A comparison of complete blood counts of capillary and venous blood samples in active individuals
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Introduction
Venipuncture, or venous blood sampling is currently the “gold standard” for clinical applications related to the evaluation of hematological and immunological aspects, however it is not ideal for all patients. Numerous patients have inaccessible peripheral veins, including severely burned patients, oncology patients whose veins are restricted for therapeutic procedures, bariatric patients with deep veins, geriatric patients with varicose veins, patients with severe peripheral edema, and recent surgical patients with scars. If a relationship is established between capillary and venous blood, capillary blood via microsampling may be optimal due to greater patient comfort and easier access due to less repeat draws and smaller volumes. A complete blood count (CBC) can be performed to assess the similarities and differences between venous blood and capillary blood at rest, immediately after exercise, and during recovery.

Data Analysis

Visit One
- Medical History
- Par-Q
- Informed Consent
- DXA
- Graded Exercise Test
- Determine VO2 max and VT
- Blood Lactate Sample

Visit Two
- Resting Blood Samples
- 40 min Exercise Protocol
- 0 min Post Blood Samples
- 30 min Post Blood Samples

Visit Three
- DXA
- Graded Exercise Test
- Determine VO2 max and VT
- Blood Lactate Sample

Purpose
Primary purpose: assess the degree of similarity between venous blood and capillary blood at rest, immediately after 40 minutes of moderate-intensity exercise on a stationary cycle ergometer at 90-98% of ventilatory threshold, and 30 minutes after the exercise regimen during recovery
Secondary purpose: explore biological sex CBC differences between venous blood and capillary blood

Participant Demographics
The participants of this study included males and females from the age of 18 to 35 years old. Participants must exercise moderately 5 days per week for 30-60 minutes or exercise vigorously 3 days per week for 20-60 minutes to qualify. Athletes who performed a combination of both moderate and vigorous exercise were also accepted.

Discussion
- The correlation coefficients for lymphocyte, neutrophil, monocyte, and overall white blood cell counts in venous and capillary blood are 0.992, 0.992, 0.996, and 0.987, respectively. A correlation coefficient of 1.000 indicates a statistically perfect correlation. Thus, these values indicate that the CBC of capillary blood is strongly associated with that of venous blood.
- There were no significant differences between male and female capillary and venous blood at rest, 0 minutes post-, and 30 minutes post-exercise.
- Based on Figures 1-4, the WBCs increase greatly in response to exercise, which supports prior research focused on the immune response to moderate to vigorous exercise.
- Venous blood samples in Figures 1, 3 and 4 remain approximately the same as or slightly higher than their capillary counterpart conveying a strong, positive correlation between venous and capillary samples.
- Neutrophils (Figure 3) convey a slightly different response than lymphocytes and monocytes as the capillary resting blood sample is slightly higher than that of the venous blood sample. In addition, neutrophils remain relatively constant for the 0 minute post- and 30 minute post-exercise sample while lymphocytes and monocytes gradually decrease following completion of exercise.


Table 1. Participant Demographics

<table>
<thead>
<tr>
<th></th>
<th>Age (SD)</th>
<th>BMI (SD)</th>
<th>Working % VO2 Max (SD)</th>
<th>Working % VT (SD)</th>
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<tbody>
<tr>
<td>Overall Avg.</td>
<td>23.6 (3.8)</td>
<td>26.3 (3.2)</td>
<td>69.7 (7.4)</td>
<td>87.2 (15.3)</td>
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<td>Male Avg.</td>
<td>23.0 (2.8)</td>
<td>27.4 (2.7)</td>
<td>69.8 (7.7)</td>
<td>85.2 (15.5)</td>
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<td>Female Avg.</td>
<td>24.1 (4.7)</td>
<td>25.1 (3.3)</td>
<td>69.7 (7.9)</td>
<td>89.2 (15.8)</td>
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