

Tidlig diagnostik netværket, grp 5: Mapping of brain structure, function, and chemistry in elite athletes at risk of concussion

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Projektmedarbejdere, estimeret omfang

Projektperiode

Projekt-resume

Concussion from sports is a serious neurological concern, with implications not only for the athlete's sport performance, but with possible severe lifelong consequences. With neuroimaging (magnetic resonance imaging, MRI) we will characterize subtle alterations in brain structure, microstructure, chemistry and functional connectivity. These methods have the potential to with more specificity and sensitivity detect anatomical and functional abnormalities. However, these methods would be greatly improved, both from a scientific but also from a practical standpoint, if combined with sensitive neuropsychological testing. Therefore, our goal is to develop a test battery that can be administered to a large number of athletes, of some which we also will have neuroimaging, to in detail map 1) who is at risk, 2) monitor recovery and 3) guide clinicians when it is safe to return to sport. Patients with mild traumatic brain injury, which all sports related concussions would be defined as, often report cognitive symptoms, indicated as inability to concentrate, memory problem, confusion. Hence, a test battery covering several different aspects of cognitive function is necessary also for athletes. Crucial for the use of both neuroimaging and cognitive testing is to have adequate baseline testing, in order to re-assess cognition in the injured patient. A more detailed and robust neurocognitive battery, as is typically used in clinical neuropsychological batteries, are required also for athletes, and this is something that is currently missing. The cognitive battery will be complemented by measures assessing the post-concussion symptoms, together with psychological and emotional functioning, coping strategies and quality of life. This is necessary in order to encompass the facets that influence the recovery process and prognosis of the affected athlete.

A failure of carefully managing the injury would put the athlete at risk, not only for short time of a second injury, but also long-term chronic impairments.

To initiate this project, we will conduct a series of tests on athletes that we know are at high risk of brain injury, we have therefore contacted the motor sport union.

Forskningsspørgsmål/hypoteser

There are two lines of research in this study:

- 1) Baseline characterization of athlete's brain function, structure, and neurochemistry in combination with detailed testing of cognitive functions including motor functions.
- 2) Reassessment following a mild head injury

The overarching research question is how will a mild head injury influence brain and cognition, and when is it safe to return to sport?

Metode

Our multimodal strategy with neuroimaging in combination with cognitive/neuropsychological testing will help athletes, coaches, and clinicians determining when it is possible to return-to-play. The strategy will also inform the subsequent treatment approach when necessary and enable development of an individually tailored treatment plan.

We will perform structural and neurochemical (metabolic) brain imaging using ultra-high field-strength (7T) MRI as well as functional MRI at 3T. The structural and neurochemical imaging will allow us to examine brain microstructure as well as the metabolic brain profile, here we are particularly interested in glial-cell activity due to the link to neuroinflammation, which is a marker of

potential brain injury. The functional MRI will be a grip force task which is sensitive to map the function of the motor system.

Samarbejde med praksis

We have made contact with the motor sport union and more federations will be included.