal evidence from individuals who suffered a heart attack just after they learned that they had won a fortune on the lottery or experienced some other kind of sudden dramatic positive event such as the unexpected survival of a loved one after a serious accident or a natural disaster. This suggests that sudden intensive positive emotions could trigger a heart attack in susceptible individuals, but strong scientific evidence for this phenomenon is difficult to find or obtain as controlled experiments are not possible for obvious practical or ethical reasons.

The Social Readjustment Rating Scale has since been modified, and the general assumption is that adjustment to new conditions as such is not a health problem provided that the individual also has sufficient time to prepare and to adjust to the new situation. Unexpected life events are more harmful for health than expected events, and negative events are more harmful than positive events. Events initiated by the individual him- or herself have also been found to be less harmful than events caused by external conditions or individuals.

In his book Toffler (1970) points out a number of future 'shocking' scenarios: babies born without pregnancy, cities under the sea, man-machine sexual relationships, sunshine at will, homosexual family units, antisocial leisure cults, accelerated education through drugs, animal servants and group marriages. As we can see today, 40 years later, some of these

Life event	Life change units
Death of a spouse	100
Divorce	73
Marital separation	65
Imprisonment	63
Death of a close family member	63
Personal injury or illness	53
Marriage	50
Dismissal from work	47
Marital reconciliation	45
Retirement	45
Change in health of family member	44
Pregnancy	40
Sexual difficulties	39
Gain a new family member	39
Business readjustment	39
Change in financial state	38
Change in frequency of arguments	35
Major mortgage	32
Foreclosure of mortgage or loan	30
Change in responsibilities at work	29
Child leaving home	29
Trouble with in-laws	29
Outstanding personal achievement	28
Spouse starts or stops work	26
Begin or end school	26
Change in living conditions	25

**Fig. 1.4** Social readjustment rating scale (adults).

'shocking' predictions have come true but are not today considered very shocking. Indeed the speed of change in society has accelerated far beyond what Toffler had imagined. As an example of how family structures have changed, having children without being formally married (cohabitating) has become common in many countries. In countries such as Estonia and Sweden today, more than 50% of children are born outside formal marriage. In Nordic countries, about 50% of all couples separate at least once in life, and a 'modern' family today often consists of a couple with children from previous marriages and from their present relationship: 'my children, your children, our children'. Other examples of 'new families' today are single-sex families with and without children, which have become more frequent and accepted; children that are born after *in vitro* fertilisation; and single mothers with children born after insemination with sperm from an unknown father. The electronic revolution, with personal computers, the internet, email and mobile phones, could not be predicted in the 1960s.

In recent decades we have seen great changes in working conditions in industrialised countries, related to a more global economy and modern communication technologies that have given rise to more competition, increased demands for speed, efficiency and productivity, the faster pace of work and more deadlines (Fig. 1.5). In the more recently developed countries, such as China, South Korea and India, these changes have been even more rapid



**Fig. 1.5** Work pace is increasing. Drawing by Urban Skytt.

and dramatic, at least in the big cities. The development from life as a farmer to life in a computerised world took a hundred years for people in western countries but is now happening in a decade in China and India. This is likely to cause extra strain on people in these countries. In addition, repeated economic recessions, such as the most recent one that started in 2008, have contributed to additional turbulence and have intensified the restructuring of companies and manufacturing techniques, leading ultimately to reduction of personnel. Such changes will be followed by increased unemployment, and even higher demands on the remaining workers. Demands for more advanced training and education and a faster pace of work make it almost impossible for people without these qualifications to get a permanent job. There is a risk that many young people will fail to be part of the permanent workforce all their lives. In Sweden, for example, about 20% of the population in the 1950s had only primary education, and at that time about 20% of the jobs did not require additional training and education. Today, however, only about 5% of jobs can be performed by individuals without specific training and education, but more than 20% of each new generation lacks that kind of training or education. This means that about 15% of each new generation will not get a permanent job. An additional group of people who will face significant problems entering the workforce of the future will be people suffering from various health problems and handicaps. Immigrants without formal education, or with the 'wrong' sort of education from their homeland, also face significant difficulties finding a permanent job.



Millions of years of evolution created individuals who adjusted to conditions which differ dramatically from what humans are exposed to today. Evolution is a very slow process, and even minor biological changes via natural selection would take thousands of years. *Homo sapiens* has proved to be very flexible, and has been able to populate almost all parts of the world but has contributed to the extinction of other species. For more than a hundred thousand years, *Homo sapiens* and Neanderthals lived together on Earth but according to recent DNA research there was limited interracial mating. Around 30 000 years ago, Neanderthals disappeared and *Homo sapiens* remained as the only human species on Earth.

Despite the success of *Homo sapiens* on Earth, constant adjustment to rapidly changing and largely unpredictable conditions is likely to tax human resources. This may be one explanation for health problems reported today in industrialised countries. Although physical health has improved considerably in most parts of the world, as reflected in longer life expectancy and more children surviving their first year of life, mental health problems as reflected in stress and lifestyle-related disorders such as anxiety, depression, burnout syndromes, chronic fatigue, cognitive (memory) impairment, overweight, Type 2 diabetes, sleep problems and diffuse muscular pains have increased dramatically at the same time. Usually physical health problems lead to mental problems, and mental problems cause a deterioration in physical health. Therefore, better physical health reflected in increased life expectancy and poorer mental health seems to be a contradiction. This contradiction can be explained by the fact that improved physical health, often measured in terms of infant mortality and life expectancy, during the last few decades has resulted from medical improvements, regular medical check-ups, reduced cigarette smoking in Western societies, and better health information and nutrition. Poor mental health is a consequence mainly of psychosocial conditions but is usually not fatal. It is possible to live a long life and suffer from depressed mood and muscle pain. However, there are considerable health differences between countries. For example, a woman in Europe and Japan can expect to live until the age of 80 or more, whereas a woman in Africa has a mean life expectancy of less than 50 years.

Presently, the new forms of work are mainly represented in the most developed countries in Europe, North America, Australia and some Asian countries such as Japan and South Korea, but are found in many big cities all over the world. In large parts of the world, hazardous physical work conditions are still causing major health problems. Examples are coal mines in China and Russia; and exposure to poisonous chemicals in the manufacturing industry and to pesticides in farming in India, Africa and South America. However, as we have seen in other parts of the world, rapid development and a more global economy may also change conditions in these countries in the near future, and people may soon be exposed to the 'new forms of work' discussed in this book. In many industrialised countries that depend on automatised production and more people working in white collar jobs, it is likely that mental stress has become the most important health problem. This could partly be the result of a reduction in physical health risks, but also of increased psychosocial demands (Pejtersen & Kristensen, 2009).

The UK Government's Foresight Project on 'mental capital and wellbeing' (Cooper *et al.*, 2009) explored the challenges and opportunities facing the UK over the next 20 years and beyond in terms of its mental capital, defined as:

the totality of an individual's cognitive and emotional resources, including their cognitive capability, flexibility and efficiency of learning, emotional intelligence and resilience in the face of stress. The extent of an individual's resources reflects his/her basic endowment

(genes and early biological programming), and their experiences and education, which take place throughout the lifecourse.

The project report identified the factors that impinge on the national mental wellbeing of the UK population. It focused on the challenges that lie ahead as a result of globalisation and associated increased demands for competitiveness, together with increased pressures on working lives and the disruption of work–life balance. Also identified were the challenges from changing family structures and care responsibilities, not only for children but also for older relatives. The increased life expectancy in most industrialised countries and an ageing population in Europe and Japan mean that larger numbers of people will be at risk of dementia and other neurodegenerative diseases. The pension crisis in many countries as a result of the recession and the collapse of the banking sector means that people will need to work longer with consequent implications in all societies.

## **ABOUT THIS BOOK**

First we will describe the new workplace and its characteristics in a rapidly changing world, and its positive and negative effects (Chapters 2–4). Then we will present scientific evidence on the conditions at work that are ‘health promoting’ as opposed to ‘health damaging’. We will summarise from a psychobiological perspective the bodily effects of stressful work conditions, and the mechanisms that link these effects to various disorders. Possible interventions to reduce stress and promote health and productivity will be described on an individual, organisational and societal level. Gender and socioeconomic differences in work-related stress and health will be of particular interest in view of the fact that women generally report more symptoms than men, and that in affluent societies low-status individuals have more health problems and a shorter lifespan than high-status individuals. Finally, we will summarise the main conclusions and speculate about future perspectives on work as it relates to health.