



Physical Development

2016 - 2017

Understanding Athlete Development and Loading Parameters

A recent consensus statement by the international Olympic Committee on youth athletic development argues that while sport performance improves with growth and development, there is an asynchronous relationship to the development of youth athletes; noting the younger the athletes, the more loaded and over trained they are becoming.

Long Term Athlete Development (LTAD) principles are widely publicized, with a very structured approach to athlete development in Canada, via Canadian Sport for Life. By the adoption of training pathways and development stages implemented early in a youth athletes career, physical development may be optimized.

With the increase in training for youth athletes across Canada, a key area of focus must now be highlighted as “Training Load” or “Loading”. Training load is the objective means by which all aspects of physical activity are quantified. The higher an athlete’s training load the higher their risk of overtraining and chance of injury may become. Through careful guidance, these risks may be mitigated, but it is important to understand the balance between risk and reward.

The objective of this document is to provide guidance in order to maximize athlete performance while reducing risk of overtraining and injury.

Key Definitions

Training Load – quantification of the cumulative amount of stress placed on an individual from a single workout or over a period of time. Inclusive of heart rate load, neuromuscular load, psychological load and environmental factors ie. temperature and humidity

$$\text{Training Load} = \text{Volume (Duration + Frequency)} + \text{Intensity (Pace or Power)}$$

Heart Rate Loading – amount of time spent within heart rate zones, with each zone increasing in intensity and load from zone 1 to zone 5

Neuromuscular Loading – amount of loading to the individual muscle groups and structures, the quantification for every lunge, jump, squat, sprint and change of direction undertaken within a given period of time

Psychological Loading – stress in relationship to performance demands, cognitive demands, and motivation, also including external sources of psychological load ie. parents, coaches and peer’s expectations

Heart Rate Variability - the variation between heartbeats, HRV gives an indication of the level of stress the body is experiencing. The higher the variability the less stressed the body is. For example, if you are scared, you can feel your heart pounding in your chest, like a metronome. When the metronome beats with low variability, this reflects you are in a stressed state. Conversely, when you are relaxed, your heart beats on demand in a more variable way.

Recovery – the ability for the body to recover fully from a period of stress, ie. return to baseline. This can be aided by increased fitness, decreased loading, proper nutrition and the utilization of recovery strategies. The more “recovered” an athlete is, the better their performance will be.

Quantifying Load

Quantifying load is not just for sport scientist and coaches; it can be completed through a variety of means and methods. Consider the questions below:

*note: all activities count towards load for youth athletes; school work, home work, technology time (TV/computer), PE class, sports programs, team training and games, gym sessions, general play and sleep.

Training Load = Volume (Duration + Frequency) + Intensity (Pace or Power)

- How many days of week of activity?
- How many activities/day?
- How long are each of the activities?

- What is the activity?
- Fast or slow?
- Hard or easy?
- Heavy or light?
- Individual or combative?

How to Quantify Physical Load

Without access to HR monitors and GPS analysis, RPE is the preferred choice for understanding the load of an activity.

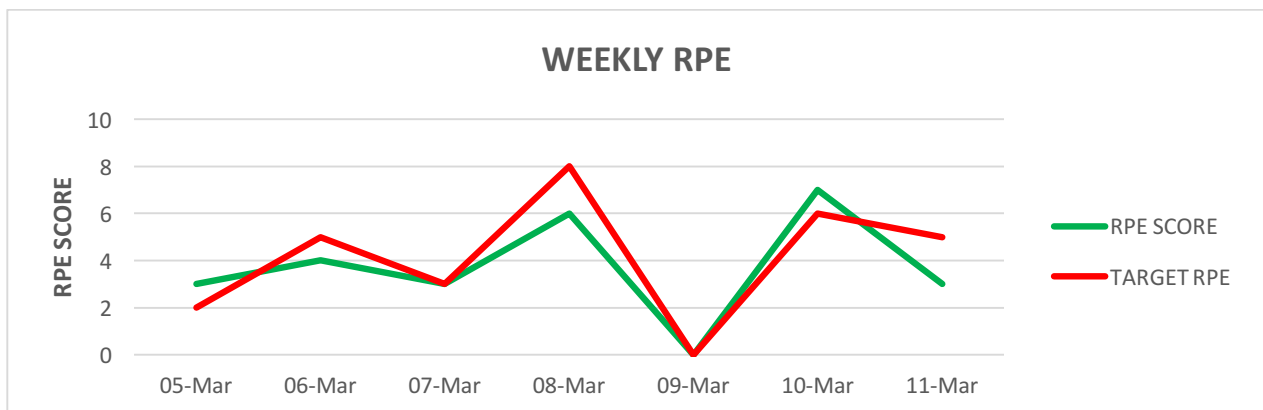
The Borg RPE is the “rating of perceived exertion” and provides a tool for understanding an athletes output within any session or activity.

RPE Scale	Rate of Perceived Exertion
10	Max Effort Activity Feels almost impossible to keep going. Completely out of breath, unable to talk. Cannot maintain for more than a very short time.
9	Very Hard Activity Very difficult to maintain exercise intensity. Can barely breath and speak only a few words
7-8	Vigorous Activity Borderline uncomfortable. Short of breath, can speak a sentence.
4-6	Moderate Activity Breathing heavily, can hold short conversation. Still somewhat comfortable, but becoming noticeably more challenging.
2-3	Light Activity Feels like you can maintain for hours. Easy to breathe and carry a conversation
1	Very Light Activity Hardly any exertion, but more than sleeping, watching TV, etc

By asking athletes to rate the session, immediate feedback may be provided. What was intended to be a hard session may be a light session to the athlete and what may have intended to be an active recovery session may have felt like a hard session. It is important to quantify what was done in-order to dictate loading for the remainder of the week.

Why and Apply

By actively tracking RPE throughout all sessions; a weekly profile of loading may be developed in order to track the athletes. By ensuring actual load is mirroring that of predicted load, you can ensure the weekly loading is appropriate and within recommended guidelines.



Recommended Guidelines

Below are the suggested guidelines for physical loading based on age and maturational development in order to maximize potential and have the greatest impact on performance.

	On-Field Training/Games	Athlete Development (S&C Sessions)	Rest & Recovery*
Males 6-9 Females 6-8	2 Field Session + 1 Game	Incorporated within on-field activity	2 Full Days
Males 9-12 Females 8-11	3 Field Session + 1 Game	1 Session	2 Full Days
Males 12-16 Females 11-15	3-4 Field Sessions + 1 Game	1-2 Sessions	1-2 Full Days
Males 16-23 Females 15-21	3-4 Field Sessions + 1 Game	1-2 Sessions	1-2 Full Days

*Full recovery days are essential to athlete development; this allows regenerate of muscle tissue, refueling of energy sources and recovery of the nervous system to return the athlete to an optimal state.

When athletes are enduring weekly trainings above the listed guidelines, it is noted the incident of over training and injury is significant. The principle of quality over quantity is should be optimized.

	GAME	GAME +1	GAME +2	GAME +3	GAME -3	GAME -2	Game -1
Field Session	60-90 min	Field Session	Field Session		Field Session		Field Session
S&C Session		Recovery	Speed & Strength		Speed & Strength		
Load	HIGH	LOW	MODERATE	OFF	HIGH	OFF	MODERATE

References

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