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Tilted Work Surfaces and Biomechanical Stress on the Musculo-Skeletal System

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Editorial

It is well known that no single posture can be maintained for a long period of time without discomfort [1], and that inadequate standing and sitting postures provoke excessive increase of intradiscal pressure [2]. *In vivo* recordings evidenced that lumbar intra-discal pressure increases with spine flexion [3-5], and many authors promoted the use of ergonomic seats designed to prevent the flattening of the lumbar lordosis while seated. Although no direct measurement of cervical intra-discal pressure was reported in the literature, it is generally agreed that increased flexion raises the load supported by this section of the spine. In an attempt to favour a more upright posture of the head and neck, a number a studies explored the use of backward tilted work surfaces (from 10° to 45°). Mandal stated that the table top should be sloped backward between 10° to 15° [6] [7], and reported a reduction of the neck angle with sloping desk [8]. Bendix and Hagberg [9], who assessed the posture of head and neck by means of inclinometers, found that the cervical spine was extended with sloping desks. Likewise, Bridger [10] reported a lower neck flexion when using a 15° sloping table top, and Freudenthal et al. [11] showed that the posture of the head and trunk was significantly more upright when using a 10° sloping desk. In a recent study exploring the angular position of the spine with inertial sensors and the EMG activity of 9 trunk and shoulder muscles, Hassaïne et al. [12] found a smaller head flexion when using a 20° tilted work surface. The authors also depicted for the first time a higher activity of the deltoideus, which may be necessary to prevent the sliding down of the forearms resting on the sloping surface. It is surprising that so little attention has so far been paid to this phenomenon, although the sliding down of papers and pens has been considered as a main drawback of sloping surfaces [11,13].

As a conclusion, it can be assumed that tilted working surfaces have a dual effect on the biomechanical stress supported by the musculo-skeletal system: positive on the cervical spine through a reduction of head and neck flexion, but negative on the shoulders with a higher activity of the deltoideus. Both factors need to be taken into account by the ergonomist to determine the more convenient workstation design as a function of its uses and users.

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