NOCSAE® NEWS

"Commissioning research and establishing standards for athletic equipment, where feasible, and encouraging dissemination of research findings on athletic equipment and sports injuries."
The National Operating Committee on Standards for Athletic Equipment

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NOCSAE urges athletes and parents to get the facts about football helmets and concussion protection

OVERLAND PARK, KANSAS, Feb. 4, 2011 – The National Operating Committee on Standards for Athletic Equipment (NOCSAE) issued a warning to athletes and parents of athletes to get the facts about football helmets and concussion protection – and not rely solely on marketing and promotional materials. NOCSAE is an independent and nonprofit standard-setting body with the sole mission of enhancing athletic safety through scientific research and the creation of performance standards for protective equipment.

"As we all prepare for the Super Bowl, football's biggest celebration of the season, there is one fundamental fact every athlete and parent of an athlete needs to know: no football helmet can prevent all concussions," said Mike Oliver, NOCSAE executive director. "Because of the efforts of researchers, manufacturers and others, the progression and improvement of football helmets over the last 20 years has been remarkable. We have no doubt that technology will continue to improve. But claims or representations that a particular helmet is anti-concussive or concussion-proof, without scientific support, can be misleading and dangerous."

For the most reliable information regarding helmets and concussion protection and prevention, NOCSAE encourages athletes and parents to carefully review:

- Hang tags that come with all new football helmets that address the helmet's abilities and limitations
- Informational booklets developed by manufacturers that contain critical information about the helmet's abilities and limitations
- Warning information that is prominently affixed to the exterior of every helmet
- Free downloadable resources created by the Centers for Disease Control regarding concussion recognition, response and prevention. Those resources can be found at www.cdc.gov/concussion/sports/

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While football helmets certified to the NOCSAE standard play an incredibly important role in protecting athletes on the field of play, they are not the only approach to protecting against concussion. Prevention, diagnosis, treatment and trained medical management for decisions about when a concussed athlete can return to play are equally important. NOCSAE offers the following recommendations for athletes, parents and coaches:

- Read and understand the warning labels on your helmet. No helmet can prevent all head injuries. Helmets do not protect against neck injuries. If you were not provided the hang tags and literature that come with every new football helmet certified to the NOCSAE standard, contact the manufacturer of the helmet and obtain copies of that information.

- Football helmets certified to the NOCSAE standard do protect against some concussions, but contact in football may result in a concussion or brain injury that no helmet can prevent.

- The certification on the back of each football helmet that states "Manufacturer Certifies Meets NOCSAE Standard" and the NOCSAE football helmet logo mean that helmet model has passed a very thorough and rigorous impact testing protocol using state-of-the-art equipment. Even with that certification and compliance, there is no football helmet standard, including the NOCSAE standard, that will prevent all concussions.

- A helmet that is older than two years also should be reconditioned and recertified to the NOCSAE standard. Helmets that have been recertified will have a recertification statement and label inside the helmet indicating the name of the recertifying company and the date of recertification. If you have doubts, ask your coach or school administrator about their policy for reconditioning and recertifying football helmets.

- Do not use the helmet to hit or strike an opponent. Such actions violate rules of play, as well as substantially increase the chance of incurring a concussion or other serious head or a neck injury. These injuries could include permanent paralysis and even death.

- Become familiar with the signs and symptoms of concussions, which can include headache, nausea, confusion, dizziness and memory difficulties, and encourage all athletes to report symptoms. If a concussion has been diagnosed, do not return to play until cleared by medically trained experts following published return-to-play guidelines. Remember, if in doubt, sit it out.

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Based on the best available science, NOCSAE has established the most rigorous standards for football helmet performance. The standard mandates that football helmets be tested across multiple levels of impact and impact locations. The organization warns that even though helmets face rigorous testing and demanding performance standards, concussions still occur. More scientific data is critical to learn why and how better to protect athletes against concussions without creating the possibility for other injuries. Since 2000, NOCSAE has invested more than $3 million toward understanding sport-related concussions and supporting research by the foremost experts in sports medicine and science to develop and advance athlete safety.

For more information, please visit www.nocsae.org.

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About NOCSAE

NOCSAE, the National Operating Committee on Standards for Athletic Equipment, is an independent and nonprofit standard-setting body with the sole mission to enhance athletic safety through scientific research and the creation of performance standards for protective equipment. Formed in 1969, NOCSAE is a leading force in the effort to improve athletic equipment and, as a result, reduce injuries. NOCSAE efforts include the development of performance and test standards for football helmets and facemasks, baseball and softball batters and catchers helmets, baseballs and softballs, ice hockey helmets, soccer shin guards, lacrosse helmets and facemasks and polo helmets. NOCSAE is comprised of representatives from a number of groups which have an interest in athletic equipment – including manufacturers, reconditioners, athletic trainers, coaches, equipment managers, sports medicine and consumer organizations. These diverse interests have joined forces in an attempt to arrive at a common goal of reducing sports-related injuries. NOCSAE is a nonprofit, charitable organization supported by individuals and organizations with an interest in athletics.

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National Operating Committee on Standards for Athletic Equipment

NOCSAE Overview

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NOCSAE Leadership

NOCSAE brings together team physicians, academic researchers, coaches, certified athletic trainers and manufacturers to establish equipment performance standards for the protection of athletes. Serving without compensation, NOCSAE's board of directors is comprised of representatives selected by the following organizations:

- American College of Sports Medicine
- American College Health Association
- American Orthopaedic Society for Sports Medicine
- Athletic Equipment Managers Association
- American Medical Society for Sports Medicine
- National Athletic Equipment Reconditioners Association
- National Athletic Trainers' Association
- Sporting Goods Manufacturers Association
- American Football Coaches Association

Football Helmet Standards

NOCSAE has established the most rigorous standards for football helmets in the world. Originally established in 1973, NOCSAE regularly has changed and updated the football helmet performance and testing standards – making them tougher to comply with to better protect the athlete. NOCSAE'S standards require testing football helmet performance across all levels of impact. Helmets either pass or fail the standard based on an impact energy evaluation called the Severity Index (SI). To be certified, helmets must score less than 1200 SI on 16 impacts at eight impact locations, including four lower level impacts. The SI threshold is based on years of science and research. NOCSAE standards are adopted by various regulatory bodies for sports, including the NCAA and the National Federation of State High School Associations, as well as the United States Department of Defense Education Activity which oversees and regulates military base athletic programs, including football, for the children of military families around the world.

Research

NOCSAE is the leading nongovernmental source for research funding in the area of sport-related concussion. Since 2000, NOCSAE has invested more than $3 million toward understanding sport-related concussions and supporting research by the foremost experts in sports medicine and science to develop and advance athlete safety. NOCSAE created the new Scientific Advisory Panel chaired by Dr. Robert Cantu, NOCSAE vice president and one of the nation's top sports concussion specialists. The committee will focus specifically on conducting and directing scientific research to help answer pivotal questions about concussion and helmet standards. NOCSAE has referred several multi-year concussion related grant proposals to the new committee for evaluation.

Funding

NOCSAE is an independent, nonprofit 501 (c)(3) organization which is funded primarily through licensing fees it charges to equipment manufacturers that want to certify or recertify equipment to the NOCSAE standards. Manufacturers and reconditioners are obligated by contract license agreement to test helmets to make sure they meet the NOCSAE standards and to provide independent, third-party validation of their certifications to the NOCSAE standard. Approximately 75 to 80 percent of all revenue collected from these license fees is reinvested into education and research to advance the science and safety of athletes.

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NOCSAE's sole focus as an independent, standard-setting body is to protect millions of athletes – young people and adults – all across the country.

- NOCSAE brings together multiple disciplines and broad areas of sport and scientific expertise to work together on behalf of athletes.
- Through its process, physicians and academic researchers, coaches and trainers and manufacturers come together to establish standards that are designed to keep athletes healthy.

NOCSAE has invested millions of dollars and tapped the knowledge of foremost experts in sports medicine and science to develop and advance the safety of athletic equipment – including helmets.

- NOCSAE is the leading nongovernmental source for research funding in all sports medicine and science related to concussion.
- Since 2000, NOCSAE has dedicated more than $3 million toward understanding sport-related concussions and supporting research by the foremost experts in sports medicine and science to develop and advance athlete safety, and continues supporting large research grants in these areas.
- NOCSAE created a Scientific Advisory Panel chaired by Dr. Robert Cantu – NOCSAE vice president and one of the nation's top sports concussion specialists – which will focus specifically on conducting and directing scientific research to help answer pivotal questions about concussion and helmet standards.

NOCSAE is working hard to advance the science and its standards so that helmets can be even more protective.

- What NOCSAE will not do is make a decision to change standards that is not based on accepted science.
- To change the standard without science to support it would be irresponsible and endanger athletes.
- Athletes deserve to know that the equipment they use meets standards of performance based on the best available science – not someone's best guess.

NOCSAE has established the most rigorous standards for football helmets in the world.

- Since they were first adopted in1973, NOCSAE has changed its football helmet standards numerous times, which has required helmets to meet more demanding tests.
- The companies who make or recondition helmets certified to NOCSAE standards MUST comply with those standards, and NOCSAE holds them to it.

While football helmets play an incredibly important role in protecting athletes in the field of play and are an important part of any potential reduction in concussions, they are not the only solution. Prevention, diagnosis, treatment, and management in return to play are equally important.

- Leagues must strictly enforce rules about helmet-to-helmet contact.
- Parents, coaches and trainers must recognize concussions and the symptoms of concussions on the field of play and treat them appropriately. They must follow medical advice and protocol in all decisions regarding when to return to play.

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New Helmet Certification

Manufacturer Certifies

"Meets NOCSAE Standards"

Helmet manufacturers that want to certify that their helmet "Meets NOCSAE Standards" must enter into a contract with NOCSAE that obligates that company to:

- ✓ Test their helmets in accordance with NOCSAE performance and testing standards
- ✓ Provide data that demonstrates that their testing equipment is calibrated and functioning properly and to participate in a round-robin test system verification program
- ✓ Have a written quality control program regarding the NOCSAE protocol and data acquisition and analysis and maintain certification testing data for review by NOCSAE
- ✓ Annually submit their certified helmets to a third-party laboratory, specially accredited to international laboratory standards, for verification that their helmets in fact meet the NOCSAE standard as certified and to submit these third-party laboratory validation reports directly to NOCSAE

Setting the Standard

NOCSAE helmet performance standards are based on accepted and recognized scientific data. By bringing together physicians, academic researchers, coaches, certified trainers, manufacturers and leading scientific experts, NOCSAE established standards that require testing football helmet performance across all levels of impact. Helmets either pass or fail the standard based on their ability to reduce impact forces to the head as measured by a Severity Index (SI) value. To pass the test, helmets must score less than 1200 SI at all impacts. NOCSAE standards are performance-based and are design neutral so that manufacturers are not restricted in design or engineering, allowing innovation in design.

Linear Impactor

Proposed Additional Test

In 2004, NOCSAE drafted a proposed revision to its helmet-testing standard that would allow helmets to be hit in additional directions and with different speeds, which NOCSAE believes will be necessary if scientists are able to identify a concussion specific addition to the NOCSAE standard. This "linear impactor" is an air-powered ram that was built from plans developed by the NFL and given to NOCSAE in a cooperative effort. Six prototype impactors are currently being tested in various laboratories around the country to establish repeatability and validity, which must be done before it can be included in the testing standards.

How Football Helmets Are Tested

NOCSAE's testing standards incorporate variable mass head forms and are the only helmet standards in the world to do so. The NOCSAE test standard involves mounting a football helmet on one of three different size and mass biofidelic head models that has been specially instrumented to measure the impact forces on the head, then dropping the helmet and headform onto a steel covered anvil with a ½-inch hard rubber pad. The helmet is dropped a total of 20 times, including: two drops from a height of 60 inches onto seven different locations, including one random location; two drops from 60 inches at high temperatures; and two drops each from 36 inches and 48 inches. A 60-inch drop is approximately the equivalent of a player running at 17.9 feet per second – more than 12 miles per hour – and hitting the helmet into a flat surface that stops the head in less than ⅛ inch. Impact force measurements are recorded by the test software to determine if the helmet passes the SI threshold and can be certified to the NOCSAE Football Helmet Standard.

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Recertification of Reconditioned Helmets

RECERTIFIED MEETS NOCSAE STANDARD. YEAR ORGANIZATION

When NOCSAE published new football helmet standards in 1973, All American Reconditioning began to test helmets they were reconditioning and found that 84 percent of all helmets currently in use and made before 1973 could not pass the NOCSAE test. As a result, NOCSAE established standards to retest and recertify football helmets that are being reconditioned so the original certification under the new standard could be maintained through the reconditioning process. There are currently 23 reconditioners nationally that are licensed by NOCSAE to recertify football helmets.

Recertification Requirements under the NOCSAE Standard

The NOCSAE recertification standards and recertification license agreement require the following:

The Facility: The testing laboratory at each reconditioning facility must be in a separate room apart from the general reconditioning work. The room must be temperature controlled at a specified range. Compliance also requires a written quality control protocol that includes issues such as sample selection and responses to test failures.

The Sample: Helmets selected for testing must be a statistically relevant sample of the helmets that particular facility will be recertifying. The helmets selected for testing must be tested prior to any reconditioning or repair work being done; in other words, they are tested in the condition they are in as they get off the bus from high school. Once the helmet is selected, it is tagged, tested and followed through the entire recertification process. That exact helmet is then tested again after it has finished the reconditioning process. No helmets that are represented by that sample may be recertified and returned to a school or club until the samples have passed the post-reconditioning testing.

The Test: Reconditioners use the same drop-testing equipment for recertification as is required for newly manufactured helmets. The entire testing process and protocol is controlled by NOCSAE computer software specifically designed to ensure that the recertification testing data is done correctly and that the testing data is valid and reliable. The software:

- ✓ Forces equipment calibration and recalibration both before and after helmets are tested. If the post-test calibration and validation fails, those helmet tests cannot be used for recertification, and they must be redone.
- ✓ Dumps all invalid test data generated as a result of a non-calibrated or invalid test into a special file for review by the NOCSAE technical advisor.
- ✓ Collects all valid and verified testing data – including date; time of day; temperature; SI results; helmet make and model, age and size; and the last year reconditioned – and stores it in a separate encrypted file, accessible only by specific personnel in the laboratory of the NOCSAE technical advisor.

Reconditioning: Once the pre-reconditioning test is complete, the helmet begins the reconditioning process. Reconditioning includes the complete disassembly of all helmet parts, cleaning, sanitizing, replacement of worn parts and shell inspection. Helmets also may be repainted and have the faceguard, jaw pad and chin strap replaced. Once the helmet has finished the reconditioning process, the shell may be the only original part of the helmet that remains. In a helmet older than five years that has been regularly reconditioned, the only part of the helmet that is *actually* five years old is probably the shell. Helmet shells may not be replaced as part of the reconditioning process.

Recertification: When the sample helmets have passed the recertification tests, a recertification label is placed on the inside of the helmet with the current year's recertification date and a statement that the helmet has been recertified to the NOCSAE standard.

Round Robin: Reconditioners also must submit the testing system to a round-robin calibration program to validate that each reconditioning and recertification laboratory test rig is properly tuned and assembled. The data from round-robin calibration tests is submitted to the NOCSAE technical director in an encrypted file, where the data is examined for consistency and internal validation.

Additional Requirements: Licensed reconditioners are required to maintain a database of information detailing how helmets have been maintained, as well as provide testing data results to NOCSAE on a monthly basis – and in some cases weekly basis – during reconditioning season. NOCSAE analyzes this data and maintains a database of all recertification tests performed from all reconditioners licensed to recertify helmets. This data has been submitted by NOCSAE to independent statisticians for evaluation on matters such as sample relevancy, consistency and trend development.

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NOCSAE Standards Changes and Research Investment Timeline

NOCSAE, the National Operating Committee on Standards for Athletic Equipment, is an independent and nonprofit standard-setting body with the sole mission to enhance athletic safety through scientific research and the creation of performance standards for protective equipment. Formed in 1969, NOCSAE is a leading force in the effort to improve athletic equipment and, as a result, reduce injuries. For decades, NOCSAE has invested millions of dollars and tapped the knowledge of foremost experts in sports medicine and science to drive, develop and advance the safety of athletic equipment.

2011

Scientific Advisory Committee created to focus specifically on conducting and directing scientific research to help answer pivotal questions about concussion and helmet standards

2010

Multidisciplinary Concussion Task Force, chaired by Dr. Robert Cantu, NOCSAE vice president, created to bring together the nation's leading experts in all relevant scientific and medical fields to help identify and direct specific research to advance science and research in the area of concussion

Can anthropometric measurements explain gender differences in concussion rates among high school basketball, soccer and lacrosse players? R. Dawn Comstock, Ph.D., Assistant Professor Center for Injury Research and Policy

The effect of sport-related concussion on cognition, balance, symptoms and health-related quality of life in adolescent athletes. Tamara C. Valovich McLeod, Ph.D., ATC, Associate Professor, Athletic Training

Genetic risk factors for concussion, concussion severity and neurocognitive recovery from concussion in college football and soccer players. Tom Terrell, M.D.

KEY

[ ] : Standard Change

▨ : League Rule Change

Body : Research

2009

Evaluating changes in depression symptoms and neurocognitive impairments among male and female concussed high school and collegiate athletes. Tracey Covassin, Ph.D., ATC

Prospective investigation of sport-related concussion: relationship between biomechanical, neuroanatomical and clinical factors. Kevin M. Guskiewicz, Ph.D., ATC

Neuropathological and clinical consequences of repetitive concussion in athletes. Ann C. McKee, M.D. and Robert A. Stern, Ph.D.

2008

High school sports injury surveillance: monitoring rates and patterns of injury over time. R. Dawn Comstock, Ph.D., Research Institute at Nationwide Children's Hospital

Prospective evaluation of head impacts sustained by youth ice hockey players: part II. Kevin M. Guskiewicz, Ph.D., ATC; Professor and Chair, Department of Exercise and Sport Science, University of North Carolina at Chapel Hill

Characterizing concussion in boys high school lacrosse: epidemiological, biomechanical and neuropsychological dimensions. Andrew E. Lincoln, Sc.D., MedStar Research Institute, Hyattsville, Md.

An investigation of the NOCSAE proposed linear impactor test protocol based on in-vivo measures of head impact acceleration. Joseph T. Gwin

2007

Gender differences in head impact acceleration in collegiate ice hockey. Richard M. Greenwald, Ph.D., Simbex, Lebanon, N.H.

2006

[In January 2006, NOCSAE changed the helmet standard to require that each NOCSAE licensee annually submit a report from an independent and accredited testing laboratory that the equipment certified by that licensee in fact did meet the NOCSAE standard. This verification requirement applies to all new equipment certified.]

[Motor evoked potential abnormalities following acute concussion among high school and collegiate athletes: relationship to post-concussive symptoms, neuropsychological test scores and balance error scores. Christopher D. Ingersoll, Ph.D., University of Virginia]

2004

Acute effects and recovery after concussion in high school athletes: a clinical and functional magnetic resonance imaging (fMRI) study. Michael McCrea, Ph.D., ABPP, Waukesha Memorial Hospital, Waukesha, Wis.

The influence of environment and regular use on football equipment over a full season of participation and its relation to face mask removal efficiency. Erik E. Swartz, Ph.D., University of New Hampshire

2003

[A new and updated data acquisition program was written and implemented for the recertification of football helmets. A key feature of the new program provides an encrypted reporting format that limits the user's ability to modify test scores. The program requires, among other steps, that the pretest and posttest system checks be performed correctly or all helmet test data performed between these system checks becomes invalid. A temperature sensor incorporated in the software automatically invalidates all test data generated when the temperature of the test lab is outside the specified range.]

[By 2003, most of the laboratories testing to the NOCSAE standards were using the newest NOCSAE instrumented headform, the most biofidelic headform available, which had been revised and upgraded several times, making the resulting data much more reliable and accurate.]

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2002 – 2003

Catastrophic football injuries: 1984-2000 Frederick O. Mueller, Ph.D., University of North Carolina

Various types of football helmets, face masks and face mask loop straps and their effects on the efficiency of face mask removal. Erik E. Swartz, Ph.D., University of New Hampshire

2001

A comparison of traditional and computerized neuropsychological assessment of athletes prior to and following cerebral concussion. Ruben Echemendia, Ph.D., Pennsylvania State University, Pennsylvania State University, University Park, Penn.

Sudden death in sports impacts, mechanism, prevention and treatment. Mark S. Link, M.D., New England Medical Hospitals, Boston, Mass.

1999

The new anthropometrically correct size medium headform was introduced. This change produced a more robust head model to prevent the excessive breaking of headforms that had resulted from the earlier changes made to the drop system that increased drop velocities and energies. This change created a head model thatis less likely to break under normal use and resulted in a more demanding helmet test, particularly for impact sites located along the rear portion of the headform. After extensive tests were carried out on the new medium head model, the size small and large headforms were introduced in 2002.

Neuropsychological assessment of sports-related mild traumatic brain injury: a prospective multi-sport study. Ruben J. Echemendia, Ph.D., Department of Psychology, Pennsylvania State University, University Park, Penn.

A prospective study on injury assessment, return to play and outcome following concussion in athletes. Kevin M. Guskewiewicz, Ph.D., University of North Carolina at Chapel Hill

The development of a system using triaxial accelerometers to measure head motion and energy exposure during high velocity vehicular impact. Stephen E. Olvey, M.D., University of Miami School of Medicine

1996

The pass/fail threshold value was changed from 1500 SI to 1200 SI, making the pass/fail criteria 20 percent harder and bringing it in line with the federal motor vehicle safety standards for head injury prevention in automobile occupant crash protection.

Limiting performance studies of sports helmets. Walter D. Pilkey, Ph.D., University of Virginia.

Effect of mild head injury on cognition and postural stability. Kevin Guskiewicz, Ph.D., University of North Carolina at Chapel Hill.

1995

Early prediction of severity of closed head injury in football accidents using neuropsychological testing, mri and pet scanning. Howard H. Kaufman, M.D., West Virginia University School of Medicine.

Cervical spine protection: a comprehensive review. Manohar M. Panjabi, Ph.D. and Barry S. Myers, M.D., Ph.D.

The role of vertebral geometry and density, and the effectiveness of neck protective devices in cervical impact injuries. Merle Shea, M.S., Beth Israel Hospital, Boston, Mass.

1994

Mechanisms of head injury during freestyle ski jumping: a biomechanical analysis. Stephen C. Johnson, Ph.D., Orthopedic Biomechanics Institute, Salt Lake City, Utah

Biomechanics of second impact catastrophic brain injury. Glenn W. Kindt, M.D., University of Colorado Health Sciences Center.

1969 – 1993

1980 - The National Federation of State High School Associations required use of helmets certified to the NOCSAE standard.

1992 – An implementation of a scientifically proven calibration method of the NOCSAE headform using the 3 – inch MEP is introduced. Required calibration performed before testing, produces increased repeatability between laboratories. This change was mandatory for all NOCSAE licensees. The NOCSAE carriage assembly was made more rigid, and the air craft cable guide wires were replaced with smoother music wire. This decreased friction in the drop system and increased stability of the carriage assembly throughout the drop impact. A tapered bolt for locating the different impact sites was introduced. The test MEP was hardened from a 36 Shore A hardness natural rubber surface to a 43 Shore A hardness urethane to produce a more consistent impact surface. These changes resulted in significantly higher impact velocities and increased impact energies to the helmet, a more demanding test than in the previous standard. The impact energies and the velocities were increased to the point that sophisticated testing headforms were being broken and had to be redesigned and replaced at a cost of $350,000.

1978 – National Collegiate Athletic Association rules mandated the use helmets certified to the NOCSAE standard.

1977 – NOCSAE adopted specific standards for recertifying helmets.

1973 – NOCSAE adopted football helmet standards.

1970 – The work of establishing a football helmet standard began.

Head and neck injury and injury prevention. Voigt R. Hodgson, Ph.D., Guardjian-Lissner Biomechanics Lab, Dept. of Neurosurgery, Wayne State University School of Medicine, Detroit, Mich.

1969 - The National Operating Committee on Standards in Athletic Equipment was formed.