Heat Illness in Football Athletes

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Abstract

Purpose: The primary objective was to monitor core temperature and symptom variation among football linemen during morning and afternoon practices, in the first, second, and third practice of various division I intercollegiate football teams.

Methods: Ingestible thermistors were swallowed by division I football players prior to practices during the first week of two-a-day practices for the three consecutive years. Athletes were monitored during practice for core temperature, clinical heat illness, weight changes, environmental data, and subjective symptoms (Heat Illness Symptom Index (HISI)).

Results: Mean core temperatures were 38.0°C and 38.2°C during the morning and afternoon practices, respectively. Temperature practice revealed higher mean core temperature gain of 0.77°C compared to afternoon (0.44°C). The morning practices had higher average environmental temperatures (30-30.5°C) The average time to T max was 1 hour and 48 minutes during morning and 2 hours and 15 minutes for afternoon practices. Offense linesmen trended toward higher mean core temperatures than defensive (0.47 vs. 0.3°C). Additionally, the rise in the core temperature was significantly greater in the morning practices (p=0.04). Finally, a significant decrease in the slope of core temperature was seen from the 1st to the 2nd hour of the morning practice (p=0.48). Biostatistical analysis of symptom data and relation to core temperature are underway.

Conclusion: Significant core temperature elevations, even in asymptomatic athletes are common in the extreme heat of Florida during practices. The higher morning temperature changes may be attributed to increased intensity and equipment burden seen during morning practices. The significant drop in core temperature seen during breaks and with more aggressive cooling seen in morning practices and is countervailed by the retained heat from the previous day, possibly related to the previously swallowed thermistors. More research is indicated in understanding the complex interplay of human thermoregulatory physiology and symptomatology.

Key Words: Temperature, heat illness, heat stroke, heat exhaustion, thermoregulation

Results

Total Data Points: 5552
Number of Players: 66
Hours per player: 4.8 hours
Average practices/ player: 6

Table Data Points

<table>
<thead>
<tr>
<th>Variables</th>
<th>AM Practices</th>
<th>PM Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB vs. DB + WR</td>
<td>p&lt;0.05</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>DL vs. DL + WR</td>
<td>p&lt;0.05</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>DL + WR vs. OB</td>
<td>p=0.002</td>
<td>p=0.62</td>
</tr>
<tr>
<td>OL vs. OB</td>
<td>p=0.004</td>
<td>p=0.004</td>
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<tr>
<td>OL vs. DL</td>
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</tr>
</tbody>
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Discussion

Exertional heat stroke is the third leading cause of death in United States high school athletes. Gastrointestinal temperature monitoring is a growing trend in heat illness prevention in athletes exercising in the heat. Wireless monitoring is particularly effective in field work where monitoring can be critical and interference with normal play is not acceptable. Other means of monitoring athletes for heat illness risk remain desirable, particularly on the youth fields of summer and fall fields throughout the United States. With substantial data acquisition over the last two years of monitoring our athletes during two-a-day practices, we have been able to demonstrate significant relationships, position specific tendencies, and some predictors of elevated TGI. Further study is indicated in better understanding the complex interplay of human thermoregulatory physiology and symptomatology.

Conclusion

Football athletes obtain significantly elevated TGI with overexertion in extreme heat and humidity even when clinically asymptomatic. Typically, athletes obtain higher core temperatures in sun practices with full pads and more intense activity sessions. TGI is higher at the initiation of practice, possibly related to retained heat stores from non-practice. Athlete’s risk of exertional heat stroke is increased if practice TGI is greater than 37°C for 30 minutes. There is a statistically significant correlation between TGI, and symptom scores on the Heat Illness Symptom Index taken the same day after practice.

TGI by Player Group