

### **CHRONIC ANKLE INSTABILITY**

# FUNDAMENTAL AND CLINICAL INSIGHTS ON THE BRAIN, COGNITION AND BALANCE

# **ALEXANDRE MARICOT**

PUBLIC DEFENCE TO OBTAIN THE DEGREE OF DOCTOR IN REHABILITATION SCIENCES AND PHYSIOTHERAPY

## MONDAY, JUNE 23rd 2025 at 18:00 PROMOTION ROOM I.0.01, CAMPUS ETTERBEEK

#### PROMOTORS

Prof. dr. Romain Meeusen (VUB, be) Prof. dr. Bruno Tassignon (VUB, be) Prof. dr. Jo Verschueren (VUB, be) Prof. dr. Bart Roelands (VUB, be)

#### JURY MEMBERS

Prof. dr. Nele Adriaenssens (VUB, be) – Présidente Prof. dr. Emma Rheel (VUB, be) Prof. dr. Steven Provyn (VUB, be) Prof. Dr. Eleni Kapreli (Uth, Gr) Prof. Dr. Brice Picot (USMB, Fr)









#### **DESCRIPTION OF THE RESEARCH**

#### Chronic ankle instability: more than just an ankle injury

Lateral ankle sprains are one of the most common sports injuries. For many people, they lead to permanent symptoms such as pain, instability and the sensation of the ankle repeatedly giving way. This condition is known as chronic ankle instability (CAI).

As part of this doctoral research, I looked beyond the ankle itself, investigating the role of the brain in this condition. My research had four objectives:

1) To map brain changes related to CAI and relate them to their symptoms.

- 2) To examine whether cognitive processes can be reliably measured using cognitive functional performance tests.
- 3) To investigate whether individuals with CAI perform worse on these cognitive functional performance tests.
- 4) To analyse whether visual behaviour can contribute to balance impairments in CAI.

A systematic review of the literature has shown that people with CAI exhibit structural and functional changes in brain regions involved in movement, balance and fear. Interestingly, these changes often correlate with the severity of symptoms reported by patients using questionnaires.

I then assessed the reliability of an innovative performance test that also measures cognitive load and integrates it with its motor component. The reliability of this test was fair to good, and people with CAI performed less well in terms of decision-making and environmental perception under time pressure.

Finally, we analysed the use of visual information during balance tasks in individuals with CAI. Although their fixation patterns and pupillary responses did not differ significantly from those of healthy individuals, other visual behavioural characteristics could play a role in balance.

The results of my doctoral research argue for a more holistic approach to rehabilitation, in which not only the ankle but also the brain is actively involved. A neurocentric approach, integrating cognitive and motor training, could improve chronic symptoms in patients with CAI.

#### **CURRICULUM VITAE**

My academic career began with the Rehabilitation Sciences and Physiotherapy program at the Vrije Universiteit Brussel, where I obtained a Master of Science in Rehabilitation Sciences and Sports Physiotherapy in 2020. During my Masters, I developed a growing interest in scientific research, which prompted me to take part in the Honours College program.

In 2021, this interest led to the launch of a PhD project on sports injuries and the role of the brain within the MFYS (Human Physiology and Sports Physiotherapy) research group, in collaboration with LIROMS (Luxembourg Institute of Research in Orthopaedics) and LIH (Luxembourg Institute of Health).

Alongside my academic work, I have remained involved in clinical practice. As a physiotherapist at BCAT, I had the opportunity to closely monitor sports injuries in the world of Belgian basketball and to deepen my clinical expertise.

The last four years have resulted in ten publications, three awards, a research exchange with the University of Nebraska, Omaha and numerous presentations at international conferences, during which I have had the opportunity to share the results of my research with great enthusiasm.

