5. Project aim

The overall aim of this PhD project is to investigate the effect of different compositions of intense training as part of identifying and qualifying how training structure can be optimized. Specifically, this PhD project investigates the following research questions and hypothesis:

5.1. Research Questions

1. What is the exercise response related to mitochondrial biogenesis, metabolism, angiogenesis and myogenesis in trained human skeletal muscle to speed endurance exercise, endurance exercise and speed endurance combined with endurance exercise?
2. How does muscle fibres from trained runners adapt to a period of speed endurance training and can adaptations be related to changes in running economy?
3. What is the effect of a period of high and low-frequency speed endurance training on short-term performance (<10 min), 10-km performance and muscular adaptations in trained runners accustomed to speed endurance training?
4. What is the effect and time course of reduced training volume after a period of high-frequency speed endurance training on short-term performance (<10 min), 10-km performance, running economy and muscular adaptations in trained runners?
5. Can trained runners further increase short-term performance (<10 min) and 10-km performance if a period of speed endurance training is repeated, and are changes related to alterations in the effect of training on VO_2-max, running economy and the expression of muscle ion transport proteins.

5.2. Hypotheses

1. The exercise response of proteins related to muscle oxidative capacity and substrate regulation is amplified when speed endurance exercise is combined with endurance exercise compared with single-mode exercise, and speed endurance exercise will elicit a similar response as endurance exercise.
2. Fast twitch fibres will adapt to speed endurance training by increased expression of oxidative proteins, which can explain better running economy and improved performance of a standardized 10-km test when slow twitch fibres are in a glycogen depleted condition.
3. High-frequency speed endurance training will lead to muscular adaptations related to Na^+/K^+ transportation and improved running economy together with improved short-term

performance and 10-km performance that are not found with a period of maintained low-frequency speed endurance training.

4. After 16 days of reduced training volume following high-frequency speed endurance training, short-term performance and 10-km performance will be improved, and muscle expression of proteins related to Na^+, K^+ and Ca^{2+} transport will be higher.
5. Short-term and 10-km performance can be further improved if a period of speed endurance training is repeated and changes are related to alterations in the effect of training on running economy and expression of muscle ion transport proteins.