

BIOMECHANICS, TECHNOLOGY AND COACHING

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INTRODUCTION: The interactions between biomechanics, technology and coaching are presented via a research example. The purpose of this paper is to review new technologies and applied biomechanics in a coaching setting. Sprinting is used to highlight technological demands in providing meaningful feedback. This is a snapshot of work in progress, which builds on years of combined expertise within a large multi-partner research team. The overall objective is to apply novel wireless technologies in an elite sport setting with the aim of improving performance through the use of enhanced coach and athlete feedback.

APPROACH: Wide ranging methods have been employed, including structured coach interviews, field data collections requiring novel developments (e.g. Kerwin *et al*, ISBS2007, 497-500) and extensive technological development, prototyping and from our point of view evaluation (e.g. Kuntze *et al*, ISBS2009). Sprinting was selected for its clear objective performance measure (time). Sprinting also presents a set of technological challenges including the need to adopt high sampling rates whilst ensuring that athlete worn sensors are small enough not to alter an athlete's running action. Speed is the ultimate goal in sprinting and so an obvious device to deploy would be a 'speedometer'. Remote and accurate measurement of velocity turns out to be particularly difficult to achieve. Laser 'guns' (e.g. Opti-Logic™, LaserTech™) have been used to track athlete's speed in training and occasionally in competition – e.g. the 1997 World Athletics Championships, (Müller & Hommel, 1997). This technology requires a dedicated operator per athlete. The vision within the current project is to produce a turnkey system where a coach flicks a switch on entering the training arena and the technology is 'live' and ready for use. This vision is still somewhat off, but current examples from the project will illustrate progress.

EXAMPLES: Four examples will highlight different challenges and outcomes. Wireless technology was central to this research project, and so sensors were key components. The problem with any athlete-worn sensor is that it has volume and mass, requires a battery and is generally not popular amongst athletes. Two such systems will be used to illustrate that progress has been made in addressing these issues. By extension, the athlete needs to become part of a ubiquitous computing network, within a training environment – in this case the National Indoor Athletics Centre (NIAC) in Cardiff. Two approaches, where wireless technology has been employed but without athlete-worn sensors, will be highlighted. The four examples comprise insole pressure measurements; a multi-sensor integrated system; automatic video tracking and a multi-lane light gate solution.

CONCLUSION: This paper outlines how wireless technology is addressing problems associated with collecting biomechanical data in a training environment to aid understanding, and enhance feedback with the ultimate goal of improving sporting performance.

REFERENCES:

Müller, H. and H. Hommel (1997). "Biomechanical Research Project at the VIth World Championships in Athletics, Athens, 1997: Preliminary Report." *New Studies in Athletics* **12**(2-3): 43-73.

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