Prescription of training load in relation to loading and unloading phases of training

Executive Summary, Version 1, 4 May 2015

Background:

Performance enhancement and athlete wellbeing is the collective responsibility of the coach and all support staff (including but not limited to Physiology, Medicine, Strength and Conditioning, Physiotherapy, Nutrition, Psychology). Although driven by the coach and athlete, performance enhancement and athlete wellbeing should not be 'owned' by any single entity or discipline.

Systematic training prepares the athlete for the demands of the sport such that both performance and safety are enhanced. It is acknowledged that moderate to high training loads improve performance[1] and are protective against injury.[2] The skill in planning high performance training programs is in balancing the risks and benefits associated with ensuring an adequate training stimulus without accumulating excessive training stress. Recent evidence has highlighted a link between match availability rates of players and performance in team sports.[3, 4] A similar relationship between injury burden and performance in individual sports[5] has been observed from analysis of internal data with athletes reporting injuries in the month prior to World Championships at risk of sustaining an in-championship injury.[6] Importantly, if substantial amounts of training are modified, individual athletes are significantly less likely to achieve their goals.[5] This paper will focus on the process to attain required training levels and specifically, appropriate load strategies following training troughs due to planned rest, tapering or injury/illness.

<u>Planning training load is imperative to maximise exposure to training to allow adaptation and skills development to occur thus improving the opportunity to perform.</u>

If an athlete trains at 60% of their normal volume and intensity for 2 weeks, it takes 10 days to progressively return to full training load to reduce injury risk.

Longer breaks in training and greater drops in volume and intensity require a longer progressive return to full training to reduce injury risk.

Key Findings and Recommendations:

1. What is "rest"?

Rest may be defined as a substantial decrease in training load from the normal. A decrease in training load can be absolute (no training) or relative (as percentage drop from normal load i.e. 30%).For an elite athlete, long periods of absolute rest causes reduced physical capacity. There is an increased risk of injury and illness on return to training, if the volume, intensity and frequency of training are not well managed. Data from Australian athletes indicate that after pronounced reduction in training load due to planned rest, tapering or injury/illness, resumption of training is associated with increased risk of injury. The time taken to return to normal loads should be proportional to the length of the break and the amount of training achieved in this break. The figure on page 2 illustrates this relationship.

2. Inclusive and effective planning

Effective planning requires a multidisciplinary approach. This should include the athlete, support service team and coach working collaboratively to design and implement a periodised training plan. The periodised plan identifies key training variables impacting on the acquisition and maintenance of optimal physical standards.

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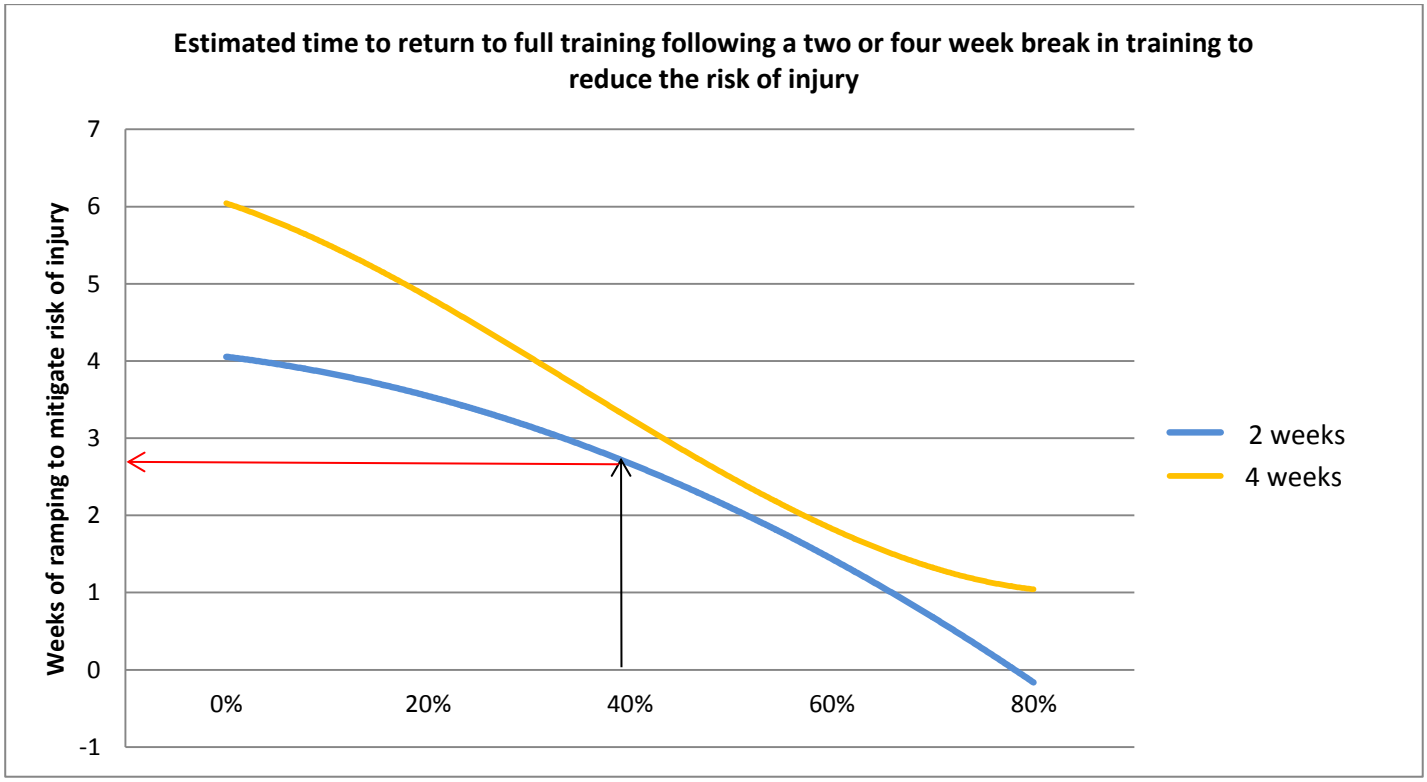
3. Loading and unloading of training

Evidence exists showing a relationship between steep increases in training load (spikes) and onset of injury.[7-10] Care should be taken to reduce the magnitude of the spikes in training load as these increase risk of injury and illness. Risk can be mitigated by ensuring a high base of training is achieved before intensive training blocks. Camps and similar intensive training blocks should not occur within 4 weeks of a training trough due to planned rest, taper or injury/illness. Mismanagement of training loads during a period of injury may lead to subsequent injuries which account for 37% of injuries in athletes.[11]

4. Acquiring and maintaining optimal physical standards

Poor physical conditioning is not conducive to performance and exposes the athlete to injury or illness. The periodised plan provides information on the athlete's current physical status, the specific physical standards required for the sport and appropriate training strategies to address identified deficiencies. Support staff must work in collaboration to ensure holistic, multidisciplinary assessment and planning in returning the athlete to the physical standards required by the sport.

5. Give an indication of how long it takes to return to training (reloading) following a period of "rest" to reduce the risk of injury in this period



To use the graph above, first decide the length of break intended (in this case we have chosen a two week break- blue line or a four week break- yellow line). Secondly, decide the amount of training percentage of a normal training week that the athlete can be reasonably expected to average over the break (black arrow). From here you can calculate the recommended time for return to full training that will minimise the athlete's risk of injury and illness (red arrow) (i.e. not spike the athlete's training load above 150%). Note: the loads must be sport-specific. E.g. runners should reduce the volume but maintain intensity. This will reduce the chance of sustaining a running related injury. In this example, a runner of 100km weekly mileage who is prepare to run 40km per week, can expect a reloading period of 2.5 weeks following a 2 week break at 40% of normal training loads. Returning quicker than this will increase the injury risk. Therefore, 2 weeks of break equates to 4.5 weeks (2 weeks at 40% plus 2.5 weeks of reloading) of modified training total. These scenarios are expanded in the Appendix.

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Conclusion:

This document does not oppose hard and high training loads. In fact high training loads, achieved safely, are protective from injury. It is likely that training loads higher than what is required for peak performance can be reached. However the period after training troughs due to planned rest, tapering or injury/illness is a time of increased injury risk. It is therefore the responsibility of all staff supporting the athlete to ensure that progression of load is appropriately planned to safely achieve the levels required for performance.

Recommendation:

When full training decreases by 4 days or more, a clear return to full training plan should be implemented. It is recommended that the coach develops and implements this return to full training plan with their interdisciplinary support team.

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Secretary: Michael Drew
Committee Members (in alphabetical order): Peter Blanch, Dr Dale Chapman, Dr Tim Gabbett, Prof Chris Gore, Dr David Hughes, Tim Kelly (Facilitator), John Mitchell, Craig Purdam, Dr Tony Rice, Ben Raysmith

References

1. Foster C, Daines E, Hector L, et al. Athletic performance in relation to training load. *Wis. Med. J.* 1996; 95(6):370-374.
2. Orchard JW, Blanch P, Paoloni J, et al. Cricket fast bowling workload patterns as risk factors for tendon, muscle, bone and joint injuries. *Br. J. Sports Med.* 2015.
3. Podlog L, Buhler CF, Pollack H, et al. Time trends for injuries and illness, and their relation to performance in the National Basketball Association. *J. Sci. Med. Sport.* 2014.
4. Hägglund M, Waldén M, Magnusson H, et al. Injuries affect team performance negatively in professional football: an 11-year follow-up of the UEFA Champions League injury study. *Br. J. Sports Med.* 2013; 47(12):738-742.
5. Raysmith B, Drew MK. Performance success or failure are explained by weeks lost to injury and illnesses in elite Australian Track and Field athletes: a 5-year prospective study. In review.
6. Alonso J-M, Jacobsson J, Timpka T, et al. Preparticipation injury complaint is a risk factor for injury: a prospective study of the Moscow 2013 IAAF Championships. *Br. J. Sports Med.* 2015.
7. Rogalski B, Dawson B, Heasman J, et al. *Training and game loads and injury risk in elite Australian footballers*, Journal of Science and Medicine in Sport. 16 (6) (pp 499-503), 2013. Date of Publication: November 2013.; 2013.
8. Hulin BT, Gabbett TJ, Blanch P, et al. Spikes in acute workload are associated with increased injury risk in elite cricket fast bowlers. *Br. J. Sports Med.* 2013:bjsports-2013-092524.
9. Piggott B. The relationship between training load and incidence of injury and illness over a pre-season at an Australian Football League Club. 2008.
10. Anderson L, Triplett-McBride T, Foster C, et al. Impact of training patterns on incidence of illness and injury during a women's collegiate basketball season. *The Journal of Strength & Conditioning Research.* 2003; 17(4):734-738.
11. Drew MK. Subsequent injury in National Sporting Organisations: Towards a National Reporting System. *Australian College of Science and Medicine in Sport*. Canberra, Australia2014.

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Appendix

Table 1 – Determining modified training period on return from reduced training load.

		Weeks of modified training required to return to full training (total weeks of modified training)				
Weeks of training at a reduced load	8	8 (16)	6.9 (14.9)	5.8 (13.8)	4.8 (12.8)	3.7 (11.7)
	7	7.4 (14.4)	6.3 (13.4)	5.3 (12.3)	4.2 (11.2)	3.1 (10.1)
	6	6.9 (12.9)	5.8 (11.8)	4.7 (10.7)	3.7 (9.7)	2.6 (8.6)
	5	6.3 (11.3)	5.2 (10.2)	4.2 (9.2)	3.1 (8.1)	2.0 (7.0)
	4	5.7 (9.7)	4.7 (8.7)	3.6 (7.6)	2.5 (6.5)	1.5 (5.5)
	3	5.2 (8.2)	4.1 (7.1)	3.1 (6.1)	2.0 (5.0)	0.9 (3.9)
	2	4.6 (6.6)	3.6 (5.6)	2.5 (4.5)	1.4 (3.4)	0.4 (2.4)
		0%	20%	40%	60%	80%
		Percentage of training of normal training load completed				

In this example after having 2 weeks of reduced load (40%) the athlete would require a 2.5 weeks of incremental training to return to full training. Returning quicker than this period exposes the athlete to increased risk of injury. Therefore the time out of full training is 4.5 weeks.

Equation 1 – Calculation for the time to return to full training following

Weeks to return to training = 0.5533 x (length of break in weeks) - 0.0587 x (percentage of training to be completed) + 3.533

The adjusted-R^2 for this equation is 0.94

Note: Percentage of training must be expressed as an integer. That is, 40% is recorded in the equation as “40” not 0.4.

Using the example above:

Weeks to return to training = 0.5533 x 2 - 0.0587 x 40 + 3.533

= 2.5

Total modified training time in weeks = 2 + 2.5

= 4.5

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