Lumbar load during care-activities with patient transfer Part 1: Determination of postures and movements

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Abstract

The lumbar load of several care-activities with patient transfer was determined. In part 1 of this study, the methodology of the posture-and-movement determination is described. A combination of video-analysis and opto-electronic measurement was used to collect data for the graphically supported simulation of postures which are a necessary basis for the quantification of lumbar load applying a formerly developed 3-D dynamic multisegmental model *The Dortmunder* (Jäger et al., 1991, 2001).

Introduction

Mechanical load on the lumbar spine, which occurs during manual materials handling, can be regarded as a substantial cause for the development of mechanically induced musculoskeletal disorders in the lower back. The transfer of patients, a typical "manual handling of loads", in many cases causes high load on the spine and leads to low-back pain and, perhaps, to the development of disc-related diseases (Videman et al., 1984; Hofmann et al., 1995; Jäger et al., 1999). An avoidance of such spinal overloading is meaningful. Therefore working situations causing high spinal load have to be identified and the level of the lumbar load has to be quantified. The research project "Determination of lumbar load in selected care-activities with patient transfer" (Jäger et al., 2003) was performed to determine the lumbar load of activities which are classified as "definitely being endangering" in the sense of the German occupational disease no. 2108 (Intervertebral disc related diseases of the lumbar spine caused by long-term lifting or carrying of heavy objects or caused by long-term activities in extremely trunk-flexed postures: BMA, 1992). In spite of their undoubtless merits with other aspects in scientific analysis and prevention, previous biomechanically oriented studies into nurses' low-back load were either focussed on other types of patient transfer tasks or were limited to "best-case scenarios" with, for example, low-weight patients. In other cases, inertial effects due to patient-and-nurse movements or horizontal handforce components were disregarded (e.g., Garg et al., 1991; Marras et al, 1999; Morlock, 1999; Schibye et al., 2001). For ethical and medical reasons, invasive measurement of mechanical indicators of the load on the lumbar spine can only be performed in a clinical environment and only for a few simple postures and movements. In this study, therefore, the determination of lumbar load is alternatively performed by model

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