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[What You Need to Know From the 2017 Annual Congress of the ECSS](#)

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We were fortunate enough to attend this year's 22nd annual Congress of the European College of Sport Science (ECSS) in Essen, Germany. Over four days, an abundance of research was presented covering several disciplines.

TIME TO EMBRACE THE COMPLEXITY

Although we would generally agree that simple is better in the world of sport science, several presentations highlighted the need for more complex approaches. Below we summarise some of our favourite talks.

Firstly, we were captivated by the team from FC Barcelona's innovation hub and their investigation of [machine learning to determine the training load variables that were associated with greater physical match output](#) (via GPS). GPS variables were first classified into [three groups: locomotor, mechanical, and metabolic variables](#). Using a clustering algorithm, greater training monotony (i.e. training involving high variation over 3 week blocks) was shown to be associated with greater match physical output. Although acknowledged as a preliminary exploration, these techniques may provide us with greater insight into the training-to-match performance relationship.

Secondly, Colby and colleagues took a multifactorial approach to determining the non-contact injury risk of elite Australian footballers. Weekly measures of training load, musculoskeletal screening, and subjective wellness ratings were first investigated independently, and then combined to determine if a multivariate model improved the predictive accuracy. Here, the multivariate model performed significantly better than all univariate models suggesting a combination of variables may help improve injury risk detection. A table of the predictive qualities of the model can be seen below. As demonstrated

with the notable misclassification rate of 25%, this model is far from perfect but provides some insight into the multifactorial cause of injury. Potentially more complex models (i.e. machine learning approaches) may lower the number of false negatives and positives, however, the practicality of such complex approaches must still be considered (i.e. how a coach can best interpret). The full paper can now be found [here](#) and a previous blog on the applied aspects of the research within Smartabase [here](#).

		Actual status	
		Injury	Not injured
Predicted Status	Predicted injury	True positive N = 54	False positive N = 861
	Predicted no injury	False negative N = 43	True negative N = 2646
		Sensitivity 56%	Specificity 70%
Likelihood ratio +		2.27	
Likelihood ratio -		0.59	
Correctly classified		75%	
Misclassification rate		25%	
AUC		0.70	
RMSE (SD)		0.16 ± 0.02	

Figure 1. Accuracy of multivariate model for predicting non-contact, lower body injuries

[Patrick Lucy](#) of STATS also gave a fascinating presentation on a data scientist’s approach to utilising tracking data. The concept of goal expectancy was discussed, defined as the probability that a goal will be scored given sport-specific information. A soccer example would include shot location on the pitch, type of shot, location of defenders/goalkeepers and the play leading to the shot. These models estimate the probability based on hundreds of thousands of previous shots, allowing for more complex investigations of performance.

WE STILL HAVE A WAY TO GO TO UNDERSTAND OUR METRICS

The use of innovative metrics to capture novel aspects of workload was examined in detail. Of particular interest was the use of metabolic power — discussed in an [invited workshop](#). Here it was clearly highlighted that metabolic power is merely an estimate of the energetic cost of variable speed locomotion. Simplistically, it models the cost of changing speed. It is **NOT** a measure of overall energy expenditure, nor is directly related to oxygen consumption. There is still room for improvement in our ability to quantify aspects of change in direction and lateral/ backward movements; however, this metric suggests we’re making progress on quantifying the overall workload in field sports. Keep an eye on future developments!

TIMING IS EVERYTHING

Timing of nutrition, cooling, injury prevention exercises were notable themes.

For example, a presentation by [Lovell and colleagues](#) highlighted the timing of injury prevention exercises in the weekly soccer micro-cycle. He found the prescription of injury prevention exercises early in the micro cycle (match day +1) elicited lower soreness levels prior to the subsequent game, compared to completing exercises later in the week (match day +3).

NUTRITION, SLEEP, AND PSYCHOLOGY ARE CRITICAL TO YOUR INTEGRATED PERFORMANCE SYSTEM

[Keith Baar](#) gave an interesting talk on the role of nutrition in the rehabilitation process. Several clinical take away points from the talk are noted below:

1. Connective tissues adapt maximally with short periods (5-10 minutes) of activity separated by six hours of rest. This is an ideal recovery exercise protocol.
2. The increase in collagen synthesis can be augmented by consuming 15g of gelatin one hour before these short periods of activity.
3. Leucine rich protein may also augment collagen synthesis and sinew mechanics
4. Women have a four-fold higher rate of ACL rupture in part because oestrogen inhibits the primary cross-linking enzyme lysyl oxidase resulting in decreased stiffness. Copper rich foods may help prevent this.
5. Exercise results in a global production of a factor that increase collagen synthesis is collagen rich tissues. Therefore, heavy weight lifting of an unaffected area could improve recovery from a connective tissue injury.

[Pitchford and colleagues](#) investigated the influence of sleep extension by way of increased overnight sleep opportunities and daytime napping on physiological and psychometric measures of recovery following high-intensity intermittent running exercise (HIIE). Following a bout of HIIE, participants slept in laboratory conditions for one night of restricted sleep (six hours in bed). A sleep intervention for the following three nights was then administered. It was found that extended sleep (10 hours in bed) and a nap protocol (eight hours in bed + two hours nap each afternoon) was associated with greater total sleep time (measured by wrist worn actigraphy) compared to the control group (eight hours in bed). Furthermore, following these protocols, sprint times (5m, 10m and 20m) recovered in full — suggesting they may positively influence the recovery of muscle function and stress.

[Les Podlog](#) presented on the psychological aspects of injury. To summarise, an individual may be considered at risk of injury if they are high stress responders, have a history of stress, and poor coping abilities. To mitigate risk, intervention strategies may include relaxation techniques, imagery, self-talk, and mindfulness training.

COLLABORATION IS KEY

There was much debate regarding statistical power and adequate sample size. Greater collaboration between research groups, teams and organisations is still required to allow for more sophisticated analyses.

If you are managing multiple sources of data within an integrated performance team, it may be time to invest in an athlete data management system to automate your processes.

If you are interested in hearing more about the SMARTABASE system, do not hesitate to contact us at smartabase@fusionsport.com.

By [Marcus Colby](#), PhD Candidate at The University of Western Australia