Coupling recovery and training load to indicate readiness to train in professional sports Graham Stark



Training monitoring is now commonplace in elite sports.

Two main reasons for doing so:

- Ensuring athletes are performing at the highest possible level
- Minimising the negative effects of injury, i.e. fatigue, injury risk etc.

There are various ways of interpreting and modelling the data.

We must ask, can these models tell us everything we need and should we be looking at the bigger picture?



## TRAINING LOAD MODELS

One of the most popular models is the Acute : Chronic Workload Ratio (Blanch & Gabbett, 2016; Gabbett, 2016). Based upon the work of Bannister (1975, 1991) and Coggan.

Research has shown that there are some links to injury risk and rate (Stares et al., 2017; Bowen, et al., 2019).

However while there is the association with injury they do not appear to predict injury (Franchini, et al., 2018; Bornn, et al., 2019) or performance (Taha & Thomas, 2003; Scarf, et al., 2019).

They are useful tools, but not sufficient to tell us everything we need to know and certainly not a "golden bullet".

## **INTRICACIES OF THE TRAINING PROCESS**





## WHAT ARE THE INDIVIDUAL CHARACTERISTICS?







## TRAINING MONITORING, OR ATHLETE MONITORING?

We need to consider the athlete as a whole, rather than just their training loads.

They don't exist purely on the pitch / court / field.

Therefore we should look for other tools that can help us consider the Individual Characteristics that affect training outcome.

Thus we need to monitor the athlete, not just the training!







# CAN HRV HELP MONITOR THE ATHLETE?

Heart Rate Variability (HRV) may help provide more of a holistic picture of the athlete.

HRV is influenced by a variety of factors (Sammito & Böckelmann, 2016):

- Non-modifiable factors age, gender, genetics
- Disease
- Body Weight
- Physical Fitness
- Sporting Activity
- Stress
- Well-being



### HRV AS AN INSIGHT INTO ATHLETE WELLNESS

It's well established that HRV is an indicator of stress and general well-being (e.g. Delaney & Brodie, 2000; Geisler, et al., 2010; Munla, et al., 2015).

Relevant to athletes as stress is a factor in increased injury risk (Galambos, et al., 2005; Maddison & Prapavessis, 2005; Slimani, et al., 2018).





## HRV & ACUTE ATHLETIC PERFORMANCE

"Smart-phone-derived HRV may provide an indicator of readiness to train within elite soccer" (Chrismas, et al., 2019)

"In-match player performance, measured by data from Geographical Positioning System (GPS) devices, was predicted with a correlation coefficient of greater than 0.7" (Cornforth, et al., 2015)

"Individually HRV-guided block training may be more optimal compared to predetermined training" Nuuttila, et al., (2017)



#### ACUTE PERFORMANCE IN SKILL-BASED SPORTS – CRICKET





### **HRV & PHYSICAL ADAPTATION**

Could HRV also be used as a window into adaptation? Evidence suggests it can.

- HRV was associated with increased in plasma volume and aerobic fitness (Buchheit, et al., 2011)
- HRV related to changes in VO2max in female soccer players (Esco, et al., 2016)
- Can discriminate playing level in competitive soccer players (Proietti, et al., 2017)
- Larger increases in HRV were associated with greater performance improvement in the Yo-Yo IR1 test (Nakamura, et al., 2018)
- Increases in weekly HRV correlated with improvements in 10km running time (Plews, et al., 2013)



### FINAL SUMMARY

Training Load models are useful for managing periodisation and mitigating injury risk, but probably don't inform us about performance.

Therefore we need to consider more than just what happens on the training field.

HRV can give us insights into a variety of aspects:

- The general wellbeing of the athlete
- Their recovery/readiness status, and how they are likely to perform at their best in the short-term
- Long term adaptation and improvements in physical capacities

HRV is an easy & powerful method for painting a more holistic picture of the athlete.



## COUPLING RECOVERY AND TRAINING LOAD TO INDICATE READINESS TO TRAIN IN PROFESSIONAL SPORTS







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