FUNCTIONAL PERFORMANCE TESTS AND RETURN-TO-SPORT DECISION-MAKING: FOCUSING ON TRANSLATIONAL RESEARCH WITH SPECIAL INTEREST IN FATIGUE AND THE BRAIN.

BRUNO TASSIGNON

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The overall purpose of this dissertation was to contribute to clinical decision-making and functional performance testing across the sport injury spectrum. The three specific objectives encompassed:

1. Establishing return to sport criteria following lateral ankle sprains,
2. Mapping the reliability characteristics of the new reactive balance test,
3. Exploring electrophysiological brain changes induced by various types of fatigue when participants performed the Y-balance test and reactive balance test.

The systematic review (Chapter 2) showed that currently no scientifically sound return to sport criteria following lateral ankle sprain injury can be determined. This was because not one original research study was performed on this topic. Therefore, we provided an overview of the relevant retrieved questionnaires, clinical assessment measures, functional and sport-specific performance tests within ankle sprain populations. Based upon this empirical research, return to sport variables were proposed. This chapter also encompasses rationales and considerations for return to sport decision-making following lateral ankle sprain injury.

In Chapter 3, the reliability study is the first study to assess test-retest, intra- and inter-rater reliability of the reactive balance test within a recreationally trained population. Excellent intra- and inter-rater reliability for both outcomes (i.e. visuomotor response time and accuracy) were found. However, test-retest reliability showed good reliability for visuomotor response time and moderate reliability for accuracy. These results indicate that the reactive balance test is suited for performing analyses over time at the group level.

The third study (Chapter 4) was designed to evaluate the impact of mental fatigue on electrophysiological brain measurements during Y-balance test and reactive balance test performance. Even though mental fatigue was successfully induced, it did not affect Y-balance test performance. However, an increase in prefrontal cortex theta activity was observed when performing the Y-balance test in a mentally fatigued state. Which means mental fatigue was successfully induced, and might suggest a lower availability of attentional resources and poorer decision-making. Regarding reactive balance test performance, only accuracy was compromised due to mental fatigue. No changes in visuomotor reaction time and electrophysiological brain outcome measures were found following the mental fatigue intervention.

In Chapter 5, the results showed that acute physical fatigue impairs the accuracy of the reactive balance test, while Y-balance test performance and visuomotor response time of the reactive balance test remained unaffected. Nevertheless, the underlying changes at the peripheral and central physiological level completely differed from the previous study. During the execution of both tests, acute physical fatigue induced alterations in electrophysiological brain outcome measures in line with previous Wingate literature. Higher α power in the prefrontal cortex, motor cortex and posterior parietal cortex as well as higher β power in the prefrontal and posterior parietal cortex were observed during the execution of the Y-balance test in a fatigued state. Following acute physical fatigue, α and β power increments were found in the posterior parietal cortex and the prefrontal cortex during the execution of the reactive balance test, respectively.

Bruno Tassignon obtained his Master of Science in Rehabilitation Sciences and Physical Therapy (option Sports Physiotherapy) at the Vrije Universiteit Brussel in 2015. Currently, Bruno is a PhD student at the Vrije Universiteit Brussel and Vrije Universiteit Amsterdam. His main research areas of interest are (1) to improve return to sport decision-making after sports injuries and (2) to explore the interactions between the brain, sports injuries and different types of fatigue within the sports injury prevention, rehabilitation, as well as return to sport context.