The acute effect of specific exercise intensities on plasma testosterone and cortisol concentrations

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THE ACUTE EFFECT OF SPECIFIC EXERCISE INTENSITIES ON PLASMA TESTOSTERONE AND CORTISOL CONCENTRATIONS

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INTRODUCTION

Previous research has shown that the hormonal response to exercise varies dramatically with exercise modality, intensity and duration. Testosterone levels have been shown to increase in exercise of short to moderate duration (Cadoux-Hudson et al., 1985) and decrease in long term endurance events and over the course of a period of heavy training (Vervoorn et al., 1991). It has been suggested that cortisol levels only rise significantly in response to high intensity aerobic exercise, chronic exercise stress and heavy resistance exercise (Rowbottom et al., 1995). The aim of this study was to examine the response of plasma testosterone and cortisol to 30 min of cycle exercise at intensities below, at and above the individual D-max lactate threshold (LT$_{Dmax}$) (Weekes et al., 1996).

METHODS

Fourteen subjects consisting of cyclists and triathletes performed four cycle ergometer exercise tests, 1) an incremental test to exhaustion to determine the workload corresponding to the LT$_{Dmax}$, 2) 30 min of exercise at a workload corresponding to the LT$_{Dmax}$, 3) 30 min of exercise at a workload 15 watts below the LT$_{Dmax}$, and 4) 30 min of exercise at a workload 15 watts above the LT$_{Dmax}$. Venous blood samples were taken at rest, after 5 and 10 min of exercise and 10 min after the cessation of exercise (post sample) to determine the plasma testosterone and cortisol concentrations.

RESULTS AND DISCUSSION

The blood testosterone concentration for all three of the prolonged exercise tests increased up to the tenth minute of exercise and then decreased to the post exercise sample. Whilst the testosterone concentration above the D-max workload had the highest values at rest, 5 and 10 min, this workload also had the lowest post value. In all cases, the largest increase in testosterone levels appeared from rest to 5 min.

Table 1. Means ± SD for Testosterone Concentration at Rest, 5 min, 10 min and Post for the Three Prolonged Exercise Tests

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Testosterone (nmol·L$^{-1}$)</th>
<th>Below D-max</th>
<th>At D-max</th>
<th>Above D-max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest</td>
<td>20.29 ± 5.73</td>
<td>19.80 ± 7.37</td>
<td>22.12 ± 5.08</td>
<td></td>
</tr>
<tr>
<td>5 min</td>
<td>26.46 ± 7.84</td>
<td>25.78 ± 8.13</td>
<td>27.99 ± 7.03</td>
<td></td>
</tr>
<tr>
<td>10 min</td>
<td>30.17 ± 9.53</td>
<td>28.96 ± 8.06</td>
<td>30.34 ± 8.20</td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td>27.12 ± 9.01</td>
<td>28.72 ± 9.10</td>
<td>23.79 ± 8.87</td>
<td></td>
</tr>
</tbody>
</table>

Although the largest increase in blood testosterone levels appeared from rest to 5 min, this increase did not differ significantly among the three intensities. When using a time effect in the statistical analysis though, a significant difference was discovered between rest and 10 min, 5 min and 10 min, and 10 min and post. The only increase in blood testosterone levels that were significantly different among the three intensities were the rest and post samples between the below and above D-max workloads.
The blood cortisol concentration below, at and above the D-max workload all showed varying responses over the duration of the prolonged exercise tests. Despite some large differences between blood cortisol concentrations at the different time points, these differences did not significantly vary among the three intensities at any of the time points. No significant differences were found between rest and 5 min, rest and 10 min, rest and post, 5 and 10 min and 10 min and post among the three intensities.

**Table 2** Means ± SD for Cortisol Concentration (nmol.L⁻¹) at Rest, 5 min, 10 min and Post for the Three Prolonged Exercise Tests

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Cortisol (nmol.L⁻¹) Below D-max</th>
<th>At D-max</th>
<th>Above D-max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest</td>
<td>530.8 ± 335.7</td>
<td>356.0 ± 200.5</td>
<td>421.2 ± 341.4</td>
</tr>
<tr>
<td>5 min</td>
<td>298.2 ± 349.9</td>
<td>434.1 ± 210.5</td>
<td>1052.8 ± 771.3</td>
</tr>
<tr>
<td>10 min</td>
<td>585.0 ± 362.7</td>
<td>513.3 ± 313.8</td>
<td>762.7 ± 422.0</td>
</tr>
<tr>
<td>Post</td>
<td>542.1 ± 342.8</td>
<td>496.5 ± 459.9</td>
<td>954.2 ± 715.2</td>
</tr>
</tbody>
</table>

**CONCLUSION**

The results of this study have shown that cycle exercise at intensities ranging from 15 watts above to 15 watts below the D-max threshold do not produce significant variations in plasma testosterone and cortisol concentrations.

**REFERENCES**


