

NEW CHALLENGES AND TRENDS IN ERGONOMICS AND HUMAN FACTORS

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Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design to optimize human well-being and overall system performance. The terms *ergonomics* and *human factors* are often used interchangeably or as a unit (e.g., human factors and ergonomics – HFE or EHF), a practice that is adopted by the International Ergonomic Association. EHF considers physical, cognitive, sociotechnical, organizational, environmental, and other relevant factors, as well as the complex interactions between the human and other humans, the environment, tools, products, equipment, and technology. In this presentation the focus is on new challenges and trends in physical ergonomics and human factors.

Although the work life has changed tremendous during the last decades towards more complex systems. The health outcomes are many times the same for blue- and white-collar workers. We still have a lot of physical demanding jobs, but sedentary work, in addition to low physical activity in leisure time has become a growing challenge. Some jobs which have been physically very exhaustive, as for example forest harvesting, has changed dramatically during the global restructuring of the forest industry. Digitization and technological developments in timber harvesting have increased competence requirements and changed the forms of work demands to be more like sedentary office work. Office work has gained very much from innovative ergonomics and well- designed workstations and offices, thus still office workers suffer from many musculoskeletal disorders. An increasing challenge is teleworking. After the lockdown due to COVID-19 in early 2020, more people than ever are working from their homes. The pandemic did not leave any time to design and organize the homes for telework and workers had to improvise his/ her own work- station as best as possible. In addition to musculoskeletal disorders, people who regularly telework from home have a higher likelihood of experiencing sleeping disorders, for instance, related to irregular working time patterns, stress and exposure to the blue light of digital screens. Workspaces set up ad hoc in the home as well as laptops and other ICT equipment might not meet ergonomic standards. This can lead to constrained or poor postures, which puts teleworkers at risk of developing musculoskeletal disorders. It is likely that in the long term the number of people working from home, or under other flexible arrangements, will remain much higher than in the pre-COVID-19 era. This current real-life experiment is proving to employers that such arrangements work, especially if combined with some physical presence at the workplace, can have a positive impact on productivity and work–life balance. After the first lockdown, some guidelines for proper ergonomics where given (e.g., European Agency for Safety and Health at Work), but after that also cognitive (work life balance) and organizational (work hours, supervision) ergonomics should be taken more into account.

The increased sedentary work, and less physical activity in leisure time has been ongoing already several decades. We know that leisure- time physical activity is beneficial for your health, but we also know that occupational physical activity is not, contradictory it may

have harmful effects, especially with aging of the body (Hinrichs et al, 2014). This is very important when aiming to design ergonomic proper tasks. Automatization should be done when there are very heavy tasks like lifting, but to what extent? What do with sedentary jobs? Could it be possible to redesign office work to include more physical activity? What is the optimal physical load at work, which does not lead to neither overstrain nor to too little physical activity, but may have positive impact on your health and functional capacity? A large potential for improving occupational health remains unexploited by a limited focus on preventing health impairments by reducing physical activity at work. A new hypothetical concept called The Goldilocks' Principle aims to promote health and physical capacity by designing physical activity during productive work to be "just right". Physical (in)activity profoundly influences health and physical capacity, with effects depending on the extent and temporal structure of the (in)activity. Like the porridge, chair and bed that needed to be "just right" for Goldilock in the Three Bears fairytale, physical activity during productive work needs to be "just right" for promoting rather than deteriorating health and too little capacity. In many jobs, physical activity is, however, either too much/high/frequent or /low/infrequent to give positive biomechanical and cardiometabolic stimuli. (Holtermann et al 2019).

Most important is to change work demands (physical exposure, working hours etc.), but after that a feasible solution for heavy physical exposure could be use of new technology. A cobot, or collaborative robot, is a robot intended for direct human robot interaction within a shared space, or where humans and robots are in close proximity. Cobots are designed to work alongside human employees, to complete a task that cannot be fully automated, while industrial robots do work in place of those employees. Practical examples of using a cobot are tasks where an object needs to be displaced or re-oriented, or loading and/or unloading of a given machine with parts or material. Exoskeletons are support frames and wearable devices for the worker, which are developed to help the worker for example when working in difficult postures and can be used in a range of industries from manufacturing and construction to agriculture. They are different from autonomous robots in that they don't work in place of the blue-collar worker. They are placed on the body and act as amplifiers that augment, reinforce or restore human performance, as opposed to mechanical prosthetics, such as a robotic arm or leg, that replace original body parts.

In conclusion, ergonomics and human factors has been an important practical discipline already for decades and has still much to provide. Despite work is going more towards cognitive and organizational ergonomics, there are still a lot of physical demands as well as sedentary tasks in the work, which could be solved with proper ergonomic planning or new technology. The early slogan "fitting the task to the man" is even as important as before.

References

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