

## **Time to revisit the content and duration of the Graduated Return to Play after concussion**

1. Simon Kemp<sup>1</sup>
2. Jon Patricios<sup>2,3,4</sup>
3. Martin Raftery<sup>5</sup>

### Author Affiliations:

1. *Chief Medical Officer, Rugby Football Union, London, UK*
2. *Sports Concussion South Africa, Johannesburg, South Africa*
3. *Faculty of Health Sciences, The Section of Sports Medicine, University of Pretoria, Pretoria, South Africa*
4. *Faculty of Health Sciences, The Department of Emergency Medicine, University of the Witwatersrand, Johannesburg, South Africa*
5. *Chief Medical Officer, World Rugby, Dublin, Ireland*

### Correspondence to:

Dr Simon Kemp, Rugby Football Union, Twickenham Stadium, 200 Whitton Road, Twickenham, London TW2 7BA, UK [simonkemp@rfu.com](mailto:simonkemp@rfu.com)

## **Introduction**

Determining the appropriate starting time and duration of the Return to Play (RTP) process after any injury is fundamental to the practice of clinical sports medicine. A framework on RTP after concussion is outlined in the Graduated Return to Play protocol (GRTP) of international consensus protocols that is a key element of concussion management across all levels of sport and a cornerstone of current concussion education initiatives. In Rugby Union, RTP guidelines last underwent a major update by World Rugby, the International Federation, in 2011 and are consistent with international concussion consensus.

The limited evidence base informing the content and duration of the GRTP is acknowledged. Specifically the evidence evaluating the effect, optimal amount and type of rest is sparse. Moreover, current RTP guidelines for children and adolescents are based on those of adults [1] making post-concussion exercise prescription largely generic.

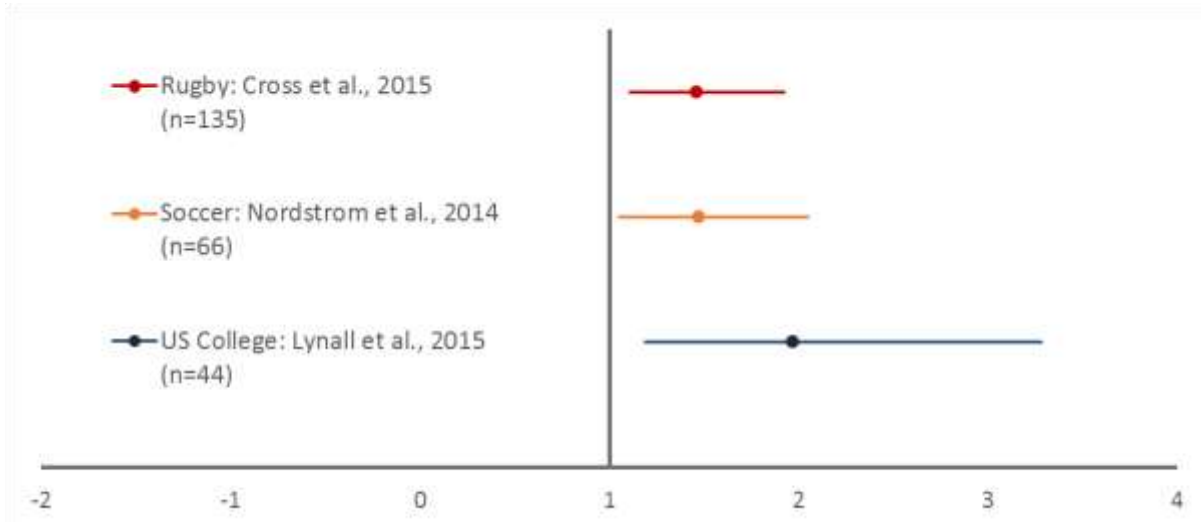
Whilst research concerning a range of clinical outcomes following concussive injury in sport continues to develop, relatively little has been known until recently about the consequences of return to play.

## **Increased injury risk following return to play**

Three recently published studies have all identified an increased risk of musculoskeletal injury following return to play following concussion in professional soccer players, American college athletes and professional rugby players. [2-4]. These increased relative risks of subsequent injury are

significant, particularly when set against the background risk of injury in professional rugby and soccer and are set out in Figure 1.

Fig 1. (Will need re-formatting and axes labelling)



#### **Possible mechanisms for the increased risk**

The results from these three recent studies raise a number of questions.

Firstly, what is the underlying mechanism for the apparent increase in reported injury risk? Is it a consequence of the primary concussive injury where disruption of cortical pathways may result in slower reaction and movement times and/or could impaired functioning of the vestibular system lead to reduced balance and proprioceptive function?

Alternatively, is the increased risk a consequence of the way recovery after concussion is currently assessed and managed? The current GRTP focuses on rest and recovery rather than on the re-development and re-training of neuro-muscular control, proprioception and co-ordination that is typically seen in the rehabilitation of musculoskeletal injuries.

Finally, it may be that the time to RTP is simply too short or not specific enough. Typically the time to RTP after concussion is shorter than for the majority of other injuries. The average time taken for professional rugby players to return after concussion in the Cross study [2] is 11 days compared to an average of 21 days for musculoskeletal injury in the same cohort [5].

#### **Are the current tools used to assess recovery adequate?**

In the light of this increased injury risk, are the current recommended assessment tools in the SCAT3 and the common computerised neuro-cognitive testing systems sufficiently sensitive and repeatable to detect subtle symptom, balance and cognitive deficits that may be associated with this increased injury risk?

Currently assessments of recovery during the GRTP performed on an athlete at rest may not be valid predictors of in-game injury risk and the benefit of post-exertional testing has been demonstrated [6].

Neuromuscular control deficits (conservative adaptations and increased sway) have been observed experimentally, under dual-task conditions, typically gait in conjunction with a cognitive distractor task [7].

These deficits, seen during standard gait tasks may be exacerbated during more demanding athletic activities, contributing to the increased rate of musculoskeletal injury following concussion.

The benefits of more targeted rehabilitation focussing on cervical and vestibular interventions following concussion have also been demonstrated in a number of studies [8 9].

We believe that there is a place for more physically and cognitively challenging athletic tasks both as part of re-training and rehabilitation and as part of the assessment of recovery.

### **What next?**

We believe that the design and timescale of the standard graduated return to play protocol for professional athletes be re-visited with a greater emphasis on dual task activities, active re-training (cognition, balance & vision) and the development and validation of functional assessments performed during exertion in order to better meet the principles that underpin other rehabilitation models.

We suspect that the current minimum GRTP may well not be long enough in all cases to meet these aims.

The role of modifying factors in the prognosis of concussion has been acknowledged (if not quantified) for some time and should influence RTP decision-making. More targeted clinical evaluation and interventions could further improve the specificity of the timing, duration and nature of the GRTP protocol for individual athletes.

Berlin in 2016 provides an opportunity to revisit GRTP guidelines for rugby and all sports.

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