Papers and manuscripts based on the studies presented in this thesis

Chapter 2

Elders LAM, Burdorf A. Prevalence, incidence, and recurrence of low back pain in scaffolders during a three year follow-up study. Spine, accepted.

Chapter 3


Chapter 4


Chapter 5


Chapter 6


Chapter 7


Chapter 8

Musculoskeletal disorders, especially of the back, constitute a major health problem in many occupational populations. The one-year prevalence of low back pain may be as high as 83% at the expense of very high costs for society regarding sickness absence and disablement. Among the factors that significantly contribute to the occurrence of back disorders are several modes of physical and psychosocial load. The attributable fraction of physical load in the occurrence of low back pain in various working populations was estimated between 11-58%. Manual handling of materials (i.e. lifting and carrying of loads), awkward back postures, and whole-body vibration have been identified as significant physical risk factors of low back pain. Low job control and lack of social support from colleagues have been suggested as psychosocial risk factors for musculoskeletal disease. However, the combined impact on the development of low back pain of various physical, psychosocial, personal, and health related risk factors within different occupational settings remains unclear.

Despite the large numbers of epidemiological studies there are clear deficiencies in knowledge about which risk factors are causal and which factors only aggravate pain or low back pain perception. Hence, little is known about the interrelations of risk factors and their association with different stages of low back pain. Some risk factors may even act as dynamic modifiers of these relations as a result of a continuous alteration and changing presence of both low back pain and associated risk factors. In order to better understand the interrelations between work-related risk factors, potential modifiers, and back disorders, it may be beneficial to apply a theoretical model as framework for the research presented in this thesis. Figure 1 depicts a dynamic model for low back pain. This model differentiates three health grades commonly used in epidemiological research on low back pain: no back problem ($D_0$), back problem and no disability ($D_1$), and disability due to back problems ($D_2$). The horizontal arrow between $D_1$ and $D_2$ symbolises the aggravation from back complaints to back disability, for example resulting in sickness absence. The return to work after a period of sickness absence due to low back pain is depicted by the change from $D_2$ to $D_1$ or $D_0$. In this dynamic model, the passing from one disease state to another is influenced by work related and individual risk factors which may vary according to the disease stage. The recovery from one disease state to another is also influenced by health care intervention that address the interactions between the worker, the workplace requirements, and the work load. The dynamic model assumes that workers will move through different disease stages, characterised by onset, aggravation, and recovery from back complaints.
This model illustrates also another important issue in low back pain research; the fact that onset and duration of low back pain episodes are difficult to measure since the transition, back and forth, from one stage to another stage is a dynamic process among subjects in a population. If the time of onset of LBP is not clearly defined, it is very difficult to distinguish between incidence and recurrence. Hence, results from various studies on prevalence, incidence, and recurrence of low back pain are difficult to compare, often due to differences in the period of recall of the subjects under study.

Acknowledging that low back pain is a dynamic entity that can change over time, there is a clear reason for longitudinal studies that describe the dynamic pattern of low back pain episodes in a certain time window.

The vast majority of low back pain patients (90%) are expected to recover in about six weeks. However, high recurrence rates of 40-70% have been reported. In the Netherlands, musculoskeletal disorders constitute about 35% of all sickness absence, while in the United States the category accounts for 40% of all compensation claims. Although, low back pain in most cases is a self limiting condition with spontaneous recovery, many workers seek some form of medical care. In one study 60% of the population sought medical care from their general practitioner, about 25% from a specialist, 15% from a chiropractor, and 52% received physiotherapy as treatment.

Several other studies have demonstrated that the decision to seek medical care depends on various aspects such as severity and nature of back pain, education, age, physical load at work, psychosocial factors, and non-disabling comorbidity. Different health care practitioners may cater for different populations of back pain patients and, consequently, may have different views on the work-relatedness of back problems. Nevertheless, different sets of risk factors for sickness absence may be associated differently with various end points of low back pain.
Therefore, some authors have suggested that prevention and treatment should focus on preventing chronicity of low back pain and disability resulting from low back pain rather than preventing the onset of pain.\(^{19-21}\)

In 1998, disability benefits were paid to 13.2% of the labour force in the Netherlands, a figure that varied in the rest of Western Europe between 3.1% in Spain and 11.9% in Sweden.

In 2002 about 250,000 workers diagnosed with any form of musculoskeletal disease received a disability pension, more than 60% because of back disorders and low back pain. An elevated risk of becoming disabled can only be reduced by starting the preferred interventions at the right time. In the literature three types of occupational interventions have been described (a) organisational and administrative interventions (b) technical, engineering or ergonomic interventions and (c) personal interventions.\(^{22}\) It would be of great help if stakeholders in reintegration, like general practitioners and occupational health physicians, could benefit from protocols or guidelines for various types of interventions.\(^{23,24}\) Although some of these guidelines do exist they are based on consensus among general and occupational health practitioners and there is little knowledge about their effectiveness for return to work.

**Objective of this thesis**

The objective of this thesis was to study the occurrence of low back pain in an occupational population, with specific focus on the dynamics of low back pain complaints, sickness absence and disability due to low back pain and their relationship with work-related and personal risk factors.

The study population consisted of scaffolders working at a large scaffolding company. Scaffolders experience high levels of physical load every day. Their principal tasks are erecting and taking down large scale scaffolds. During these tasks manual handling of materials totalling between 5,000 or 15,000 kilograms every day is one of the most dominant activities. Among scaffolders sickness absence is one of the highest in the Netherlands, with an estimated 10% in 2002. Musculoskeletal disorders including injuries due to accidents are the main cause of disability. In addition, scaffolders rank among the occupations in the construction industry with the highest incidence of disability pensions.\(^{25}\) Although the scaffolding company was sufficiently equipped with its own occupational health service and kept a thorough registration of sickness absence and disability, the company was not able to gain enough insight in the complex of risk factors that lead to a dramatic loss of personnel due to sickness absence and disability. Considerations about how to stop this human and economic disaster was the direct cause for this investigation.

The specific aims of this thesis are:

1. To study the dynamic character of low back pain over time and the impact of work-related risk factors on the occurrence of low back pain.
2. To study the consequences of low back pain complaints in terms of sickness absence and disability and to identify intervention strategies to successfully enhance return to work.
The results should include information on work-related risk factors and back disorders, as well as information on the role of these factors in the progression from back symptoms to disability and how this might be prevented.

Reading guidance

This thesis is divided into 3 parts. Part I (Chapters 2 and 3) provides information about prevalence, incidence, and recurrence of low back pain in scaffolders and their relationship with different risk factors. It also presents an overview of the interrelations between physical, psychosocial, individual, and health related risk factors and the association with four different endpoints of low back pain.

Part II (Chapter 4-7) elaborates on the problem of medical care seeking concerning different low back pain endpoints. It also presents information on risk factors for short-term and long-term sickness absence. Furthermore, it tries to unravel the ethnic differences in disability risk between native Dutch and Turkish scaffolders. Finally, it presents the results of a systematic review regarding the effectiveness of intervention programmes on return to work after sickness absence due to back disorders.

Part III (Chapter 8) presents an occupational injury of the shoulder caused by neural damage after lifting and carrying weights up to 50 kilograms, resulting in disability. Preventive measures to anticipate on the aetiology of this invalidating injury are discussed.

References