October 30, 2012



Braeden Benedict shows off the mechanical sensor he designed to help warn coaches and trainers of potential head injuries. (*FOX Sports West)*

    **CONCUSSION SYNDROME**

Football has its risks, a fact Braeden Benedict learned this season when he sustained a broken collarbone during practice with the Palos Verdes Peninsula High JV team. The injury was nothing new; he broke the same collarbone playing lacrosse in January.

Benedict knows all about sports injuries, perhaps too well. But because he has seen how they can affect his fellow athletes in contact sports, he’s on a path to developing something that eventually may help detect one of the most sinister football injuries of all: concussions.

A small mechanical sensor he designed could eventually become a low-cost, mass-produced device that fits on the front of helmets and releases a liquid that is visible from the sidelines, warning coaches and trainers that a player should be checked for a possible head injury.

The idea won Benedict, now 15, the top prize in the Discovery Education 3M Young Scientist Challenge last year. He was named “American’s Top Young Scientist,” earned a visit to the White House and won $25,000, most of which he’s putting away for college.

But while many contestants might have abandoned their ideas by now, Benedict, now a sophomore at Palos Verdes Peninsula, is pushing forward. He has sent in an application for a provisional patent and continues to look for ways to improve his device.

If he’s learned anything, it’s that these things take time. But he clearly remains intent on seeing it through.

“That’s for sure,” said his mother, Maurena Nacheff-Benedict. “He definitely wants to do that if he’s working on a project.”

Benedict’s idea was spawned from two factors. He saw a couple of his teammates sustain concussions on the field over the past few seasons. So when he learned about the young scientist challenge while attending St. John Fisher School in Rancho Palos Verdes as an eight-grader, he made a connection.

The idea, he said, “was in my mind. I saw this contest, the Discovery Education 3M Young Scientist Challenge, and they had some topic starters: What can keep us healthy? What can make a difference in the world? That’s when I pieced it together and thought, 'Wait a minute, this is a problem, concussions in sports,' and recognizing (them), and I saw that maybe this was something I could help try to solve — or at least make a difference.”

So began a yearlong quest that became so much more than your average science-fair project.

Sports-related concussions are a significant issue. According to the Centers for Disease Control, traumatic brain injuries, including concussions, represent almost nine percent of all injuries reported across nine high school sports. Numbers and rates are highest in football, followed by girls’ soccer.

Benedict, a running back and defensive back who measures a mere 5-foot-6 and 120 pounds, is not the first person to develop a product designed to help detect concussions in football players. Researchers have found several methods of recognizing possible head injuries, including sensors inside helmets, chinstraps and mouth guards. Helmet-maker Riddell has developed a liner system to help reduce blows from frontal impacts.

But devices can cost anywhere from $150 to $1,000. Benedict’s sensor, which is not electronic, could fit in the $20 range, making it accessible to youth and high school teams.

“I wanted to come up with something low cost that could be done, and I found that there really wasn’t anything like that out there,” he said. “And from there, I tried to figure out ways you could measure the impact from the helmet. I did a ton of research. I tested them on the helmet, I tested them on the sensors themselves and finally found something that worked.”

One of the most important components of his device is the patch on the front of the helmet that allows coaches and trainers to see if a player has sustained a hit that requires additional examination. Other devices send a signal to a monitor on the sideline, or each helmet may have to be checked individually to see if it registers a possible head injury.

“One of the big things that I was trying to test over the summer was to make it visible so that if it goes off, you will be able to see from the stands,” Benedict said. “You know, ‘Johnny has a concussion, or may have a concussion. We may need to get him looked at,’ rather than having to look at each helmet one by one to see if it had gone off. And, in addition to making it work, visibility was a big issue that I wanted to deal with.”

Benedict currently is trying out a sensor designed by a company that had given up its technology for another product. It heard about Benedict’s work and asked if he wanted to use it as a proof of concept to show its feasibility.

He used the sensors on several teammates’ helmets and saw amazing results: In his team’s recent homecoming game, two players whose sensors went off were found to have sustained concussions, he said.

“I kind of felt weird,” he said. “I was happy that this thing worked, and one of the players wouldn’t have talked about his symptoms just because he didn’t really know it. He might have later on, but I told him that his sensor had gone off, and he was like, ‘Really?’ Obviously I felt bad for the player, but I also felt good because they worked.”

Benedict’s mother said it’s possible Braeden could work with the company on his sensor. Given the time he’s put in so far, a little help might speed up the process.

“My design needs fine-tuning,” he said. “Right now, what I’m looking at is, this testing on our football team has really improved the concept. Because even if my sensors work perfectly, you still need to know if they’re going to work in the real world and how a team, how players, will react to it and accept it. That’s what I’m looking at.”

In the meantime, he has plenty of other activities on his plate. He plays saxophone in the school jazz band, is working on attaining Eagle Scout rank in the Boy Scouts and still attends football practice daily.

Not surprisingly, his mother acknowledges it can be difficult balancing so much while also working on his sensor.

“It’s a concern because there’s so many hours in the day,” she said. “He has a very heavy academic load, and then throw in football practice between 5:30 and 6:30 every day, depending on when they let them out. But he’s very capable and he knows what classes he wants to take. He pushes himself hard, but he knows it’s very important to balance.”

At various times in the day, Benedict is an athlete, a musician, a scientist and, in some respects, even an inventor.

So how does he identify himself?

“I think I’m someone who works hard,” he said.

If he keeps at it, football players and other young athletes eventually may reap the benefits.

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