

Are Female Athletes at **GREATER RISK** for

Concussions?

By Jordan Conn

Alaina Werling ran down the basketball court, unaware that in a moment her season would end. She and her Fishers High teammates were playing in an invitational tournament game on the road that Saturday afternoon in February, tucked in a warm gymnasium while the Indiana winter concocted a belligerent and unpredictable snowstorm outside. As Alaina rushed to take her position on defense, an opposing player turned and blocked her path. What happened next Alaina can't quite recall.

There was a collision, she later learned, a violent impact that left Alaina lying still on the gym floor, staring upward at the teammates and onlookers who surrounded her, her lip split open and bleeding profusely. "I'm fine," Alaina told her teammates. She rose to her feet and walked to the sideline, eager to return to the game. The opposing team's trainer took her aside and tested her vision and memory. He called her mother, Carol, who had decided not to attend the game because of the storm, and delivered the news that so many high school athletes have heard, a diagnosis that

would alter the next few months of Alaina's life. "I think your daughter has a concussion," the trainer said.

Concussions occur when the brain is shaken within and against the skull, sometimes producing bruising and typically leaving patients with somewhat subtle but serious negative effects on the brain. A few years ago, Alaina's injury might have gone undiagnosed. She could have returned to the court and resumed playing, continuing to contribute to her team while risking her long-term health. But along with advances in technology and increased awareness, coaches and parents across the country have grown more cautious about concussions. And research suggests that female athletes may need to be even more vigilant than males. In the immediate aftermath of her injury, however, Alaina cared little about what the research had to say. She just wanted to get back onto the court.



Worth a Closer Look

In most sports, girls are more likely to suffer concussions than boys, research shows. A study published in the *Journal of Athletic Training* earlier this year found that female soccer players are 68 percent more likely to suffer concussions. Among basketball players, girls are three times more likely to be concussed. But studies are inconclusive as to why.



Making An IMPACT

Since concussions don't show up on MRI or CT scans, doctors can't tell whether someone has one or not based only on symptoms. So they've developed tests such as IMPACT, (immediate Post-concussion Assessment and Cognitive Testing), a computerized 20-minute evaluation system that involves sequences of words, shapes and colors—sort of like a street test for your brain. Athletes undergo a baseline evaluation before their season starts so that a record of their pre-injury brain function can be kept on file. Concussed athletes retake the tests, and the results are then measured against that baseline to see when their brain is back to functioning normally and it's safe for them to return to play. IMPACT suggests that athletes take the baseline tests at the start of seventh, ninth and 11th grades—because young brains are still developing. Learn more at impacttest.com.

Carol told the trainer, "Whatever you do, don't let her back in the game. If you leave it up to her, she'll say she can play, but don't let her." Sure enough, Alaina protested the decision to make her sit, as she saw no reason why she shouldn't be allowed to play. She was a little out of sorts, sure, but this wasn't like a blow to the knee or the elbow, the kind of injury that rendered the body incapable of performing. Her head hurt. That was all. As her teammates struggled to put the game away during the second half, Alaina longed to rejoin them.

Her team lost, and Alaina rested for the rest of the weekend. Her head pounded. She felt drowsy and dizzy, and she wanted only to sleep. She visited her school's trainer the following Monday.

He gave Alaina the ImPact test (see box), a computerized exam that measures brain function. She had

not previously taken a baseline exam for reference, but her scores were so low that the trainer referred Alaina to a sports medicine physician. "It was a classic case," says Dr. Daniel Kraft, who treated Alaina that week. "As soon as we saw her scores and learned about her symptoms, it was clear that she had a concussion." Alaina missed the rest of the season.

In most sports, girls are more likely to suffer concussions than boys, research shows. A study published in the *Journal of Athletic Training* earlier this year found that female soccer players are 68 percent more likely to suffer concussions. Among basketball players, girls are three times more likely to be concussed. "Sometimes we just focus on football when it comes to concussions," says Dr. Marci Goolsby of New York City's Hospital of Special Surgery. "But we're seeing that they're affecting [all] young athletes, and people need to understand that football players aren't the only ones who suffer concussions."

While it's clear females incur more concussions than males, no studies have yet explained why. Experts have several theories. "There's a physiological component to it, and then there's also a cultural component to it," says Kelsey Logan, medical director of the Sports Concussion Program at Ohio State University. Because girls' heads tend to be smaller, Dr. Logan says, the impact of collisions may be more pronounced. Boys, on average, also have stronger neck muscles than girls, which may allow them to better sustain the impact. "Females may not have as much head and neck control," Dr. Goolsby says. "That affects the force that gets transmitted to the brain." Tests of this theory have been inconclusive, however.

Doctors agree that in recent years, female athletes have been expected to play through pain as much as males. "These girls are just as hardcore as the boys are," says Dr. Kraft. "They come in with the belief that they need to play, and they hide things."

Some experts believe girls may be more likely than boys to report the concussions they receive, which would explain at least part of the discrepancy. Dr. Logan says some studies have suggested that girls are more willing to sit out than boys, but doctors agree that in recent years, female athletes have been expected to play through pain as much as males. "These girls are just as hardcore as the boys are," says Dr. Kraft. "They come in with the belief that they need to play, and they hide things." While coaches value toughness, doctors stress that athletes are harmed by the belief that they should continue playing while injured. "They think they're letting their team down or they can't showcase their talents," says Dr. Logan. "That can be dangerous." Cultural expectations aren't the only aspect of girls' sports to change in recent years. "The nature of athletics among females has changed," says Dr. Goolsby. "It's a lot more high-contact and aggressive."

Once they've suffered head injuries, girls often reveal different symptoms than boys do. "It's thought that perhaps girls are more willing



After Alaina Werling (left, with her mom) suffered a concussion during a

to report the less-obvious symptoms," says Dr. Logan. While boys are often diagnosed because of loss of memory or trouble concentrating, girls are more likely to report increases in anxiety or irritableness, as well as headaches and neck pain. "It's important to remember," Dr. Logan says, "that this isn't the case with everyone. Plenty of boys report the more behavioral symptoms, and plenty of girls report the more cognitive symptoms."

In Dr. Kraft's office, Alaina insisted that she be cleared to play immediately. "She didn't quite understand how serious it was," Dr. Kraft says. Once informed that not only would she be unable to play that week, but also that she would need to miss classes and avoid sports for several weeks, Alaina was devastated. As the days progressed, however, it became clear that the injury had taken a toll.

The headaches continued. She remained sensitive to light. Most startling, her personality changed. "I felt goofy," she says. "Sometimes I would die laughing at things that weren't even funny. I made strange noises. My friends were like, 'You're weird now.'" A girl who typically approaches schoolwork and sports with a methodical intensity, Alaina became uncharacteristically relaxed. For two weeks, she attended school for only half the day. She spent the rest of her time sitting still, avoiding stimulation from homework and television, and allowing her brain to rest. She couldn't even watch her teammates practice. "The hardest part was not being able to do anything to help it," she says. "It's not like I could do some stretches to make it better."

Over time, Alaina came to understand the necessity of the precautions. "I wanted to play, but if I had jumped back in, I could've gotten hurt a lot worse." Multiple concussions, particularly if they occur close together, can lead to dementia, depression and other mental illnesses, research suggests. "It's important to realize these concussions are not insignificant," Dr. Goolsby says. "They need to be

treated just like a torn ACL needs to be treated."

While Alaina's case was handled well, doctors insist that a cultural shift needs to happen so that athletes and coaches will consistently give concussions the respect they deserve. Because concussions don't hinder movement like leg or shoulder injuries do, athletes are tempted to play through them. "High schoolers should advocate for a concussion education program in their schools," says Dr. Logan. "It's important for athletes in particular to know when something isn't right. So often, players are taught to 'suck it up' and keep playing, but this is a serious injury, and it needs to be treated that way."

About six weeks after her concussion, Alaina was cleared to play. She rejoined her club volleyball team, shaking off rust on her way back to peak form. Her proudest moment, however, came during a morning workout. Every Monday, athletes from various sports at Fishers High gather to perform (or endure) conditioning drills. They rotate among stations, jumping hurdles, running sprints and otherwise working themselves ragged. Alaina initially struggled to keep up, no longer feeling the effects of the concussion but still working herself back into shape. Until one day, near the end of the year, she noticed herself no longer lagging behind the others. "Finally," she says, "I was back." **HE**

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Anatomy of a Concussion

A concussion is a brain injury caused by a hit to the head or body.

Your brain is suspended in fluid, which has the consistency of Jell-O. It sits inside the skull, which is kind of like nature's helmet.

If your head whips around too fast, your brain moves through the fluid and bounces off the inside of your skull.

That prompts what is referred to as a "metabolic cascade" during which the brain's nerve cells stop functioning as they should and blood flow is slowed.

Concussed athletes need cognitive rest meaning no reading, writing, or texting.

While they heal, cells are vulnerable to a second injury, which is why concussed athletes must

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