

Injury Prevention in Sports Through the Use of Technology

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Technology has changed the world we live in today. Whether this be through social media, cellular devices, or the internet, our world revolves around the continuous evolution of technology. Not only has it changed how people work, but it has also changed the world of sports. Broadcasting has made it so where we can literally watch any game in the world from the comfort of our home. Athletes' diets and workouts have revolutionized the life expectancy in sports due to new research on the impact of technology. It would seem like technology has only created advantages, but there are always people that would say otherwise. Social media has created a place for people to speak their mind. This raises both good and bad connections. Instant replay, or VAR (video assisted referee), has been criticized for ruining the element of human error to the game. Some people believe that sports are reverting to too much technology and getting away from the true version of the game. New technology has also allowed the world to see just how dangerous some sports truly are on the body. There are always two sides to every story, which is why there is never a perfect product in the eyes of the public. This paper will explore the advantages and disadvantages that technology has offered sports and discuss the implementation of a technological tool to address sports injuries, using the PLC process as the framework for the implementation.

Review of Literature

In this section the paper will discuss the advantages and disadvantages that technology has offered the sports world. The section will discuss specific technological devices, which have changed the way certain games can be played.

Advantages of Technology in Sports

The world of sports is ever changing, and we can see this today with how much each sport's playing style has changed. Athletes are becoming quicker, stronger and faster, thus allowing new possibilities for coaches and players to test out new technological devices and new training techniques every day. An article called, *Does Technology Influence Sports* written by K.V. Venugopal (2015), talks about the advantages that technology has given sports today. The article says,

“There is no doubt that technology has invaded and acquired a chunk of sport's space through aids that help in preparation in the form of video analysis that all coaches swear by practice tools like bowling machines and razor sharp camera angles that makes the third umpire's job easy and brings thrills into drawing rooms. Add to it the evolution of protective gear, stronger helmets and pads make the cricketers life much easier than the olden days” (p.52).

This example is talking about the advantages sports science and technology gave the cricket players leading into the last cricket world cup. Other examples of how sports have been helped by technology can be seen in tennis and soccer. Tennis has developed a hawk eye's technology and ball tracking devices that allow players and referees to make a decision with actual proof of the ball being in or out (K.V. Venugopal 2015). Soccer has also developed a goal line technology that has sensors go off whenever the soccer ball has completely crossed over the goal line. Not everything that technology has changed has to do with the flow of the game, however.

Athletes today are much more knowledgeable about their bodies. This is not an assumption either. With sports scientists and nutritionists coming up with new studies and understandings of foods, we have seen a culture change with how athletes eat and practice. One example of this is through the technology called GPS. Yes, this is the same type of GPS that one

may use in their car on a long road trip. The device stands for global positioning system (GPS). An orthopedic review written by John S. Theodoropoulos, Jeremy Bettle, and Jonathan D. Kosy, discusses the actual science behind how the GPS works. The article talks about how the first GPS program allowed for, “tracking of players, in outdoor areas, where sufficient satellite coverage was available” (Theodoropoulos, Bettle, Kosy, 2016, p.2). The tracking of players is done by each player wearing an attachable device, usually in a position in their upper back. The GPS allows the reader to monitor the athlete’s heart rate (HR), rate of perceived exertion (RPE), and measure internal loads. Think of internal loads as the level of tiredness that a player feels. In summary, we now can track how an athlete’s body is reacting to a practice, session or workout internally. You see the term “load management” used all the time in the NBA. This all comes from GPS tracking. Of course, the NBA teams have the best doctors, physicians and physical trainers, but they are using this new technology to better understand their athlete’s bodies and allow these players to continue to play well past their 30’s. That is ultimately the goal. Technology in sports is meant to help the speed of the game, the fairness of the game, and the health of the players.

There are two other technological devices that are beginning to be implemented into different sports. The first is the Whoop strap that has been implemented into leagues such as the NFL and MLB. Mercey Livingston, health expert, discusses the benefits that the Whoop strap has given some professional teams. In her article, *A Great Fitness Tracker for High Performers and Serious Exercise Fans*, written in February of 2020, Livingstons states, “It uses your HRV, average resting heart rate and sleep patterns to tell you when to push yourself through a tough workout and when to take a rest day and recover.” The technology is intended to help with your sleep patterns and to allow people to get a more effective workout based on their heart rate and

rest levels (Livingston 2020). This device goes onto your wrist and has almost the same feeling as wearing a watch on your wrist.

The last technological device is a mouth guard. This device is intended to help with concussion protocol. If you have ever seen the movie *Concussion*, then you know that chronic traumatic encephalopathy (CTE) is a huge concern for both American football and soccer players. Without getting into specific numbers, there is plenty of research and proof that has been uncovered in the last couple of years which show that CTE can be a consequence of playing the two sports named above. This new mouth guard technology has been created to help athletic trainers, doctors and physicians to be better alert of a potential concussion. Research performed by the Learner Research Institute and the Cleveland Clinic Concussion Center have helped create this “intelligent mouthguard.” Jay Alberts, Ph.D. and head of research at both Learner Research Institute and Cleveland Clinic Concussion Center, states that (Alberts 2018), “Many ‘concussion protocols’ have subjective aspects which can compromise their value. Our approach provides a more systematic and standardized method of objectively assessing a participant with concussion.” The mouthguard is able to send a signal to the staff whenever a hit or impact has exceeded the pre-determined threshold.

Disadvantages of Technology in Sports

Although sports has been intertwined with technology, there are people that argue the benefits do not outweigh the negatives. For starters, we can go back to goal-line technology. This is the technology that soccer leagues all around the world are using now in determining whether a ball has completely crossed the line for a goal. The counterpart technology that has seen much criticism is virtual assistant referee (VAR). This new technology has been implemented into the English Premier League (EPL), Union of European Football Association (UEFA) Champions

League, and many other leagues across the country. The EPL and UEFA are the two biggest leagues in the world, however, so VAR is seen by millions of people a weekend. The technology is used as basically an instant replay check for referees to decide if they made the right call or not. Professional coach Jose Mourinho, who has coached some of the biggest clubs in the world, in fact, according to Forbes, Mourinho has coached 4 out of the top 10 most valuable clubs in the world. Mourinho said this about VAR, "I thought I was going to love VAR the way I love goal-line technology. I love goal-line technology because there is no mistake. The VAR has too many mistakes."

VAR and instant replay are not the only issues that fans, coaches and players have with technology in sports though. For starters, technology is not cheap. These new innovative devices are highly demanded, which allows the companies to skyrocket prices. The Whoop strap is around \$200 a piece and requires a smart tablet/phone in order to access the data. The Whoop strap does not have a face like an Apple watch does. There have also been studies that argue against the accuracy of heart rate monitors located on the wrist. Sean Arters, who is the High Performance Coach for the United Soccer League team (USL) San Antonio Football Club (SAFC), stated that, "Apple watches, Whoop straps, and anything that is required to be placed on the wrist will produce less efficient numbers versus the monitors that are placed on the chest or back." This is just another disadvantage that some devices on the market have. Finding the right fit and right data may actually be tougher than some people realize.

With all of this information above, you may be confused on whether or not to trust any of the products and wonder if you can even afford them. The GPS monitors require high speed wifi, or else they can take up to 3-4 hours to actually sync to the computer. The mouthguard technology also has its limits. Yes, concussions are a serious injury in soccer, but they are

unpredictable, and the technology is limited to only alerting the staff on head trauma.

Researching and reading about the three technologies listed above, it is safe to say that the GPS monitors are the best fit for St. Mary's Men's Soccer. In this next section, I will explore how the GPS monitors can become an integral part to the men's soccer team, and how I will need to form a PLC in order to make this possible.

Implementation Plan of GPS Monitors in Men's Soccer

In this next section I will discuss how I wish to implement GPS monitors into the men's soccer program at St. Mary's University. The section will start off by describing what exactly a PLC is and how a PLC will be beneficial to the men's soccer team, and finally I will discuss the actual plan of implementing GPS monitors into men's soccer everyday life.

PLC

So, what exactly is a PLC? The book *Learning by Doing*, states that (Richard DuFour, Rebecca DuFour, Robert Eaker, Thomas W. Many, Mike Mattos), "We argue that it is an ongoing process in which educators work collaboratively in returning cycles of collective inquiry and action research to achieve better results for the students they serve" (2016, p.10). According to *Learning by Doing*, PLC's are put in place in order to help kids achieve better results. A PLC has many parts to it, but the end goal is to create a community that will create better standards and curriculum for the students to learn at the most effective way the PLC believe possible. There are 6 major steps that I believe will help create an effective new PLC. These steps are very specific to creating a brand-new PLC's, however, because an already established PLC will be able to skip steps 1 and 2. The steps will go as such: create your mission, find a team, determine your SMART goals, list your action steps, develop a timeline, assess the effectiveness of the PLC.

The first step is to develop your purpose or your mission. Ask yourself exactly what you envision the PLC fixing or helping with. We are not talking about setting your measurable goals. This is the part where the principal, head coach, or boss will figure out what mission statement they want to implement. Your second step is to find a team. Your team needs to be people that are directly involved with your job. For example, a good PLC idea is to have teachers from the same grade level. They are all teaching with the same goal in mind of helping their students learn as much as possible. The third step will revolve around SMART Goals. A PLC will want attainable goals that they deem important for the children to reach by the end of the year. From here the next step will be to figure out how you are going to make this possible. What steps are you going to take? This is your action steps in order to implement this PLC plan. Next, you will need to create a timeline. You must put a timeline into effect in order to reach your goals. The ideal scenario is to reach your goals at the end of each year, but this can differ from each school or business. The final step is to test the students on the material that they have learned. From here you can use formative assessments and change the curriculum accordingly. This will show if the PLC was actually effective.

The Plan

Now that we have went over the basics of a PLC, we will dive into how this relates to me. I am the assistant men's soccer coach for St. Mary's University. Technology is constantly coming out with new innovative devices that can elevate coaches and players' abilities. I have discussed some of these above, but I now want to create a PLC plan to implement the GPS monitors into the men's soccer program. My underlying goal with this PLC is to create a team of athletic coaches and trainers that want to develop a program that will allow us to track player's health, recovery, athletic ability and injuries, which will allow us to better understand our

student-athlete's bodies. College athletics have student-athletes playing 2 games a week, and this requires research and proper understanding of the body in order to keep them from injuring themselves. I will use the same 6 steps that I have listed above in order to develop my PLC plan for the 2020 season.

Create Your Mission	To develop a collaborative team, which will work towards the goal of helping student-athletes develop and train in the most effective and safest environment possible. We aim to keep student-athletes from long-term injuries and will do our best to put our soccer players back on the field in the best physical and mental shape possible.
Find a Team	The PLC team will consist of myself (assistant men's soccer coach), Johnny Clifford (head men's soccer coach), Brittany Davis (head athletic trainer), and C.J. Richardson (head strength and condition coach).
Determine Your SMART Goals	In 2019, the men's soccer team sustained two knee injuries, a shin (tibia) fracture and two sports hernias. Therefore, our SMART goal for the 2020-2021 season is to decrease non-contact injuries by 50%-100%.
List Your Action Steps	This will start out with tracking an athlete's baseline ability. Have each athlete tested and measured for their vertical jump, strongman test, t-test, yo-yo and FMS test. Each member will then meet to discuss and compare where each student-athlete is at. An individualized training program will then be sent out to each athlete in regard to their strength, flexibility, heartrate (current fitness), speed and injury history. All of this will be done while wearing a GPS monitor.
Develop a Timeline	Team members will meet at the start of August after each individual has performed each test. The PLC team will continue to meet every Monday, which will be to evaluate every player and update their player profile. At the start of September, October and November we will have each individual player's GPS readings looked at by all members in order to make sure that the individual is in good health and practice sessions can continue as normal. There will be a final assessment of the player at the start of December. This will indicate the plan moving forward for each individual in the spring.
Assess the Effectiveness of the PLC	Every student-athlete will be required to do end-of-the year tests and evaluations. These will be evaluations and comparisons of their GPS monitors throughout the year compared to their end-of-the year readings. Each individual will also be required to perform the FMS, t-test, strongman test and vertical jump test. This will be a common formative assessment and will allow us to change player's training program based on their results.

The table above lists exactly how the implementation of the GPS monitors will look like. I will now explain it in more detail. For starters, the mission statement is self-explanatory. Our goal is to help educate the student-athletes about their body and give them the safest training environment possible. The team that will be assigned for this plan is listed above, as well. Obviously, the head coach and I will need to be involved in the discussions and development of each player's individualized program. The next member listed is our head athletic trainer, Brittany Davis. An athletic trainer's job is to monitor and help student-athletes prevent or recover from injuries. Her input will be very vital, as she is the one that will be able to evaluate the players from a mental side. There are things that the GPS monitor may not be able to track correctly. For example, a student's heart rate may be at an average threshold thus meaning that the student is ok to keep going. The trainer may see different tendencies in the running pattern of breathing and decide to pull them out. Keeping an eye on the athletes' mental stability is crucial in this. The final team member will be C.J. Richardson. This is the head strength and condition coach for St. Mary's University. Our athletes will not only be training on the field, but they will also train in the gym. The GPS monitors will be able to notify us on whether or not the workout was too easy or too hard. We also have to keep in mind that the athletes will be training in between games, so we do not want to push them to their absolute maximum effort. C.J. can create more effective workouts with this information and help our players get stronger and quicker during the season. Our next step lists our SMART goals. This is really the whole reason for doing this. We want to limit injuries within the team. The action steps are laid out pretty clear, but I will explain the tests. The vertical jump test is used to calculate how high an athlete can jump. This measurement is beneficial for soccer due to the high demand to win the ball in the air. The strongman test is used to track an athlete's overall strength throughout the season.

The t-test is an agility test that will help players become more explosive. The yo-yo test deals with a player's endurance and finally, the FMS test will evaluate a player's flexibility. All of these tests will have underlying information about where an athlete is at for the start of the year. This is our base test for each individual's program. GPS monitors would be worn through every test in order to track the heart rate, RPE and load management. We will use all of this information for games and practices. The results of the test and GPS monitor will allow us to understand if a player is simply not fit enough, or if we have worked the player too hard for the week. This will allow the head coach and I to tweak the practices that we run. We must keep in mind that we worked our players to the brink of exhaustion the day before, thus meaning we need to dial down the intensity of the practice the next day. At the end of the year, we will be able to evaluate each player and have them record their new results for the tests listed above. The results will show the PLC team what progress the athletes have made and where we need to reevaluate.

Conclusion

A first-year implementation for anything will always face some issues. This is just natural in a business or school. There will be unforeseen situations and circumstances that we may have not properly planned for, but the end goal will always stay the same. Student-athlete's health is our main focus and that is what we will continue to do even when problems arise. The team that I have assembled above will be more than happy to put extra time in. The implementation of these GPS monitors is not a short-term goal. This is something that I feel will be able to benefit multiple different sports. Technology has given us tools to help change the way sports are played and seen, and I believe that this plan will help bring greater success for both athletes and coaches at St. Mary's University.

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