U.S. Consumer Product Safety Commission
LOG OF MEETING

SUBJECT: NOCSAE Standards Advisory Committee Meeting

DATE OF MEETING: October 17, 2019

LOG ENTRY SOURCE: Rick McCallion, EXHR

DATE OF LOG ENTRY: 15 January 2019

LOCATION: Chapel Hill, NC

CPSC ATTENDEE(S):

Name	Office
Rick McCallion	EXHR

NON-CPSC ATTENDEE(S):

Name	Company
See NOCSAE Meeting Minutes attached	

NOCSAE Scientific Advisory Committee
10/17/2019
The Carolina Inn - Chapel Hill, NC
8 AM – 3:30 PM

Attendees

Robert Cantu, MD [SAC Chair] – Fred Mueller, PhD [NOCSAE] – Steve Rowson, PhD [Virginia Tech] – Rick Greenwald, PhD – Rick McCallion [CPSC] – David Camarillo, PhD [Stanford] – Blaine Hoshizaki, PhD [University of Ottawa] – Pat Bishop, PhD – Dave Halstead [SIRC/NOCSAE] – Ken Stephens, MD [NOCSAE] – Melinda Cook [NOCSAE] – Mike Oliver [NOCSAE] – Elizabeth McCalley [SIRC/NOCSAE]

Remotely: Steve Olvey, MD – Kelly Sarmiento [CDC]

Absent: Margo Putukian, MD [Princeton] – Tom Gennarelli, MD – Kristi Arbogast, PhD

Cantu: Introduction and Presentation

- History and purpose of Scientific Advisory Committee
- Review of current and draft NOCSAE Football Helmet Standards [ND002 and ND006]
- Reasons why NOCSAE should pursue a scientifically valid Youth Football Helmet Standard

Halstead: Presentation on why the NOCSAE Youth Football Helmet Standard has not progressed past "DRAFT" status

Many youth helmet standard questions remain unanswered due to lack of scientific evidence, and the youth helmet standard should not move forward until some of these questions can be answered.

- Should helmets have a mass limit?
- Should the pass/fail metrics be different? If yes, what should they be?
- What age or age ranges should a youth standard target?
- What impact energies? Should the drop test and pneumatic ram test have different impact energies?
- Should a smaller headform be developed for those players under 10 years old?

Hoshizaki: Presentation

"Establishing Test Paramenters for American Youth Football Helmets"

Overview of University of Ottawa research funded by the SAC committee based on video analysis and biomechanical analysis of youth head impacts

- Broken into 2 age ranges – 5-9 and 9-14 year olds
- The highest percentage of impacts for the 5-9 range occur from head to head impacts
    - The highest magnitude impacts occur from helmet to ground impacts because the players are not skilled enough to protect themselves during a fall

- The highest percentage of impacts for the 9-14 range occurs from helmet to helmet impacts, but there are far more helmet to shoulder impacts for this group due to change in head size to body size relationship
    - High magnitude impacts also occur during helmet to ground because this group still cannot completely protect themselves during a fall
- Relationship between neck stiffness and level of brain trauma were not consistent and was dependent on impact location, striking mass, and impact velocity
- Youth players concussion symptoms at lower magnitudes of strain when compared to adults
- All but one concussive event fell within the low and medium level of injury risk

Suggestions for updated youth football helmet standard

- Decreased inbound velocity for both tests
    - Drop test: 4.5 - 5.0 m/s
    - Pneumatic Ram: 5.0 - 5.5 m/s
- Reduce ram mass from 13 kg to 5.0 - 8.0 kg
- Reduce pass/fail requirements for both drop test and pneumatic ram
- Limit helmet mass to 0.8 kg
- Limit the circumference of the helmet (30.0 inches)

Rowson: Presentation

"Research Initiatives to Inform the Development of a Youth Football Standard"

Overview of Virginia Tech research funded by the SAC committee based on biomechanical data and clinical data

- 114,001 head impacts measured from 415 subjects
- Impacts were recorded using HITS and verified through video analysis

Biomechanics of Youth Concussion

- 15 Youth concussions measured with average accelerations of 62 +/- 30g and 2609 +/- 1591 rad/s^2
- Concussive impacts were among the highest magnitude accelerations within **each player's** impact history. These impacts do not always stand out when analyzing the data as a whole.
- 105 Varsity concussions measured with average accelerations of 102 +/- 34 g and 3977 +/- 2272 rad/s^2

Youth Impact Conditions

- Paired impact velocity with head acceleration for >200 on-field head impacts [Video Analysis]
    - Helmet to helmet: n=148
    - Other: n=55

- Relationship between impact velocity and acceleration (linear or rotational) varies by impact type.
- Proposed 5.2 m/s velocity in ND002 is 94th percentile of on-field velocity measurement for 9-14 year olds. 5.2 m/s is associated with ~80 g and 4000 rad/s^2
- Possible refinements to standard could be reducing pass/fail criteria based on risk
- Proposed standard impacts are equivalent to 98th percentile on-field head impact

Suggestions:

- Adjust head/neck interface to better match anthropometry
- Reduce ram mass

Bishop: Discussion on Helmet COR

Canadian Standards Association considering Coefficient of Restitution as an additional pass/fail metric for hockey helmets

Measured COR of 27 hockey helmets and found them to be in a range of .33 to .44

COR determined by dropping from 80 cm on the side onto a flat steel anvil and then integrating the acceleration/time curve. COR and peak linear acceleration were not well correlated.

Halstead: SIRC completed COR testing on some football helmet samples. Results generally showed lower COR with lower peak linear acceleration but more work would need to be done to determine true trends.

Olvey: Presentation on Head/Neck Anthropometry

- Overview of Anthropometric study completed at 2004 USSA summer camp in Park City, Utah
    - 128 Ski/Snowboard Athletes – 24 females and 104 males
- Overview of Anthropometric Measurements from University of Michigan School of Dentistry of 95 children ages 6-17
- Suggestions/Concerns
    - Limit helmet mass
    - Due to lack of skull calcification in young children, helmet liners should not become too dense

Suggested changes to NOCSAE Doc 006 for presentation to Standards Committee at Winter NOCSAE Meeting

- Add the following definitions:
    - Youth Play: Football played by persons who have not yet reached high school.
    - Youth Player:
        - Under 10
        - 10 and over and meeting criteria of youth play

- Helmet mass should be limited to 3.5 lbs for the Under 10 Youth Player
- The impacting ram should be reduced to 5.0 kg

    - Dr. Camarillo expressed reservations about reducing the mass of the impactor ram and believes the change will be costly and unnecessary. He stated reducing the impact velocity could have the same effect.
    - Ms. McCalley was concerned with the feasibility of modifying the current pneumatic ram to accept a 5 kilogram impactor ram as creating a new machine for youth testing will be costly if the current machine can't be modified.
- The rotational acceleration pass/fail criteria should be reduced to 2000 – 3000 rad/s^2
- The pneumatic ram impact velocity should be reduced to 5.0 m/s

Respectfully submitted,

Elizabeth McCalley