

[Editorial]

The Dark Side of College Football

The public's obsession with college football in America today is as strong as ever. Despite the concerns over head trauma and its long-term consequences (eg, chronic traumatic encephalopathy), ticket prices are skyrocketing, TV contracts are mind-boggling, and huge revenues continue to flow to colleges and universities while head and even assistant coaches continue to become new millionaires. All these escalating trends are dependent on the fine young high school athletes who are recruited, entertaining hopes and dreams of hitting pay dirt at the professional level.

As the college football game has matured over the past hundred years, competition within the sport and its preparation to play have evolved. Especially at the Division I level, and at many Division II schools, preparation for the game has become a year-round, full-time job. A couple of vacation weeks per year may be allowed, but not more than that for time off from training and conditioning schedules. Besides the time commitment for physical preparation, there is an ever-increasing emphasis on improving strength, power, speed, and size. Accordingly, the 8 months between the NCAA National Football Championship in January and the start of fall practice in August are designed to maximize the physical attributes the athletes will bring to the field of competition in the fall. The coaches in charge of this physical improvement process are usually from the strength and conditioning discipline. Their job is to develop the athletes to their maximum potential. These coaches determine who is the best, both mentally and physically, at enduring rigorous workouts. From January through August, except for spring practice, the strength and conditioning coaches are often in charge of the team while the other coaches recruit and strategize for upcoming opponents.

Before the process of physical improvement begins as incoming freshmen, athletes undergo the preparticipation physical examination (PPE). These examinations are designed to evaluate previous injuries and to detect risk factors for injuries and medical conditions. Knowing the degree to which these athletes will be stressed physically, the adequacy of the PPE is a major health safety determinant for the athlete. Once the athlete is cleared for football participation, he must be ready for the rigors of football training and conditioning. In a review of 158 sudden deaths among high school and college athletes (from 1985 to 1995), 115 underwent a standard PPE.⁸ Unfortunately,

only 4 were suspected of having cardiovascular disease. The PPE identified the condition responsible for death in only 1 player.⁸ This poor detection rate for fatal risk factors suggests that the PPE is not adequate for the intensity of today's football training and conditioning.

A shocking fact is that 34 NCAA football players have died during football activities in the past 18 years; 27 nontraumatic deaths were reported in 2017,¹ while 6 players died from trauma to the head or neck over the same time period. Most deaths in the nontraumatic category are attributed to the sickle cell trait (SCT), sudden cardiac arrest, exertional heat stroke, or asthma.¹ SCT should be the easiest risk factor to detect. There is a blood test for hemoglobin S, the defective form of hemoglobin that causes sickle cell anemia. Hospitals routinely screen newborns at birth, and this test can also be performed on adults. SCT occurs in 8% of African Americans in the United States and can occur rarely in the Caucasian population (between 1 in 2000 to 1 in 10,000).⁶ In a 2012 review of SCT in NCAA football athletes, all deaths associated with SCT occurred in black, Division I football players.⁷ The risk of exertional death occurring from SCT in Division I football athletes was 1 in 827. SCT raised the risk of death by a factor of 37.⁷ Nearly half (12/27) of nontraumatic deaths occurring during football conditioning since 2000 have been attributed to SCT.¹ For those individuals with this trait, intense exercise is the provocative stimulus that can cause the fatal crisis when adequate precautions in training are abandoned. While SCT does not prevent outstanding athletic performance, the progression through conditioning is a concern. If athletes are not progressively advanced through conditioning, resulting in intense exertion, hypoxia can occur, with sickled red blood cells accumulating in the blood.⁶ Dehydration can exacerbate this condition and lead to exertional rhabdomyolysis, which can result in renal failure and death. Both the National Athletic Trainers' Association (NATA)¹¹ and the NCAA⁶ have provided guidelines for conditioning athletes with this condition.

Sudden cardiac death has also claimed the lives of football players, but the incidence is quite low (1 to 3 in 100,000).^{8,14} These deaths are usually attributed to congenital or inherited cardiac abnormalities. The most common cardiac condition causing death in athletes is hypertrophic cardiomyopathy.⁸ Cardiac screening, including family history, physical examination, and electrocardiography, has not been able to identify all of those at

risk. A publication in this issue of *Sports Health* examines the cardiovascular screening practices of NCAA autonomous 5 Division I schools. General agreement and standard practice remain elusive at the Division I level.¹⁰ Interestingly, sudden cardiac death has not occurred during an NCAA football game since 2000 but has occurred during conditioning sessions, suggesting that the rigor of the conditioning programs is more intense than that of the games themselves.¹ This fact raises the issue of how strenuous training sessions should be to adequately prepare the athlete for college football.

Exertional heat stroke⁵ is another preventable cause of death in football conditioning. While climate does play a role in the risk for its occurrence, it is caused by physical exertion. Conditioning schedules should always be adjusted for climate conditions, knowing the risk that excessive heat and humidity pose for the conditioning athlete.

Asthma is the least common cause of nontraumatic death in college football players, with only 1 fatality occurring since 2000.⁴ The lone case was a Northwestern University football player with a known diagnosis of chronic asthma who died in 2002 while conditioning.

In a review of high school and college football fatalities between 1990 and 2010, Boden et al² found 164 indirect (or nontraumatic) deaths compared with 79 due to trauma. The fatality risk for college players was 2.8 times greater, possibly reflecting the increase in the intensity of the game from high school to college. Again, most of the nontraumatic events did not occur during games, suggesting that the intensity of preseason practices and conditioning sessions was actually greater than that of games.

The excessive nature of some college football conditioning programs is further evidenced by a report from the University of Iowa in 2013.¹² The problematic session included sled pushing and weight-lifting tasks. Players performed 100 back squats at 50% of the 1-repetition maximum. This workout resulted in 13 player hospitalizations for exertional rhabdomyolysis,¹² which is characterized by exercise-induced muscle fiber breakdown with release of muscle components into the bloodstream. This condition can lead to renal failure and death; fortunately, none of the Iowa football players became fatalities.

With the recent documented examples of excessive training routines, it is becoming more and more clear that the current medical safeguards for the college football athlete are inadequate. With 28 nontraumatic deaths since 2000 occurring during conditioning and training, that part of the NCAA football program demands investigation. With the most recent death of Jordan McNair, a 19-year-old Maryland football player who succumbed after an off-season workout in August 2018, we are again reminded how dangerous the intense preparation can be.³ Most startling is that these deaths have occurred in preparation for the game of football and not during the games themselves. This fact suggests that the intensity of the preparation is tougher than it needs to be.

In 2010, Head Football Coach Terry Bowden lamented,

There is no reasonable expectation of death while playing football. So why are lives being lost preparing for the game? Maybe these tragic deaths are not inevitable? Maybe it's time to start asking ourselves different questions. Are we demanding much more from these athletes than is required for safe play?⁹

The coaches directing these workouts are usually from the strength and conditioning discipline. An online review suggests that there are multiple routes to this certification available.¹³ No doubt the medical and human physiologic portions of these credentials are of utmost importance for the protection of the athlete. The qualifications, certifications, and experience of those in the strength and conditioning field should be of highest interest to those institutions that seek their employment and services.

Each tragic loss of a young athlete is a challenge to the current athletic medicine complex. Critically examining the current system from the PPE to the training and conditioning workouts and those who direct them is the least we can do for the football athletes entrusted to our care.

—Edward M. Wojtys, MD
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