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## Best Practice & Research Clinical Rheumatology

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# Knee pain, knee injury, knee osteoarthritis & work



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### A B S T R A C T

#### Keywords:

Osteoarthritis

Knee

Occupation

Injury

Activity

Biomarkers

Symptomatic knee osteoarthritis (OA) can be viewed as the end result of a molecular cascade which ensues after certain triggers occur and ultimately results in irreversible damage to the articular cartilage. The clinical phenotype that knee OA can produce is variable and often difficult to accurately predict. This is further complicated by the often poor relationship between radiographic OA and knee pain. As a consequence, it can be difficult to compare studies that use different definitions of OA. However, the literature suggests that while there are multiple causes of knee OA, two have attracted particular attention over recent years; occupation related knee OA and OA subsequent to previous knee injury. The evidence of a relationship, and the strength of this association, is discussed in this chapter.

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## Introduction

Osteoarthritis (OA) is a degenerative joint disease involving the cartilage and many of its surrounding tissues. In addition to damage and loss of articular cartilage, there is remodelling of sub-articular bone, osteophyte formation, ligamentous laxity, weakening of periarticular muscles, and, in

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some cases, synovial inflammation. These changes may occur as a result of an imbalance in the equilibrium between the breakdown and repair of joint tissue. Primary symptoms of OA include joint pain, stiffness and limitation of movement. Disease progression is usually slow but can ultimately lead to joint failure with pain and disability.

OA may develop in any joint, but most commonly affects the knee, hip, hand, spine and foot. The incidence of knee OA increases with age, and women have higher rates than men, especially after the age of 50 years. A levelling off or decline occurs at all joint sites around the age of 80 years. Osteoarthritis (OA) of the knee is an extremely common condition globally, with over approximately 6 million sufferers in the UK alone. The prevalence of knee OA in adults aged over 80 years old in the UK approaches 1 in 2 [1]. As the UK population life-expectancy gradually increases, so does the burden of symptomatic and functionally limiting osteoarthritis, which is thought to affect at least 15% of the OA patient population [2]. The implications of knee OA are not to be underestimated on either an individual or population scale, particularly given an aging working population.

In the absence of an extrinsic cause, such as prior knee injury, we refer to osteoarthritis as primary. The proportion of individuals within a specific OA population that have primary OA varies greatly, but increases with age. There are also differences by gender; in the Queensland Aboriginal communities it was found that 88% of women had primary OA, whereas 82% of men had secondary OA [3]. We know that the risk of developing OA is determined by both systemic and local factors. Several systemic factors have been identified; these may act by increasing the susceptibility of joints to injury, by direct damage to joint tissues, or by impairing the process of repair in damaged joint tissue; occupational factors may hence be very relevant. Local factors are most commonly biomechanical in nature and adversely affect the forces applied to the joint; some sporting injuries, or injuries sustained at work, fall into this category.

The relationship between age and the risk of OA is likely multifactorial, as a consequence of numerous individual factors; these include oxidative damage, thinning of cartilage, muscle weakening, and a reduction in proprioception. Furthermore, basic cellular mechanisms that maintain tissue homeostasis decline with aging, leading to an inadequate response to stress or joint injury and resultant joint tissue destruction and loss. This may be relevant when considering the ability of the body to repair joint injury. The prevalence of OA and patterns of joint involvement vary among different racial and ethnic groups. Prolonged squatting and kneeling is associated with increased risk of moderate to severe radiographic knee OA [4].

While risk factors for osteoarthritis are well described in the literature, the link between occupation and osteoarthritis is less well documented, although a direct and causal link has been postulated. There also appears to be a significant link between previous knee injury and subsequent development of knee osteoarthritis [5].

We know that the mechanical alignment of the knee influences the distribution of load across the articular surfaces. In a normally aligned knee, 60–70% of weight-bearing load is transmitted through the medial compartment. Any shift in either a valgus or varus direction affects load distribution. Abnormal increases in compartmental loading are thought to increase stress on the articular cartilage, and other joint structures, subsequently leading to degenerative change. A recent systematic review confirmed that knee malalignment is an independent risk factor for the progression of knee OA [6]. This may be relevant as knee alignment may influence risk of OA following injury or as a consequence of occupational factors.

### *Osteoarthritis of the knee and occupation*

There has been research conducted into the potential link between occupation and the future risk of developing osteoarthritis. Notably, some of these studies postulating a link between occupation and arthritis contained inherent design features which make the findings less reliably clinically interpretable. For example, some of the studies used radiographic OA as their only diagnostic inclusion criterion related to OA [7]. Given the discrepancy between radiographic and clinically symptomatic OA, this criterion alone could significantly influence interpretation of studies suggesting a link between occupation and OA.

However, despite some studies having potential problems in their design or diagnostic criteria, the overall consensus is that there is at least moderately strong evidence to support the hypothesis that

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