

# Tracking the wave of success for Team GB's swimmers

June 28 2012

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Training sessions for Team GB's swimmers have been getting a helping hand from a new system incorporating cutting-edge movement tracking and sensor technologies.

From starting dives to tumble turns the state-of-the-art coaching aid is the first of its kind to be able to track movement wirelessly through water.

The system has been developed at Loughborough University's Sports Technology Institute in conjunction with British Swimming, with funding from the Engineering and Physical Sciences Research Council (EPSRC). Other partners are UK Sport, Imperial College London and Queen Mary University of London.

It generates comprehensive data on the swimmer's [body position](#), speed and acceleration and enables coaches to provide feedback and advice that is more immediate, more detailed and more objective than previously possible. The data is accessed via a laptop and could be used by those with expertise to interpret the information to suggest alterations to the swimmer's technique at the poolside during training.

Not only has the Loughborough team refined a range of existing sensing and motion tracking technologies for use in the system, but this is also the first time these technologies have been assembled into one integrated package. Moreover, the system is underpinned by revolutionary patentable technology specially developed by the researchers that enables

data to be transmitted wirelessly through water.

"Transmitting signals wirelessly is much more difficult through water than through air, especially in a swimming pool where there is so much water turbulence and noise from pool filtration systems," says Professor Paul Conway, who, together with Professor Andy West, has led the project. "Solving this problem was vital to the development of our multi-component motion tracking system."

In the past, during [training sessions](#), coaches have provided feedback to Britain's elite swimmers based on the limited impression they form using their own eyes. Although video footage has been available, it has only been possible to study this for technical information after a session has been completed.

You can find out more about the research from the team involved in an audio slide show on the EPSRC YouTube channel.

([www.youtube.com/user/EPSRCvideo?feature=mhum](http://www.youtube.com/user/EPSRCvideo?feature=mhum))

In the new system, a lightweight, streamlined box (80 x 50 mm and 12 mm thick) containing tiny accelerometers, gyroscopes and other sensing technologies is fitted to the small of the swimmer's back. Force transducers are incorporated into the starting blocks and pressure sensors into touch pads at the end of swimming lanes. Waterproof \*LED markers have also been developed as part of the project and these can be attached to the swimmer's hips or other key body areas to help monitor their body movements.

As the swimmer moves, data are sent to the laptop where bespoke software interprets and displays the information, in easy-to-understand forms, alongside video footage provided by cameras positioned above and below the waterline. The data includes, for example, the force of the swimmer's push-off from the blocks, the length of time they remain in

the air during their dive, the angle of their body as they enter the water and as they swim, their stroke rate and the length of time they are in contact with the pool wall during a turn – all of which provides the best possible platform of accurate information equipping the coach to offer the best possible timely feedback.

"The new system has enabled elite training sessions to become even more productive," says Professor Michael Caine, Director of the Sports Technology Institute. "Ultimately, even small adjustments to technique can pay big dividends. Our aim has been to provide a legacy for [swimmers](#) to fulfil their potential at this summer's and future Olympics."

The current system represents the culmination of five years' development and potentially also has a wide range of applications beyond sport. For example, in healthcare, the movement tracking technology could provide an objective assessment of the rehabilitation performance of someone recovering from a stroke, while in industry the ability to work wirelessly in wet or electronically noisy environments could be useful for tracking high-value components or assets in challenging factory conditions.

Provided by Engineering and Physical Sciences Research Council

Citation: Tracking the wave of success for Team GB's swimmers (2012, June 28) retrieved 25 April 2024 from <https://phys.org/news/2012-06-tracking-success-team-gb-swimmers.html>

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