

SPORTS MEDICINE ARTICLE

Concussions - From Hands to Head

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Three years ago, Dale Mildenberger, Associate Athletic Director and Head Athletic Trainer at Utah State University, decided that he wasn't comfortable with how his athletic department assessed concussions. The protocols did not provide adequate direction and were not in line with the latest research, he says. So with help from the school's team physician, Mildenberger began looking for something better.

He knew he wanted to incorporate some baseline testing, and to measure his athletes' cognitive recovery as well as their physical balance. He wanted more science behind every post-concussion return-to-play decision.

After doing extensive research, Mildenberger instituted a concussion protocol that has made his decisions easier and his athletes safer. "I know that if I've got to stand in a court room and defend my decision to put somebody back into a contest, and they've gone through our protocol, I'll feel comfortable in my defense," he says.

Starting his concussion review process three years ago, Mildenberger was ahead of the curve. Today, as parents and the mainstream media pay more attention to the risks associated with concussions, especially in regard to return-to-play decisions, every athletic program clearly needs a protocol that takes into account the latest research and advice on this topic.

USING BASELINES

The reason assessing concussions is so critical was demonstrated in a study conducted by Kevin Guskiewicz, Director of the Sports Medicine Research Laboratory at the University of North Carolina. The study found that 92 percent of repeat concussions occurred within 10 days of the initial injury. It also showed that once an athlete suffers a concussion, the probability that he or she will experience a second concussion during the same sport season is greatly increased.

Those statistics imply that many athletes are returning to play before their concussions have completely healed. "This underscores the critical importance of making certain that athletes are without symptoms before they are allowed to return to participation," says Guskiewicz.

The question that had previously baffled sports medicine professionals was: How do we tell if an athlete is symptom free? Assessing when a concussion has healed is much more difficult than assessing recovery from a torn muscle or broken bone.

However, thanks to extensive research conducted over the past five years, a process called baseline testing has emerged to gauge recovery from concussion. This process measures healthy athletes' neurological functions, which establishes a "normal" baseline for each athlete. If the athlete is suspected of sustaining a head injury, he or she is given the same test. If scores are lower than the baseline, the concussion is confirmed and the athletes don't return to play until their test scores return to their baseline.

The most sophisticated method of baseline testing involves computer-based neuropsychological exams that measure aspects of brain function most affected by a concussion, such as memory, attention, concentration, reaction time, problem solving, mental speed and processing speed. "We baseline all of the incoming freshmen and players new to the school," says Cheryl Williams, an Athletic Trainer at Detroit Country Day School in Michigan. The test takes 25 – 30 minutes per student, and is administered in the school's computer lab, where

10 people can be tested at one time. Student-athletes are tested again before their third year so Williams always has an updated baseline score in the system.

“It’s made my life 100-percent easier,” Williams says. “Before, the role of the athletic trainer was just to keep concussion athletes out. Now we have more data to back us up in regard to holding them out and managing their injuries. It feels like my athletes are safer because of it.”

Utah State decided not to go with the computer-based testing, but still wanted to baseline its athletes’ cognitive levels and balance. Mildenberger chose two tests to use: The Standard Assessment of Concussion (SAC), a mental-status exam that tests orientation, immediate and delayed memory, and concentration; and the Balance Error Scoring System (BESS), a clinical test battery that uses modified stances on different surfaces to assess postural stability. “We chose those tests because they were fairly inexpensive, well-respected, and the most widely used in terms of measuring cognitive values and balance,” says Mildenberger.

Establishing baseline scores for both tests takes about 20 minutes per athlete and is part of each athlete’s incoming pre-participation physical. The scores are put into each athlete’s medical file and kept in their team’s field travel kits. Scores are used for the duration of the athletes’ college career.

Because of the time requirement of the testing, Mildenberger says the key is to train as many staff members as possible to help conduct the exams. “Part of our protocol is the annual training of our athletic training staff to administer the tests, so that we have consistency,” he says. “By doing this we’re not dependent on the same person who did the baseline testing having to do the follow-up exams.” Mildenberger has also developed a videotape of the procedure, which each athletic trainer views and is tested on.

Mildenberger is also helping three nearby high schools install the SAC and BESS tests into their concussion protocols. At these schools, coaches as well as athletic trainers are being trained to administer the tests. “The training takes about three hours,” he says.

Because of the developmental changes that an adolescent goes through during the high school years, a single baseline score may not be applicable for their entire career. “This year we will begin testing to see if a follow up exam between the sophomore and junior years reveals any significant difference in balance or intellectual ability,” says Mildenberger.

RETURN-TO-PLAY DECISION

Whether or not you choose to use baseline testing, developing a return-to-play protocol is a critical step. Most experts agree that the protocols need to include a combination of screening tools appropriate for sideline use that can test cognition as well as postural stability. Sideline evaluations should also include a symptom checklist that can be filled out immediately following an injury.

Last fall, the National Athletic Trainers’ Association (NATA) released a position statement on managing concussions, and it mentions three approaches to consider:

- Grading the concussion at the time of the injury.
- Deferring final grading until all symptoms have been resolved.
- Rather than using a grading scale, focusing attention on the athlete’s symptoms, neurocognitive testing, and postural-stability testing.

The first approach, which calls for assessing the concussion within 15 minutes of the time of injury based on signs and symptoms, relies heavily on concussion grading scales. One such scale that is recognized by the NATA is the American Academy of Neurology Concussion Grading Scale, which primarily grades concussions based on whether the athlete has lost consciousness, and for how long. This approach can be disadvantageous at times, as head injuries can manifest quite differently after an initial evaluation. In addition, many researchers

point out that loss of consciousness should not be the sole determinant in how a concussion is judged – there are many cases of athletes sustaining severe concussions without getting knocked out.

The second approach is to grade concussions based on the duration of symptoms. The NATA says this approach is best served by the Cantu Evidence-Based Grading Scale, which calls for a grade to be assigned after all of the signs and symptoms have been resolved. The Cantu model places less emphasis on loss of consciousness, instead focusing on the duration of symptoms. It designates grades and directives for return to play based on the amount of time an athlete is symptom-free.

Mildenberger's return to play criteria follow the NATA's third suggestion. And he uses the same process whether he's evaluating an athlete 15 minutes after the injury or seven days later. "In our system, we do not attempt to grade – we don't say Grade I, II or III," says Mildenberger. "Our discussions and decisions are all based on function."

When an athlete is suspected of having sustained a concussion, an athletic trainer administers the SAC and the BESS on the sideline or in the locker room, and compares the athlete's scores against his or her baseline numbers. A post-injury portion of the SAC also calls for evaluation of symptoms regarding exertion, coordination, strength, and sensation. Before allowing an athlete to return to play, Mildenberger initiates an exertional maneuvers test, in which the SAC and the BESS are re-administered after the athlete has been put through a series of physically demanding exercises.

At Detroit Country Day, if a student is found to have a concussion after a sideline evaluation and a subsequent neuropsychological test, he or she is restricted from competition and given an appointment with Dr. Kenneth Podell, Director of Sports Concussion Safety Program at Henry Ford Hospital, who re-tests the athlete 48 hours after the injury. If the athlete's follow-up score matches his or her baseline score, the athlete goes through exertional training and takes a symptom test. Then, based on whether or not symptoms exist and the athlete's concussion history, Williams and Podell determine if that athlete should be allowed to return to play.

Even though baseline testing is highly recommended by authorities such as NATA, it is important to note that even without baseline scores to use as comparisons, the SAC and BESS tests have both been proven to be effective sideline assessment measures. When baseline scores are not available, it is important to conduct an evaluation immediately after an injury is suspected. Then, while closely monitoring any symptoms and behavior, re-testing should take place 15-20 minutes after the injury, when the athletic trainer can compare the scores to determine whether the athlete's cognitive ability and postural stability have improved.

"It's not quite as good as having a baseline number to compare to, but it does allow us to say, 'You scored this a half an hour ago, and now you scored this,'" says John Reynolds, Athletic Trainer at George C. Marshall High School in Falls Church, VA. "Based on the scores, the athlete is either improving or not improving. That helps you make an immediate decision: Are they going home with mom and dad to be observed, or are they being rushed to the hospital in an ambulance?"

COACHES ON BOARD

By requiring the school's athletic trainer to use objective measures to assess and manage concussions, athletic directors can have greater confidence that their student athletes are at decreased risk of returning to play too soon. However, if coaches are more apt to be responsible for the initial assessment of an athlete suspected of having a concussion, they need to be educated on the same assessment techniques.

"We know that a motivated student athlete will quite often not be completely truthful in answering people's questions about their readiness to return," says Richard Ray, Athletic Trainer at Hope College and author of *Management Strategies in Athletic Training*. "It's not enough to simply ask an athlete, 'How do you feel? Do you feel ready to go back?' because you're not going to get the truth except in the most serious impairment

cases. It's not that they're purposely evasive, it's that they don't always understand the seriousness of the situation."

To help get coaches on board, athletic directors can consider implementing workshops and learning aids that can direct coaches in on-field concussion assessment. In Texas, for example, all coaches are given a pocket-sized concussion-grading card created by the Brian Injury Association of America and distributed by the University Interscholastic League. Designed to easily fit on a clipboard or in a medical kit, the card contains instructions on how to recognize symptoms of concussions and provides treatment recommendations. The card lists symptoms of three grades of concussion and explains what a coach's course of action should be for each grade.

"For athletic trainers, it's not new information, but for those people who don't deal with concussions very often, it makes a big difference," says William "Hondo" Schneider, Head Athletic Trainer at Midland Lee High School in Texas. At Midland Lee, coaches are required to call the athletic trainers if they suspect a concussion of Grade II or higher.

Once an athlete is found to have a concussion, the return-to-play decision needs to be made by a medical authority and not a coach, says Ray. "Ideally, the team physician will make the decision. If it's going to come from anybody else, it should be a certified athletic trainer, working under guidelines and directives that the team physician has developed," he says. "It should not be made by a coach or parent because, those folks, while well intentioned, just don't have the training or the tools necessary to make a good medically-based judgment about when an athlete is ready to return to play."

EDUCATION

Along with getting your coaches up to date on new concussion assessment procedures, it also helps to educate parents and athletes about your return-to-play protocol. One convenient way to do this is by posting it on your school's Web site. You can also add links to the latest concussion research as well as email addresses for the sports medicine staff.

In addition, your athletic trainer can present a short speech at teams' preseason meetings, especially in sports with higher incidence of concussion. Reynolds does this as well as providing handouts that include the school's injury assessment and management guidelines. He says that this approach has been very effective at his school for fostering awareness about the symptoms of the injury and the dangers of returning before being fully healed.

In fact, it helped lead one athlete to spot a concussion in a teammate. "One of our student-athletes came to us during a football practice and said his teammate was being very silly in the huddle – which was atypical for that athlete – and that he thought something was wrong," says Reynolds. "So I pulled that kid to the side and started talking to him, and it was very clear that something was not right. I continued the evaluation process and, sure enough, he had sustained a fairly significant concussion, and the only symptom that was initially recognizable was a change in personality."

From the athletes and parents to the coaches, to the entire sports medical staff, getting everyone in sync about concussions is critical to ensuring the safety of your student-athletes. And a key to this process is reviewing and updating concussion-assessment protocol. Take a look at the new research, discuss ideas, and then put a process in writing and follow it every time.