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Focus on IFA's work

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CUELA activity system for analysis of physical activity

Problem

Labour-saving devices and the widespread use of computers have led to low levels of physical activity at large number of workplaces. Since physical inactivity and static body postures are associated with serious health risks, many companies are taking measures to promote physical activity.

Objective and valid recording methods are required in order for physical activity at the workplace to be quantified and for the efficacy of the relevant influencing measures to be evaluated.

Use of the CUELA activity system at an office workplace

Activities

The CUELA activity system was developed for precise quantification of physical activity by workers. It consists of an instrument worn on the body which records body movements detected by sensors. Movements of the torso, legs and dominant arm are recorded by a combination of acceleration and angular velocity sensors.

The miniature sensors are attached beneath the clothing by means of elastic and breathable straps. The measured data are recorded in a memory unit worn over the clothing, and can be evaluated subsequently on a PC by means of the associated software.

Pattern detection algorithms are used by the software to identify body postures and tasks automatically. The intensity of movement is determined both for specific body regions and for the whole body. The activity type and intensity of movement and the personal data recorded beforehand are used to estimate the energy expenditure. Statistics are also generated automatically on the type, intensity, duration and frequency of physical activity and body postures.

In order for estimation of the energy expenditure in the CUELA activity system to be calibrated and subsequently validated, two studies were conducted, with mobile breathing measurements being performed synchronously (ergospirometry). The automatic activity detection was verified by means of simultaneous video recordings.

Results and Application

The validation studies show that the new measurement system detects the physical activity being performed with a high degree of accuracy (1% error rate) and delivers a valid estimation of the energy expenditure (mean deviation 2.2%). In the future, the CUELA activity system will thus serve as a measurement system which is suitable for precise analysis of physical activity. The system delivers differentiated information on the movement behaviour of persons.

The CUELA activity system has already been used in a small pilot study, for analysis of the effectiveness of measures intended to promote physical activity at workplaces associated with a low level of movement. Further applications in this area are planned.

Area of Application

All industrial sectors involving occupational tasks characterized by physical inactivity

Additional Information

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Expert Assistance

IFA, Division 4: Ergonomics – Physical environmental factors

Literature Requests

IFA, Central Division

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