Repetition questions – *answers in italics*

1. Which type of training has been shown to reduce the number of ankle injuries in team sports like basketball or soccer?

*Generally, there are many different training studies found in the literature. Main types of training are strength training vs. balance training. With regard to the latter, some authors refer to ‘proprioceptive training’ as the exercises used include tasks which require and, therefore most likely, improve the feedback from skin sensors, joint position sensors and intrinsic muscle sensors. With regard to the first, there is talk of ankle muscle strength as well as ‘core strength’. Both have been shown to be important/helpful. Overall, it seems the balance trainings studies, often using wobble boards, appear to be most effective.*

2. During a tackle in a soccer game a player is hit by the foot of an opponent at the outside of his knee. What injury is most likely to occur?

*A forceful movement of the knee into a valgus position will most likely lead to a strain/rupture of the medial collateral ligament (MCL). Next, depending on the forcefulness of the blow it may be the anterior cruciate ligament which will be damaged. The medial meniscus might be involved because it shares fibres with the MCL while the lateral meniscus might be jammed between the two condyles (femur and tibia). What really happens in individual cases will very much depend on the direction of the blow, most likely the muscle contractions at the instant of the blow and the amount of flexion the knee had then.*

3. What is the immediate aim of applying the “rice” procedure after an acute injury?

*R = rest, minimize cardiovascular activity to reduce blood flow, blood pressure. Avoid further tissue disruption, allow clot to build up and solidify quickly.*

*I = ice, generate a vasoconstrictive effect. Blood vessels are to be contracted (reduced in diameter) and kept contracted to reduce further bleeding into damaged area. Inflammatory reaction to be reduced and swelling and pain reduced.*
c = compression, further reduction of blood flow but mainly fixation of the joint, preferably in a neutral position to reduce further damage by movement, transport.

e = elevation, again reduction of blood flow, hydrostatic pressure. A certain offloading can be achieved depending on the type of injury. Tissue fluids may move to more proximal areas which may assist in removing them, again to reduce swelling and pressure on the injured area.

4. What is meant if an M or D is added to the acronym “rice”?

M = mobilisation, it is important to expose tissues to early mobilisation as all tissue regeneration is guided by mechanical loads. However, this is not advisable in the acute phase after injury (often approximated by the first 72 h as new tissue disruption may occur). Advice by medical personnel is required. Depending on the type of injury and treatment it may well be possible use isometric muscle contractions to maintain muscle function without inducing tissue damage immediately after primary reduction treatment.

D = diagnosis, whenever an injury occurs which requires rice a physician or otherwise qualified medical person should be consulted to receive a precise diagnosis/grading of the damage.

5. Injury prevention:

a) Explain the injury prevention cycle (sequence of prevention) using one example sport and an injury typical for that sport.

b) Which component has been identified as the most problematic point in this cycle (as well as in other injury models)? Explain why?

‘Establishing the cause and mechanism of injury’ is the most critical point as only very limited information exists on how the actual injury happens. TV video is most likely to be imprecise (slow, low resolution) to infer on kinematically happened. No force measurements are typically carried out and therefore it is only speculation what might have happened internally inside the body of the injured athlete.

6. In which tissue do we find osteocytes and where do we find chondrocytes?

The first are found in bone, the latter in cartilage.
7. What might be the reason for eccentric exercises being used in many rehabilitation exercise programs after injury?

Muscles can generate the highest forces during eccentric contractions (force-velocity relationship). As muscles are the organs which allow us to vary loading in a relatively controlled manner we have to work with their characteristics. Of course, we would always start with low intensity, slow movements but during the later phase of rehabilitation we need to provide sufficiently high stresses in tissues which can only be realized during eccentric contractions.

8. What are the 3 phases of tissue healing in the general model of tissue repair? Provide a sketch.

9. Landing analysis by video has been proposed to estimate the risk for ACL injuries in team sports. The pictures below show two techniques of such a landing test. Which of the two demonstrates a safer technique?

A is the safe version of landing technique.

Describe the difference in anatomical terms and indicate the key factor by drawing over the picture. Outline how the skeletal alignment may affect the loading of the knee joint.

In A the ankle, knee and hip joint centres are aligned making it very likely that the ground reaction force (GRF) vector generates minimal varus-valgus torque at the knee. In B the GRF generates a valgus torque which has been proposed to potentially endanger the knee (this might not be critical if landing on two feet but is highly critical in single-footed landings). Therefore, training a good technique under controlled conditions will be beneficial.

Which type of training would you suggest to improve landing technique? Give only up to 3 selected exercises but explain what you want to achieve by each of them.

As indicated in the videos shown in the lecture (Norwegian webpage) a controlled landing training – giving specific corrections is most important. This would improve body awareness (kinesthesia and proprioception).

e.g.: jumps with video feedback, trainer correction. landing on one leg, …

Awareness of foot and leg positioning during other movements would be a second range of exercises to choose from (see again the Norwegian website). Foot work, footwork with partner, and ball – maintenance of proper alignment even when perturbed.
e.g.: lunges with control of knee and foot alignment, jumps with rotations, and additional tasks, hamstring strength training (controlled and eccentric), …

balancing exercise on wobble board, soft cushions, …

inclusion of additional tasks such as dribbling of ball, …

single legged squats to train hip extensors, …