

Focus on IFA's work

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Laboratory study of the efficacy of dynamic office workstations

Problem

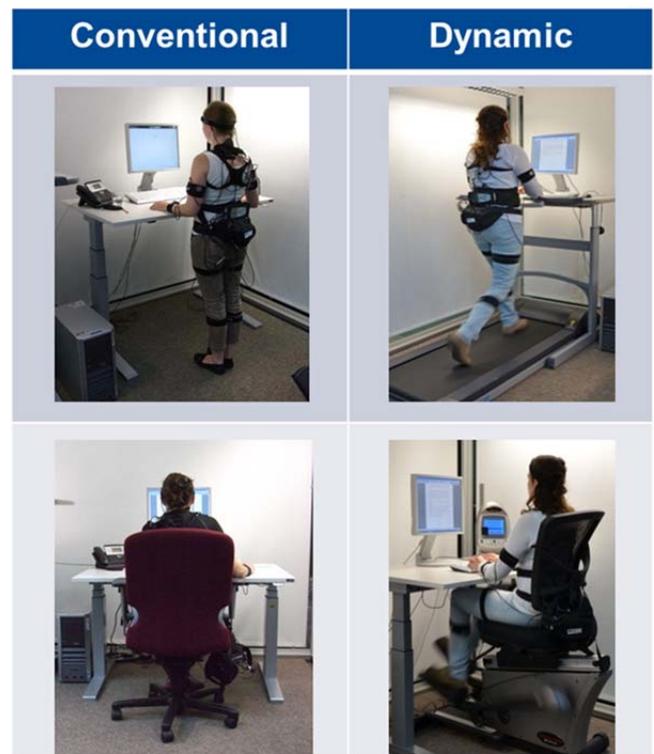
The maintaining of seated postures for longer periods is discussed as a cause of chronic diseases. Studies show a detrimental relationship between sustained physical inactivity and musculoskeletal disorders, obesity, cardiovascular disorders, type II diabetes, and premature mortality. Approximately 18 million workers in Germany currently work for at least part of the time in sustained seated body postures. Immobility can therefore present a problem. Manufacturers now offer dynamic office workstations that combine office and VDT work with light physical exercise.

Against this background situation and in conjunction with the Netherlands' TNO institute, the IFA conducted a comparative study of physical activity on dynamic and conventional office workplaces.

The questions to which the study sought answers were: compared to conventional workstations, do dynamic office workstations lead to a significant change in body postures, physical activity and heart rate, muscle activity and energy expenditure? What effects to the dynamic office workstations studied have upon productivity?

Activities

In a laboratory environment, twelve test persons tested two dynamic office workstations (treadmill and semi-recumbent exercise machine), in each case at low and high intensity of movement, in



Test subject wearing the CUELA¹ measurement system during comparative laboratory studies at a conventional standing workstation (top left), dynamic treadmill workstation (top right), conventional seated workstation (bottom left) and workstation with semi-recumbent dynamic exercise machine (bottom right)

comparison with conventional seated and standing workstations. During the test, they completed five standardized office tasks. Simultaneously, the

¹ CUELA: computer-based measurement and long-term analysis of stresses upon the musculoskeletal system

CUELA system recorded the body postures and movements, physical activity and heart rate data of the test persons. The activity of selected back muscles was quantified by electromyographic measurements and the energy expenditure determined by spirometric and heart-rate measurements. The influence of the dynamic workstations upon the productivity was recorded objectively by performance parameters and subjectively by questionnaires.

Results and Application

The measurements of body postures and joint angles revealed no essential differences between the dynamic workstations and their conventional counterparts. Significantly higher values for the mean heart rate and the physical activity of the entire body were measured on dynamic workstations than on the conventional seated workstation. Measurements on selected back muscles revealed minor differences in the muscle activity. Only in the comparison of the treadmill workstation (at high intensity) with the conventional seated workstation were significantly higher levels of muscle activity measured. Almost all tests on the dynamic workstations revealed significantly higher mean energy expenditure than on the conventional seated workstation. The highest mean energy expenditure values were measured on the semi-recumbent exercise machine at high intensity. Objective measurements showed almost no difference in productivity between the dynamic and conventional workstations.

When questioned on their subjective impressions, the test persons rated their productivity as being lower on the dynamic workstations. The perceived comfort was also rated lower on the dynamic workstations. Altogether, dynamic workstations may in principle assist in increasing the physical activity at office and VDT workplaces. In use, the dynamic workstations tested exhibited certain deficits in their ergonomic design, however.

More recent versions of the dynamic workstations have already been improved in their ergonomic design and require less space.

Area of Application

All industrial sectors involving occupational activity performed seated at office and VDT workplaces

Additional Information

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- Botter, J.; Ellegast, R.P.; Burford, E.M.; Weber, B.; Könemann, R.; Commissaris, D.: Comparison of the postural and physiological effects of two dynamic workstations to conventional sitting and standing workstations. *Ergonomics* (2015) Sep 21:1-15. [Epub ahead of print]

Expert Assistance

IFA, Institute management

Literature Requests

IFA, Central Division