How AI is revolutionising rugby's concussion problem... and why an ex-England captain is investing in the technology

- **Former England star Courtney Lawes reveals how AI can help revolutionise the treatment and management of concussion in rugby and across sport**
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They are two of the biggest buzz words in society today and represent a growing force in almost all our lives, despite many of us not even being aware.

Now, the use of artificial intelligence (**AI**) and significant technological advances are leading to hope that the treatment of head injuries and the management of concussion in rugby – as well as across professional sport – can be revolutionised.

The belief is they can be a 'game changer' for athletes on the field at both the highest level and at the grassroots.

An arms race is underway to provide just that. And, perhaps surprisingly, former England captain Courtney Lawes is heavily involved at the forefront of the new era.

'I'm buzzing about it from a players' perspective, but also as a parent of kids that love playing the game,' Lawes told Mail Sport of the promising developments being seen in rugby's ongoing aim to improve concussion management. 'It could make concussion diagnosis more accurate and consistent which is so crucial for player welfare.'

Rugby's damaging legal case involving hundreds of former players, who are claiming compensation for alleged negligence from the game's authorities over the neurodegenerative brain diseases they are now struggling with, remains ongoing. As a result, it is clear progressive steps must be taken to safeguard its future. Thankfully, that is happening.

Former England captain Courtney Lawes has invested in AI companies tacking concussion

Lawes, who won 105 England caps and played for Lions, had his own battles with brain injuries

Lawes took part in a research project on concussion welfare during his time at Northampton

In rugby's amateur era and at the start of the dawn of professionalism, there was significantly less technology available for the diagnosis of concussion and its treatment.

Now, with World Rugby, the RFU and the WRU potentially liable for millions of pounds as ex-professionals suffer with diseases such as early-onset dementia, probable chronic traumatic encephalopathy (CTE) and motor neurone disease, strides have been made thanks to scientific advances.

While there is undoubtedly still work to do, such developments are cause for promise.

Lawes, who won 105 England caps and has had his own battles with brain injuries, has invested in two companies in this area.

One is a project with his former Northampton Saints team-mate Nick Greenhalgh and provides schools with software which can log head injuries, deliver timely clinical assessments and leverages cutting-edge smartphone technology and AI to monitor and manage pupil recovery.

‘Concussion welfare has been an area of interest for me since my time at Saints. We took part in a research project there using saliva-based biomarkers,’ Lawes added.

‘That was a concussion diagnostic which provided an objective, biological measure of brain injury for diagnosis rather than relying on symptom reporting.

‘Having been part of the saliva biomarker research, I’ve seen first-hand how innovations like this can help shape the future of the sport and improve the way we approach concussion testing, diagnosis and recovery.’

In the current **Six Nations**, all players are mandated to wear instrumented mouthguards in a directive laid down by World Rugby at the start of 2024. Sensors in the mouthguards measure accelerations of the head. If the threshold is exceeded, the player is removed from the field for the standard head injury assessment (HIA) protocol.

‘I’ve seen concussion management change massively,’ said the Welsh Rugby Union’s national medical manager Prav Mathema, who has worked with Wales for the last 14 years and been on the past four Lions tours.

Players in the Six Nations are wearing mouthguards which measure accelerations of the head

‘There have been huge technological advances and they are continuing. Instrumented mouthguards have become mandatory. The return-to-play time for players has also been extended for those failing a HIA, meaning the vast majority of them won’t come back now before 12 days which gives us a lot of confidence.

‘It means people aren’t inclined to try and hide symptoms because they know they’re usually going to miss the next game anyway.

‘Education has changed. Players and coaches around the world now know these issues are about people’s health and not performance. That’s something we want to continue to drive as much as possible because we want the players playing our game to be as safe as possible.

‘We have all this data in rugby at the moment around head injury management and performance markers. Now, it’s about best we use it.

‘I think rugby is ahead of other sports when it comes to concussion management, but there’s always room for improvement. I’d love to see the sport get to a position where the use of AI can help. I think it could be a potential game changer. In medicine when we talk about humans being in charge of the process, there are always going to be areas where we can improve. ‘We will always strive for perfection. We won’t always get there.

‘But if there are new technologies available to us, it can only be a positive thing. I can only hope we can progress in this area in the next 10 years like we have in the previous 10.’

And herein lies the key point. Treatment and management of concussion has been and, on the whole continues to be, human-driven.

England wing Immanuel Feyi-Waboso self-reported concussion symptoms last year

Scotland's Finn Russell passed a HIA during their match against Ireland last month

Russell, however, was kept on the bench because he was deemed not to be quite right

Such a scenario leaves margins for error.

In past eras, stories that players would deliberately underperform during their baseline assessments and not declare head injury symptoms were commonplace.

Again, things are changing. Immanuel Feyi-Waboso's self-diagnosis of suspected concussion symptoms in the 2024 Six Nations was a hugely positive indicator of that.

So too was Scotland's decision to keep star man **Finn Russell** off the pitch in their Six

Nations defeat by Ireland this year despite him passing his HIA because he was deemed not to be quite right. As a trainee doctor, England wing Feyi-Waboso's head injury awareness is perhaps higher than that of the average player.

But, it is undoubtedly true that the stars of today are more educated on the health risks of their career than those from yesteryear.

Greenhalgh's start-up, Luca Health, is not only backed by Lawes, but also his fellow former Saints team-mate Alex Waller and Gloucester's Ollie Thorley. Luca Health works with school pupils for now having launched in 2022, but the hope is in time it will grow to be available across all levels. Users of the Luca Health app complete objective baseline testing and the technology – although not yet fully diagnostic – can analyse your symptoms and organise treatment.

Greenhalgh said: 'Technology is at a place now where we all have supercomputers in our pockets. As a result, I think sport can be made a much safer place through using that. We have a wonderful opportunity to help so many people with this.

'Why do you need a human to carry out a memory or eye tracking test when a computer or technology can do it more accurately? It makes so much sense.

Greenhalgh's Luca Health company uses AI to help monitor pupils recovery from concussion

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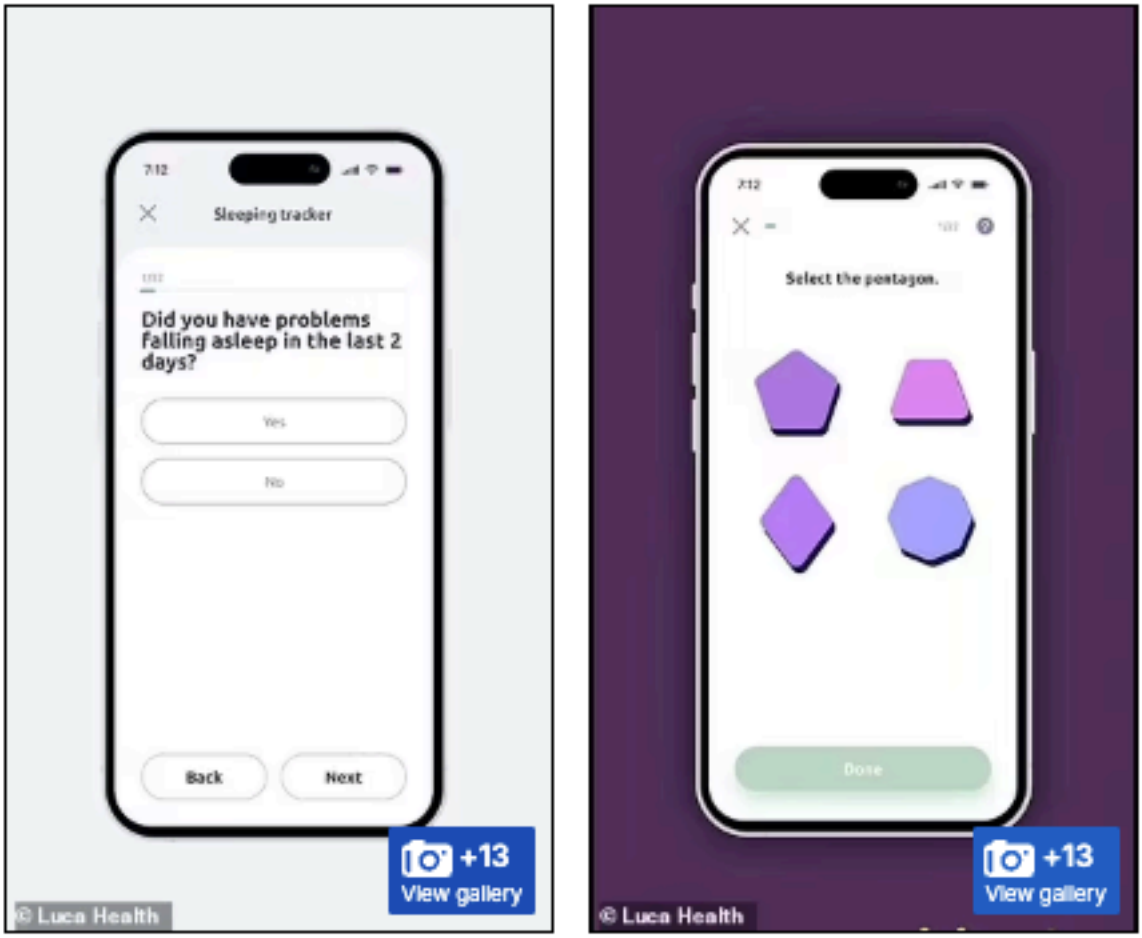

The app can help to track symptoms and organise treatment following concussions

'It's a much better use of a clinician's time to be carrying out assessments and treatment rather than doing testing, which a computer is better at anyway.

'Courtney understands the problem. He is incredibly passionate about the need for the concussion provision that exists in professional rugby to drip down to the grassroots level.

'I was treated pretty poorly in my playing career from an injury and welfare standpoint. I wasn't looked after as I should have been and I use that experience as fuel and motivation for what we're doing at Luca to protect youngsters and to make sport as safe as it can be.'

David Bartlett is chief operating officer of Your Brain Health and has a history of dealing with concussion while working as a physio in cricket.

Your Brain Health provides data-driven technological tools such as virtual reality (VR) headsets to take the guesswork out of return-to-play protocols following a concussion where, historically, decisions have been made either by the subsistence of demonstratable symptoms or, questionably, the athlete's word.

'You can't beat the machine,' Bartlett said matter-of-factly. 'Why would you not use technology to get objective data? We do that with everything else. If a player tears a hamstring, all the injury recovery is driven by data. We don't do that with concussion.

'I find that crazy. With so much of it, it's a case of "How are you feeling?" "What are your symptoms?" If a player is asked how he's feeling, there is always going to be a temptation to say: "I'm good to go." That player has their career and things like appearance fees to think about. In sport, we go through a protocol that in my opinion is pretty basic.

'There is so much more you can do. The focus of what we're doing is using technology to improve concussion care.'

England's Tom Curry was knocked out in November but Australia continued to play on

It was a sign technology cannot make everything perfect, but efforts are being made

The concussion arms race won't be able to help the stricken former players who continue to struggle onwards amid protracted legal wranglings. And it is true that technology can't make everything perfect. There are also cost and accessibility problems to consider here.

Even all the television cameras in the world and the mouthguard technology failed to stop Australia playing on at Twickenham last November while England flanker Tom Curry lay stricken on the floor having been clearly knocked out. It was truly awful to see.

But, hopefully, such incidents will become a thing of the past and all but virtually – excuse the pun – removed in the future. It is understood World Rugby – the game's governing body – are close to making further announcements on increased technology usage.

Rugby – and all sports for that matter – will undoubtedly be better now the 'smelling salts' and 'magic sponge' have been removed from a physio's bag.

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And who knows, in time those old-school and out-of-date treatment methods could be permanently replaced with a smartphone app or VR headset.

Luca Health and Your Brain Health were speaking at the Ahead of the Game talks series. For more information visit www.concussed.media