Long, Hot Summer: A Preliminary Investigation of Seasonal Variations in the Physical Fitness Performance Of Law Enforcement Recruits in Southern California

Bloodgood, Ashley M.; Moreno, Matthew R.; Dulla, Joseph; Heredia, Caitlin; Heredia, Javier; Dawes, Jay J.; Orr, Rob Marc; Lockie, Robert G.

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Long Hot Spring: A Preliminary Investigation of Seasonal Variations in the Physical Fitness Performance Of Law Enforcement

INTRODUCTION

• Law enforcement agencies (LEA) conduct physical testing to assess readiness of recruits prior to the start of academy training (1). The LEA in this study uses a test battery called the Validated Physical Ability Test (VPAT) on set dates during the year- typically performed outdoors. Warmer ambient temperatures can negatively affect physical performance via increased heat stress and decreased time to muscular fatigue (2). Previous studies on performance in hot environments have shown impairments for recruit performance. The purpose of this study was to determine whether seasonal differences in temperature and relative humidity impacted LEA recruit performance during their VPAT+ fitness assessment.

• Retrospective analysis was conducted on data from four courses during different environmental seasons. The physical fitness conditions for each season are displayed in Table 1. Ambient temperatures and humidity percentages were obtained via meteorological records (4).

• The sample included 375 recruits from one LEA.

• Both the VPAT+ performed in the week prior to the start of academy and consisted of: push-ups and sit-ups completed in 60 s; seated medicine ball throw with a 2 kg ball (MBT, vi); arm ergometer revolutions in 60 s; VPAT+− class temperatures, and humidity percentages could have implications for recruit performance. The purpose of this study was to determine whether seasonal differences in temperature and relative humidity impacted LEA recruit performance during their VPAT+ fitness assessment.

METHODS

• Retroactive analysis was conducted on data from four courses during different environmental seasons. The physical fitness conditions for each season are displayed in Table 1. Ambient temperatures and humidity percentages were obtained via meteorological records (4).

• The sample included 375 recruits from one LEA.

• Both the VPAT+ performed in the week prior to the start of academy and consisted of: push-ups and sit-ups completed in 60 s; seated medicine ball throw with a 2 kg ball (MBT, vi); arm ergometer revolutions in 60 s; VPAT+− class temperatures, and humidity percentages could have implications for recruit performance. The purpose of this study was to determine whether seasonal differences in temperature and relative humidity impacted LEA recruit performance during their VPAT+ fitness assessment.

• Significant differences were found between the seasons in specific VPAT+ tests, and the descriptive data is displayed in Table 2.

• For the push-ups, WIN and SUM performed 16% and significantly better than SPR. In the MIB, SUM performed 18% better than FALL. Regarding the arm ergometer, SPR and SUM performed 8%-9% better than WINTER, while SUMMER performed 11% better than FALL. WIN performed significantly better than SUM, SPR, and FALL in the MFT, completing 18% better, and 16% more shuttle runs.

• No significant differences were found in sit-ups, vi, and the VPAT+.

RESULTS

• Significant differences were found between the seasons in specific VPAT+ tests, and the descriptive data is displayed in Table 2.

• For the push-ups, WIN and SUM performed 16% and significantly better than SPR. In the MIB, SUM performed 18% better than FALL. Regarding the arm ergometer, SPR and SUM performed 8%-9% better than WINTER, while SUMMER performed 11% better than FALL. WIN performed significantly better than SUM, SPR, and FALL in the MFT, completing 18% better, and 16% more shuttle runs.

• No significant differences were found in sit-ups, vi, and the VPAT+.

CONCLUSIONS

• Warmer ambient temperatures, coupled with high relative humidity, could have negatively affected recruit performance. This was indicated by Maughan et al. (4), who found that a reduced rate of heat loss at high levels of humidity, coupled with warmer temperatures, progressively impaired exercise capacity.

• It should be noted that variability in VPAT+ performance across the seasons could be due to class-to-class fitness variations in recruits. However, WIN was still significantly better in the MFT, which is a maximal running test. Warmer temperatures can increase cardiovascular strain, while humidity can decrease sweat evaporation rates. Both factors can result in an increased rate to fatigue and poorer performance on the MFT. A decrease in cardiovascular output due to heat stress in warm and humid environments can prevent adequate blood flow to the skeletal muscle and has been shown also decrease VO2peak (4).

• A recruit’s performance in fitness assessments could impact possible employment. Ambient weather conditions could have a significant influence on how a recruit performs during fitness assessments, potentially playing a role in the hiring process (3).

• LEA staff may need to consider ambient temperatures and humidity during tests such as the VPAT+ due to possible adverse effects on recruit performance, and this is particularly true for maximal running tests.

Table 1: Ambient Temperatures and Humidity Percentages across the four seasons.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Summer</th>
<th>Fall</th>
<th>Winter</th>
<th>SPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>22-28°C</td>
<td>18-26°C</td>
<td>22-29°C</td>
<td>21-25°C</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>30-35</td>
<td>22-30</td>
<td>10-20</td>
<td>6-14</td>
</tr>
<tr>
<td>Humidity (%)</td>
<td>36-95</td>
<td>55-75</td>
<td>25-45</td>
<td>10-20</td>
</tr>
</tbody>
</table>

Table 2: Descriptive data (mean ± SD) between seasons and VPAT+.

<table>
<thead>
<tr>
<th>Test</th>
<th>Fall</th>
<th>WIN</th>
<th>SUM</th>
<th>SPR</th>
<th>FALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push-ups</td>
<td>41.23 ± 16.02</td>
<td>41.15 ± 13.41*</td>
<td>38.54 ± 13.58</td>
<td>44.99 ± 17.78*</td>
<td></td>
</tr>
<tr>
<td>Sit-ups</td>
<td>35.06 ± 8.62</td>
<td>35.79 ± 10.17</td>
<td>36.66 ± 12.94</td>
<td>37.71 ± 9.77</td>
<td></td>
</tr>
<tr>
<td>MIB (cm)</td>
<td>5.71 ± 3.34</td>
<td>6.16 ± 1.11</td>
<td>6.15 ± 1.46</td>
<td>6.27 ± 2.28</td>
<td></td>
</tr>
<tr>
<td>Arm Erg. (watt)</td>
<td>51.49 ± 12.89</td>
<td>54.20 ± 12.30</td>
<td>53.33 ± 14.75</td>
<td>55.58 ± 12.64</td>
<td></td>
</tr>
<tr>
<td>75 PR (sec)</td>
<td>17.32 ± 1.74</td>
<td>16.79 ± 1.95</td>
<td>17.01 ± 1.15</td>
<td>17.42 ± 1.40</td>
<td></td>
</tr>
<tr>
<td>MFT (minutes)</td>
<td>17.32 ± 1.74</td>
<td>16.97 ± 1.95</td>
<td>17.01 ± 1.15</td>
<td>17.42 ± 1.40</td>
<td></td>
</tr>
</tbody>
</table>

*Significantly (p<0.05) different than SPR. †Significantly (p<0.05) different than FALL. **Significantly (p<0.05) different than SPR. ‡Significantly (p<0.05) different than FALL. WIN, and SPR.