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Soccer's concussion problem

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Case study 1: Taylor Twellman

Twellman got his first concussion in his college soccer debut as a freshman University of Maryland striker. Seton Hall's goalie charged out at a loose ball and rammed Twellman in the face, breaking his nose in three places. Two years later, while with 1860 Munich, he got another concussion when he knocked heads with a defender during an exhibition game. The third came during a U.S. national team practice in 2003, when defender Danny Califf elbowed him. Later that year, Twellman had Califf to thank for the fourth concussion, when he kicked Twellman in the face during a Major League Soccer game, breaking his orbital bone, nose and jaw. He had never had post-concussion symptoms before. But this time he spent the month after the incident with a severe headache, wooziness and nausea. He got his fifth concussion in 2005. In 2008, Los Angeles Galaxy goalkeeper Steve Cronin hesitated too long on a cross against Twellman's New England Revolution and had to charge out on the double. He was late to the ball and instead punched Twellman in the face. He was concussed again. This time, he had every known concussive symptom: migraines, sensitivity to light, vertigo, nausea, impaired vision, fatigue, insomnia and memory loss. Heavily medicated, he played through eight more games, scoring five times. But he felt all wrong. "Doctors would tell me I had diabetes or that I had situational depression," Twellman said. "I thought, 'Something's not right here, somebody's not telling me exactly what should be said.'" He sat out for a year until his symptoms subsided. During the 2009 season, he returned and scored on a header in his first game back. His excited family and friends had traveled to the game and met him afterward. He told them he was done. His head felt "like a sponge." He went home and had the worst headache of his life. Twellman never played again, quitting a career that had yielded 101 MLS goals, making him one of the league's poster boys and a national team regular at age 30. Twellman tumbled into a deep depression, took to alcohol and painkillers. He has recovered from all three and moved on. He has become the unofficial spokesman for concussion victims in soccer and has started a foundation, ThinkTaylor, to help educate people about the problem. He sits on the MLS Concussion Protocol Committee. After he dies, his brain will be donated to scientists researching the long-term effects of multiple concussions. To this day, Twellman is by no means symptom-free. "I have a headache every day that I wake up to," he said. He hasn't been able to work out since the day he quit because elevated heart rate trigger migraines. When he joined ESPN as an on-air soccer analyst, he had to wear a heart-rate monitor.

The concussion problem

In spite of the attention they've gotten, ice hockey and football of the gridiron variety do not have a monopoly on concussions. Soccer, which has long had a reputation for being a relatively safe sport in the U.S., is nearly as likely to cause brain injury.

"Soccer is one of the higher-risk sports for diagnosed concussions," said Dr. Robert Cantu, co-director of the Center for the Study of Traumatic Encephalopathy at Boston University Medical Center and one of the nation's foremost authorities on sports-related concussions. "The incidence rate of concussions in soccer is as high as the recognized concussion rate in other sports like lacrosse, ice hockey and football."

According to a recent study in the Journal of Athletic Training, girls' soccer produces 36 concussions for every 100,000 high school games or practices a player takes part in, while boys' soccer produces 22 -- only football's score of 47 ranks higher. A study conducted during the mid-90s found that girls' and boys' soccer yielded the third- and fourth-most concussions, behind football and wrestling. A third study, reported in 2007, found that concussions make up 6 percent of all severe game injuries in soccer.

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The trauma of a concussion, which occurs when the head shakes violently and the brain slams into the skull, temporarily cripples the mind's operation. But it's the longer-term dangers -- ranging from emotional distress such as depression and anger to making sufferers more prone to dementia and diseases such as Parkinson's and Alzheimer's at younger ages -- is even more worrying.

There isn't much knowledge about the effect of concussions in soccer yet, making for an uncertain future for its victims. "I just don't know what's going to happen in 10 years because of the hits I've taken," said former MLS and U.S. defender Jimmy Conrad, who retired in August after symptoms lingered following his seventh concussion. "The scary part of the process is that some doctors just don't really know. We're just scratching the surface of this, and it's going to take 15 years of trial and error to get on top of it."

This isn't a problem for American soccer alone. Just last month, Chelsea's Didier Drogba was knocked out with a concussion when he collided with Norwich City keeper John Ruddy. During the preseason, Manchester United's Javier Hernandez suffered one after badly misheading a ball.

The American sports media report on concussions more frequently than in Europe. This is likely due to some combination of the following: an increased awareness of head injuries, thanks to football and hockey; a physical, long-ball style; and statistical aberration. Six Major League Soccer players have retired because of an accumulation of

concussions since 2005. At one point this season, D.C. United had four players out with concussion symptoms, and that was without counting Brian Namoff, who had retired because of persistent post-concussive issues the winter before. Columbus Crew defender Chad Marshall suffered four concussions over a 12-month period during the 2006 and 2007 seasons and has had three since.

Case study 2: Ross Paule

He never even saw it coming, and he didn't wake up until he was in an ambulance on his way to the hospital. Colorado Rapids midfielder Paule was hit in the head by a shoulder while backing up for a header and was knocked out cold. He was concussed, his cheekbone fractured and a nerve in his neck damaged. His head hurt; something was off. "I felt sluggish in the way I thought, sluggish in the way I was moving, which aggravated me," Paule said. He recovered fully from that 1998 incident, but in 2003, when he was with the Columbus Crew, Paule suffered three more concussions in a six-week span: bumping heads with a teammate walking alongside him and knocking him out briefly, although he kept playing; getting hit in the head by a shot that took a weird deflection; and getting knocked in the back of the head on a header. Again, he didn't feel right, but he sat out just two weeks between the second and third concussions and two more after the third before returning to the field. "I'd always been taught that if you're only a little bit injured you can play," Paule said. Experts told him he'd rested enough. In 2004, he again had multiple concussions, from increasingly weaker blows to the head. By the 2005 preseason the slightest contact to his head would trigger his concussive symptoms. During a game, a soft shove to his head knocked him out cold. He soon retired at 28 years old. It's been six-and-a-half years. He has never been the same. Paule has double vision in his right eye, which even glasses can't correct. If he turns his head too fast, he loses his balance. He gets migraines almost daily. He can't multitask. His memory is shot -- he can watch a movie and see it again a month later without recalling having ever seen it before. If he doesn't sleep for a few hours in the middle of the day, his symptoms get worse. He's learned to cope and built a career as the national soccer director of the Fellowship of Christian Athletes. "I've just gotten used to it," Paule said. "Which is sad."

The trouble with an imperceptible injury

If his legs are fully functional, it's hard to convince a professional soccer player he shouldn't be playing. That and a disconcerting dearth of information are the biggest factors contributing to soccer's concussion problem. Scholarship of the brain is rudimentary, and the study of concussions is still in its infancy. General practitioners and team doctors have long lacked the information to properly diagnose and treat concussions in athletes and often still do. Only since the recent onslaught of high-profile, concussion-related deaths in American football has there been a growing awareness in concussions. As of September 2011, 21 states have laws concerning the treatment of concussions in youth sports. But, said Twellman, "We're still not handling it the right way."

The under-education on concussions has been startling. By distributing a questionnaire in 1999, the McGill Sports Medicine Clinic found that of the 201 Canadian soccer players

queried, 62.7 percent had experienced symptoms of a concussion during the previous year. Yet only 19.8 percent of those concussed players were aware that they'd in fact had a concussion.

"My situation wasn't handled the right way in 2008 and that's not that long ago," Twellman said. "Maybe we weren't smart enough and the medicine wasn't far enough. The protocol was going to see a doctor and he'd say, 'OK, you've got a headache.' Treatments going back as far as mine have been ridiculous and not as thought out as they should have been. I don't think the league took it seriously enough. If we knew in 2008 what we knew in 2010, and have the protocol now in there, I'm probably not done playing."

Keeping a professional athlete off the field is no easy task. "The only thing that could have saved my career is sitting out longer, but I wasn't going to make that decision as an athlete," said Paule. And before the rash of concussion-related retirements in soccer, there was little understanding from teammates. Several of the players profiled in this article said they felt pressured by teammates and clubs to play long before their symptoms subsided, since there was nothing visibly wrong with them.

"It's not easy but you just have to be very concrete that if they don't have medical clearance, the team doesn't allow them back," Cantu said. "A brain injury is unlike any other injury to any other part of the body. You can't safely play with remaining symptoms of a brain injury no matter how mild it is, whereas other parts of the body you can."

"They've got to be man enough to be mature and say, 'I know I've had six concussions and I know I need to not play with fire and wait until I'm symptom-free,'" Twellman said. "You can have an ankle replacement, you can have a knee replacement but you cannot have a brain replacement. Concussions can ruin your life."

Case study 3: Alecko Eskandarian

Eskandarian went up for a header and collided with two players. His legs were cut out from under him and he was flipped upside down, hitting the ground head-first. He briefly lost consciousness but stayed in the game; it was his first game as a professional, after all, with D.C. United in 2003. Opposing defender Carlos Bocanegra asked him where they were. After cussing him out for a spell, Eskandarian said San Francisco; they were in D.C. He was eventually taken off. His memory didn't return for another hour. The next season, Eskandarian got cracked in the head when a teammate was pushed in a skirmish. He blacked out. Again, he stayed in the game and scored twice, even if for the 30 minutes after getting hit he hadn't the faintest idea where he was and what he was supposed to be doing. He was eventually diagnosed with a concussion and sat out for a week. His next concussion, resulting from a goalkeeper's knee colliding with his head, took him out of commission for 10 months. "That one messed me up pretty good," Eskandarian said. He felt like he had a 5-pound brick in the back of his head for the next six months. He saw several neurologists who couldn't come up with an explanation or treatment plan. Eskandarian felt constant pressure in his head, with migraines that felt like lightning was

striking inside his dome. Some would go away after seconds, some lasted for days. He had been on the verge of stardom. His psyche was shattered. So desperate was Eskandarian to return that he would linger by the practice field, walking around with a weighted vest -- the only physical exercise he was allowed to do -- for hours on end. Eskandarian recovered, although he never did become a star, bouncing from team to team. In July 2009, then with the Galaxy, he took a clearance to the face from close range while he was airborne in a friendly against AC Milan. He blacked out and only recalls trying not to swallow his tongue and being asked questions in several languages. He had whiplash, a broken nose and another major concussion. He suffered from bad vertigo when his surroundings became too stimulating, like during rowdy family dinners, when he'd fall out of his chair. At 27, Eskandarian had no choice but to retire. He now works as the youth technical director for the Philadelphia Union. He still suffers from painful neck and back pain and headaches and bouts of vertigo. "It's daily," said Eskandarian. "I can't tell you how much life has changed. I was a pretty social guy but intense laughter can trigger vertigo. You have no choice but to change your personality and lifestyle to avoid it. It's taken a lot out of me and made me a different person."

The sub-concussive hit

The danger afflicting soccer players is really two-pronged. Awareness of concussions is growing at long last, but the lesser-known sub-concussive hit -- a blow to the head that falls short of a concussion -- is potentially just as dangerous to long-term neurological health.

In soccer, the sub-concussive hit relates mostly to heading, an act inextricably linked to the game. "Total brain trauma is related to not just concussive blows but all those thousands upon thousands of sub-concussive blows that happen to brains in sports that take a lot of trauma, and soccer is one of them," Cantu said. "Because there's a lot of heading and the brain is often shaken in that activity."

This is a contested claim, however. "Is a ball that's traveling 25 to 40 miles per hour a sub-concussive event? Yes it is," said Dr. Thomas Kaminski of the University of Delaware, who has been researching concussions and the long-term effects of heading in soccer since 1996. "That defender who in the course of a game has perhaps 20, 25 headers -- do those sub-concussive impacts to the brain have an effect? Perhaps, I don't know. But in 20 years of data that I've assembled, I just don't see detrimental effects to neuropsychological function from heading in the short or the long term so far."

A 1975 Norwegian survey of 77 players found that after full examinations, half of the players had neurological symptoms related to heading. A second Norwegian study concluded that 11 of 33 former Norwegian national team players given a computerized cerebral exam suffered from central brain atrophy and attributed it to heading. One thing all parties can agree on: Heading can't possibly be good for you.

Case study 4: Josh Gros

Starting in the 10th grade and through four years at Rutgers University and his first three professional seasons with D.C. United, midfielder Josh Gros estimates he averaged a concussion a year. "It seemed like the longer I went, the easier it was for me to get a concussion," Gros said. During the 2007 MLS season, Gros had seven concussions. His bad luck, perhaps, was that none of his concussions were severe. He was never knocked out and suffered from no more than a few days of headaches, blurry vision and nausea. Each time he had to be cleared to play quickly. He had been told all his life that if nothing was bleeding or broken, he was to play on. But the quick succession of concussions in 2007 changed him. His wife noticed his memory was deteriorating. After games he would spend a few days in bed, avoiding the light to which he had become so sensitive. Nausea was constant. He was tired all the time but could never fall asleep. Still, it wasn't until Cantu got his hands on Gros' entire medical record that he was told that he was causing long-term brain damage by continuing to play. At 25, Gros retired. Today he works as a team coordinator for the Philadelphia Union and is practically symptom-free. He doesn't get much exercise but he can do most anything except stay out in the sun very long. He got off easy.

The search for a solution

There's no easy answer to the concussion problem, partly because it can occur during many game scenarios. They do, however, almost all relate to heading. According to a 2007 study of soccer concussions in the *Journal of Athletic Training*, 67.7 percent of them are caused by player-to-player contact, 18.3 percent due to player-to-ball contact, 13.4 percent due to player-to-surface contact and less than 1 percent due to player-to-goalpost contact. That would mean 86 percent of concussions result directly from heading.

Cantu suggests that the risk of concussions can be lowered by taking several precautions for heading: strengthening the neck to make the head less vulnerable to violent movement while heading; minimizing heading in practice; and minimizing heading in youth soccer. "A growing brain is more predisposed to concussion and recovers more slowly because it isn't fully coated yet," he said. "And youngsters have a bigger head relative to the body than adults and because it's coupled with a weaker neck, the brain can be much more easily accelerated with that big head and weak neck."

Minimizing heading in youth soccer is advocated by Twellman and his foundation, too. "At the youth ages, you see very few headers, yet at practice coaches are punting balls in the air for them to head," Twellman said. "Just ask, 'Why? Why is my 8-year-old daughter heading the ball 20, 30 times in practice when in games she's headed it three times in two years?' I think we can eliminate some concussions by getting rid of headers up to the teenage years."

Yet at the adult levels, heading -- or punching by keepers, another frequent culprit -- can't possibly be outlawed, lest the intention is to change the game to its very core. Protective headgear has been on the market for decades, but, says Kaminski, "the evidence for the

headgear is that it's really not helping a whole lot. And athletes might start wearing them and think they're invincible and act like human missiles."

Reducing concussions is troublesome. MLS, forced to the forefront of this issue by its bad fortune, has emerged as a leader in raising concussion awareness and trying to shield its players from its risk without tampering with the game. Affixed to every MLS locker room wall is a poster designed by Twellman outlining the symptoms and risk of concussions. Before the 2008 MLS season referees were instructed to give out straight red cards for deliberate blows to the head and to stop play immediately if there's a suspected head or neck injury. When an MLS player is diagnosed with a concussion, the team's on-call neurologist performs a test and isn't allowed to release him for a gradual return to practice until he has been symptom-free for 24 hours and has posted a neurological score that is at least equal to his performance registered before his concussion. Internally, MLS is discussing a rule change to allow players to be subbed back in after coming out for re-evaluation when a concussion is suspected.

Case study 5: Bryan Namoff

The trainer asked him if he knew where he was. "Rockford, Illinois," answered Bryan Namoff, who had just been knocked out midair after bumping heads with another player going for a high ball. He was in Toronto, playing a Player Development League game in between college seasons in 1999. The trainer asked him what the score was. Namoff: "0-0." It was 3-0. That's when he was taken to the hospital and diagnosed with what was probably his second concussion -- the first after taking an elbow to the head that made him nauseous in high school. He was discharged without seeing a doctor. He sat out a week and returned without examination. Namoff went a decade without another concussion. On Sept. 9, 2009, he was in his ninth season as a D.C. United defender. He had beaten an opponent to another ball in the air but as he headed it away, his adversary hadn't the room to evade him and drove his shoulder through Namoff's extended head and neck. His neck whipped sideways and the rest of his body followed, slamming to the ground. He decided he was fine and didn't need to be substituted. After the game, Namoff's vision turned blurry, he got dizzy. He rested for two days and, feeling better, started in United's next game. Namoff had the utmost difficulty tracking the ball and caused a goal. The entire afternoon he felt as though he trailed the game by several seconds. That was the last game of his career. The next day the merciless migraines started. They lasted for eight months. Anything that moved fast, like the switching frames on a television or computer, hurt his head. He couldn't sit in a car because the passing scenery moved too fast and windshield wipers were a nightmare. Only walks offered an outlet. Then a neurologist picked up a malformation in his brain that he thought capable of causing aneurysms. After extensive and painful testing, it was ruled an abnormally large draining vein -- harmless, although the uncertainty had been unsettling. Still, the dizziness, the vertigo, the constant neck pain, the pressure in his head, the pins-and-needles sensation in his forehead, the blurriness when he looked up and the eye pain, they remained. Namoff suspended his career not long after his 31st birthday. To this day, two years after the concussion, the symptoms linger. Namoff works in United's front office but the headaches stop him from working for very long amounts of time. "I'm getting

better compared to my first eight months, but am I back to where I need to be to live my everyday life? No," Namoff said. He has seen four physical therapists, four neurologists, a team chiropractor, a massage therapist, an acupuncturist, three neuro-ophthalmologists, two neurotologists and the team optometrist but is still looking for effective treatment. "I feel a kind of hopelessness," Namoff said. "I haven't felt normal for even a minute during this whole ordeal. There hasn't been a single minute when I haven't had pain in my head. I'm on a two-year headache."

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