

PRINT-Testing the path to better concussion diagnosis

Miami Dolphins quarterback Tua Tagovailoa recently suffered his third confirmed concussion in 25 months – just another reminder that football and other contact sports pose the threat of a traumatic brain injury. [Research](#) indicates it's important to accurately and immediately diagnose a concussion because the consequences of misdiagnosis or faulty management can lead to major disability or death.

Illinois State University senior Cyerra Hibbert knows about concussions. She's had multiple ones while playing soccer in high school and at ISU, the most recent just a month ago. Hibbert is one of the first athletes to test a new [FlightPath](#) concussion app. The lead app developer is Adam Cross, MD, a pediatric hospitalist and clinical informaticist for OSF HealthCare and director of the OSF Children's Innovation Lab at [Jump Simulation & Education Center](#) in Peoria, Illinois. He is working with co-lead [Inki Kim](#), of the Health Care Engineering Systems Center at the Grainger College of Engineering at the University of Illinois Urbana-Champaign.

The concussion assessment app is a grant-funded project through [Jump ARCHES](#), a research collaborative that partners teams of clinicians and engineers working together to improve patient outcomes and reduce health care costs. The FlightPath app is being tested at Illinois State, Illinois Wesleyan and Bradley Universities as part of a clinical trial and research coalition. As part of the research, Hibbert used the FlightPath app after receiving instructions from her athletic trainer six days after she received a blow to the head during a game.

She was able to finish the test. It only takes about two minutes to collect more than a million data points as a person tries to catch a hummingbird within a 3D space on a screen.

"After a while it did bring a little confusion or if I wasn't aware of where the bird flew on or off the screen, that did trick a little bit of my memory and concentration skills, so I do think it's definitely approachable, Hibbert explains. "It's definitely doable. I think just based on your outcome will determine where you are in your concussion level."

Dr. Cross says the single biggest risk factor for prolonged time to recovery is delayed diagnosis, so FlightPath is his answer with its ability to diagnose a concussion within minutes. His research team has done some internal testing.

"Regarding how well it detects differences in impairments with people – how well they can determine if someone is functioning, acting appropriately, or if there's if there's something else going on. The challenge has been really doing that with individuals that have true concussion," says Dr. Cross.

Athletes with a suspected concussion are challenged by FlightPath to walk in their environment while trying to keep a hummingbird in a bubble on the screen.

"The players themselves are trying out this app while concussed after having been consented earlier on in the year so that we can get data around how they perform with this app while concussed versus not concussed, and comparing that to the normal, typical present-day evaluation techniques that the trainers perform."

Dr. Cross stresses, right now, the clinical trial does not involve trainers using the app to help make decisions. He says the research is not that far along and data collection needs to happen first. But, Karan Rai, MD, a sports medicine physician with OSF HealthCare who also serves as the team doctor for ISU Athletics, says eventually, the data from FlightPath could help beyond diagnosis.

"It in turn can help us with making prognoses, coming up with recovery timelines, implementing certain [vestibular therapy](#). Other than diagnostic purposes, we can extrapolate that data to help us come up with a better treatment plan as well."

Takes the pressure off

Both Hibbert and Dr. Rai are excited to be part of what they consider ground-breaking research that has the potential for helping athletes in the future. Hibbert, who plans to go into medical sales, says it's helpful to have an objective tool for an evaluation. She thinks it takes the pressure off athletes.

“Because as athletes, we’re always eager to be on the field or play the game and to have that mindset to be better and get back on your feet as quickly as you can. I think this app will allow you to really settle and to really take your time with your symptoms.”

The clinical trial is looking at whether FlightPath can do as good or better as traditional methods in diagnosing a concussion. So far, Dr. Rai says nearly 15 athletes who have suffered a concussion have completed a FlightPath assessment and it’s been performing well.

“Results are early so far but in our sample size we found some associations at least where FlightPath has shown some abnormalities similar to what other examinations have found as well, whether that’s the [SCAT](#) test or the [ImPACT](#) test.”

There are other concussion applications commercially available, but Dr. Cross suggests none are as robust as FlightPath.

“There aren't any, as far as I've seen, that use this mixed reality approach to gather the kinds of data that we're gathering. This is very rich data in a very short time in our app. One of the things that makes it so unique and sets it apart is that we get so much data about so many different manifestations of concussion in such a short time.”

Testing is expected to take at least two years. After testing, the app will be submitted to the FDA for clinical approval.

[Here is a video demonstrating](#) how the app works.

*Dr. Adam Cross also holds these positions:

Assistant Professor, University of Illinois College of Medicine Peoria, Division of Pediatric Hospital Medicine
Adjunct Professor, University of Illinois at Urbana-Champaign, Health Care Engineering Systems Center (HCESC)
Clinical Research Informatician, OSF HealthCare | Jump Trading Simulation & Education Center (JTSEC)