D22 Real-World Football Helmet Performance Versus Certification Testing, Refurbishment, and Inspection

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After attending this presentation, attendees will be familiar with a survey of the current state-of-the-art of sport helmet performance, testing, and real-world usage. Football, rodeo, and equestrian helmet performance, testing, and usage enforcement will be described. This will provide forensic scientists and engineers with new information regarding how football and other sport helmets are performing in relation to the growing field of knowledge regarding the incidence of Chronic Traumatic Encephalopathy (CTE) and other maladies related to youth, high school, college, and professional sports (especially football).

This presentation will impact the forensic science community by enabling those called upon to investigate head and neck injuries in football and other sports, as well as motorcycle helmets, to understand the effects of environmental conditions, certification testing, refurbishment, and real-world usage practices on helmet performance.

Testing and research has proven that significant degradation of football helmet energy-absorption performance occurs due to predictable environmental heat and humidity, as well as unavoidable body heat and contact sweat. New football helmets meeting minimal, antiquated National Operating Committee Standards on Athletic Equipment (NOCSAE) performance standards testing at moderate temperature and humidity repeatedly failed to perform adequately at higher, more realistic levels of heat, humidity, and impact forces consistent with predictable real-world usage conditions. Study testing proved that refurbished football helmets certified fit for safe use demonstrate even greater degradation of protective capacity.

Teams without adequate funds often fail to refurbish helmets adequately, and refurbishment companies often fail to refurbish or test helmets properly to insure reliable safety, leading to potentially insufficient protective performance. Not surprisingly, significant gaps have been discovered between intended or advertised levels of helmet protection, user expectations, and actual user protection. This disparity is likely affected by the proven degradation in protective capacity caused by real-world environmental and usage conditions discovered by this study. It is also predictable that helmet materials will degrade over time and with greater use. Football helmet refurbishment and testing has not always been performed to required standards, resulting in criminal prosecution of refurbishment companies for fraud. Since football helmets can be refurbished for ten years under NOCSAE guidelines with limited testing to determine actual protection performance of this equipment, all with little institutional oversight, this is clearly an even more significant concern.

Research conducted on football helmets to determine real-world, repeat-impact performance demonstrated poor helmet performance. Improper usage, maintenance, fit, damage and refurbishment, and adverse environmental conditions also affect helmet protective capacity. Investigative reports of inadequate helmet refurbishment, as well as evaluation of environmental conditions and inspections of helmets by officials, are described. Despite significant recent efforts to analyze and prevent football-related head injuries, there are far more opportunities for head injuries in practices than in competition because there are fewer trained medical personnel and other observers available to monitor head impacts, proper helmet usage, and potential helmet damage at practices.

In addition to concerns regarding inadequate or misleading helmet refurbishment, effective usage of helmets can be unpredictable and unreliable due to lax enforcement and inspections, poor fit, inadequate maintenance, accumulated helmet damage, basic ignorance, etc. The safety culture of a sport also influences how helmets are utilized and maintained as well as whether injuries are reported or head-injured athletes are restricted from play until medical approval is given for their safe return. Although football has widespread helmet-due-to-rules requirements, other hazardous sports (rodeo rough stock events) often see relatively little helmet use in training despite similar or even greater injury risks. Rodeo competitors in championship events are known to wear helmets without fastening the chin strap, showing a contempt for risks, safety equipment, and rules by competitors and their coaches, and a lack of effort by event officials to insure that safety equipment is in good condition and properly worn.

In contrast to the ten-year refurbishment of football helmets, other sports require that helmets be taken out of use after significant impacts. This is common with bicycle, motorcycle, and auto-racing helmets, but not with football, rodeo, and many other higher head injury-risk sport helmets.

Sport Helmets, Energy Absorption, Environmental Degradation

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