

Developing useful wearable technologies for Exercise Science: From research to practice

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Introduction & Aim

Wearable technologies include electronic-based “smart” technologies, which can be incorporated into items that individuals wear daily as accessories, implants or clothing. These technologies should always work when switched on and provide a useful function. Recent advancements in technology and material science have provided unique opportunities for very small sensors and actuators, which can be integrated into a variety of host fabrics. This has created the potential to develop disruptive devices that can sense and monitor human motion and specific biophysical signals, as well as items that can respond to these signals for a given purpose. Wearable devices, in fact, constitute one of the fastest-growing technology markets globally, with smart clothing forming a major component of this market.

Wearable technologies have huge potential to assist Exercise Science practitioners to enhance human performance and health. For example, wearable technologies can be developed to provide tools to help Accredited Exercise Physiologists objectively monitor the rehabilitation of patients to optimise patient outcomes. Similar wearable technologies can be used by Exercise and Sport Scientists to help individuals in the community to live healthier and safer lives, or to improve the performance of both recreational and elite athletes.

To have a meaningful purpose and to be effective, however, it is imperative wearable devices are developed based on robust scientific evidence rather than merely serving as gimmicks. Furthermore, to be comfortable to wear any devices must suit the individuals for whom they are designed, taking into consideration the structure and function of the human body and the forces involved in an activity. The plethora of claims by those marketing some of the latest wearable devices to improve human health should be closely scrutinised to ensure that all Exercise Rehabilitation and Exercise or Sport Science practitioners use devices that provide valid and reliable data, and are evidence-based rather than just being gimmicks.

This presentation aims to describe our involvement in developing various wearable technologies, including the “Intelligent Knee Sleeve” [1] and the “Smart Bra” [2]. An overview of the technology underlying these devices, as well as how these devices have progressed from research through to practice, with implications for Exercise Science practitioners, will be provided. Current challenges associated with developing robust, useful, valid and reliable wearable devices will also be highlighted.

Conclusions

Wearable technologies have enormous potential to enhance human performance and health if the devices are evidence-based and developed to meet a true need. Before adopting their use, Exercise Science practitioners must ensure such devices provide valid and reliable data, rather than just being gimmicks.

References

- [1] Munro BJ et al. (2008). The intelligent knee sleeve: A wearable biofeedback device. *Sensors and Actuators: B. Chemical*, **131**: 541-547.
- [2] Steele JR et al. (2018). The Bionic Bra: Using electromaterials to sense and modify breast support to enhance active living. *Journal of Rehabilitation and Assistive Technologies Engineering (RATE)*, **5**: 1-9.

