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## Concussion Studies Show Girls Are More Vulnerable

By ALAN SCHWARZ

Hannah Stohler sat beside the piano she could no longer play, in the living room that spun like a carousel, in the chair in which she tried to read but could not remember a word. Ten months after her third concussion while playing high school soccer knocked her into a winter-long haze of headaches and dizziness and depression that few around her could comprehend, Stohler recalled how she once viewed concussions.

"I thought they were a football injury -- a boy thing," said Stohler, a junior at Conard High School in West Hartford, Conn. "Those guys are taught to hit hard and knock people to the ground. But anyone can get a concussion, and I don't think a lot of girls recognize that. They have no idea how awful the effects can be -- it changes your life."

Stohler, 16, has more company than most people know. While football does have the most concussions (and controversy over their treatment) in high school athletics, girls competing in sports like soccer and basketball are more susceptible to concussions than boys are in the same sports, studies show.

According to a study to be published in the Journal of Athletic Training, in high school soccer, girls sustained concussions 68 percent more often than boys did. Female concussion rates in high school basketball were almost three times higher than among boys.

Girls also consistently took longer for their symptoms to resolve and to return to play. The study, conducted by researchers at Ohio State University and Nationwide Children's Hospital, examined data submitted by 425 certified athletic trainers across the United States during the 2005-6 academic year. According to the National Federation of High School Sports Associations, a million youngsters play high school basketball and 700,000 play high school soccer each year; male participation is only slightly higher than among girls.

Fatal brain injuries in high school sports outside football are exceedingly rare, but post-concussion syndrome -- in which dizziness, lethargy and the inability to concentrate can cost teenagers weeks or months of school -- is a growing concern, doctors said. They added that it was just as common among girls as boys and even more misunderstood.

"Generally speaking, the medical profession does not do a very good job in recognizing that female athletes sustain concussions at an equal or even higher rate as males," said Dr. Robert Cantu of Brigham and Women's Hospital in Boston, one of the nation's leading experts in concussion management. "It's flying under the radar. And as a result, looking for concussions in women is not pursued with the same diligence, and it's setting girls up for a worse result."

Hannah Stohler twice slammed her head against the turf while playing soccer last fall, both times experiencing the disorientation, blurred vision and nausea that are telltale signs of concussion. She said her neurologist at the time told her that when her headaches subsided, she could play again.

"I really didn't think it was a big deal," she recalled, adding that she returned a few weeks later before her other symptoms had cleared. "Soccer is everything to me. I identify myself as an athlete."

In November, Stohler collided with another player, could not get up for 10 minutes, and left the field with her vision totally black. Her eyesight returned, but she experienced headaches and disorientation for three months, could barely read and was forbidden to exercise for fear of causing further damage.

"I was the freak at school who could only do half days and had to go home all the time," said Stohler, whose reading comprehension and memory remain slightly impaired. "I didn't feel like myself -- ever. I was miserable. It takes the life out of you."

Another young female victim of post-concussion syndrome lives just 20 miles up the road from Stohler. Kate Pellin, a standout basketball player in Suffield, Conn., has sustained at least four concussions, three times being knocked unconscious while diving for balls or being slammed to the hardwood by other players. "I get offended when people say girls don't play sports as hard as boys," she said.

Pellin's last concussion, in April, caused such lingering headaches, sensitivity to light and noise and constant dizziness that she ultimately missed the rest of her junior school year.

"My teachers couldn't understand why I couldn't do my homework," Pellin said. "I didn't have crutches, where everyone can see you're hurt. It's a hidden injury. Boys would tell me, 'You should wear a head brace!' like ha-ha, and I was like, 'Maybe that's what I should do for you to take me seriously.'"

According to the study to be published in the Journal of Athletic Training, football has the highest rate of concussions in high school sports, with 47 such injuries per 100,000 player games or practices. Girls soccer was second highest with 36 per 100,000, followed by boys soccer (22) and girls basketball (21).

Most soccer concussions are caused by hard falls to the ground or collisions with other players. Heading the ball is not a primary cause, studies have determined, because the impact is not of sufficient force to send the brain crashing into the skull.

Attempts at heading do engender many concussions, however, as players' heads collide in battles for the ball. This has led to the increased use of padded headbands designed to lessen the forces of many blows, but their effectiveness remains the subject of debate.

One study published this summer said that such headgear appeared to reduce concussions among soccer players, but some coaches and doctors fear that their use could foster more aggressive play. Hannah Stohler said she wore one only temporarily. "It was really distracting," she said, "and I didn't feel it was going to make much difference."

Doctors are also uncertain as to why documented rates of concussion among high school girls are consistently higher than among boys in the same sports. The primary theory is that girls might be more honest in reporting injuries -- though experts are confident that many girls, just like boys, hide injuries either because they are not aware of the risks or because they simply do not want to miss playing time. Other rationales include the fact that girls' neck muscles are less developed than boys', providing less shock absorption during impact.

After sustaining her second concussion playing high school basketball in Ohio, Sarah Ingles kept playing the rest of the game because, she said, "I didn't really realize it had happened." On the bus ride home she began asking friends, "Where are we? What's going on?" She did not know she had played basketball two hours before, let alone been knocked hard to the floor on a layup.

Ingles missed six weeks of school. Now at Ohio Wesleyan University, she found her dizziness and nausea return two weeks ago by merely bumping her head on a bed frame. She is sitting out her freshman field hockey and basketball seasons on the advice of a neurologist.

"Girls are just as competitive as boys, and they'll push through concussions just like boys would," Ingles said. "For every one of me, who ends up getting treated, there are maybe four or five who keep playing because they don't want to admit they're hurt. It's easier not to do anything. It's really going to mess them up further."

The decision over whether to stop playing competitive sports can be agonizing for high school girls and their families.

Kate Pellin planned to serve as basketball captain this winter, in part because several colleges her parents could not otherwise afford -- Colgate, Iona, Lehigh -- were considering her for a full basketball scholarship. But her headaches have persisted for five months. She still has trouble reading and transposes numbers in math, signs that her brain has not yet recovered and remains susceptible to greater injury.

Pellin decided only recently not to risk playing basketball anymore, in large part because of news media coverage of concussions' role in long-term brain damage among professional football players. She sat on her living room couch, a seemingly healthy teenager, and broke into tears.

"I don't want to have Alzheimer's when I'm 40," Pellin said. "I want to know who my husband is. Who my children are. I never knew this was such a concern. In the long run, I'll be glad I stopped now."

The decision was less clear-cut with the Stohlers. Sherry Stohler said that she and her husband spent many hours talking with Hannah about whether her soccer career should end. Half-seriously, she said, "It's like she can have depression when she's older because of the concussions, or be in therapy now because she hates her parents."

Sitting beside Hannah, she said: "It's a nerve-racking decision when your child's identity is so wrapped up in something she's played since she was 5 or 6. To snatch that dream of playing high school sports away is a pretty large burden to carry. It's very hard to take away something they treasure."

Hannah looked at her mother and said defiantly: "There was no way I wouldn't play. I know I'm not going to be a professional soccer player, but I'm good at it, and the team atmosphere is something I love. It's not something I'm willing to give up easily."

She did not. The next evening, having convinced her neurologist and her parents that her remaining symptoms were minimal, Hannah Stohler wore No. 22 and played defensive midfield as Conard High played rival Windsor High.

As Sherry Stohler watched from the stands, leaning forward slightly every time No. 22 hit the turf during a slide tackle or rough play, old images of her daughter lying motionless were superimposed over the new.

"As long as she gets up and keeps playing," the mother said with a sigh, "it's a good night."