Calculations

For the current study, we calculated the cardiac power (CP) using the cardiac output (CO) and mean arterial pressure (MAP), following:

\[
\text{Cardiac power (Watt)} = \left( \frac{\text{CO} \times \text{MAP}}{451} \right)
\]

Oxygen consumption was calculated as a measure of energy usage. Here, we assume that all metabolic activity is aerobic, although in an in-vivo setting the metabolism may switch to anaerobic metabolism. \(\text{O}_2\)-content of the blood is given in \(\mu\text{mol/ml}\) and computed as:

\[
\text{\(\text{O}_2\) content} = (0.621 \cdot \text{Hba (g/dL)} \cdot \text{SO}_2)
\]

The \(\text{PO}_2\) was neglected since it has only limited added value in the measurement. The oxygen consumption (MVO\(_2\)) was measured using the arterial and venous \(\text{O}_2\)-content and the coronary blood flow (CBF), following:

\[
\text{MVO}_2 \ (\text{mLO}_2/\text{min}) = (\text{arterial } \text{O}_2 \text{ content} - \text{venous } \text{O}_2 \text{ content}) \times \text{CBF (mL/min)}
\]

The MVO\(_2\) can be converted into energy (1ml \(\text{O}_2 = 20.2\) Joule). For the efficiency we combined the two parameters, CP (W) and MVO\(_2\) (J) following:

\[
\text{Total mechanical efficiency (TME)} = \frac{\text{CP}}{\text{MVO}_2}
\]