

**Preliminary program**

8th International Ankle Symposium. October 3 &amp; 4 2019, Amsterdam, the Netherlands

**Day 1**

Thursday October 3 2019

08:00 **Registration****UvA****Erasmus 1****Erasmus 2**

08:30

**Opening**Evert Verhagen (NL) &  
Thomas Kaminski (US)

09:00

**Keynote #1**Jay Hertel (US)  
Development of Chronic  
Ankle Instability

10:00

**Break**

10:30

**Free papers****Symposium #1**Gain a Footing for Patients  
with Chronic Ankle Instability**Symposium #2**New ideas for preventing  
sport-related ankle inversion  
sprains

12:00

**Lunch break**

13:00

**Keynote #2**Gino Kerkhoffs (NL)  
Treating the burdened ankle

14:00

**Free papers****Workshop #1**Demystifying the functional  
subtalar joint through a better  
understanding of its  
functional demands**Workshop #2**In search for RTS-criteria in  
LAS and CAI populations

15:00

**Break**

15:30

**Free papers****Symposium #3**The CAI Rehabilitation  
Spectrum: A multifaceted  
approach to improving patient  
outcomes**Symposium #4**The ankle of a football legend

17:00

Welcome Reception &amp; Posters

**Preliminary program**

8th International Ankle Symposium. October 3 &amp; 4 2019, Amsterdam, the Netherlands

**Day 2**

Friday October 4 2019

08:00 **Registration**

UvA

Erasmus 1

Erasmus 2

08:30

**Keynote #3**

Michelle Smith (AUS)  
International perspectives on  
 best practices for ankle injury  
 rehabilitation

09:30

**Free papers****Symposium #5**

The ankle and haemophilia:  
 background, imaging and  
 treatment options

**Symposium #6**

Moving beyond the  
 laboratory: using novel  
 sensor technologies to assess  
 individuals with CAI

11:00

**Break**

11:30

**Free papers****Workshop #3**

How do we manage simple  
 ankle injuries in the complex  
 world of elite sport?

**Workshop #4**

Talocrural Joint Mobilization  
 for Patients with Chronic  
 Ankle Instability

12:30

**Lunch break**

13:30

**Keynote #4**

Erik Wikstrom (US)  
Development and  
 management of chronic  
 ankle problems

14:30

**Free papers****Symposium #7**

Quantitative analysis of the  
 mechanism of ankle  
 inversion sprain injury

**Symposium #8**

Neuromechanical Strategies  
 Adopted by Chronic Ankle  
 Instability Patients:  
 Perspectives on Re-injury

16:00

**Break**

16:30

**Free papers****Workshop #5**

Blinking and counting: how  
 to rehabilitate the brankle  
 sprain

**Workshop #6**

Manual therapy techniques  
 to improve weight-bearing  
 Dorsiflexion in the ankle-foot  
 complex

17:30

**Closing**

**Keynote #1**

**An Updated Model of Chronic Ankle Instability**

**Speaker:** Jay Hertel (Department of Kinesiology, University of Virginia, US)

**About this lecture:** An updated model of chronic ankle instability (CAI) will be presented that aims to synthesize the contemporary understanding of the etiology of CAI and serve a framework for the clinical assessment and rehabilitation of ankle sprain and CAI patients. The model describes how primary injury to the lateral ankle ligaments may lead to a collection of interrelated pathomechanical, sensory perceptual, and motor behavioral impairments that influence a patient's clinical outcome. With an underpinning of the biopsychosocial model, the concepts of self-organization and perception-action cycles derived from dynamic systems theory, and a patient-specific neurosignature, stemming from Melzak's neuromatrix of pain theory, are incorporated into the model to describe the integration of these interrelationships.

**Take home messages:**

- Each CAI patient will present with a unique collection of pathomechanical, sensory perceptual, and motor behavioral impairments. Not all CAI patients will present with each impairment identified in the literature in studies reporting on group means of CAI patients.
- It is incumbent on clinicians to identify specific impairments during physical examination and design patient-specific treatment plan to optimize each CAI patient's clinical outcome.

**Keynote #2**

**There is no simple lateral ankle sprain: Cartilage cracks**

**Speaker:** Gino Kerkhoffs (Department of Orthopedics, Amsterdam UMC, NL)

**About this lecture:** Lateral ankle sprains remain the single most frequent injury in modern sports. With the growing knowledge on ankle joint disorders, it appears that this injury causes more damage to the ankle joint than was previously assumed. A lateral ankle sprain may cause a cartilage injury as the medial talar dome impacts on the distal tibial plafond. This may initiate the development of an osteochondral cyst through cracks in the subchondral plate, destabilise a previously stable osteochondritis dissecans lesion or create an osteochondral fracture leading to chronic pain from a talar osteochondral lesion (OCL). Different aspects of the morphology are presented. Results of various surgical treatment protocols for primary OCLs are presented—ranging from debridement and drilling to the Lift Drill Fill Fix (LDFF) procedure, a new arthroscopic talar cartilage preserving technique and a new Talar Osteoperiostic Iliac Crest (TOPIC) graft.

**Take home messages:**

- There is no simple lateral ankle sprain, beware of cartilage damage
- Cartilage lesions should preferably be treated by a specialized center

**Preliminary program**

8th International Ankle Symposium. October 3 & 4 2019, Amsterdam, the Netherlands

**Keynote #3****Establishing return to sport criteria after acute lateral ankle sprain injuries**

**Speaker:** Michelle Smith (School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane, AUS)

**About this lecture:** This presentation will discuss the findings from an international Delphi approach to develop consensus for return to sport (RTS) criteria for individuals who have sustained an acute lateral ankle sprain injury. Health professionals working with national level athletes completing in field or court sports and involved in making RTS decisions completed surveys about criteria that should be used to support the RTS decision after a lateral ankle sprain injury. The consensus on RTS criteria will be discussed.

**Take home messages:**

- The quick return to sport and high re-injury rate after lateral ankle sprain injuries suggests the need for evidence-based RTS criteria.
- Collation of expert opinion through a Delphi approach is a first step to inform the development of RTS criteria for acute lateral ankle sprains.

**Keynote #4**

**Ankle Sprain to OA - Implications for Mitigating Cartilage Degeneration**

**Speaker:** Erik Wikstrom (Motion Science Institute & Department of Exercise & Sport Science, University of North Carolina at Chapel Hill, US)

**About this lecture:** Lateral ankle sprains are highly prevalent, costly, and have significant long-term sequelae including the development of posttraumatic osteoarthritis. Ankle cartilage degeneration is thought to be facilitated by the chronic maladaptive sensorimotor and biomechanical strategies adopted by those with a history of lateral ankle sprains. Multi-modal interventions, delivered early post injury, offer promise for mitigating ankle cartilage degeneration but several critical knowledge gaps limit their development. This lecture will present the current evidence related to: (i) how ankle joint injury impacts measures of cartilage health, (ii) modifiable factors that could influence cartilage health measures, and (iii) how cartilage health associates with patient-reported outcomes in those with a history of lateral ankle sprains.

**Take home messages:**

- Ankle cartilage degeneration onset occurs rapidly following ankle joint injury.
- Several biomechanical and metabolic factors show promise and therapeutic targets to mitigate cartilage degeneration.

## **Symposium #1**

### **Gain a Footing for Patients with Chronic Ankle Instability**

**Symposium Chair:** Matthew Hoch

**Background & Relevance:** People with chronic ankle instability exhibit sensorimotor dysfunction across a broad spectrum of tasks ranging from standing balance to athletic maneuvers. The widespread nature of sensorimotor deficits suggests there may be underlying impairments which compromise the ability to maintain a base of support associated with this condition. There is mounting evidence that individuals with chronic ankle instability exhibit alterations in somatosensation, motor control, and mobility of the foot. Specifically, people with chronic ankle instability have demonstrated decreased plantar cutaneous sensation, atrophy and decreased activation of the intrinsic foot muscles, increased rearfoot internal rotation, forefoot on rearfoot eversion, and first metatarsal plantarflexion. These impairments in foot function may affect local foot and ankle stability, gait and posture, and force attenuation during high energy activities such as running and landing. Examining deficits in foot function through the concept of the foot core with the associated active, passive, and neural subsystems may provide a theoretical basis to direct evaluation and treatment strategies. Interventions including plantar massage and intrinsic foot muscle activation exercises have emerged as evidence-based treatments which target specific deficits within the foot. These interventions have demonstrated the ability to improve postural control and self-reported function. Therefore, foot focused interventions may compliment the current rehabilitation paradigm for treating patients with chronic ankle instability and further enhance patient outcomes. This symposium will present the foot core as a theoretical approach to examine foot function, highlight specific deficits in foot function associated with chronic ankle instability, and introduce clinical intervention techniques to improve foot function.

**Speaker 1:** Patrick McKeon

**Presentation title:** The Foot Core: Implications for Patients with Chronic Ankle Instability

**Speaker 2:** Matthew Hoch

**Presentation title:** Sensorimotor Deficits of the Foot Associated with Chronic Ankle Instability

**Speaker 3:** John Fraser

**Presentation title:** Alterations in Foot Mobility and Biomechanics Associated with Chronic Ankle Instability

**Speaker 4:** Kathryn Webster

**Presentation title:** Clinical Strategies for Addressing Foot Core Impairments

**Speaker 5:** François Fourchet

**Presentation title:** Advanced Strategies for Activating the Intrinsic Foot Muscles

## **Symposium#2**

### **New ideas for preventing sport-related ankle inversion sprains**

**Symposium Chair:** Daniel Fong

**Background & Relevance:** Ankle sprain is very common in sports. Multiple ankle sprains may lead to chronic ankle instability, therefore, besides working on the treatment and rehabilitation modalities after ankle sprain injury, it is also worth to work on injury prevention to prevent the occurrence of ankle sprain injury.

Injury prevention strategies can be classified into warm-up exercise, prophylactic devices, exercise intervention, proprioception training, and change of game rules. In this symposium, the speakers will present some new ideas to prevent ankle sprain injury by reducing floor friction, neuromuscular training, improving peroneal muscle reaction time, as well as training pre-landing muscle contraction.

**Speaker 1:** Filip Lysdal

**Presentation title:** The role of lateral shoe-surface friction for the prevention of ankle sprain injuries

**Speaker 2:** Oluwatoyosi Owwoeye

**Presentation title:** Neuromuscular training for primary prevention of ankle sprain injuries: what is the evidence and what next?

**Speaker 3:** Peter Thain

**Presentation title:** The effects of cryotherapy on muscle reaction time to a simulated lateral ankle sprain mechanism

**Speaker 4:** Aliaa Youssef

**Presentation title:** Smarting-up your ankle: the design for a preventive ankle sprain orthotic

**Speaker 5:** Daniel Fong

**Presentation title:** A wearable device to enhance quick or pre-landing peroneal contraction to prevent ankle sprains



### **Symposium #3**

#### **The CAI Rehabilitation Spectrum: A multifaceted approach to improving patient outcomes**

**Symposium Chair:** Alan Needle

**Background & Relevance:** Despite revelations into the complex etiology behind chronic ankle instability (CAI), deleterious outcomes persist in patients despite rehabilitation efforts. This is evident by high rates of recurrent injury, decreases in health-related quality of life, and increasing rates of post-traumatic osteoarthritis. Considering that CAI evolves from a musculoskeletal injury, rehabilitation has largely emphasized a peripheral impairment-based approach, targeting specific behavioral corrections (e.g. strength, motion, balance). While effective for improving function in the clinical setting, these patients appear to experience re-injury when returning to uncontrolled activity, thus failing to disrupt the continuum of disability. It has been well established that CAI is not solely a musculoskeletal injury, but rather a neuromechanical condition comprised of both central nervous and peripheral impairments with long-term effects impacting multiple body systems. These data suggest that clinicians and researchers must re-evaluate and expand their approach to rehabilitation for CAI & joint instability to encompass all contributing factors, and address multiple systems. The focus of the proposed symposia will be to present a broad approach to the rehabilitation of CAI that focuses on four key areas: neuromodulation, impairment, functional performance, and general health. Dr. Needle will present on what is known regarding the role of maladaptive neuroplasticity in affecting motion in patients following injury, and will discuss rehabilitation techniques that are neuromodulatory in nature. Dr. Donovan will present on the state of impairment-based rehabilitation, and discuss motor learning strategies that have the capability to improve the rate and durability of adaptations as it pertains to correcting behavioral impairments. Dr. Rosen will present on functional performance deficits in patients with CAI, and what must be done in the clinic to facilitate the transfer of functional movements into real-world settings. Finally, Dr. Hubbard-Turner will present on the impact of CAI on general health, and the need to take a broad approach towards improving physical activity and decreasing fear-avoidance behaviors among this population. This presentation will be designed to engage both clinicians and researchers attending IAS 2019, and will generate the following anticipated outcomes. As the focus of the symposia will be largely practical, attending clinicians will leave with knowledge of new techniques that can be immediately adopted in their care of patients with ankle injury, as well as an increased awareness of the limitations of more traditional approaches. The attending research audience will similarly be engaged and will obtain an increased understanding of the multiple systems that are affected by CAI, hopefully stimulating discussion towards the development of new rehabilitation paradigms for CAI.

**Speaker 1:** Alan Needle

**Presentation title:** Can we rewire the sprained brain? Addressing neurophysiologic deficits in CAI rehabilitation

**Speaker 2:** Luke Donovan

**Presentation title:** Strategies to enhance the impairment-based rehabilitation model for patients with CAI

**Speaker 3:** Adam Rosen

**Presentation title:** Bringing the real-world to the clinic: the use of functional testing

**Speaker 4:** Tricia Hubbard-Turner

**Presentation title:** Increasing Physical Activity Across the Lifespan in CAI Patients

**Preliminary program**

8th International Ankle Symposium. October 3 & 4 2019, Amsterdam, the Netherlands

**Symposium #4****The ankle of a football legend**

**Symposium Chair:** Vincent Gouttebarge

**Background & Relevance:** Ankle injuries account for 10-15% of all injuries in professional football. Especially ankle sprains are common, being often recurrent as the consequence of the cumulative exposure to running, cutting and jumping as well as contact with other players. Therefore, the treatment of ankle injuries (including surgery) should be optimal in order to secure an optimal return-to-play process, while attention to prevention should be given in order to reduce recurrence. This should favour the sustainability of players' career and prevent long-term consequences.

**Speaker 1:** Gino Kerkhoffs

**Presentation title:** There is no simple ankle sprain in football!

**Speaker 2:** Evert Verhagen

**Presentation title:** How can we prevent recurrent ankle sprains?

**Speaker 3:** Hans Zwerver

**Presentation title:** The ankle sprain and beyond: a soft (t)issue?

**Speaker 4:** Vincent Gouttebarge

**Presentation title:** Long-term consequences of severe ankle injuries and related surgeries

**Speaker 5:** Marco van Basten

**Presentation title:** My experience with ankle injuries

## **Symposium #5**

### **The ankle and haemophilia: background, imaging and treatment options.**

**Symposium Chair:** Olav Versloot

**Background & Relevance:** Haemophilia is an X-related, inheritable blood coagulation disorder. Persons with haemophilia (PWH) suffer from low levels of factor VIII (FVIII, haemophilia A) or factor IX (FIX, haemophilia B) coagulation proteins(1). In PWH, repetitive joint trauma and associated bleeds can lead to chronic synovitis and haemophilic arthropathy, which in turn can lead to severe cartilage damage(2), decreased joint function and disability(3). The elbow, knee and particularly the ankle are most frequently affected in PWH(4). The use of prophylaxis in haemophilia has contributed greatly to sport participation of PWH and consequently attributed to the risk of sport related injuries, e.g. in the ankle region. As in recent years, the body of knowledge concerning the pathophysiology, imaging and therapeutic interventions (both conservative and surgical) of ankle involvement in PWH has greatly improved this will be the topic of this symposium. During this symposium, the pathophysiology, imaging possibilities and treatment options, both conservative as well as surgical, of the ankle in PWH will be discussed.

1. Srivastava A, Brewer AK, Mauser-Bunschoten EP, Key NS, Kitchen S, Llinas A, et al. Guidelines for the management of hemophilia. *Haemophilia*. 2013;19(1):e1–47.
2. Pulles AE, Mastbergen SC, Schutgens REG, Lafeber FPJG, van Vulpen LFD. Pathophysiology of hemophilic arthropathy and potential targets for therapy. *Pharmacol Res* [Internet]. 2017;115:192–9. Available from: <http://dx.doi.org/10.1016/j.phrs.2016.11.032>
3. Poonnoose PM, Srivastava A. Functional assessment of arthropathy - An international perspective. *Semin Hematol*. 2006;43(SUPPL. 1).
4. Stephensen D, Tait R, Brodie N, Collins P, Cheal R, Keeling D, et al. Changing patterns of bleeding in patients with severe haemophilia A. *Haemophilia*. 2009;15(6):1210–4.

**Speaker 1:** Olav Versloot

**Presentation title:** Sports participation and ankle injuries in Dutch children with haemophilia

**Speaker 2:** Merel Timmer

**Presentation title:** The application of ultrasound in persons with haemophilia with ankle problems

**Speaker 3:** Lize van Vulpen

**Presentation title:** Pathophysiology and surgical treatment of ankle arthropathy in persons with haemophilia

**Speaker 4:** Nichan Zourikian

**Presentation title:** Conservative treatment of haemophilia related ankle injuries

## **Symposium #6**

### **Moving beyond the laboratory: using novel sensor technologies to assess individuals with CAI**

**Symposium Chair:** Alexandria Remus

**Background & Relevance:** Quantified evaluation of biomechanics and physiological performance has been a mainstay of research into the causes, features and determinants of outcomes in CAI for a number of years. However, the vast majority of this research effort has been rooted in a laboratory environment. In the laboratory setting, we are not capturing a representative sample of typical movement behaviours due to environmental and observational constraints, in addition to the fact that people generally don't get injured in the laboratory.

We now have access to a range of wearable sensor technologies that can capture objective and reliable data on measures of micro and macro level behaviours and motor performance. Furthermore, the availability of mobile computing platforms means we can aggregate very large multi-modal data sets from the real world environment. Of course, these same technologies can also be used to drive remedial interventions aimed at addressing the deficits associated with CAI. The use of this technology opens up a whole new world of opportunity for the understanding of and development of more robust preventative and treatment methods of CAI. It has the potential to revolutionize the biomechanical and performance evaluation of CAI populations so that clinicians would now have access to representative data to guide interventions for optimised care.

In this symposium we will provide an overview of this technology opportunity and will showcase work from leading research groups who are leveraging wearable and mobile platforms to bring CAI research into a new paradigm.

**Speaker 1:** Brian Caulfield

**Presentation title:** An overview of wearable technologies and their potential

**Speaker 2:** Aliaa Rehan Youssef

**Presentation title:** Is a smartphone application a valid and reliable tool to assess balance in patients with CAI?

**Speaker 3:** Alexandria Remus

**Presentation title:** Wearable sensors to assess change of direction during agility tests in athletes with CAI

**Speaker 4:** Alexandra DeJong

**Presentation title:** Wearable sensors for distance running analyses: a framework for evaluating lower leg pathologies

## **Symposium #7**

### **Quantitative analysis of the mechanism of ankle inversion sprain injury**

**Symposium Chair:** Daniel Fong

**Background & Relevance:** Ankle sprain is very common in sports. The clinically presented mechanism has been described as excessive inversion, or supination, in the literature. In order to help devise injury prevention strategies, it is essential to investigate the injury mechanism with biomechanics quantities.

The mechanism has been investigated extensively in laboratory with platforms with trapdoors or different types of sprain simulators, however, as these devices did not introduce real injuries, the findings could not fully represent the biomechanics of real ankle sprain injuries. The most direct way to study the mechanism is to investigate the real injuries, and a handful of accidental cases in laboratory and real cases during sports have been presented in the literature since 2009. They generally presented the mechanism as excessive inversion, with the range of inversion and the maximum inversion velocity quantified. However, they also did not show great plantarflexion or supination, but suggested that internal rotation could have been missed before.

In this symposium, authors of the some of the above mentioned quantitative case reports will present their cases and their methods to analyse. Some of these cases have caused ligamentous sprain injuries, and some have only caused 'giving way' at the ankle joint with minimal damage to the tissues and structure. At the end, the speakers will summarise the current findings and will discuss what's next on this research direction.

**Speaker 1:** Feng Wei

**Presentation title:** Study of ankle ligamentous sprain injuries using various techniques

**Speaker 2:** Dominic Gehring

**Presentation title:** Kinematics, kinetics and neuromuscular activation of an ankle sprain during a run-and-cut movement

**Speaker 3:** Masafumi Terada

**Presentation title:** Does proximal joint function contribute to ankle sprain mechanisms?

**Speaker 4:** Alexandria Remus

**Presentation title:** The first ever laboratory captured "giving way" episode in an athlete with CAI during performance of the Agility T-Test

**Speaker 5:** Daniel Fong

**Presentation title:** Summarising the ankle sprain cases reported in the literature: what have we learned and what's next?

## **Symposium #8**

### **Neuromechanical Strategies Adopted by Chronic Ankle Instability Patients: Perspectives on Re-injury**

**Symposium Chair:** Ty Hopkins

**Background & Relevance:** Chronic ankle instability (CAI) has been characterized by various signs and symptoms, including “giving way” episodes and re-injury. Several instruments have been used to identify patients who suffer from CAI. These self-report instruments allow a relatively clean subject population from which sensorimotor deficits may be identified. The goal of these data is to identify deficits or alterations that may perpetuate the chronic nature of instability and the consequences that may stem from them. This is ultimately done in an effort to design interventions specific to the deficits. Our data describe potential neuromechanical deficits from 6 distinct movement patterns identified from 200 patients with CAI. We will review kinematic and kinetic differences from the various movement patterns relative to healthy subjects and highlight alterations that may be problematic to CAI patients. We will also review descriptive data and clinical test data, and their ability to predict specific movement patterns within the CAI sample. In addition to describing the neuromechanics of an existing CAI population, evaluation of re-injury within this population may provide keys as to specific movement mechanics that increase the susceptibility within the population. Our sample of CAI patients was followed over 12 months to identify those who were re-injured. Relative to activity level and exposure, we will review the unique movement characteristics of those who were re-injured, which may provide clues as to what specific mechanics may be key to re-injury. In summary, relative to the non-reinjury group, the re-injury group demonstrated greater plantarflexion, knee extension, hip flexion, inversion, knee abduction, and hip abduction internal joint moment during the initial landing phase of a demanding jump/cut task. The reinjury group also demonstrated greater eccentric ankle, knee and hip joint power during the landing phase. Finally, the re-injury group revealed greater medial, posterior and vertical ground reaction force during initial landing phase. During the final portion of our presentation, we will discuss the predictability of the re-injured CAI patients from descriptive and clinical test data. Five descriptive or clinical test scores may predict the risk of ankle re-injury in patients with CAI: (1) Greater number of giving way episodes (Odds Ratio (OR): 5.19), (2) Higher arch height index; supinated foot (OR: 2.96), (3) Poor static Biodex balance stability (OR: 1.31), (4) Slower figure of 8 hop test (OR: 1.32), and (5) Lower passive dorsiflexion ROM (OR: 1.11).

**Speaker 1:** Ty Hopkins

**Presentation title:** Characterization and Prediction of Specific Movement Patterns Associated with Chronic Ankle Instability

**Speaker 2:** Hyunsoo Kim

**Presentation title:** Biomechanical Risk Factors for Recurrent Ankle Sprains During Landing and Cutting

**Speaker 3:** S. Jun Son

**Presentation title:** Prediction of Recurrent Ankle Sprains Based on Descriptive and Clinical Test Data

## **Workshop #1**

### **Demystifying the functional subtalar joint through a better understanding of its functional demands**

**Speaker 1:** Jennifer McKeon

**Speaker 2:** Patrick McKeon

**Background & Relevance:** Over the past 50 years, the epidemiological trends associated with chronic ankle instability (CAI) have not changed. Emerging evidence over the past 20 years implicates subtle subtalar instability as a key contributing factor to the recalcitrant nature of CAI. However, a major barrier to linking the contributions of subtalar instability to CAI is an appreciation for its complex anatomy and biomechanics. Traditionally, the anatomical description of subtalar joint has been limited to the talus and calcaneus. Consequently, evaluation of the subtalar joint's structural integrity has been limited to either the talar tilt or the medial subtalar glide test. This represents a major gap in the evidence and subsequently a major gap in our clinical understanding of subtalar instability in CAI. The functional subtalar joint is far more complex, consisting of functional interrelationships among the talocalcaneal, talonavicular, and calcaneocuboid articulations. The primary goal of this workshop is to provide participants with a clinical framework for understanding the functional subtalar joint in order to help them develop an enhanced ability to uncover dysfunction that may contribute to CAI.

In the first section of this workshop, we will provide participants with a framework for evaluating walking and running gait using the foot and ankle rockers. These rockers help to contextualize the functional demands of absorption, propulsion, and stability across the lower extremity as they relate to pronation and supination of the functional subtalar joint. Specifically, the foot and ankle rocker system provides a logical framework for linking key events of the ankle to pronation and supination events of the functional subtalar joint. Through this experience, participants will learn simple rules of thought to streamline gait evaluation as it relates to foot and ankle pathology.

In the second section of the workshop, we will guide participants through the anatomy and biomechanics of the functional subtalar joint. By linking the anatomy and complex mechanics of the functional subtalar joint to the foot and ankle rockers, we will help participants better understand how this joint complex becomes dysfunctional. Participants will be able to gain a better appreciation for the foot's transition between a supple platform and rigid lever through the lens of the medial and lateral columns of the foot that the functional subtalar joint controls. Using the emerging evidence from subtalar instability, we will then provide the anatomical and mechanical factors that can help guide clinicians to develop a more robust evaluation of functional subtalar joint integrity. These factors include key palpation points related to functional subtalar joint ligamentous support and a clinical stress test that stresses these ligaments more appropriately.

A better understanding of the anatomy and complex mechanics of the functional subtalar joint can lead clinicians to a better ability to observe and describe functional subtalar instability. From better observation and description, more appropriate intervention strategies can be developed to enhance outcomes in those with CAI.

**Learning Objective 1:** Participants will be able to explain the foot and ankle rockers during gait as they relate to the functional demands of absorption, propulsion, and stability.

**Learning Objective 2:** 2. Participants will be able to interpret the anatomy and complex mechanics of the functional subtalar joint through the functional demands of absorption, propulsion, and stability.

**Preliminary program**

8th International Ankle Symposium. October 3 & 4 2019, Amsterdam, the Netherlands

**Learning Objective 3:** 3. Participants will be able to relate the anatomy and complex mechanics of the functional subtalar joint to key evaluation factors in order to develop a more robust ability to recognize dysfunction.



## **Workshop #2**

### **In search for RTS-criteria in LAS and CAI populations – which functional tests make sense and how to integrate adaptability in functional testing?**

**Speaker 1:** Bruno Tassignon

**Speaker 2:** Jo Verschueren

**Background & Relevance:** This workshop will give an overview of the relevant functional performance tests in LAS injury and CAI-populations (e.g. Y-balance test, hop tests) and discuss new functional tests that have added environmental perception, decision-making and variable motor responses as additional dynamic components (e.g. reactive balance test, neurocognitive hop tests). Given the importance of adaptability in sports performance, these insights can be of added value in the functional test repertoire used to objectify the progress throughout rehabilitation or support RTS decision-making.

A recent review documented that there are currently no prospectively validated RTS criteria in LAS or CAI populations [1]. Given the high recurrence rate after LAS injury and the risk of developing CAI, it is important to address both the functional performance of the injured athlete during rehabilitation as well as the sensorimotor control alterations after LAS injury and its possible implications towards the concept of adaptability. The rationale for the use of functional performance tests is to assess possible impairments that need to be addressed in rehabilitation, monitor rehabilitation progress and to form an impression as to whether an athlete is ready to start working towards performance enhancement [2-4]. Such tests often encompass more generic movements (e.g. walking, hopping) or simpler tasks (e.g. unilateral leg stance) with research in different populations investigating their role in rehabilitation and injury prevention.

Part one of the workshop will give an overview of the current relevant functional performance tests that are documented in LAS and CAI populations, integrate these into a practical session so that participants can easily use them in clinical practice, and discuss the specific relevance of these tests in both rehabilitation and prevention.

Nevertheless, an important insight that is currently lacking in literature is the importance of adaptability relating to prevention, rehabilitation and RTS decisions. Adaptability is defined as the ability of an athlete to effectively modify responses under a broad spectrum of conditions [5]. Functional performance tests currently neglect the importance of environment perception and the coupled adequate motor responses. Furthermore, it was found that this concept was not implemented in the current functional test repertoire for LAS injury and CAI patients.

Integrating adaptability in functional testing can be done by evaluating an athlete's response to unanticipated stimuli during goal-oriented motor tasks. Some new functional tests (e.g. reactive balance test, neurocognitive hop tests) have been developed to bridge this gap, but these tests are still in their infancy. Nevertheless, these tests can be an important step in the rehabilitation and RTS decision-making process, because there is a need to develop and implement evidence-based progressive rehabilitation programmes, as well as specific evidence-based criteria to guide RTS decisions for individuals with acute LAS injury.

Therefore, part two of the workshop will focus on reactive balance testing, neurocognitive hop tests and other functional tests that integrate the construct of adaptability. Also, the relevance in rehabilitation and possible implications for injury prevention and RTS-decision making will be discussed in combination with a practical session, where participants can try out these new tests.

**Learning Objective 1:** The participant expands his/her knowledge on current and newly developed relevant functional performance tests in LAS injury and CAI-populations.

**Preliminary program**

8th International Ankle Symposium. October 3 & 4 2019, Amsterdam, the Netherlands

**Learning Objective 2:** The participant is able to perform, instruct and interpret the current functional performance tests in LAS injury and CAI-populations.

**Learning Objective 3:** The participant is able to perform, instruct and interpret the newly developed neurocognitive and reactive functional performance tests and recognize their potential value in LAS and CAI populations.

## **Workshop #3**

### **How do we manage simple ankle injuries in the complex world of elite sport?**

**Speaker 1:** Lee Herrington

**Speaker 2:** Ros Cooke

**Background & Relevance:** Ankle ligament injuries within the high-performance sport are common constituting 10% of all consultations for musculoskeletal injury within the UK. These injuries lead to time loss and training restriction impacting on availability for competition and performance outcomes.

Success in rehabilitation is currently judged on grade of injury and time to return to sport with the intention that performance will occur if the athlete is available. With the high rates of recurrence for ankle injuries this approach appears to not be successful and returning the athlete to sport let alone performance.

It is unclear if high recurrence rates are due to inadequate management at time of first occurrence of lateral ligament injury. Of further significance is the emerging research which links ankle ligament injuries to other musculoskeletal injuries primarily within the lower limb so poor resolution of ankle injury not only creates issues at the ankle but in other areas as well. The resolution of laxity is commonly used as a clinical assessment to clear an athlete to return to sport but there is little correlation of this objective marker with a successful return to sport.

Because of the level of burden, the risk of re-injury and development of other musculoskeletal injuries, it would appear to be imperative that the management of ankle ligament injuries is optimized.

This workshop aims to help clinicians to develop their clinical reasoning skills and assist them to develop comprehensive programmes that enable athletes to return to performance and reduce their risk of future injury. This will also consider constraints such as time – preparation for major events Olympic games, World Cup, athlete performance level and sport requirements. The approach used to aid reasoning will be one of performance backwards thinking. Here the end goal of rehabilitation; safe and optimal performance, will be first defined and worked backwards from to develop rehabilitation programmes specific to the athlete's end goal requirements. Within the workshop participants will also explore contemporary thinking in relation to movement skill development and how this can and should be incorporated into a rehabilitation program in order to prepare the athlete for the performance environment they are returning too.

This problem-solving approach will be developed through a series facilitated case studies workshops, where participants will consider real clinical cases and in small groups develop management and return to performance plans.

**Learning Objective 1:** 1. To understand and utilise needs analysis of sports or activities to inform rehabilitation intervention and planning for athletes to return to performance following ankle ligament injury

**Learning Objective 2:** 2. To utilise a framework underpinned by physical qualities to monitor and progress athletes through rehabilitation

**Learning Objective 3:** 3. Share clinicians own current clinical practice to develop peer to peer learning

## **Workshop #4**

### **Talocrural Joint Mobilization for Patients with Chronic Ankle Instability**

**Speaker 1:** Matthew Hoch

**Background & Relevance:** Joint mobilization interventions are commonly used to restore mechanical ankle function in chronic ankle instability (CAI) patients. However, emerging evidence indicates joint mobilization interventions have more widespread benefits including improvements in sensorimotor and patient-reported function. Therefore, the rationale for incorporating joint mobilization into CAI rehabilitation has expanded and several novel approaches for using these interventions have been developed. While the evidence supports using joint mobilization for CAI patients, it is important for clinicians to apply techniques properly and capture patient outcomes to successfully implement this manual therapy. This workshop will review joint mobilization techniques that are commonly applied to patients with CAI, synthesize the evidence related to treatment outcomes from mechanical, neurophysiological, and patient-centered perspectives, and demonstrate how joint mobilization interventions have advanced the CAI rehabilitation paradigm. This workshop will also introduce clinical techniques for implementing joint mobilization and capturing clinical and patient-reported outcomes in clinical practice settings through an evaluate-treat-evaluate model. These concepts will be reinforced through laboratory practice of talocrural joint mobilization techniques and clinical strategies for measuring range of motion, sensorimotor function, and patient-reported outcomes.

**Learning Objective 1:** 1. Attendees will be able to explain the rationale for using joint mobilization techniques in patients with chronic ankle instability.

**Learning Objective 2:** 2. Attendees will apply and interpret clinical outcome measures associated with manual therapies in patients with chronic ankle instability.

**Learning Objective 3:** 3. Attendees will be able to apply talocrural joint mobilization treatments and systematically collect patient outcomes through an evaluate-treat-evaluate framework.

## **Workshop #5**

### **Blinking and counting: how to rehabilitate the brankle sprain**

**Speaker 1:** Christopher Burcal

**Speaker 2:** Adam Rosen

**Background & Relevance:** Recent research has found discrepancies in brain and neurocognitive function in patients with ankle sprains and CAI. As a functional reorganization in the cortex occurs, altered sensorimotor feedback and processing may influence reinjury in these individuals. CAI patients rely more on visual cues for balance, and have a decreased ability to direct cortical attention to cognitive tasks while moving. We have seen a large increase in research identifying functional central nervous system deficits in CAI patients. However, how do sports medicine and orthopaedic clinicians utilize information to change their rehabilitation protocols? This session will serve to provide guidance for the clinician how to interpret and utilize this recent evidence, and provide some ways to enhance current balance protocols during rehabilitation. Solutions will range from hi-tech to low-tech, with use of stroboscopic glasses, choice reaction mats, dual-task computer programs, virtual reality headsets, blurry glasses, google cardboard VR headsets, to simple blinking!

**Learning Objective 1:** Attendees will be able to individually assess sensorimotor deficits such that patient-oriented decision-making may be individualized in order to maximize outcomes.

**Learning Objective 2:** Attendees will learn how to devise protocols which utilize visual and cognitive inputs throughout balance protocols in the management of acute and subacute ankle sprains.

**Learning Objective 3:** Attendees will apply their knowledge through the practice and performance of balance exercises which manipulate visual and cognitive inputs.

## **Workshop #6**

### **Manual therapy techniques to improve weight-bearing Dorsi-flexion in the ankle-foot complex**

**Speaker 1:** Helene Simpson

**Background & Relevance:** Teaching physiotherapists a variety of manual techniques to facilitate dorsi-flexion at the talo-crural and midfoot to enable walking and running in the post-traumatic ankle - after long term immobilisation for severe sprains, and fractures, both conservatively and surgically managed. These techniques are easy to perform, safe and are based on the biomechanics and arthokinematics of the ankle-foot complex.

**Learning Objective 1:** Enabling participants a practical framework to do and design appropriate skills to manually improve range of active loaded movement to optimise gait and rehabilitation

**Learning Objective 2:** Teach participants to determine which technique would be most suitable to improve range and decrease pain.

**Learning Objective 3:** Teach participants an evidence based range of manual skill in this session, ranging from mobilisation with movement, myofascial releases, PNF hold relax, Maitland mobilisations, cuboid manipulations and many more