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Vintage leather football helmets often as protective as modern helmets in common, game-like hits

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Old-fashioned "leatherhead" football helmets from the early 1900s are often as effective as – and sometimes better than – modern football helmets at protecting against injuries during routine, game-like collisions, according to Cleveland Clinic researchers.

The study – published online Nov. 4 by the *Journal of Neurosurgery: Spine* – compared head injury risks of two early 20th Century leatherhead helmets with 11 top-of–the-line 21st Century polycarbonate helmets.

In their biomechanics lab, Cleveland Clinic researchers conducted impact tests, crashing helmets together at severities on par with 95 percent of on-field collisions (75 g-forces or less) in collegiate and high school football games. For this study, researchers analyzed hits that are common in games and practices – hits that taken separately may not seem perilous but when added together may lead to serious long-term injury.

For many of the impacts and angles studied in the lab, the researchers found that leather helmets offered similar, or even better, protection than modern helmets.

"The point of this study is not to advocate for a return to leather helmets but, rather, to test the notion that modern helmets must be more

protective than older helmets simply because 'newer must be better,'" said lead researcher Adam Bartsch, Ph.D., Director of the Spine Research Lab in Cleveland Clinic's Center for Spine Health. "Unlike cars, in which seat belts, airbags and crumple zones make the choice between a 1920's Model T and modern mini-van a no-brainer, these results tell us that modern helmets have ample room to improve safety against many typical game-like hits."

Though head and neck injuries were greatly reduced after football helmet standards and rule changes were instituted in 1970's and 1980's, the incidence of concussions have continued to increase. In fact, concussions are the leading cause of brain damage in sports, particularly in football. Estimates suggest that up to 40 percent of football players experience a concussion each year, with more than half of these going unreported.

Cleveland Clinic researchers note that helmet safety standards – as measured by the Gadd Severity Index – are based solely on the risk of severe skull fracture and catastrophic brain injury, not concussion risk. So, while modern helmets may prevent severe head injuries, this study found that they frequently did not provide superior protection in typical on-field impacts when compared to leather helmets.

"Today's safety standards are no longer state-of-the-art predictors of injury," said Edward Benzel, M.D., Chair of Cleveland Clinic's Department of Neurological Surgery. "Of course, preventing skull fractures is vitally important, but concussion prevention needs to be an integral part of the standards as well. Also, helmets need to protect against the cumulative effects of multiple lower impact blows that may not lead to a concussion immediately but may add up to cause severe long-term head, neck or brain injuries."

The findings suggest that helmet testing should focus on both low- and

high-energy impacts, not solely on potentially catastrophic high-energy impacts. This is especially true of youth football helmets, which are currently scaled-down versions of adult helmets. The lack of adequate knowledge surrounding adult helmet protectivity at low-energy impacts, as well as the current absence of any youth-specific helmet testing standards, may have serious brain health implications for the 3 million youths participating in tackle football in the United States each year.

The leatherhead study is one of several projects Cleveland Clinic is undertaking to better detect and prevent brain injuries across a wide range of sports, including football, boxing, hockey and soccer. Teams of researchers are working to make safer youth football helmets (through a grant from NFL Charities); create an Intelligent Mouthguard that measures the number and severity of hits to the head among athletes; produce a blood test that can diagnose concussions; and develop an iPad app that uses the device's built-in gyroscope to quantitatively capture pre- and post-game measures of balance, memory and cognition. In Las Vegas, the Cleveland Clinic Lou Ruvo Center for Brain Health has launched a landmark study with professional fighters that will help determine whether MRIs of the brain, along with other tests, can detect subtle changes in brain health that correlate with impaired thinking and functioning. The research teams draw from their experiences of caring for thousands of professional, amateur and youth athletes every year on the sidelines and in clinic.

Provided by Cleveland Clinic

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