Autonomic Nervous System, Cardiovascular and Circulatory Effects of Cool, Neutral and Warm Water Immersion

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Abstract

Background

Heart Rate Variability

Vagal PSD Autonomic Change

HF Power Spectral Change

Male vs. Female Sympathovagal Balance Change

Great Toe Medial Surface Blood Flow Change

Mean Heart Rate Change

Mean Systolic & Diastolic Pressure Changes

Conclusions

References

Vagal PSD Autonomic Change

Sympatho-vagal Autonomic PSD

Mean Heart Rate Change

References

Study Results

There were marked increases in parasympathetic activity, and decreases in sympathetic activity, with warm water immersion. The changes were rapid, with the largest changes occurring in the first three minutes, and in some cases, lasting throughout the 24-min session. Systolic blood pressure (SBP) remained unchanged throughout the warm water immersion periods, whereas diastolic blood pressure (DBP) and mean arterial pressure (MAP) decreased. Heart rate variability (HRV), as measured by the low frequency (LF) and high frequency (HF) components of the spectral analysis, increased in the warm water immersion periods. This effect was far greater than could be explained by the rise in heart rate.

Subject Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male Average</th>
<th>Male Range</th>
<th>Female Average</th>
<th>Female Range</th>
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<tbody>
<tr>
<td>Age</td>
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<td>21.0</td>
<td>19-23</td>
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<td>Height (cm)</td>
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<td>20.5-27.8</td>
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<td>% Body Fat</td>
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<td>8-25</td>
<td>26.82</td>
<td>25-30</td>
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</tbody>
</table>

Conclusion

Our results showed that warm water immersion had a significant effect on the autonomic nervous system. This effect was seen in a number of ways, including increases in parasympathetic activity, decreases in sympathetic activity, and decreases in blood pressure. These changes were rapid and lasted throughout the 24-min session. The implications of these findings are significant, as they suggest that warm water immersion could be a beneficial intervention for improving cardiovascular health.

References