Child Athletics and Mild Brain Trauma

In June 2012, over 2400 former professional football players filed a class action lawsuit against the National Football League for neglecting to take sufficient precautionary measures that would have protected them against head injuries during their careers.[1] Stories of famous athletes suffering from depression and other severe mental issues, even suicidal tendencies, brought on by repeated concussions throughout their careers dominate sports headlines. As professional leagues begin to take necessary action to protect players' heads, parents, educators, and coaches watch, wait, and wonder. Concern for child athletes who emulate sports "stars" grows, because, being vulnerable to head injuries, they have an enormous amount to lose.

A child's suffering an avoidable concussion while playing contact sports is, at best, disconcerting. Immediate diagnosis and awareness of consequences of a concussion are critical. According to the U.S. Center for Disease Control and Prevention, during the past decade visits to emergency departments for traumatic brain injuries caused by sports and recreation related accidents have increased 60%. This increase can be attributed to both increased number of concussions sustained, as well as increase rate of diagnosis. The number of patients diagnosed with concussion has doubled in the past decade while the number of concussion patients admitted to hospitals has remained constant.[2]

From 2001-2005, one in 1000 children aged 8 to 13 and three in 1000 aged 14 to 19 years visited an emergency department for a concussion sustained while playing football, basketball, soccer, baseball, or ice hockey.[3] Sports causing concussions most frequently are football for males and soccer for females. Brain trauma in these young athletes occurs during practice and competition, so the only sure way to avoid them is to not participate. Injuries to younger children, birth to nine years of age, most often occur off the playing field during playground activities or while riding a bicycle.[4]

While the connection between concussions in children and mental health is not yet fully understood, trauma to the brain, even a mild concussion, can have long-term negative consequences because the brain is still developing and forming. The chief of cognitive neuroscience at the National Institute of Neurologic Disorders and Stroke, Jordan Grafman, Ph.D., says that, "if a concussion occurs in a still-developing brain, the trajectory

of that development will presumably be affected. Even a mild head injury can certainly create problems in day-to-day functioning, particularly in higher cognitive functions."[5] The prefrontal cortex is the section of the brain where complex cognitive behavior, personality, decision making and behavior moderation takes place. In adolescents and teens, ages approximately ten to eighteen years, the frontal lobe of the brain is developing rapidly; this is the center of overall functional efficiency. As a child's brain develops, emotional emphasis is shifted away from the more primitive limbic system toward the newly developed and sophisticated frontal lobes.[6]

Beginning around age seven, a child's cognition begins to develop rapidly, correlating with the development of the prefrontal cortex. The child becomes more independent of external stimuli and more creative. Through the teenage years, a child improves at integrating information and constructing goal-oriented methods of speech and behavior.[7]

When a concussion occurs, this process is compromised, if not momentarily stunted: neural tissue is jostled, thus resulting in damaged brain cells and blood vessels. As a result, the brain is starved of energy, and nerve cells become especially vulnerable to further damage or death.[8] A recent study shows that, while sports related concussions in children generally do not cause structural injury, they do cause significant reductions in flow cerebral brain fluid (CBF) in the brain, and full recovery of CBF flow often does not occur until after 30 days from the time of injury.[9]

Learning new skills and knowledge can become an issue for children who sustain a concussion. A traumatic brain injury to a child decreases her ability to selectively learn important information, although she does not lose the ability to identify that important information. Children who suffer a traumatic brain injury perform significantly worse in selective learning efficiency than those who do not have an accident.[10]

Long-term effects of concussions sustained by children and adolescents on their mental health are not yet fully known. The fact that the brain is still developing when a concussion occurs is both a blessing and bane. Because the child is still young, his or her brain can recover (with rest and avoidance of subsequent concussions). But the fact remains: never sustaining a concussion is substantially healthier for the brain than sustaining even a single mild one. It is clear that brain trauma to adults' fully developed

brains does have long-term effects on mental health, most notably, depression. While depression most often occurs in the first year after injury, the risk of developing depression remains high for decades.[11] Other symptoms often appear and persist: fatigue, decreased involvement in activities, insomnia, lack of appetite and concentration.[12] With repeated concussions, a child may show similar signs of compromised mental health.

Every child will be unique in the time he needs to recover; however, no child should immediately return to play, and the physician should determine when recovery is full. Children will show noticeable signs of attention impairment immediately following a traumatic brain injury, and it can take anywhere between three to six months following the injury for substantial recovery.[13] Without a doubt, a child who has sustained a concussion should avoid further violent contact at all costs: a period of rest after an injury is critical to return to normal.

For the sake of fully healthy brains and the ability to maximize learning, adults should take every precaution to protect children from head injuries sustained during athletics. Fortunately, Illinois policy makers recognize the ramifications of new research showing the risks that contact sports have on developing brains of young students. Governor Pat Quinn signed legislation aimed to protect student-athletes in the state from concussions and other brain injuries on July 28, 2011. House Bill 200 requires evaluation and written clearance from a licensed health professional of an athlete who suffers a concussion in order to return to play or practice. It also requires each school board in Illinois to adopt a concussion and head-injury policy that complies with Illinois High School Association policy.

Administrators of youth sports leagues are taking measures to protect the safety of young athletes. Understandably, if not obviously, football is the largest cause of sports related concussions, and therefore the sport that poses the greatest risk to young male athletes. In June 2012, the largest child and adolescent football association, Pop Warner Football, made changes to rules for practice and games aimed to protect developing brains. One rule limits the maximum amount of time in practice that players can be involved in full contact. The second rule prohibits full speed head-on blocking or tackling drills in which players start three yards or more apart.[14] These are important steps in preventing serious injury to young athletes.

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