

Sports Illustrated

Multiple concussions have changed the life of one California teen

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Sammy Barish doesn't remember hearing a sound when she hit the floor, but the smack of her skull meeting the linoleum reverberated throughout the gymnasium. It wasn't an important match and her junior varsity volleyball team was already behind. Still, it wasn't surprising when the teenager stood back up and prepared for the next point. Sammy -- a part time volleyball blocker; part time soccer goalie - always played without fear. What was worrisome was that Sammy couldn't stop shaking her head and that, with her team down at the end of the first game, the fiercely competitive teenager asked to be taken out.

The headaches didn't really kick in until the next morning. By the time Sammy left her San Francisco home for Marin Academy, an exclusive private high school in San Rafael, Calif., her head was pounding and she squinted as she walked out into the glare of the daylight. At lunchtime, when she visited Marin Academy athletic trainer Aaron Gill to retake the ImPACT test, a neuro-cognitive assessment used to determine whether an athlete has suffered a concussion, everything felt hazy. After examining her results, Gill was certain that Sammy had a concussion.

But because Sammy didn't quite understand what it meant to have a concussion, the 15-year-old went about her day as usual. As she sat at a friend's house that afternoon watching television, Sammy felt the din from the TV ringing inside her head. She tried to play a board game, but Sammy felt herself falling into a deeper and deeper haze. She called her mother, who arrived at 8:30 p.m. to see Sammy standing at the front door in tears. In the car, she sat in the back seat with her head between her legs, screaming every time they drove over a bump. She begged her mother to help, to take her to the hospital, to do something. Sammy's mother, Kathy, didn't know what to do.

"We couldn't understand how Samantha had such an intense concussion experience when it was her first concussion and she didn't pass out," said Sammy's mother. "That's when we started thinking that this was not her first concussion."

When the family looked into it, they thought Sammy had probably suffered at least two other concussions. During tryouts for the Marin Academy varsity soccer team just eight months earlier, Sammy was struck in the side of the head with a ball, fell to the ground, and then couldn't remember what had happened after she returned to the sidelines. The next day she was back on the field. Then, two months later, while playing goalie, Sammy was kicked in the head as she scrambled for a ball. She immediately felt dazed and for the next 24 hours had a ringing headache.

The dangers of concussions are well publicized, especially with recent evidence linking head injuries to dementia in ex-NFL players. Less attention has been paid to the dangers of high school sports, even though those youth athletes - whose brains will still be developing until their early-20s -- experience at least 300,000 concussions per year, according to the American Journal of Sports Medicine. That number could be much higher because concussions are

often under reported. Studies show that girls' soccer ranks second only to football when it comes to incidence of concussions in high school athletics.

And while there are no studies on the long-term effects of repeated concussions on young athletes, evidence from studies of NFL players indicate that the risks may be greater than players -- or their parents -- realize.

"Most of these kids are probably not going on to play professional sports ... If I had a child with multiple concussions it wouldn't be worth the risk," said Catherine Broomand, Clinical Neuropsychologist and Director of the Youth Sports Concussion Program at Kaiser Permanente's Center for Neuropsychological Services.

For Sammy, the symptoms from her concussion on the volleyball court didn't subside easily. In the beginning, she would go to sleep at 9 p.m. and wake up 12 hours later. She would lay in bed for a while because she felt tired and rundown. Then she would sit up, put her sunglasses on and walk downstairs to lie on the couch. She couldn't do schoolwork or watch TV or read. She missed three weeks of school, and when she did return to class, she had fallen behind. She could only concentrate long enough to sit in two classes a day and would often take walks around Marin Academy's campus when she began to experience headaches.

Sammy's parents immediately told her to quit volleyball. She agreed; it wasn't her favorite sport to begin with. Soccer was a different story. Sammy's father Andy, thought it would be all right for Sammy to continue to play. Her mother wasn't so sure. She had watched Sammy struggle to recover for so many months and saw her happy, bubbly daughter become subdued and distant. Kathy wanted to protect her from another concussion.

But when Kathy explained her fear to her daughter, Sammy reminded her mother that it was her life, and that she needed to make her own decisions. She promised that if her mother told her she couldn't play, she would stop, but it would be demoralizing.

In the end, Kathy left the decision up to Sammy. She chose to play.

"I can't let my physical injuries or concussions hold me back from what I want to do," said Sammy, now 17. "I mean that's a lot of what goalie is for me on a normal basis -- Getting up even when I'm down is kind of what I'm all about."

At 5-foot-4 ½, Sammy doesn't look like a typical high school goalie. She can't jump and touch the top of the goal with ease and seems to rely on her feet a little too much. What Sammy does have is toughness. Being a goalie requires that a player repeatedly throw her body at the ground or in front of opponents to get the ball. It demands someone who is undeterred by a few scrapes and bruises, or a sprain here or there.

But a concussion isn't like a bruise or a sprain. The brain is like a jello mold that tolerates a lot of jiggling throughout the day. A concussion happens when the brain is rapidly jostled. When it is impacted, it stiffens and becomes deformed and stretched as it rotates dramatically in the skull. This impact damages -- sometimes permanently -- the nerve fibers that deliver information across the brain.

Most of the time, the brain can recover from a single concussion. But as the brain works to return to normal processing speed, the athlete becomes more vulnerable to a second concussion. If the athlete suffers another concussion before she has recovered from the first, her symptoms could become more exaggerated and last longer or, in rare cases, there could be permanent brain damage or even death.

Douglas Smith, Director of the Center for Brain Injury and Repair and Professor of Neurosurgery at the University of Pennsylvania Perelman School of Medicine, compared it to "throwing salt water over live circuits."

Females and youth athletes appear to respond worse to concussions than their male and collegiate counterparts. Tracey Covassin, an associate professor and Undergraduate Athletic Training Program Director at Michigan State, has found that females tend to display more symptoms and both females and youth athletes take longer to recover from concussions. The difference is significant. It could be because females have weaker necks compared to males,

or because of their neuro-anatomy, or partially because they report symptoms more often. In youth athletes, the brain is fragile because it's still developing and will continue to develop until the athlete is in her early-20s, but this might also mean the brain is more malleable and can recover. Doctors really can't say for sure.

With repeated concussions, though, symptoms often get worse or take longer to resolve. In the long term, research on deceased NFL players has shown that repeated brain trauma could lead to Chronic Traumatic Encephalopathy (CTE), which causes memory loss, psychotic symptoms and dementia later in life. But the research remains limited to professionals in major contact sports -- football, boxing, and ice hockey. There is really no research that tracks the long term impacts for youth or female athletes.

In the months after her concussion, Sammy struggled to do schoolwork, hang out with friends or go through a whole day without headaches.

Unlike some competitive athletes, who rush back from injuries, fearing they might lose the chance at a Division I scholarship or professional career, Sammy has no aspirations to play competitively in college. Still, Sammy returned to her varsity team to finish out the last month of her sophomore season.



"Every time someone crosses the ball, I still think about getting another concussion," Sammy said. "I just try to move past it. It's definitely hard because it's always in the back of my mind. But a lot of people are counting on me."

After a practice this spring, I asked Sammy why she loves playing goalie. She smiled and paused. For a few seconds I thought that she couldn't supply an answer. But then she earnestly responded with surprising clarity, reminiscing about diving for a ball and hitting the ground with it in her grasp. "It's just such a good feeling to be weightless for a second and then hit the ground and have it and be in complete control," Sammy said.

Again she hesitated. The smile that seems permanently engraved on her face disappeared for a moment. "It's hard to give up something that you love," she said.

In March, two days before the third game of Sammy's junior season, she was hit in the head once again, this time in practice. Her teammates were split into teams and passed the ball around in a square trying to maintain possession.

But as one freshman made a turn she and Sammy collided head-to-head. Sammy usually wears protective foam headgear called a "Full 90," but the drill wasn't supposed to have contact, and she wasn't wearing it.

Sammy's teammate winced. Sammy immediately noticed a headache in the left side of her forehead -- the same place she had been hit when she sustained her previous concussions. As the headache spread throughout her head, Sammy hunched over, hoping to slow the quickly intensifying pain. Her coach came over and told Sammy to sit down for five minutes before allowing her to walk to the trainer's office. Soon it was confirmed: Sammy had another concussion.

Two days later, Sammy sat on the sidelines and watched her team lose 1-0 to University High. Sammy is usually hard to miss on the field: she's the one yelling and cheering on her teammates. But on this day she seemed subdued as she was still experiencing headaches.

"I am a little worried because it was so easy to hit my head again," Sammy said. "I knew subconsciously coming back to play last spring that it could happen again really easily because now that you've had this major one, it could happen at any time."

Kathy was away on a trip to John Hopkins University when she heard that Sammy had experienced a little knock to the head. When she found out it was another concussion, it was hard for Kathy not to burst into tears.

At the Barish's home in San Francisco, the family discussed this most recent concussion. Sammy's symptoms were not severe and they subsided within a few days. Still, as they discussed the hit, Sammy's younger brother, Bradley, turned to Sammy and said, "If you get another concussion, you're done. No more sports." Sammy's parents agreed. "You know he's right," Kathy told her.

For Sammy's mother, it's a constant state of fear. Sometimes, she wants to take Sammy out of soccer immediately. But then Sammy will have a phenomenal game in goal. She will be praised and high-fived by her teammates and coaches. Sammy will feel so happy, so empowered.

"These moments in her life are so powerful," Kathy said. "I don't know how to take that away from her."

A few weeks later, when Sammy was cleared to play, she returned to the field. In goal she competed with the ease and confidence of a seasoned player, yelling out commands to her teammates with the passion of someone who cares deeply about the game. If she has another bad concussion, her parents are in agreement that her athletic career will be over. But for now, Sammy keeps on playing.

"You hit your head, but life goes on," Sammy said. "You can't just sit in a dark room forever. That's not how life works."