European Agency for Safety and Health at Work

EVENT SUMMARY

EU OSHA E-TOOLS SEMINAR 2022

Wearable technologies for risk assessment

Bilbao, 6 – 7 October 2022

1 E-tools seminar introduction

Topic of this year's e-tools networking event was the use of digital technology, especially wearables, for Risk Assessment in the context of Occupational Safety and Health. Four speakers were invited to introduce the topic and present examples used for OSH, as a start for discussion. Finally, the approaches and examples were discussed in groups.

Presentations and discussions in the seminar were built on the following key aspects:

- the challenges and benefits of the use of wearables in risk assessment;
- in what circumstances are wearables most useful; what could be problematic issues in their use;
- how to use them so that they are one of the tools, and risk assessment does not just become a measurement issue (e.g. so workers still involved e.g. In validating data); and on
- what issues do you see related to data protection.

Attendees were invited via the FOP network including social partners and Commission, as well as other interested groups (e.g. SLIC, ILO)

Viewpoints, practices, and experiences were shared in the seminar and also there were opportunities for networking for collaboration in the future.

2 Introductory presentations and presentations from the member states.

First, EU-OSHA introduced the seminar and its objectives and the program of the two days. To set the scene, a definition of an e-tool was presented: an e-tool is an IT- based, online/ web-based tool, used via phone or computer. E-tools are interactive and adaptive (tailored outcome based on the data input), and are focused on health and safety issues. E-tools guide the user through the process of decision making instead of other more static tools, like 'checklists'.

EU-OSHA described how it supports the use of e-tools, as well as developing tools their own (e.g. OiRA). Web based tools (e-tools) have also been referred to by DG Employment in relation to the support of OSH risk assessment, especially to be embedded in national legal systems and to reach out to SME's, and to have strong engagement with social partners.

EU-OSHA emphasised that E-tools are helpful in promotion and dissemination and especially supportive to reach the groups that are hard to reach, mainly SME's. Next to benefits, there are also drawbacks, for example related to privacy and the fact that they can only support but not ensure compliance. In addition, there is not enough known yet about their impact.

Next, an overview presentation was provided by Nelson Costa (University of Minho, Portugal) to the use of wearable technologies as potential avenues, and 3 presentations from the member states on recent examples of wearables for risk assessment:

- the use of **wearables in stress risk assessment** – Elsbeth de Korte (TNO), Netherlands;
- the use of **wearables for MSD risk assessmen**t – the case of an industrial laundry service, Marco Bordignon (ErgoCert), Italy and Gabriele Cesari from Servizi Italia, Italy;
- **Wearables for monitoring emergency workers** – Respond-A project. Cleo Varianou Mikellidou, European University, Cyprus. (See PPTs).

Following the presentations, there was group work to discuss the implications and practices of wearables, followed by feedback and discussion in the plenary, based on the following questions

- **What are the benefits of using data from wearable technology in the risk assessment process?**
- E.g. affordable, immediately accessible data for decision-making
- **What are the challenges of using data from wearable technology in the risk assessment process?**
- E.g. too much, inaccurate data,
- **Where could the use of wearable technology be of most benefit?**
- Sector, work process, job type
- **To what extent is data collected by wearable technology actually useful in the risk assessment process?**
- Is it making risk assessment mechanistic rather than qualitative
- Is worker input being lost?
- **To what extent is the collection of personal data and the risk of its (mis)use a concern?**
- Access to personal data by employers, sharing of data with other entities

3 Discussion points from the group work and plenary discussions

The following points have been discussed, related to the presentations and in general:

Wearables in Stress Risk Assessment

- Need to know what causes symptoms, if not then treatment difficult. But can we trust the data?
- Need a combination of qualitative data collection (e.g. via app) as well as quantative (e.g. via wearable)
- OSH prevention hierarchy prioritizes prevention at source, and collective measures over personable measures (this covers all hazards and risks including psychosocial risks)
- Wearables can give real time risk management by the worker (individual intervention – but decisions needed about when and what (adaptive)). Need to collect data via app – qualitative information entry but demands on users' time
- Physical stress responses can be measured
- Stress can be reduced by reducing the load (prevention at source), or increasing load capacity (resilience)
- What happens if limit values are exceeded?
- Multi-disciplinary approach for wearable implementation
- What do you want to measure (target group, what you want to address, what you want to measure
- What are the right tools for the job, (privacy, utility, data rights, reliability)
- What's needed to deploy remotely and at scale (planning of process, implementation, evaluation)
- Just because you can does not mean you should
- Wearable tech use has to be personalized
- Need to avoid perception of blame the victim.

MSD risk assessment

- How can you track many factors for MSDs?
- Very subjective perceptions by expert (BORG scale of perceived effort)
- Combination of different systems
  - Inertial motion capture system now a reliable system from whole body captures and covering range of ergonomic factors
  - Use of glove system to examine hand contact duration and activated areas and exerted force
- Training essential as well as engagement with workers and representatives
- Need for engagement with OH professional (doctor)
- Personal data may not be needed (use of video)

Emergency Response

Focus on early assessment

- Risk mitigation
- Common operation picture
- Sensors for HR, Breathing, activity level, radiation, temperature and toxic gases,
- Positioning (GPS)
- Heatstroke danger level, CO danger level are two main risks
    - CO monitors not currently suitable
- Control room has dashboard with alarms system.
- Different pilot approaches, early warning and communication technologies
    - Important to identify who is in control centre

General Discussion points of all presentations

- Broad use of technology in different scenarios and applications - Transferable to e.g. SMEs due to cost barrier?
- Challenge to balance quantitative (sensor driven) and qualitative (user input) data and data (calibration of technology)
- Data collection tool - Wearable, embedded in work station, reliable, accurate, sufficient (multiple data sources)
- Data - Reliability, collection, (mis) use, storage, sharing, transportability, transferability, access, ownership, access by Labour Inspectorate for compliance…
- The use of wearable technologies in the context of the framework Directive hierarchy of prevention
    - Employer primary duty (avoid victim blaming) – Control at source, Focus on collective solutions before individual solutions
- Need to be adapting the technology to individual differences
    - Adapt the work to the worker - Gender, age, ethnicity, baseline health / physiology
- If AI is being used, how is it appropriately “trained”? - How does it adjust to individual differences?
- Is the data collected helping or hindering the risk assessment process?
    - Too much data not helping in prioritization of measures?
    - Who has the last word – worker or controller – and who has responsibility?
    - Data is an aid not the decision-maker
    - Psychosocial impact of wearing technology loss of autonomy? – creating new risks?
    - Over-reliance on technology as warning system?
- How to certificate – medical equipment, PPE, CE marking, health apps?
- Legislation standardization and certification struggling to keep up
- Data ownership, access, validation, security, storage, and sharing is a challenging topic (see below). The amount of space that such data takes up can be huge and may be a limited factor.
- There is a wide range of data available to be measures, such as fall detection, chemical exposure, location of nearby hazards (vehicles), noise levels, or temperature.
- Measurement of such data may not require a wearable, it can be done by your chair, keyboard, a patch, or phone.
- No data collection and monitoring system will be properly used without the appropriate training of all concerned – including of the AI!

4 Conclusions

Based on the presentations and the group work, we summarized the following insights:

Implementation

Implementation is a process, with planning, implementation, and evaluation phases. How the evaluation takes place should be decided before the start of the implementation. There has to be the engagement of all stakeholders from the start of the implementation process. A supporting multimedia strategy (poster, video) that is informative, short, simple and relatable may be beneficial. Concerns should be addressed face-on, including the design of wearables, the system design, and how it will be implemented and used. Clarity and transparency essential, and peer-to-peer learning can be very beneficial

Responsibilities of all should be clearly defined, and the whole process will require dialogue with and training for all engaged, including the ICT and OSH professionals, management and workers. Maintain an open feedback loop from all participants, but manage expectation as to what can be achieved, the limitations, and limitations for data use

The acceptance of technology / monitoring may depend on risk perception of worker. For example, immediate risk (e.g. in entering confined space) monitoring may be seen as acceptable, whereas long-latency outcomes may not be seen by workers so there may be a reluctance to accept monitoring.

The use of wearables in RA should be the point of the exercise and not a side effect for other purposes (e.g. worker monitoring, better production).

There is no “magic bullet” – no single technological solution, and the usefulness and usability depend much on the task or job for which the wearable system is being used.

OSH Management and wearables

The Framework Directive (89/391/EEC) sets the legal base for OSH management, and any wearable system for risk assessment has to be part of broader prevention approach that makes the workplace safer and healthier. The monitoring and assessment should feed into the broad prevention approach. However, data should *not replace* assessment, and who is making any decision should be clearly identified. For example, if a worker reports an unsafe situation how is that treated if not reflected in data from the wearable. The person carrying out the risk assessment end-user should be able to see what to do next (in a treatment or prevention approach) - an **“action perspective”**

Monitoring via wearables can introduce additional hazards/risks as well as removing other dangers. For example, the wearable may increase the physical or mental load on the worker, or could interfere with PPE.

Any wearable system for risk assessment has to take into consideration the needs of all workers. For example, how does it work related to workers with a disability? Does the wearable fit all workers comfortably regardless of physiology or gender?

If the wearable system uses algorithm-based learning, there may be concern that the AI could increase risk rather than reduce it.

Drivers and benefits

Wearable technologies are a fast-developing technology that can offer benefits in OSH management such as more and more accurate data, more quickly accessible and so allowing quicker processing and a faster implementation of prevention measures. The data is in real time and not just sampled, allowing the opportunity for early warning and a better control of high-risk and emergency procedures.

Such systems can also be used where workers are returning to work after ill-health or injury, allowing the monitoring of a graduated process.

An integrated approach can provide real benefits, particularly where there is cross-platform use (where data can be transferred between systems).

Barriers and challenges

Implementing a wearables system has a significant cost, which may mean that at present the use of such systems are only justified for specific situations or tasks (e.g. in high-risk environments). However, it should be noted that the cost of wearable technology is declining while the cost of observation (paying for a competent person to observe a process) is increasing.

For the transmission of data in “real time”, a reliable wireless or Bluetooth system will be required that can have a high cost and so be a barrier for some employers such a SMEs. The employer then needs to have the resources for processing the data in real-time.

As with any system where failure may lead to a risk to human health, a wearable system for risk assessment has to be reliable – the device itself, any communication mechanism (e.g. wifi), and any device / software to which it connects. The implementation of such a system is likely to require competent persons in occupational safety and health and in ICT.

Certification of such systems and apps is developing[1] and along with relevant legislation may lag behind technological development.

There may be resistance to the use of such systems by workers and other stakeholders, particularly where the benefits of the intervention is not immediately visible, or the wearable is not comfortable.

Data

The importance how data is collected, securely stored, transferred, and used cannot be overstated. The EU has strong data protection requirements, particularly with regard to medical data and this may limit the transferability, storage, and use of data. It is essential that the data owner (the worker) has trust in the use data collected and this may depend on the OSH culture of the enterprise of country as well as who is collecting the data (private enterprise or State body).

The use of data collected for OSH purposes for non-OSH reasons (e.g. performance enhancement through gamification) may damage this trust. Similarly, technology installed for an OSH reason that is subsequently used for non-OSH purposes will also damage trust in the system. There should be clarity where wearable technology is offered for health-promotion reasons rather than the purpose of risk assessment as there is the risk of intrusion into a workers' private life.

Any data collected is likely to need further processing and analysis to establish what risk elimination or mitigation measures are required, and it may be that the data being collected is insufficient on its own to allow this decision making.

Data should not be collected for the sake of collecting it. There is a risk of too much data being collected "data smog" and that the data is not of sufficient quality. Moreover, the data may be indicative only rather than "direct data". Data reliability is at the core of any wearable system for risk assessment. The data also has to be accurately interpreted. The limitations of any system should be made clear and potential data collection, interpretation and process errors recognized. Often, to make an appropriate risk assessment, both quantitative and qualitative data is needed and it may be that wearables alone cannot provide this.

What data is collected, from whom, how it is used, and how it is shared are the fundamental questions relating to the use of wearable technologies for collecting data for risk assessment. Linked to this is the issue of consent by workers (whose data is being collected) and whether they can "opt-in" or "opt-out".

What happens to the data after collection and initial use has to be resolved. How is the data retained and stored? Who has access? This is an issue for the worker, the employer, and possibly social insurance systems.

Data sharing is a highly sensitive topic, which should be clarified before the implementation of a wearable system. For example, is the data stored for the worker to be transferred when the worker changes jobs? Can it be sold? Can it be used for training purposes? Can it be aggregated and shared anonymously ("meta" or "big" data)? If the data is owned by the worker, what is the process of informed consent prior to data sharing?

Data segregation may be an issue – who gets to see what data. For example, an OSH professional may see some data collected for the purposes of risk assessment, while an occupational health Doctor may see a different part of the data set for health surveillance purposes.

OSH Professionals and labour inspection and social insurance systems

Wearable technology systems being used for OSH have great potential to assist OSH professionals, labour inspectors and those in social insurance systems but they have to know how to use and interpret the data. This requires awareness of the systems and training in their use. In turn, the widespread use of wearable systems could change the role and approach of OSH professionals and labour inspectorates. If data is available, labour inspectors may want to access it to assess compliance or for incident investigation.

As mentioned above, access of a national OSH or social insurance system to worker data collected by wearables raises may questions on data storage, transfer and use. The metadata derived from such systems could provide input to national OSH Strategies or awareness raising activities.

[1] CEN ISO/TS 82304-2 'Health software — Part 2: Health and wellness apps—Quality and reliability'