= Health issues in American football =

Health issues in American football comprise a large number of health risks associated with participating in the sport . Injuries are relatively common in American football , due to its nature as a full @-@ contact game . Injuries occur during both practice and games . Several factors can affect the frequency of injuries : epidemiological studies have shown older players can be at a greater risk , while equipment and experienced coaches can reduce the risk of injury . Common injuries include strains , sprains , fractures , dislocations , and concussions . Concussions have become a concern , as they increase the risk of mental illnesses like dementia and chronic traumatic encephalopathy (CTE) . In individual leagues like the National Football League (NFL) and National Collegiate Athletic Association (NCAA) , a public injury report is published containing all injured players on a team , their injury and the game @-@ day status of each player .

Catastrophic injuries ? defined as serious injury to the spine , spinal cord , or brain ? and fatalities are uncommon in football ; both have become less common since the 1970s , although a small number of them still occur each year . Both concussions and catastrophic injuries can be caused by helmet @-@ to @-@ helmet collisions as well as impact against the ground or other players ' knees ; in other cases , they can be caused by players who have sustained a head injury returning to play , which can place the player at risk of sustaining a severe injury . Despite the downturn in catastrophic injuries , a greater number of players at the NFL level reported major injuries and shortened careers from the 1970s onwards , in part due to the increasing size and speed of players and the use of artificial turf .

In many cases , injuries sustained while playing can cause long @-@ term damage . In addition to neurological damage caused by hits to the head , injuries to the mid and lower body can force players to retire or lead to nagging ailments in later life . Various methods have been used to reduce injuries in football , including rule changes such as the abolition of large wedge formations ; a sharp decline in cervical spine injuries since the 1970s has been attributed to rule changes that altered blocking and tackling techniques . More recently , rule changes to protect players from head injuries have been instituted . Equipment like the football helmet and pads are used to give players a level of protection from injuries , while other factors such as cleat size are used to minimize the risk of injuries due to field condition .

= = Injuries = =

Because American football is a full @-@ contact sport , head injuries are relatively common . According to the San Francisco Spine Institute at Seton Medical Center in Daly City , California , up to 1 @.@ 5 million young men participate in football annually , and there are an estimated 1 @.@ 2 million football @-@ related injuries per year . An estimated 51 % of injuries occur during training sessions , while 49 % occur elsewhere . Injuries are nearly 5 times more likely to happen during contact training sessions than in controlled , non @-@ contact sessions . Older players are at the most risk for injuries , while teams with experienced coaches and more assistant coaches are less likely to experience injuries . Fifty percent of injuries occur in the lower extremities (with knee injuries alone counting for roughly 36 % of all injuries) and 30 % occur in the upper extremities .

The most common types of injuries are strains , sprains , bruises , fractures , dislocations , and concussions . According to the NFL Physicians Society , the most common injuries in football are " concussions , blunt injuries to the chest such as cardiac contusions , pulmonary contusions , broken ribs , abdominal injuries , splenic lacerations and kidney injuries . " Orthopedic injuries to the knee , foot , ankle , shoulder , neck and back are also common , as are muscle strains to the hamstrings , quads , calves and the abdomen .

Concussions are particularly concerning , as repeated concussions may increase a person 's risk in later life for chronic traumatic encephalopathy (CTE) and mental health issues such as dementia , Parkinson 's disease , and depression . Concussions are often caused by helmet @-@ to @-@ helmet collisions , impact against the ground or other players ' knees , and upper @-@ body contact between opposing players . However , helmets have prevented more serious injuries such as skull

fractures . Cervical spine injuries can be catastrophic , but have sharply declined since the mid @-@ 1970s due to rule changes and improved workout regimes , equipment , and coaching .

Performance @-@ enhancing drugs (PEDs) are an issue in both high @-@ school and professional @-@ level football . Steroid use has been linked to an increased risk for musculoskeletal injuries among players . Human growth hormone (HGH) is used by some players to improve performance , recover from injuries , decrease aging , and to lose weight . Although none of these uses are scientifically proven or legal , HGH places users at risk for adverse side effects such as onset of diabetes and negatively impacting joints and organs such as the heart . However , there have been no studies of HGH use or the baseline levels of the hormone in NFL athletes . NFL players are routinely subject to drug tests in accordance with the NFL 's two substance policies . Players found using performance @-@ enhancing drugs , including anabolic steroids , can face suspension and other penalties . As of 2014 , the league does not test for HGH use among players .

= = = National Football League = = =

An injury report section is common in the sports sections of American newspapers , detailing injuries for each team and the amount of time each injured player is expected to be out . The injury report was created to prevent gamblers from gaining inside information about injuries from players , and as a result , NFL teams must report on the status of injured players on a set schedule during the season . The standard severity descriptions are " out " (will not play in the upcoming game) ; " doubtful " (25 % chance of playing) ; " questionable " (50 % chance of playing) ; or " probable " (75 % chance of playing) . Teams have been known to downplay , exaggerate or overly detail their teams ' injuries in an attempt to confuse or mislead upcoming opponents . Injured players may be placed on one of several injured lists , including the Physically Unable to Perform (PUP) list . If a player is injured in an event outside of a game or team practice , or during collegiate practice prior to being drafted , he is eligible for the Nonfootball Injury list . Players who have sustained major injuries and are not expected to play for the rest of the season may be placed on the Injured Reserve (IR) list . These players do not count towards the teams ' roster limit .

= = = College and high school football = = =

According to the College Football Assistance Fund , over 20 @,@ 000 injuries occur from college football each year . The National Collegiate Athletic Association (NCAA) maintains an injury list similar to that used by the NFL ? injured players are listed as " Out " , " Doubtful " , " Questionable " , or " Probable " , but suspended players are also included on the list . College players are limited to four years of eligibility , but can receive a medical redshirt that lets them play another year if they have suffered a season @-@ ending injury and have not played in more than 30 % of the season 's games .

= = = Brain injury = = =

In 1994 , the NFL established the Mild Traumatic Brain Injury Committee (MTBI) , which was later replaced by the Head , Neck and Spine Committee , to study concussions and brain injuries in professional football players . The committee and its leadership , including Dr. Ira Casson and Dr. Elliot Pellman , were criticized by former players for stating that there is not enough research to determine if concussions lead to permanent brain injury . Pellman , who served as chairman of the committee from 1994 to 2007 , was met with a large amount of criticism because he did not have a background in neurology and the research he published on brain injuries disagreed with the findings of independent scientists . In 2009 , a NFL @-@ commissioned report showed increased incidence of diagnosis of memory loss and dementia among retired professional football players when compared to the general population . The study also indicated that these symptoms were related to the effects of concussions . However , the NFL and the report 's own researchers questioned the

reliability of some of the data @-@ gathering methods employed by the study , including the fact that the study was conducted by phone . The same year , the committee acknowledged for the first time that concussions can lead to long @-@ term brain injuries . A Congressional hearing in October 2009 , as well as pressure from the National Football League Players Association (NFLPA) , led to an overhaul of the concussion policy in November and December of that year .

NFL commissioner Roger Goodell addressed the issue of head injuries in professional football during a talk held on November 15 , 2012 at the Harvard School of Public Health . In the talk , he highlighted the NFL 's efforts to reduce head injuries by enacting measures such as penalizing hits to the head , better assessing concussions on the sideline , and removing players from the game after they have been diagnosed or suspected of having sustained a concussion . He also discussed the need for increased research on brain injuries and long @-@ term disorders , and called for a culture change in the league , saying that players need to be more willing to acknowledge their injuries to medical staff . In September 2012 the league pledged a $ 30 million donation to the National Institutes of Health to research the connection between brain injuries and long @-@ term mental health issues . Beginning in 2012 the NFL was the subject of several lawsuits initiated by former players who alleged that the league withheld information and misled players about the potential long @-@ term impacts of head injuries . Six of the lawsuits were approved to be tried together . In August 2013 the NFL reached a settlement with more than 4 @,@ 500 former players , agreeing to pay $ 765 million to be used to pay for medical examinations for former NFL players and for research and education purposes . Additionally , the funds will also be used to compensate former players who are determined to have significant cognitive impairment .

Concussions are also an issue outside of professional football . In a 2010 study by Purdue University and Indiana University , an estimated 43 @,@ 000 to 67 @,@ 000 football players suffer a concussion every season . However , because many injuries go unreported , the true number may exceed 100 @,@ 000 . The study , " Functionally @-@ Detected Cognitive Impairment in High School Football Players Without Clinically Diagnosed Concussion " , was published in 2013 in the Journal of Neurotrauma and observed 21 high school players throughout a season ; it determined that even players who would not be diagnosed with a concussion based on their symptoms can display notable impairments via MRIs and verbal or cognitive testing , indicating that the current tests used on the sideline to assess concussions may not be adequate . A 2013 study by the National Academy of Sciences found that concussion rates in college football exceed those in any other sport , and that high school players have twice the risk of sustaining a concussion as collegiate players . The study found that , as reported by athletic trainers , college football players sustain 6 @.@ 3 concussions for every 10 @,@ 000 athletic exposures (meaning an individual practice or game) , and the rate for high school football players is 11 @.@ 2 . The high school concussion figure is nearly double that of the next @-@ highest sport , lacrosse . The study , funded by the a $ 75 @,@ 000 donation from the NFL to the Centers for Disease Control Foundation , also found that there is no evidence that newer helmet technology decreases the risk for concussions .

= = = Catastrophic injuries and fatalities = = =

Catastrophic injuries are not common in American football . According to the National Center for Catastrophic Sport Injury Research , there were 468 non @-@ fatal injuries resulting in permanent neurological damage across all high school sports in the United States from 1982 to 2011 . In football , catastrophic injuries are rare but are devastating when they occur . The rate of catastrophic head injuries has remained low since the introduction of the modern football helmet in the 1970s , but rates of injury are much higher at the high school level than the college level . A 2007 study found that , in high school and college football , there are an average of 7 @.@ 23 catastrophic head injuries per year : there were 0 @.@ 67 injuries per 100 @,@ 000 high school players and 0 @.@ 21 injuries per 100 @,@ 000 college players . Over a 13 @-@ year period from September 1989 to June 2002 , there were 94 players who sustained catastrophic head injuries ? 8 of these players died as a result of the injury , 46 sustained permanent neurological damage , and 36 made a full recovery . Fifty @-@ nine percent of these players had a history of head injuries , 71 % of them

occurring in the same season as their catastrophic injury , and most of the catastrophic injuries resulted from being tackled or making a tackle . The study recommended that players exhibiting neurological symptoms should be strongly discouraged from returning to play .

The medical costs for catastrophic injuries can be extremely high ? a 2011 estimate from the National Spinal Cord Injury Statistical Center notes that first @-@ year costs of someone who has high tetraplegia , an injury that causes partial or full loss of use in all limbs , is USD $ 1 @,@ 044 @,@ 097 , with subsequent years costing $ 181 @,@ 328 . Many high schools across the United States require students to have an insurance policy , while others offer supplementary insurance to help offset the cost ; some schools also request that boosters help families pay for these policies .

Catastrophic injuries have been on a steady decline since the 1960s , due in part to rules banning dangerous forms of contact such as spearing , face tackling and butt blocking . However , catastrophic injuries are still caused by helmet @-@ to @-@ helmet collisions , as well when players hit their heads against an opposing player 's knee or the ground . Returning to play after sustaining a head injury earlier in the game also places players at risk for an even more severe injury . Many states are requiring teams to prevent players who have shown any signs of a concussion from returning to a game , while other steps such as more aggressive enforcement of safety rules and better condition of the neck muscles have been suggested . Additionally , coaches are being urged to train players to block with their shoulders instead of their heads .

Fatalities in football are rare . A 2013 study of high school and college football players split fatalities into two types : direct fatalities , defined as those caused by " trauma from participation in a sport resulting in a brain injury , cervical fracture , or intra @-@ abdominal injury " and indirect fatalities , defined as those resulting from external factors such as " cardiac failure , heat illness , sickle cell trait [SCT] , asthma , or pulmonary embolism " . The study found that , on average , there are 4 direct fatalities and 8 @.@ 2 indirect fatalities among high school and college players per year , making indirect fatalities more than twice as common as direct fatalities .

= = Effects on post @-@ career life = =

In addition to immediate health effects , some injuries sustained during a player 's career can have effects that extend to their post @-@ career life . A cohort mortality study by researchers at the National Institute for Occupational Safety and Health (NIOSH) examined 3 @,@ 349 NFL players who played at least five full seasons from 1959 to 1988 . The findings from this study suggest that , in comparison to the typical American male , NFL players live longer on average but have around three times the risk of death associated with neurodegenerative disorders . In particular , the risk of death from Alzheimer 's disease and Amyotrophic lateral sclerosis (ALS) was roughly four times higher among former players than the average American male . The study also compared mortality risks from speed players (quarterbacks , running backs , fullbacks , wide receivers , tight ends , linebackers , cornerbacks , and safeties) and nonspeed players (offensive and defensive linemen) , with findings indicating that a greater number of deaths were attributable to neurodegenerative disorders in speed players than nonspeed players . This may be due to the increased momentum of collisions from speed players .

Outside of neurodegenerative disorders , physical injuries sustained during a career can have an adverse effect on post @-@ career life . A 1990 survey conducted jointly between the NFLPA and Ball State University found that 65 % of surveyed players had suffered a major injury (defined as one that caused them to miss at least eight games) : among players that played before 1959 this number was 42 % , but it jumps to 72 % among those who played in the 1980s . Additionally , roughly 50 % of players who had played in the 1970s and 1980s reported that they retired due to injury , compared to only 32 % among those who played prior to 1959 . Two @-@ thirds of players reported that injuries they had sustained limited their ability to engage in recreational activity and sports in retirement , while half said their injuries decreased their ability to perform manual labor . A follow @-@ up survey in 1994 found that 47 % of recipients reported having arthritis . These reports have been attributed to several factors , including the increase in the use of artificial turf as well as the increasing size and speed of players . Dr. James Andrews , a noted orthopedic surgeon , said

that " athletes are bigger , stronger and running faster , and they 're tearing up knees from cutting , changing direction on a dime " . Andrews also noted the increase in the number of non @-@ contact anterior cruciate ligament (ACL) injuries , which he attributed to the size of modern players .

= = Prevention = =

Injuries have always been an extremely big part of American Football , and various methods have been used historically and in modern times to prevent them . One method that has been used to prevent injuries is changing the rules of the sport . An early example of this is the elimination of mass formations like the flying wedge in the early 1900s , due to the large number of severe injuries the formations caused . Smaller wedges consisting of three , four , or five players were frequently used on kickoff returns before wedges were limited to two or fewer players in 2009 by the NFL ; a similar rule was adopted by the NCAA a year later . The sharp decrease in the number of catastrophic cervical spine injuries since the mid @-@ 1970s has been partially credited to rule changes that modified tackling and blocking techniques . With the increasing awareness of the long @-@ term effects of concussions , the NFL has passed rules prohibiting the targeting of " defenseless " players over @-@ the @-@ shoulder , requiring plays to be blown dead when the runner loses his helmet , and placing more stringent limits to the ability of players who have sustained a concussion to return to play .

Similarly , modern equipment was developed to reduce injuries . The football helmet , although a scapegoat for concussions , serves as effective protection against more dangerous injuries like skull fractures . The modern helmet traces its roots back to the leather helmets used by football players in the early 1900s to protect themselves from head injuries . Helmets later evolved to be made of hard plastic , and a facemask was added to protect players from sustaining facial injuries . Many players also wear mouthguards to prevent injuries to their teeth and tongues ; at some levels , such as the NCAA , the use of a mouthguard is mandatory . Football players wear a number of pads to protect themselves ? shoulder pads are the most important pads , protecting the shoulder and sternum , but thigh pads , hip pads , tail pads , and knee pads are also used . Many quarterbacks wear flak jackets to protect their ribcage . Cleats come in a number of lengths , with players choosing which cleat to use based on the playing field ? on artificial turf , for example , players prefer a shorter cleat to prevent their feet from digging into the ground and risking injury , while longer cleats are generally used on fields that are wet or slippery to provide better traction . Athletic cups are not typically used at the professional level , because athletic cups tend to make it harder to move and there is an unwritten code among players not to target the groin area . Additionally , studies have shown that proper conditioning techniques , fitness routines and exercise routines , as well as high @-@ quality equipment and coaching , can reduce the risk of injury among players .