INTRODUCTION
A dominant view of disc degeneration has been that disc structures are damaged through cumulative effects of repeated loading, primarily from occupational physical demands. Several studies have found a correlation between disc degeneration and occupational physical demands, such as manual material handling; others have not, and clear dose-response relationships have not been identified. However, the predominant focus of most related studies has ignored the effects of routine activities that occur in the majority of wakeful hours. Such non-occupational activities could contribute significantly to spinal loading. On the other hand, research in exercise physiology has identified physical activity as a preventive measure. Overall, the effects of physical loading on disc degeneration remain uncertain and controversial.

Studies of monozygotic twins indicate that hereditary appear to have a dominant effect on disc degeneration. However, there are differences in the severity of degenerative findings by lumbar disc levels, with a substantial amount of variation in degeneration unexplained, particularly at the lower two lumbar levels. While ageing and systemic effects or genetics should influence all discs similarly, these differences are not explained by the dominant effect of heredity. Biomechanical forces could conceivably interact with structural differences between spinal levels to produce a disproportionate effect in different lumbar levels. However, it is unlikely that physical activities of work and leisure, which explain, at most, a minor part of the variation, could be responsible for the variation in degeneration between discs.

Disc space narrowing has perhaps been the most commonly used specific finding to indicate disc degeneration in clinical imaging; clear disc space narrowing is an obvious sign of pathology in the disc. Disc signal intensity reflecting disc desiccation was used to estimate 'genuine aging' of the disc, and the visual disc height narrowing score as a 'classic' measure of disc pathology.

Our aim was to search for 'most important' factors in disc degeneration among anthropometric and strength factors, and lifetime physical activity histories. Our last study question was what additional effect the specific physical activities appear to have.

METHODS
The subject were from a population sample consisted of 600 males, 35 to 70 years old. The study was approved by the Ethical Committees of both the Department of Public Health at the University of Helsinki and the Faculty of Rehabilitation Medicine at the University Alberta.

Data on possible environmental and behavioral risk factors were obtained from an extensive structured interview that determined the subject’s work history and leisure activities. Subjects were asked to estimate the weights most commonly lifted and the frequency of lifting. Each job was given an 'occupational loading score' of 1-4. The mean-weighted lifetime scores were used as reported earlier. Subjects were also questioned about regular exercise and leisure physical activities. Five-year test-retest reliability of the summary variable of mean hours of exercise per week yielded acceptable reliability (ICC=0.73). Based on body weight and height and percentage body fat, additional measurements were calculated (Table 1).

The MRIs were obtained using a 1.5 Tesla scanner with a surface coil. Disc signal intensity (ICC=0.98), adjusted by signal intensity of adjacent cerebrospinal fluid (ICC=0.998), and axial disc area measures (ICC=0.98) were extracted from digital MRI data using a custom-designed image analysis program (SpEx3) (Figure 1). Axial disc areas were traced from the middle slices of the L2-3 and L3-4 discs to serve as an indicator of lumbar spine cross-sectional size. Disc height narrowing was determined from qualitative evaluations of films using a 4-point scale (ICC=0.84). Parameters were adjusted for dependency within the twin pairs using STATA 9.1 software. Stepwise regression modeling was used to find the most parsimonious model with the maximal proportion of variance explained for disc signal and disc height narrowing scores. Subsequently, the significant variables from these preliminary stepwise models were considered in the final models.