

## FFA Sports Science Education Series

2017 Issue 1

*Scope: The aim of the FFA Education Series is to summarise either:*

*1) a hot topic or 2) a top article from the research literature.*

*The structure is to highlight i) what did they do?, ii) What did they find?,*

*iii) What does it mean? i.e. practical application and iv) Important considerations.*

### The paper reviewed:

#### Consensus statement

## How much is too much? (Part 1) International Olympic Committee consensus statement on load in sport and risk of injury

Torbjørn Soligard,<sup>1</sup> Martin Schwellnus,<sup>2</sup> Juan-Manuel Alonso,<sup>3</sup> Roald Bahr,<sup>3,4,5</sup>  
Ben Clarsen,<sup>4,5</sup> H Paul Dijkstra,<sup>3</sup> Tim Gabbett,<sup>6,7</sup> Michael Gleeson,<sup>8</sup>  
Martin Häggglund,<sup>9</sup> Mark R Hutchinson,<sup>10</sup> Christa Janse van Rensburg,<sup>2</sup>  
Karim M Khan,<sup>11</sup> Romain Meeusen,<sup>12</sup> John W Orchard,<sup>13</sup> Babette M Pluim,<sup>14,15</sup>  
Martin Raftery,<sup>16</sup> Richard Budgett,<sup>1</sup> Lars Engebretsen<sup>1,4,17</sup>

<http://bjsm.bmj.com/content/50/17/1030>

### What did they do?

The International Olympic Committee (IOC) commissioned a consensus meeting of sport science and medicine experts in which the scientific evidence for relationships between (training) load and health outcomes (injuries) were reviewed. Specifically, the expert consensus group combined the best available evidence and expert opinions in appropriate fields to provide guidelines that can be used by practitioners in the field. The outcomes were published in 2 parts, and the current FFA Education piece is Part 1 of the 2 part consensus focussing on load and injury.

### What did they find?

#### *Measuring Load*

Many different measures of load were identified (Table 1), however, no particular measure of load was shown to consistently predict poor training, maladaptation or injury occurrence.

*Table 1: Identified types of load measurement (internal and external)*

External load	Internal load
Training or competition time (secs, mins, hours, days)	Perception of effort (Rating of perceived exertion (RPE))
Training or competition frequency (sessions, competitions, per day, week, month etc)	Session RPE (intensity x duration)
Type of training or competition	Psychological inventories
Time motion analysis (e.g. GPS)	Sleep (quality, duration)
Power output, speed, acceleration	Biochemical markers (blood, saliva)
Neuromuscular function (jump test, isokinetic dynamometry)	Psychomotor speed
Movement repetition counts (pitches, throws, kicks etc)	Heart rate (HR)
Distance (km ran, swam, cycled)	HR:RPE ratio
Acute:chronic ratio	HR Recovery (HRR)
	HR variability (HRV)
	Training impulse (TRIMP)
	Blood lactate concentrations
	Blood lactate : RPE ratio

The consensus statement did attempt to define load monitoring as based on measuring external (stimulus placed on an athlete) and internal (the athletes response to a stimulus) measurements. For example, external load typically involves quantifying the training and competition loads of athletes by measures of duration (hours trained, played) and movement metrics (GPS and acceleration measures). However, potentially important external measures such as life events, daily hassles or even travel were identified but no explicit measurement was suggested. Conversely, internal load is measured by assessing physiological and psychological responses of players to the external load e.g. heart rate, rating of perceived exertion, subjective inventories for psycho-social stressors (ie wellbeing). Importantly, the load required for optimal adaptation is unique to each athlete ie. 'know your own athletes/players'.

#### *Load and Injury*

The consensus group suggested that the most important issue to consider when monitoring load for identifying injury risk may be identifying when athletes are exposed to excessive and rapid increases in the load relative to what they are prepared for. Termed an acute:chronic ratio, evidence is emerging in various football codes for a relationship between high acute:chronic ratio and injury. This ratio describes the acute (e.g. the load for the previous week) to the chronic (e.g. the 4 week rolling average). If chronic load has been progressively increased to high levels (i.e. the athlete has developed training tolerance or fitness) and the acute load is low (i.e. athlete is tolerating the load with minimal fatigue) then the athlete is considered well prepared. However if acute load exceeds the chronic load (i.e. acute load rapidly increased resulting in fatigue, or the previous 4 weeks has been inadequate to develop tolerance) then the athlete is considered underprepared and likely at increased risk of injury.

**SUMMARY: The consensus statement suggests that team-sport athletes respond better to relatively smaller increases/decreases than large changes in loads. The consensus statement also highlighted the need for the development of high training loads over time to maximise physical performance, however these high loads should not be sudden or in a 'spike' like nature.**

## What does it mean?

Monitoring of both the external (stimulus) load and the internal (response) to training and competition will give a more complete picture of how your players are coping with a given demand/s. Typically, measures of quantity of training minutes and match minutes combined with rating of perceived exertion and simple subjective wellness scales are as effective as any other method. Adding external measures such as GPS can further detail the load placed on your players, HOWEVER, it is important to remember that technology such as GPS are merely measure of what your player has done, NOT how they have responded. Be sure to compare your player to him/herself and not to other team-mates as each player will respond uniquely.

## Important considerations

While evidence is growing and showing a link of load (both external and internal) with injury occurrence, studies have not yet shown how well load measures can 'predict' injury, if at all. Be aware that a sharp increase in load does not guarantee a player will be injured. However, put into context, it can guide our decision making. Interestingly, if resources and/or financial constraints prevent from monitoring certain types of load and responses to load such as GPS, biochemical markers etc, a recent systematic review (Saw et al., 2016) found that subjective markers such as well-being, reflect acute and chronic training with superior sensitivity to many objective measures

(Open access article link: <http://bjsm.bmj.com/content/50/5/281.full.pdf+html> )

**For further details contact:**

FFA Head of Medical  
FFA R&D Coordinators

Dr Mark Jones  
Dr Alan McCall  
Assoc Prof Rob Duffield

[Mark.Jones@ffa.com.au](mailto:Mark.Jones@ffa.com.au)  
[alan\\_mccall@yahoo.co.uk](mailto:alan_mccall@yahoo.co.uk)  
[Rob.Duffield@uts.edu.au](mailto:Rob.Duffield@uts.edu.au)