



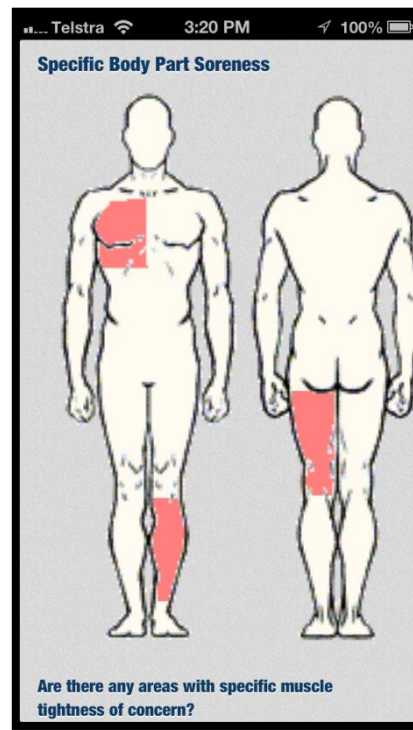
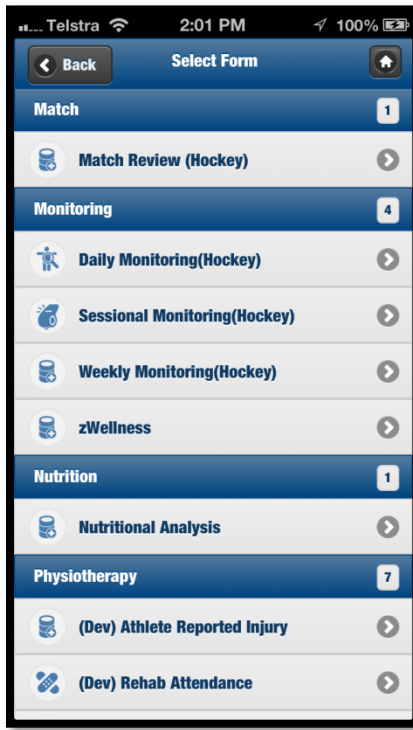
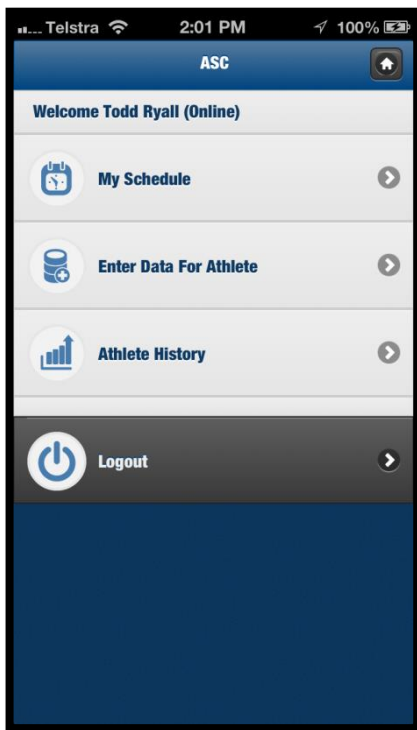
Monitoring Athlete Health- Overtraining, Sleep and the Immune System

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Monitoring- AMS



Performance success or failure is influenced by weeks lost to injury and illness in elite Track and Field athletes

Reference: by BP. Raysmith MK. Drew JSMS 2016

Designed by @YLMsportScience

METHODS 33 International Track and Field Athletes followed across five international competition seasons

The 6-month preparation season, relationships between training weeks completed, the number of injury/illness events and the success or failure of a performance goal at major championships was investigated



RESULTS

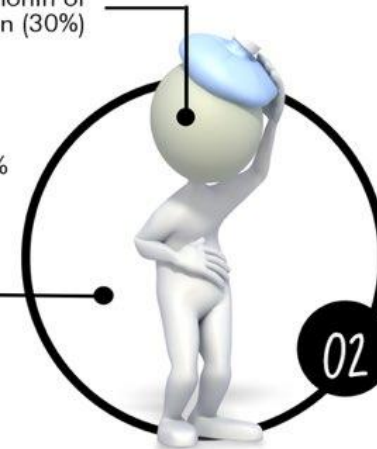


Likelihood of achieving a performance goal increased by 7-times in those that completed >80% of planned training weeks

Most illnesses occurred within 2-months of the event (50%)

Training availability accounted for 86% of successful seasons

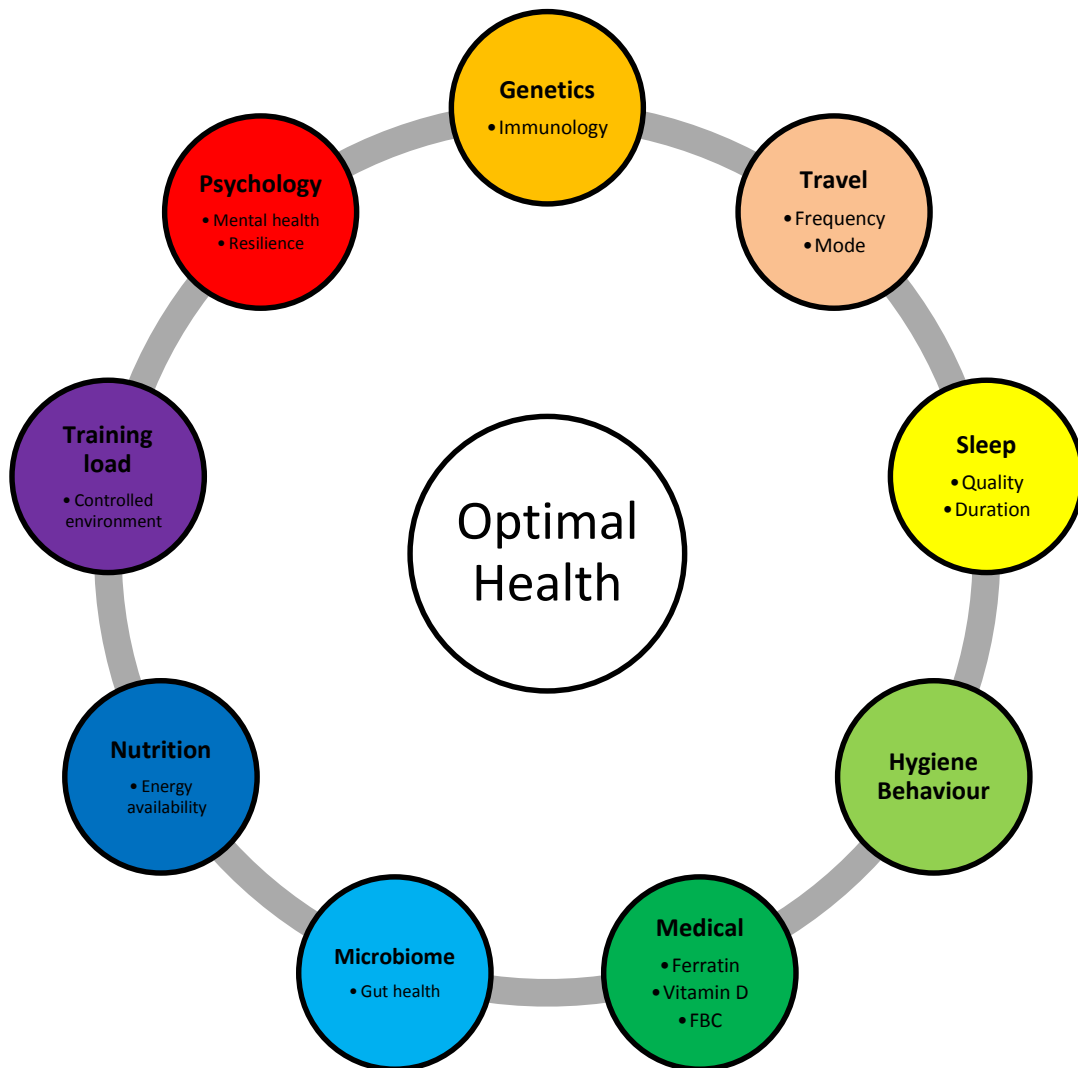
The majority of new injuries occurred within the first month of the preparation season (30%)



CONCLUSION

Injuries and illnesses, and their influence on training availability, during preparation are MAJOR determinants of an athlete's chance of performance goal success or failure at the international level. Equal attention should be paid to the prevention of both injury and illness

Research Streams- Stay Healthy





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Original research

A multifactorial evaluation of illness risk factors in athletes preparing for the Summer Olympic Games

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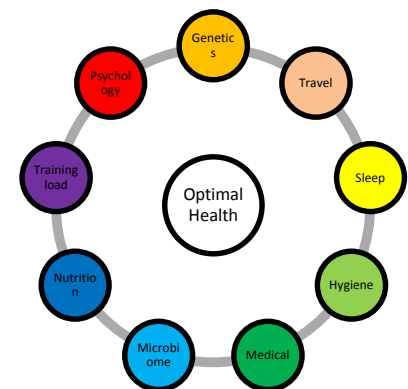
Table 2

Odds ratios, and attributable risks in the exposed and population for categorical variables.

	Odds ratio	95%CI	p-Value	Attributable fraction in the exposed	95%CI	Attributable fraction in the population
Demographics						
Sex (female)	9.4	1.3–410	0.01 ^a	0.89	0.21–1.0	0.84
Probiotic usage	2.4	0.63–8.5	0.13	0.58	–0.57 to 0.88	0.25
Injured in the last month	0.62	0.17–2.2	0.40	0.38	–1.15 to 0.83	0.19
Missed training due to injury in the last month	2.1	0.40–9.0	0.28	0.52	–1.13 to 0.89	0.13
Energy availability and menstrual function						
Low energy availability (females only, LEAF ≥ 8)	7.4	0.8–352	0.04 ^a	0.87	–0.28 to 1.0	0.76
Gastrointestinal score (females only, >4)	5.5	0.32–85	0.09	0.82	–2.12 to 0.99	0.20
Menstrual score (females only, ≥8)	6.0	0.79–43	0.03 ^a	0.83	–0.27 to 0.98	0.42
Injury score (females only, ≥4)	0.9	0.12–5.5	0.89	0.1	–4.5 to 0.88	0.04
Travel						
Month total (≥1 journey, any mode/country)	1.1	0.32–3.8	0.87	0.09	–2.2 to 0.74	0.04
Month total (≥2 journeys, any mode/country)	1.1	0.18–5.2	0.86	0.12	–4.6 to 0.81	0.02
Month total (≥3 journeys, any mode/country)	4.5	0.29–65	0.12	0.78	–2.4 to 0.98	0.10
Psychological						
Depression (mild or greater, DAS-21 > 4)	8.4	1.1–59	<0.01 ^a	0.88	0.10–0.98	0.39
Anxiety (mild or greater, DAS-21 > 3)	3.3	0.52–19	0.11	0.70	–0.90 to 0.95	0.31
Stress (mild or greater, DAS-21 > 7)	3.8	0.60–22	0.07	0.74	–0.68 to 0.95	0.32
Living arrangements						
Communal (share house or training centre) ^b	3.3	0.75–16	0.07	0.69	–0.33 to 0.94	0.43
Hygiene (see Supplement 1 for extended findings)						
Washing hands <10 s ^c	3.3	0.75–16	0.07	0.69	–0.33 to 0.94	0.43
Hand sanitiser usage	1.8	0.19–85	0.61	0.43	–4.1 to 0.99	0.40
Using hand sanitiser more than soap	1.3	0.25–5.8	0.68	0.24	–0.29 to 0.83	0.08
Washing hands ≥15 times a day	0.44	0.01–3.7	0.44	0.56	–2.7 to 0.99	0.10
Sleep						
Pittsburgh (≥5)	1.5	0.12–12	0.66	0.33	–7.5 to 0.92	0.11
Going to bed after 10 p.m.	0.86	0.11–11	0.87	0.14	–9.7 to 0.89	0.10
Rising from bed before 8 a.m.	0.27	0.02–2.2	0.14	0.73	–1.2 to 0.98	0.48

Illness Risk Factors

- In December 2015-January 2016 in the Australian Olympic shadow squad, low energy availability, mental health and female sex were associated with high attributable risks of suffering a sport-incapacity illness in the previous month.
- Small sample size (n=81) - replication in a larger cohort as warranted paying attention in greater detail to the types of illness.
- Subsequent investigation (n= 206) conducted 3 months prior to Rio 2016



Illness Risk Factors

Domain	Questionnaire	Measure
Probiotics	Custom questionnaire	Probiotic use (any brand).
Travel	Custom questionnaire	International travel details.
Psychology	Depression, Anxiety, Stress Scale (DASS-21)	Symptoms of depression, anxiety and stress. 11,12
	Dispositional Resilience Scale (DRS)	Resilience to stress response patterns. 13
	Recovery-Stress Questionnaire (REST-Q-Sport-52) 14	Multi-dimensional analysis of an individual's recovery-stress state. For analysis, the subscales scores for overall and sport-specific stress and recovery were analysed independently.
	Perceived Stress Scale	Level of global perceived psychological stress. 15
Sleep	Pittsburgh Sleep Quality Index 16	Sleep quality, latency, duration, efficiency and disturbances. For analysis, the published cut-off score of ≥ 5 was utilised.
	Epworth Sleepiness Scale 17	Daytime sleepiness symptoms. For analysis, the published cut-off score of ≥ 10 was utilised.
Nutrition	Low Energy Availability in Females (LEAF-Q) 18	Injuries and gastrointestinal and reproductive function. For analysis a global score ≥ 8 was utilised to indicate increased risk of low energy availability 18 as well as the individual components: gastrointestinal ≥ 4 , injury ≥ 4 and reproductive function ≥ 8 .

Illness Risk Factors

Domain	Questionnaire	Responses		Prevalence (%)
		Yes	No	
Probiotics	Any usage	38	95	28.6
Travel in the last month	>1 occasion	57	76	42.9
	>2 occasions	16	117	12.0
	>3 occasions	5	128	3.8
Psychology	Depression (DASS-21 >4)	22	105	17.3
	Anxiety (DASS-21 >3)	24	103	18.9
	Stress (DASS-21 >8)	18	109	14.2
	Dispositional Resilience Scale (DRS<27)	13	115	10.2
	Perceived Stress Scale			
Sleep	Pittsburgh Sleep Quality Index	51	53	49.0
	Epworth Sleepiness Scale (>10)	23	84	21.5
Nutrition	Low Energy Availability in Females (≥ 8)	36	54	40.0
Recovery*	REST-Q ¹	-	-	-

Symptom category	Definition	Responses		Prevalence (%)	
		Yes	No		
Upper respiratory	Any symptoms	61	71	46.2	
	Sports incapacity	58	3	95.1	
	Number of days	Full (n=59)	4.4±4.6		96.7*
		Mod (n=20)	0.9±1.6		32.8*
No (n=17)		0.7±1.4		27.9*	
Bodily aches	Any symptoms	26	106	19.7	
	Sports incapacity	26	1	96.2	
	Number of days	Full (n=25)	6.5±5.6		96.2*
		Mod (n=5)	0.5±1.0		19.2*
No (n=4)		0.3±0.9		15.4*	
Gastrointestinal	Any symptoms	28	104	21.2	
	Sports incapacity	22	6	78.6	
	Number of days	Full (n=22)	4.1±6.4		78.6*
		Mod (n=6)	0.4±0.8		21.4*
No (n=9)		0.7±1.2		32.1*	
Head	Any symptoms	31	101	31.5	
	Sports incapacity	27	4	87.1	
	Number of days	Full (n=27)	2.4±2.0		87.1*
		Mod (n=8)	0.4±0.8		25.8*
No (n=7)		0.3±0.7		22.6*	
Chest	Any symptoms	10	122	7.6	
	Sports incapacity	10	0	100	
	Number of days	Full (n=10)	6.8±7.2		100*
		Mod (n=3)	0.5±1.0		30.0*
No (n=3)		0.5±0.8		30.0*	
Fatigue	Any symptoms	48	84	36.4	
	Sports incapacity	45	3	93.8	
	Number of days	Full (n=45)	7.1±6.3		93.8*
		Mod (n=8)	0.6±1.5		16.7*
No (n=2)		0.2±0.9		41.7*	
Eye	Any symptoms	10	122	7.6	
	Sports incapacity	8	2	80	
	Number of days	Full (n=8)	2.9±2.5		80.0*
		Mod (n=1)	0.1±0.3		10.0*
No (n=0)		0±0		0.0*	
Other illness	Any symptoms	2	132	1.5	
	Sports incapacity	2	0	100	
	Number of days	Full (n=1)	0.5±0.7		50.0*
		Mod (n=2)	3.0±2.8		100.0*
No (n=1)		1.5±2.1		50.0*	
Injury	Number of injuries (Range) (Mean±SD)	0-3			
		0.4±0.6			
	Sports incapacity	31	101	23.5	
	Medical attention	57	75	43.2	
Medical treatments	1.9±3.5				

Illness Risk Factors

- Relating to sports incapacity low energy availability was significantly associated with body aches and head symptoms.
- Relating to athlete-self reported illness (independent of sports incapacity), low energy availability exhibited higher odds of reporting symptoms of upper respiratory tract infections, bodily aches, gastrointestinal disturbances, and head symptoms.
- Poor sleep quality was associated with higher odds of having gastrointestinal disturbances.
- **Athlete self-reported illnesses are strikingly high in the months leading to an Olympic Games with almost 100% of participants reporting at least one illness presentation in the previous month**
- **High prevalence of illness, poor mental health, low energy availability, and poor sleep quality to the 2016 Summer Olympic Games**
- **The results of the factor analyses show the interdependence of various health domains and support the proposition that athlete health cannot be independently researched or managed in one profession or discipline in the high performance setting.**

Intensified Training/ Overreaching

- Sleep disturbances are common- fatigue does not equal sleepiness
- Increased mood disturbance
- Increased prevalence of URTI

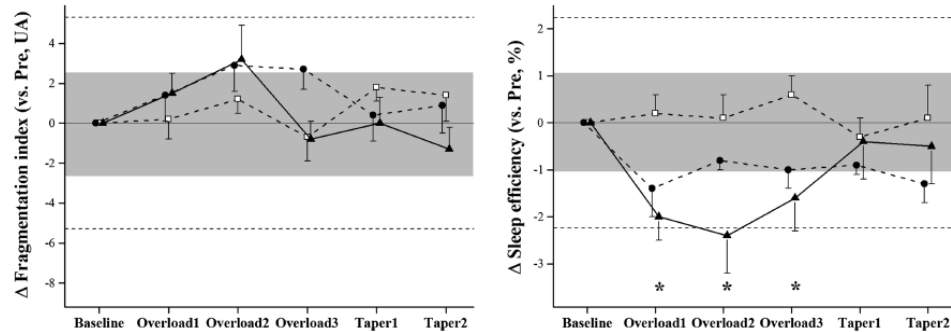
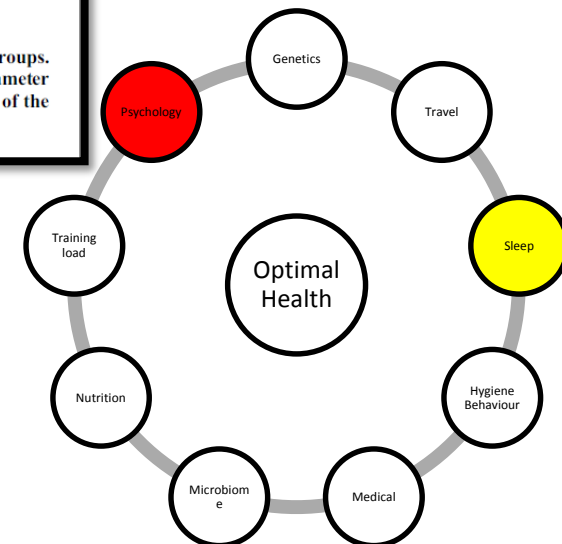
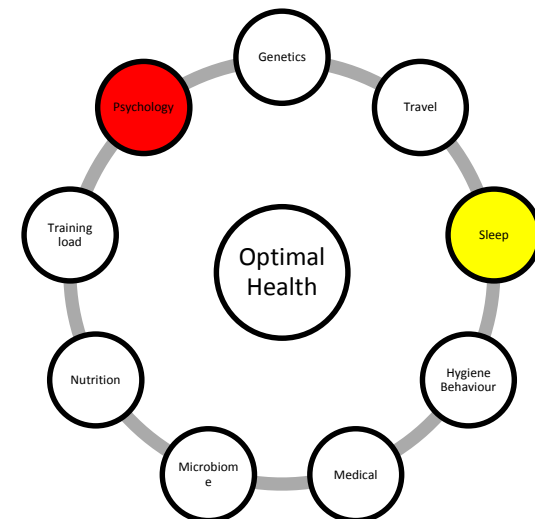


FIGURE 2—Change in mean weekly sleep parameters from baseline values during the overload and taper phase in the three experimental groups. CTL, control; AF, acute fatigue; F-OR, functionally overreached. Gray areas and dashed lines represent 1 CV and 2 CV of the considered parameter during the 6-wk protocol in the control group. *Significantly different from baseline at $P < 0.05$. †Significantly different from the third week of the overload period at $P < 0.05$.



Sleep, Anxiety and Depression

- Bi-directional link between sleep and anxiety and sleep and depression
- n=100 athletes
- Significant relationship between poor sleep and high anxiety and high depression



What to monitor?

Table 1: Variables that can be used to monitor training load and subsequent fatigue. RPE - Rating of Perceived Exertion; REST-Q - Recovery Stress Questionnaire; VAS - Visual Analogue Scale.

VARIABLE	UNITS/DESCRIPTORS
Frequency	Sessions per Day, Week, Month
Time	Seconds, Minutes, Hours
Intensity	Absolute, Relative
Type	Modality, Environment
Maximal Effort	Max Mean Power, Jump Height
Repeat Efforts	Number of Efforts, Quality of Efforts
Training Volume	Time, Intensity
Perception of Effort	RPE
Perception of Fatigue and Recovery	Questionnaires; REST-Q, VAS
Illness	Incidence, Duration
Injury	Type, Duration
Biochemistry and Hormone Analysis	Baseline, Response to Exercise
Technique	Movement Deviations
Body Composition	Total Body Weight, Fat Mass, Fat-Free Mass
Sleep	Quality, Quantity, Routine
Psychology	Stress, Anxiety, Motivation
Sensations	Hopeful, Neutral, Hopeless

- **LEAF-Q**
- **Depression**
- **Personal Hygiene**



THANK YOU



Australian Government

Australian Sports Commission

