



Data-Driven Football

Science has come to football, and it is creating new opportunities for coaches to build bigger, faster, safer, smarter and stronger players and programs.

By Paul Markgraff

Charlie Coiner was there for 16mm video. He was there for the transition to Beta, then to VHS. He was an assistant with the Chicago Bears when the team made the move to XOS Digital. For every change, Coiner says it felt like pulling teeth.

“With every change, you would’ve thought that we stole the coach’s firstborn child,” says Coiner, who began his coaching career in 1983 at Appalachian State University. He has since coached for multiple teams, including the University of Minnesota, the University of Louisville, LSU, the University of Tennessee, the Chicago Bears and the Buffalo Bills. “I remember when we went to Chicago training camp the first year we moved to XOS. We took Beta backups for every setup we had because we couldn’t imagine that we could watch video the way they said we could.”

While XOS exceeded Coiner’s expectations, during the intervening years, coaches haven’t changed their approach to implementing technology, says Coiner. The acceptance of

change comes slowly, and ideas typically come from the top-down, which slows progress.

“People are getting their music with more common sense than we use to find our plays and our videos,” says Coiner, who has also created several digital playbook apps through FirstDown PlayBook. “We coaches sometimes do business in a very archaic way.”

Though some coaches may be slow to adopt new technology, the pace with which technological change

is spreading across the game is accelerating, and there is no defense for this spread. A layer of data has descended upon the game. It’s here to stay, and for good reason.

Following are some of the technologies that are making a technological impact on the body and the brain of individual players. Coaches who look closely at these types of technology will optimize player and team performance, and sharpen that critical winning edge that sets them apart from other coaches.

“Technology is an asset and its primary purpose is to enhance learning...”

Body Of Evidence – Video Capture And Athletic Monitoring

Technology is an asset and its primary purpose is to enhance learning, says Dave Gottfeld, president of Spark Motion. His company uses iPads to capture video of players performing what many of them believe to be routine physical activity. By capturing this video, and slowing it down, frame-by-frame, coaches can show a player what's right or wrong about various techniques. This ability to show a player improper technique is vital to the communication process.

“The ultimate goal is to get the coach to communicate with the athlete successfully,” says Gottfeld. “Sometimes information goes through a coach’s filter, and the player only hears something negative. But if a coach lets the player absorb the information by looking at it, the player can see what the coach is talking about. The coach can then add corrections and minimal information so he doesn’t overload the athlete or appear overly critical.”

Coaches don’t need to stop with measuring external factors. With heart-monitoring technology from Polar Electro Inc., coaches can understand nutrition, hydration and work capacity of individual players or their team as a whole.

“You can see calories expended, percentage of heart-rate expenditure, and their training load number, which is based on a player’s height, weight, age, VO2 max test, and their aerobic and anaerobic threshold,” says Michael Valentino, national sales manager for Polar and former center for Saint

John’s University football. “The system can record up to 84 athletes simultaneously, with live telemetry allowing coaches to view up to 28 players at a time. Coaches can flip between groups of 28 players on screen, real-time.”

By looking at these numbers, coaches can determine when a particular athlete is headed toward some sort of soft tissue injury or something that can be prevented, he says. The system can give coaches a great snapshot to see if a player is redlining or in the danger zone.

“Unless you have an arm hanging off, a player isn’t going to say, ‘Take me off the field,’” says Valentino. “Now, a coach can have data that will allow them to ask the question: What’s going on with you today? Do you have a fever? A muscle twinge? Coaches aren’t required to understand every aspect of the technology to make the right decisions for their players.”

Brain Power - Hit-Sensor And Remove-From-Play Technology

Anyone paying attention to team sports for more than three minutes understands that concussions have taken center stage in football, from youth to the pros. A variety of technology currently exists to help coaches understand the impact head injuries can have in a game, in a season, and in the life of a player.

Dr. Danielle Leong is senior director of research at King Devick Test. As a trained and practicing optometrist, Leong is an expert on the connection between vision, comprehension and potential brain injury.

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Prior to the season, an athlete using the King Devick Test would read through numbers on a series of three cards. The numbers on the cards have unique spacing and the test gets progressively more difficult. By completing the test, the athlete creates a timed baseline measurement.

“When you map out all of the brain pathways involved in moving the eye from one point to another very quickly, there are a number of components involved: vision, coordination of eye muscles, cranial nerves. These pathways span the entire brain,” says Leong. “Then, when you look at the task of calling out these numbers, there is a language component, attention, concentration. Those all play a part in the ability to do this test.”

When an athlete suffers a suspicious hit during a game or practice, coaches can bring him over to the sideline and ask him to repeat the test. If there is any increase in the time it takes to complete the test compared to baseline measurements, the athlete should be removed from play.

Unfortunately, it is a reality that coaches can't watch every single player at all times during plays and practices. But computers can do that job.

Greg Merrill came to football from the military, where he worked on an assessment tool that profiled soldiers on the battlefield after an IED blast. The tool was designed to remove the right soldiers from battle after a potential – but practically invisible – brain injury.

The Brain Sentry tool sticks to the back of a football helmet and uses Directionally Adapted Sensing (DAS) technology and a micro electro-mechanical systems (MEMS) accelerometer to measure the gravitational force exerted on a helmet during a collision. The sensor lights up when it measures an impact that could result in brain injury, allowing coaches and trainers to remove that player from action.

The Arena Football League (AFL) is using Brain Sentry as its official sensor on all helmets during the 2014 season. LSU will test the sensors on its helmets this year, as well.

“One of the things that’s happening in science is the micro-miniaturization of sensors and micro-processors,” says Merrill. “We are able, for the first time, to unobtrusively put sensors in places we never could before. It’s starting to influence how we evaluate and train players and how we track their performance over time.”

Jesse Harper is vice president, sales for i1 Biometrics, a company that makes mouthguards that measure linear and rotational impact. While the measurement of linear impact is not new, rotational measurement has proven rather elusive.

“There’s a growing body of research that is saying rotational forces may be a larger contributor to the mechanics of brain

injury than linear impact,” he says. “Until now, there has been no good way to measure rotational acceleration. By using a tri-axial gyroscope, we are now able to accurately measure all three axes of rotational movement and couple them with three axes of linear acceleration from our accelerometer. This gives sideline personnel the most complete picture of the impact forces to the brain.”

i1 Biometrics distills this data down into meaningful numbers that show coaches and trainers what the brain is experiencing. Further, the data can be compiled into a color-density map of an individual player’s head so coaches can see where impacts are occurring over time.

“You can see on the system if you have a player that is using the crown of his helmet as a weapon and apply proper coaching techniques so that player isn’t costing you 15 yards because of a spear, or causing themselves an injury and costing the team even more,” says Harper.

Go Deep – Mental Profiling

What if coaches could look even deeper into a player, beyond physical

conditioning and past skull-impact measurements, right down into the core of a person to find out what makes him tick? What motivates him? What drives him?

This isn’t science-fiction. This exists. And it’s valuable for programs from high school through the professional ranks.

The Right Profile uses the Troutwine Athletic Profile (TAP) as a testing instrument and a series of proprietary algorithms to create an athletic psychometric assessment of an individual player based on 14 dimensional data silos. The TAP test helped Bill Polian – then general manager for the Indianapolis Colts – pick Peyton Manning over Ryan Leaf in 1998 and Edgerrin James over Ricky Williams in 1999.

This assessment provides tools to evaluate, develop and coach athletes for optimal performance based on their unique mental make-up. It provides key insights and directed coaching tips designed to help coaches get the most out of players by providing an understanding of how best to interact with them, how they learn, how to motivate them and how they recover after a setback.

“Winning is important, but if you focus on that, it’s just an outcome or a destination,” says Dr. Robert Troutwine, inventor of the TAP. He has worked for more than half of all NFL teams in this capacity since 1985. “We feel like we’ve designed something that is crucial for focusing on the journey, molding people, changing people’s lives. Athletics is a great stage for teaching and building relationships. If you mold these players and you have a positive relationship, they will go the extra mile for you. That’s the real meaning of winning.” 

“Football is a game played with arms, legs and shoulders, but mostly from the neck up.”

~ Knute Rockne, former head coach,
University of Notre Dame