SUDDEN INCREASES OR DECREASES IN TRAINING LOAD CAN INCREASE INJURY RISK

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Article Objectives

- Coaches often use preseason as a period for high loading to prepare players for the upcoming season.
- Research shows that sudden changes in typical loading can increase injury risk.
- Coaches should consider planning training intensity in a progressive manner

There has been much written, including by myself, about training loading and the importance of consideration of loads by the coaching staff. By loading, I mean the intensity, duration, and types of training that is completed by players. When planning training sessions, in addition to training objectives, level of training load should be taken into account.

There are many methods to quantify training load. Because physiological loading is difficult to summarize with a single number, there is not one right way to measure load. Load could be quantified by volume, such as total distance covered during a session. However, because there are many ways to complete the same distance, the total alone does not tell a complete story. For this reason, other metrics might be used, but unfortunately they all suffer from the same weakness.

Total metabolic load can be summarized using an index, like a Bannister or Edward's TRIMP (TRIMP is short for the term 'training impulse') score. These measures essentially sum the time that a players' heart rate is in specific zones of intensity. Once again, however, it could be possible to have the same TRIMP score for very different conditions. For example, An accumulated heart rate score for a long, continuous run at a speed below the maximal aerobic speed might be the same as a shorter, high intensity interval session. Same score, but entirely different training effects.

Another method to quantify load is to ask for players to report their perceived exertion on a scale of 1-10 (10 is most intense), and multiply the score by the training duration. For example, a 90 minute session with a rating of 7 would have a training load of 90 x 7 = 630. Although this method is based on the subjective ratings of the players, research has shown (including unpublished analyses I have completed on my current teams) that player reported training loads correlate well with quantitative measures completed using GPS, accelerometers, and heart rate monitors.

This brings us to the the topic of this article, acute and chronic training loadings. Coaches measure training loads in order to optimize training. The definition of optimize depends on the coach, but for me, optimize means to maximize the intended adaptations from the training while reducing injury risk.

A popular subject that has been recently emphasized is the concept of overtraining or functional overreaching. While there are scientific definitions to these terms, in simplicity, they mean training too hard. Essentially, we can stress the body (and mind) to induce a positive adaptation, but we can also stress the body too hard, resulting in less than optimal adaptation, or worse, injury.

The trick is that we never know if an injury would have occurred unless it occurs. This may sound silly, but consider this: if a player does not train, then they cannot get injured, right? So if a coach holds a player out of training, there is no chance for injury. However, there is also no chance for improvement. There has to be a balance.

When it comes to using training loads for determining if a player is over, under, or optimally trained, my experience says that this has to be completed on an individual basis. It is not prudent to establish a value of training load applied across a team that defines too high or too low. In the earlier example, a training load of 630 might be very high for one player and low for another. Making a decision that a training load of 630 is the goal could be a very bad decision depending upon the player. Any time a coach states that a training load is too high or too low leads me to the immediate questions of 1) how do you know the load is too high or too low; and 2) Too high or too low compared to what?

In order to help provide guidance, some sport scientists have started using the concept of acute vs. chronic training loads. There have been some papers Blanch & Gabbett (2016) showing that when acute training loads vary highly from chronic training loads, injury risk increases.

Acute training load is the training load for a given day (typically the most recent). Chronic training load is the average of the training load over some longer period. Coaches have used 3-day, 7-day, and 21-day periods to define chronic loads.

For example , let's say we use a 7-day window for chronic training load and use player rating as our measure. During the past 7 days, we have have had one day off, and six 90-minute sessions. A player has rated the sessions 5, 7, 6, 0 (off), 6, 8, 6. These correspond to training loads of 450, 630, 540, 0, 540, 720, and 540. The average of these loads, 488.6, is the chronic training load. The last load was 540. This makes the acute to chronic load ratio of 540/488.6 = 1.1. See the table on the next page:

Day	Rating	Duration	Training Load
1	5	90	450
2	7	90	630
3	6	90	540
4	0	0	0
5	6	90	540
6	8	90	720
7	6	90	540

Chronic Load	488.6
Acute Load	540
Acute:Chronic Load Ratio	1.1

These researchers have shown that an acute to chronic load ratio spike is related to injury risk. Quite simply, introducing a very hard session relative to what has been completed in the recent past can be difficult for the players to handle, essentially over-stressing the players' bodies.

Interestingly, these data also imply that some training load should be applied, because with no training load, the chronic load will drop to near zero. Too much training is not good, but also is too little.

This concept may seem like common sense, but it bears a very serious message for coaches at the beginning of their preseason training phases. Many coaches, including myself, have approached preseason as the period to get the players fit, and because preseason periods are typically short, plan multiple sessions per day that include high levels of intensity. Coaches might want to rethink this approach.

With my teams, we typically look for a balance. We expect the players to come to preseason with some preparation so their chronic loads coming into camp are not low. We use player questionnaires and communication to monitor training status. We also gradually increase the training loads during the preseason camp, frequently not reaching higher loads until a few sessions have been completed. We also delay player testing until after a few training sessions as these tend to be of high intensity.

While we as coaches want to get the most out of our players, we also want to eliminate and redice injury risk. The acute to chronic training load model can give us a simple method to help with planning training to be of the most beneficial levels. Coaches should consider planning training intensity in a progressive manner.

Reference

Blanch, Peter, and Tim J. Gabbett. "Has the athlete trained enough to return to play safely? The acute: chronic workload ratio permits clinicians to quantify a player's risk of subsequent injury." British journal of sports medicine 50.8 (2016): 471-475.