

Wearables – Challenges and Chances for Sports Medicine

Wearables – Herausforderung und Chance für die Sportmedizin

Portable sensors for measuring physiological, biomechanical and biological signals, so-called wearables, are increasingly determining the everyday lives of people with and without illnesses. As early as 2016, this prompted an editorial in the DZSM (3), in which the growing importance of wearables was highlighted and their potential usability for sports science and sports medicine was presented.

Developments in recent years have led to numerous new sensors and an increasing improvement in sensor quality, which should provide an opportunity to highlight the potential importance of wearables for the sports medicine of the future. Currently, they are mainly used in competitive, recreational and health sports, but their use for monitoring and diagnosing patients with chronic diseases is a growing field of application (2). This results in new requirements and opportunities for sports medicine, especially when various sensor-based parameters are linked with the help of algorithms, often referred to as artificial intelligence (AI), and the results are made available via apps. This not only enables self-diagnosis and self-management in sport, but also opens up new possibilities for stress and regeneration diagnostics and management in a sports medicine context. Wearables can be used to prevent acute and chronic overuse and injuries, but also to monitor patients with chronic illnesses and control their stress levels. Wearables can also be used in the rehabilitation process of patients and athletes to enable optimized, personalized stress control in a remote environment. One current area of application, for example, is the use in return to sport and rehabilitation after COVID-19 (6).

Wearables for Field Diagnostics

Another aspect is the use for diagnostics under real conditions, which has so far only been the focus of scientific and clinical consideration to a limited extent. Wearables have the potential to increasingly bring diagnostics from the clinical and laboratory environment into the field of field diagnostics in the future. One example of this is sensors that measure blood glucose in a minimally invasive way and now enable direct data monitoring (4). Wearables are also increasingly being used in cardiology to monitor and diagnose patients (7).

Development of Wearables

In recent years, the development of sensors has evolved from motion sensors, including pedometers, accelerometers/gyroscopes and GPS (Global Positioning Satellite) devices, and physiological sensors, including heart rate monitors, sleep monitors, temperature sensors and integrated sensors, to sensors that measure biological parameters such as electrolytes, glucose and lactate in sweat or non-invasively and minimally invasively in tissue (5). It can be assumed that further biological parameters will be added in the future, such as cytokines and other metabolic products, which are currently mainly measured in the blood. The wearables of the future will increasingly enable real-time measurements and data transmission, so that dynamic measurements with a high temporal sampling rate will increasingly allow measurements under different stress conditions that capture dynamic physiological and pathophysiological processes that can only be recorded to a limited extent in the classic clinical setting. This opens up new possibilities for diagnostics and monitoring not only in chronic diseases, but especially under stress conditions.

The Future of Sports Medicine with Wearables

The sports medicine of the future will not be able to do without the diagnostic possibilities of the current and, above all, the future generation of wearables. This applies to both orthopaedic and internal sports medicine. Wearable-based diagnostics and stress and regeneration monitoring under real-life conditions present new challenges and, above all, new opportunities. This is a particularly important field for sports medicine, as it requires expertise in understanding the effects of different physical loads on sensor-based parameters and a broader understanding of physiological, biomechanical and biological processes in healthy and chronically ill people. Sports medicine should rise to this challenge and build up both scientific and clinical expertise for application and further development in the practical clinical and scientific fields. This also includes intensifying research into wearables in a clinical context and promoting their clinical use. For use in clinical practice, however, global standards for wearables and their use (1) are required, and >

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sports medicine should be involved in their development and implementation. On the one hand, this can be achieved through a stronger focus of the chairs of sports medicine on these areas. ■

References

- (1) **ASH GI, STULTS-KOLEHMAINEN M, BUSA MA, GAFFEY AE, ANGELOUDIS K, MUNIZ-PARDOS B, GREGORY R, HUGGINS RA, REDEKER NS, WEINZIMER SA, GRIECO LA, LYDEN K, MEGALLY E, VOGIATZIS I, SCHER L, ZHU X, BAKER JS, BRANDT C, BUSINELLE MS, FUCITO LM, GRIGGS S, JARRIN R, MORTAZAVI BJ, PRIOLEAU T, ROBERTS W, SPANAKIS EK, NALLY LM, DEBRUYNE A, BACHL N, PIGOZZI F, HALABCHI F, RAMAGOLE DA, JANSE VAN RENSBURG DC, WOLFARTH B, FOSSATI C, ROZENSTOKA S, TANISAWA K, BÖRJESSON M, CASAJUS JA, GONZALEZ-AGUERO A, ZELENKOVA I, SWART J, GURSOY G, MEYERSON W, LIU J, GREENBAUM D, PITSILADIS YP, GERSTEIN MB.** Establishing a Global Standard for Wearable Devices in Sport and Exercise Medicine: Perspectives from Academic and Industry Stakeholders. *Sports Med.* 2021; 51: 2237-2250. doi:10.1007/s40279-021-01543-5
- (2) **DEVI DH, DURAISAMY K, ARMGHAN A, ALSHARARI M, ALIQAB K, SORATHIYA V, DAS S, RASHID N.** 5G Technology in Healthcare and Wearable Devices: A Review. *Sensors (Basel).* 2023; 23: 2519. doi:10.3390/s23052519
- (3) **HEITKAMP HC.** Wearables – Die Bedeutung der neuen Technologie für die Sportmedizin. *Dtsch Z Sportmed.* 2016; 67: 285-286. doi:10.5960/dzsm.2016.260
- (4) **HOLZER R, BLOCH W, BRINKMANN C.** Continuous Glucose Monitoring in Healthy Adults-Possible Applications in Health Care, Wellness, and Sports. *Sensors (Basel).* 2022; 22: 2030. doi:10.3390/s22052030
- (5) **LI RT, KLING SR, SALATA MJ, CUPP SA, SHEEHAN J, VOOS JE.** Wearable Performance Devices in Sports Medicine. *Sports Health.* 2016; 8: 74-78. doi:10.1177/1941738115616917
- (6) **SESHADRI DR, HARLOW ER, THOM ML, EMERY MS, PHELAN DM, HSU JJ, DÜKING P, DE MEY K, SHEEHAN J, GELETKA B, FLANNERY R, CALCEI JG, KARNS M, SALATA MJ, GABBETT TJ, VOOS JE.** Wearable technology in the sports medicine clinic to guide the return-to-play and performance protocols of athletes following a COVID-19 diagnosis. *Digit Health.* 2023; 9: 20552076231177498. doi:10.1177/20552076231177498
- (7) **STREMMEL C, BREITSCHWERDT R.** Digital Transformation in the Diagnostics and Therapy of Cardiovascular Diseases: Comprehensive Literature Review. *JMIR Cardio.* 2023; 7: e44983. doi:10.2196/44983