Free Communications, Oral Presentations: Impact of Preseason on Exertional Heat Illness
Wednesday, June 26, 2013, 9:15AM-10:15AM; Palm C; Moderator: Kristin Kucera, PhD, ATC

The Georgia Study: The Risk of Exertional Heat Illnesses in High School Players
Ferrara MS, Cooper ER, Miles JD, Curry PR, Grundstein A, Casa D, Powell JP: The University of Georgia, Athens, GA

Context: Exertional heat illness (EHI) is a fairly common occurrence in football particularly in the first couple of weeks of the pre-season with heat cramps accounting for about 75% of all EHI cases while heat exhaustion and heat syncope (HS/HE) accounted for the remaining 25%. Numerous investigators have posed various preventive measures to reduce the rate of EHI but it is difficult to develop a direct cause and effect relationship between variables and reducing the illness rate. The purpose of this study was to evaluate the incidence rates of EHI’s during football and to determine if there was a relationship between the rate of EHI, the week of practice and the environment. Design: Prospective observational epidemiological design. Setting: Interscholastic (IS) institutions (Georgia High School Association members) representing 5 geographical regions (North, Central, Metro Atlanta, Southeast, and Southwest). Participants: IS football players from 23 schools in the state of Georgia for the 2009 – 2011 seasons, during the months of August and September. Interventions: EHI types were recorded by athletic trainers for their respective schools. EHI definitions were based on the NATA position statement: heat cramps (HC), heat exhaustion (HE), heat syncope (HS), and heat stroke (STR). There were no recorded STR’s during the 3-year period. Main Outcome Measures: EHI’s were recorded during all practice, conditioning, and game activities held during the 3-year reporting period. Any EHI that resulted in a participant being restricted from continuation of activity constituted an occurrence. The overall EHI’s was calculated and the HS and HE variables were combined into one variable (HS/HE). IR was calculated with 95% confidence intervals (CI). Results: There were 651 reported EHI occurrences with 200,937 athlete-exposures (AE) recorded for an overall IR of 3.24/1000AE (95%CI=3.00, 3.50). For HS/HE, there were a total of 174 reported cases for an overall IR of 0.87/1000AE (95%CI=0.74, 1.00). We found that 49% (IR=1.84/1000AE; 95% CI=1.46, 2.29) of the HS/HE cases occurred during the first week of practice 23% (IR=1.55/1000AE; 95%CI=1.10, 2.12) in week 2, 11% (IR=0.74/1000AE; 95%CI =0.44, 1.17) in week 3 and 9% (IR=0.63/1000AE; 95%CI=0.35, 1.06) in week 4. We also found that 79% of the EHI’s occurred at a WBGT less than 30°C WBGT during the course of the project and for the first week of practice, 61% of the EHI’s occurred at a WBGT of less than 30°C. Conclusion: To our knowledge, this was the first ever, large-scale study directly relating to IS football players where EHI was related to WBGT. This data is of paramount importance in seeking to determine where the risks are greatest and what variables may be changed or manipulated to make sport activities in the pre-season period safer for the participants. We found that the significant EHI cases (HS/HE) occurred during the first 2 weeks of practice at WBGT that is not considered extreme. As EHI policies are developed, the first two weeks provided the greatest risk of HS/HE case and all preventive measures should be employed to mitigate these risks.

Athletic Trainer Staff Size, Number Of Exertional Heat Illness Events, And Use Of Exertional Heat Illness Prevention Strategies In US High School Football Programs
Kerr ZY, Casa DJ, Comstock RD, Marshall SW: University of North Carolina, Chapel Hill, NC; University of Connecticut, Storrs, CT; The Research Institute at Nationwide Children’s Hospital, Columbus, OH

Context: An estimated 6,500 high school football student-athletes are treated annually for exertional heat illness (EHI). Variable athletic trainer (AT) coverage may lead to disparities in implementing EHI prevention strategies. Lack of AT coverage may also lead to an increase in the frequency of EHI events. Objective: To compare the prevalence of EHI prevention strategies and number of EHI events in the 2011 high school football pre-season between high school programs staffed by one AT versus multiple ATs. Design: Cross-sectional study. Setting: NATA-affiliated ATs providing care to high school football student-athletes during the 2011 pre-season. Patients or Other Participants: We contacted 6,343 ATs that provided care to football student-athletes in the 2011 pre-season from a membership list provided by the NATA. ATs completed the online questionnaire (n=1,137; 17.9%). Our sample represented ATs from all 50 US states not considered high risk for pre-season EHI events. Most were male (51.8%), had over 10 years experience (57.9%), and had an average age of 37.0 years (±10.2). Interventions: ATs answered questions via an online questionnaire pertaining to: number of ATs, high schools’ demographics, EHI prevention strategies implemented (e.g., cold water immersion,
Demographics of Exertional Heat Illnesses Among Interscholastic Football Athletes During August/September: A 3-Year Study
Cooper ER, Miles JD, Curry PJ, Grundstein A, Ferrara MS: The University of Georgia, Athens, GA

Context: American interscholastic (IS) football players encounter many different illnesses/injuries during pre-season practice sessions in the summer months. Exertional heat illness (EHI) is one area of concern. Questions have been raised as to whether or not these EHI occurrence risk rates vary among player demographics; academic class of the participants, their specific position on the team, and the level of play.

Objective: To determine who is sustaining EHI’s among IS football participants with respect to academic rank, player position, and level of participation on the team for IS institutions in the state of Georgia.

Design: Prospective observational epidemiological design. Setting: Interscholastic institutions (Georgia High School Association members) representing 5 geographical districts (North, Central, Metro Atlanta, Southeast, and Southwest). Participants: IS football players from 23 schools in the state of Georgia for the 2009 – 2011 seasons, during the months of August and September. Interventions: EHI types were recorded by athletic trainers for their respective schools. EHI definitions were based on the NATA position statement: heat cramps (HC), heat exhaustion (HE), heat syncope (HS), and heat stroke (STR). There were no recorded STR’s during the 3-year period. Overall EHI’s (OEHI), HE and significant EHI’s (HS and HE) were tabulated as one variable due to low numbers of HS were calculated (SEHU).

Main Outcome Measures: EHI’s were recorded during all practice, conditioning, and game activities held during the 2 month reporting period. Any EHI that resulted in a participant being restricted from continuation of activity constituted an occurrence. Results: A total of 652 EHI’s (477 HC, 175 SEHI’s) were recorded over the 3-year period. Percent of overall OEHI and percent of SEHI cases reported by academic class were: freshman (OEHI=11%, SEHI=18%), sophomore (OEHI=23%, SEHI= 30%), juniors (OEHI=26%, SEHI=26%) and seniors (OEHI=40%, SEHI=26%). By offensive player position, linemen had the greatest number of episodes (OEHI=35%, SEHI=51%), followed by running backs (OEHI=31%, SEHI=22%) and wide receivers (OEHI=20%, SEHI=16%). Defensively, linemen once again had the greatest occurrences (OEHI=39%, SEHI=61%), followed by defensive backs (OEHI=34%, SEHI=18%) and linebackers (OEHI=28%, SEHI=21%). Level of play indicated “starters” represented the largest number of recorded EHI’s (OEHI =72%, SEHI=54%), followed by “substitutes” (OEHI=27%, SEHI=45%) and non-players (OEHI=1%, SEHI=1%). Conclusion: This data demonstrates specific player characteristics which can be used by the athletic trainer to determine higher risk populations to monitor during pre-season, regular practice sessions and games. Observationally, linemen (offensive & defensive) experience a higher number of SEHI’s than all other positions. In addition, participants who are labeled “starters” had a greater occurrence of OEHI than “substitutes”, however the risk for SEHI’s were similar between these two groups. Athletic trainers can use this data to formulate strategies to reduce EHI occurrence among these target groups. This project was funded by the NATA Research & Education Foundation.
Acclimatization In Georgia Interscholastic Football Players: A Three-Year Perspective
Miles JD, Curry PJ, Cooper ER, Grundstein AJ, Ferrara MS: The University of Georgia, Athens, GA

Context: Proper acclimatization can mitigate the risk of exertional heat illness (EHI) during the pre-season period. Physiologic changes due to acclimatization begin to take place within the first 3-5 days of heat exposure and continue for up to 2-3 months. However, there have been minimal field-based studies to determine the actual acclimatization period for interscholastic (IS) football players. Objective: To evaluate acclimatization trends in IS football players in Georgia. Design: Prospective epidemiological design. Setting: Interscholastic institutions from 5 geographic regions in the state of Georgia (North, Metro Atlanta, Central, Southeast, Southwest) Participants: IS football athletes from 23 schools in Georgia for August, 2009-2011 seasons. Interventions: An ATC was identified at each school and recorded all athlete-exposure (AE), EHI, and practice duration data. EHI types were identified as heat cramps (HC), heat exhaustion (HE), heat syncope (HS), and heat stroke (STR) as defined by the National Athletic Trainers’ Association Position Statement. Due to the low number of HS’s, HS and HE were combined to form one variable (HS/HE). Main Outcome Measures: The dependent variable was EHI occurrences (HS/HE) and the independent variables were practice week and practice duration. Injury rates (IR) were calculated using the following equation: number of injuries/number of athlete exposures (AE) x 1000 with 95% confidence intervals (CI). Results: In August, there were 141 HS/HE’s recorded and 106,782AE for three seasons resulting in an overall IR of 1.32/1000AE (95%CI=1.10, 1.54). IR’s for HS/HE were highest in week 1, 1.84/1000AE (95%CI=1.45, 2.30) and were 1/3 of that by week 4, 0.63/1000AE (95%CI=0.34, 1.09). During week one, the IR was 1.04/1000AE (95%CI=0.53, 1.85) for practices <120 min., but the rate increased 2.5 times for practices lasting 120-150 min. (2.41/1000AE, 95%CI=1.61, 3.48) and increased 4.5 times for practices lasting e”3 hrs. (4.72/1000AE, 95%CI=1.79, 5.15). For week two of practice, the IR was 0.50/1000AE (95%CI=0.16, 1.20) for practices lasting up to 150 min., showing 30 minutes of acclimatization. For the third week, another 30 minutes of acclimatization was seen for a 180-minute practice session (0.85/1000AE, 95%CI=0.58, 1.21). Conclusion: These data are the first to demonstrate acclimatization in adolescents in a field-based setting. The first two weeks of practice had the greatest risk of EHI. For the first week, practices lasting longer than 120 minutes, and those lasting longer than 150 minutes in the second week demonstrated an increased risk. Importantly, these data show acclimatization from the first week to the second week, with both a decrease in the HS/HE IR’s from week 1 to week 4 along with athletes’ ability to acclimatize, withstanding an additional 30 minutes of practice per week through. Speeding up practices and other authorities should use this data to create acclimatization guidelines for football, decreasing serious EHI events. This project was funded by the NATA Research & Education Foundation.

A Climate Assessment Of Best Football Practice Times
Grundstein A, Cooper E, Miles JD, Curry PR, Ferrara MS: University of Georgia, Athens, GA

Context: Football players are among the most susceptible athletes to heat-related illnesses. Practices are variously held in the morning and/or afternoon but no study has examined from a climate perspective which time of the day provides the safest training conditions with regard to heat exposure. Objective: To determine the best times to schedule football practices to minimize exposure to oppressive heat. Design: Observational study. Setting: Weather stations across the United States. Patients or Other Participants: None. Interventions: A 15-year climatology (1991-2005) of August wet bulb globe temperatures (WBGT) across the United States was computed for 217 locations across the contiguous United States using weather station observations and a physically-based WBGT model. Main Outcome Measures: The ACSM (2007) WBGT guidelines were used to determine the risk categories. We examined six, 3-hour training session times (6-9 a.m., 7-10 a.m., 8-11 a.m., 3-6 p.m., 4-7 p.m., 5-8 p.m. LDT) to identify how the WBGT varies with the time of day the practice session was held and how frequently the WBGT exceeded key ACSM safety thresholds where practices would need to be limited (30.1°C) or canceled (32.3°C). Results: Across the country, morning practices had lower WBGT values and a lower frequency of exceeding ACSM safety standards than afternoon practice times. Climatologically, WBGTs were lowest for 6-9 a.m. practices and greatest for those at 3-6 p.m., with WBGT values averaging almost 7°C greater during the 3-6 p.m. session. Starting a morning practice one (two) hours after 6 a.m. increased the WBGT by an average of 1.7±0.5°C.
(3.7±0.9°C). Importantly, only a small percentage of hours (<2.5%) exceeded the critical 32.3°C threshold for canceling practice at any station for 6-9 a.m. sessions, increasing up to a maximum of 10% between 8-11 a.m. Afternoon practice sessions more frequently exceeded safety standards with some locations experiencing up to 20% (66%) of hours exceeding the 32.3°C (30.1°C) thresholds. Starting the practice session one (two) hours after 3 p.m., resulted in an average decrease in WBGT of 0.8±0.2°C (1.9±0.3°C). Further, delaying the start time by one (two) hours decreased the percentage of exceedance relative to the 3-6 p.m. period by 40±9% (70±9%) for the 32.3°C threshold and 35±6% (66±8%) for the 30.1°C threshold for those stations (+1 standard deviation) with the greatest percentage of hours that exceeded the ACSM thresholds. **Conclusions:**

Climatologically, mornings from 6-9 a.m. are the best times to practice to minimize exposure to oppressive heat. While afternoons are hotter, delaying the start of practice a few hours may substantially reduce the likelihood of oppressive conditions and the probability of a practice being limited or cancelled.