Smartphone application can assist with concussion detection and treatment

February 8 2013, by Roy Wenzl

An entrepreneur with close ties to Wichita State University has developed an iPhone application that researchers say could revolutionize how a key symptom of concussions can be quickly and accurately detected within minutes.

The "Sway Balance" app, developed by WSU alumnus Chase Curtiss of Tulsa has been approved by the Food and Drug Administration. It was tested for two years in Wichita, both at WSU and among hundreds of athletes at Wichita East and Andover Central high schools, and in schools in Oklahoma and California.

"It's a very cool tool," said Jennifer Hudson, the head athletic trainer for the Wichita school district who helped test the app for two years with East High athletes.

What Curtiss did, said Jeremy Patterson, the WSU scientist who studied and tested it, was develop a cheap, fast, accurate tool that trainers and other health care specialists have never had before. It gathers measurable evidence in moments, showing that a person has probably suffered a concussion.

"A lot of the initial assessments by trainers on the sidelines have had to be much more subjective, much of them based on how the athlete is feeling," said Hudson, who also teaches in the athletic training program at WSU. "A concussion until now has not necessarily been an injury that you can 'see,' like a fat (swollen) sprained ankle.

"But this app shows real numbers and gives you a better assessment."

It doesn't "prove" a person has a concussion, she said, because some concussions don't affect the area of the brain that controls balance. But it gives a better assessment than she's seen before.

Testing balance

How the app works is simple, said Curtiss, who earned a master's degree in exercise science at WSU in 2008 while working under Patterson.

"We're not diagnosing concussions," Curtiss said. "We're screening balance as a key symptom of a possible head injury."

The app works like this:

Trainers like Hudson ask an athlete to hold the iPhone or iPad on his or her own chest. Then she tells them to close their eyes.

She puts them through three tests that take about 10 seconds apiece: With your eyes closed, put your feet together. Then put your dominant foot in front of the other, heel to toe. Then lift the dominant foot, and stand on the non-dominant foot.

The app then gives an indication of numbers.

Athletes will be tested at the beginning of a season, when everyone is healthy and un-injured. That gives the trainer a recorded baseline of how much balance the athlete has when healthy. That recorded baseline is then compared with whatever the app might show next if the athlete is ever injured in a practice or competition.

Hudson said the app, within minutes, gives a reading about whether an

injury victim has developed a new problem with balance. This can be done on the field or court right after an injury.

Currently, researchers said, athletes, team trainers and coaches don't know for sure that an athlete has developed a concussion until extensive physical tests and expensive medical scanner tests are done. They also rely more heavily now on how the athlete tells them he or she feels.

Some of those same tests will still need to be done, but the advantage of the new technology is that trainers won't have to guess when a player needs to sit down, or go to a doctor.

Concussion dangers

Patterson, an associate professor and director of the human performance laboratory at WSU, said the app is an important innovation not only for National Football League players but for children and adults who play sports of any kind.

"Most people think concussions are when an NFL linebacker hits a quarterback helmet to helmet," Patterson said. "The dangers are more extensive than that."

Thousands of high school and college football players suffer concussions every year. Concussions, Patterson said, are a significant problem for soccer players, for basketball players, for tennis players diving for balls, for any sport.

Soccer enthusiasts have become increasingly concerned. Most concussions in soccer do not involve head-to-head but rather head-to-knee collisions, or a "shaking" injury to the brain inside the skull during collisions or falls where the head is whiplashed.

Medical people have even begun to ponder the safety of baseball catchers who get hit in the protective mask with a foul tip or an errant pitch.

Another good thing this app will do is help sort out when an athlete is ready to return, first to practice, then to competition, Patterson said.

The real danger of concussions is not the first head injury, Patterson said. It's "second-impact syndrome," a dangerous outcome.

"It's very important that the first injury gets picked up and identified," he said. "You get a second injury, and you are really cooked."

Brain damage and recovery can be more extensive after a second injury, he said.

Other uses

Because the new tool measures balance, researchers also said this tool will almost certainly become a key feature in seemingly unrelated professions.

"The possibilities are pretty astounding, really," Hudson said.

Police officers can use this kind of tool to accurately find balance problems in drunk drivers or impaired drivers, researchers said. Physical therapists could use it to cheaply and quickly track the progress or deterioration of nursing-home patients, who must exercise to prolong their lives or recover from injuries.

Curtiss said that under the Affordable Care Act, physical therapists treating elderly clients must now assess and put a value on function limitations for every patient who comes for treatment; the new app could

help speed that process, he said.

And athletic teams from grade school to the NFL to the NBA could use it not only to deal much more effectively not only with concussions but - because it assesses balance - could more accurately and quickly chart progress of athletes recovering from ankle sprains, knee problems and many other injuries.

After he graduated from WSU, Curtiss moved to Tulsa and founded Capacity Sports, a software company where he developed the app.

The app will be relatively cheap for the value delivered, Curtiss said. Downloading the app will cost a one-time charge of $9.99. The amount of a monthly fee that medical providers will be charged for using the app has not been settled on yet, but will probably cost about $20 to $30 per month, Curtiss said.