

Introduction: There are questions from 7 seminars. All parts count equally. Manage your time. The answer must be written in English, Norwegian, Swedish or Danish.

Seminar 1: Running Economy

- 1) Define running economy and explain how it can be measured.
- 2) Describe spatiotemporal variables (for example ground contact time, stride rate, stride length) and how they can be measured.
- 3) What mechanisms could explain how spatiotemporal variables may be associated with running economy?

Seminar 3: Biomechanics of overuse injuries

- 1) Describe the loading that may be experienced by lower limb bones, for example the tibia, during running and how this can influence bone remodelling.
- 2) When designing a research project to assess biomechanical risk factors for running overuse injury, what are important factors to consider that would influence the quality of the study?

Seminar 4: Performance analysis in Team sport.

1. Briefly explain what a match analysis is. Discuss how match analysis can contribute to improving team performance.
2. When interpreting the results of match analysis studies, two crucial factors must be considered: the context of the data and the methodology used. Explain why this is important.

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Seminar 6: Integrated performance analysis

1. During a 15-km individual-start cross-country skiing competition, oxygen demand and oxygen uptake interact dynamically as athletes navigate varying terrain (uphill, flat, and downhill sections).
 - a. How do changes in terrain influence the relationship between oxygen demand and oxygen uptake? Describe what happens during uphill sections and immediately after, in a downhill section.
 - b. Explain how skiers use this interplay between oxygen demand and uptake to optimize pacing, tactics, and overall performance.
2. Pacing is a critical determinant of performance in middle- and long-distance running events held on level ground, such as track races (800 m to 5000 m) and road races (half-marathon and marathon).
 - a. Describe pacing patterns that are considered optimal for performance in the 800 m, 5000 m, and marathon.
 - b. Explain the tactical challenges related to pacing faced by a runner with comparatively lower physical capacity in a competitive field.

Seminar 7: Ergogenic aids

A female 100-m sprinter comes to you with a question whether she would benefit from using creatine.

1. Give an overview of the proposed ergogenic mechanisms, quality of scientific evidence and relevance for use of creatine supplementation in her sport.
2. Provide concrete advice for her with respect to supplementation protocol and how to verify if she responds to the supplement.

Seminar 8: Sex differences in oxygen transport and utilization during exercise

1. Briefly describe the main steps in the oxygen cascade and identify which steps most strongly limit maximal oxygen uptake (VO_2max) during whole-body maximal exercise.

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2. Compare the relative roles of the lungs, blood, heart, and skeletal muscles in limiting VO_2max in untrained versus endurance-trained individuals. Explain why the cardiac output is larger in the endurance-trained individual.
3. In well-trained individuals, VO_2max normalized for lean body mass is typically about 10% higher in males than in females. Explain the physiological mechanisms behind this biological sex difference (e.g., cardiac output, hemoglobin concentration, muscle oxidative capacity).

Seminar 9: Strength training

1. Discuss the role of satellite cells in muscle hypertrophy in response to strength training.
2. Explain how satellite cells contribute to the “muscle memory” phenomenon.