

Injury Prevention – Watching for Warning Signs During Distance Training



Trent Rempel, MPT August 2020

Outline

- Types of Training - Aerobic Vs. Anaerobic
- Aerobic - VO2 Max, Adaptations, Principles
- Anaerobic - Acid buffering, Adaptations, Principles
- Signs to Watch For - Performance, Lifestyle, Personality
- Why Do We Get Injured? Types of Common Injuries
- The Case for Prevention
- Structuring Training for Injury Prevention
- Conclusions
- Questions

Types of Training - Aerobic Vs Anaerobic

- Aerobic

- Requires a few minutes of activity to fully engage (Reason for the warm-up)
- Burns fat to release a consistent source of fuel/energy
- Cardio - anything that imposes an energy demand over a long enough period of time
- Currently exists as running, laps, etc

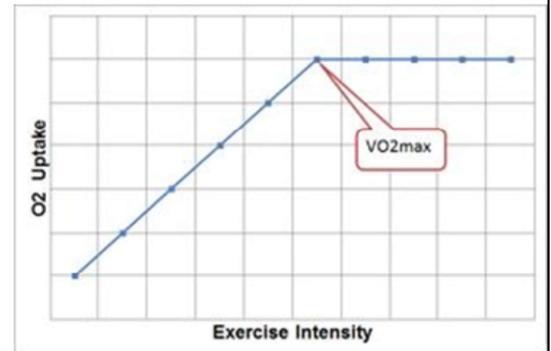
- Anaerobic

- Available much faster
- Used for more intense activity that the aerobic system can't handle independently
- Any activity done at a high enough intensity or under the right circumstances
- Currently exists as stunts, run-throughs, and conditioning



Aerobic - VO2 Max

- VO2 Max - How much oxygen we can use per kg of weight
- Highly trainable - Muscle cells, Lungs, Heart
- Relatively quick to adapt
- Incredibly useful as anything above the VO2 Max will become anaerobic in nature
- Provides the recovery for the anaerobic system
 - should be considered the backbone of recovery and training

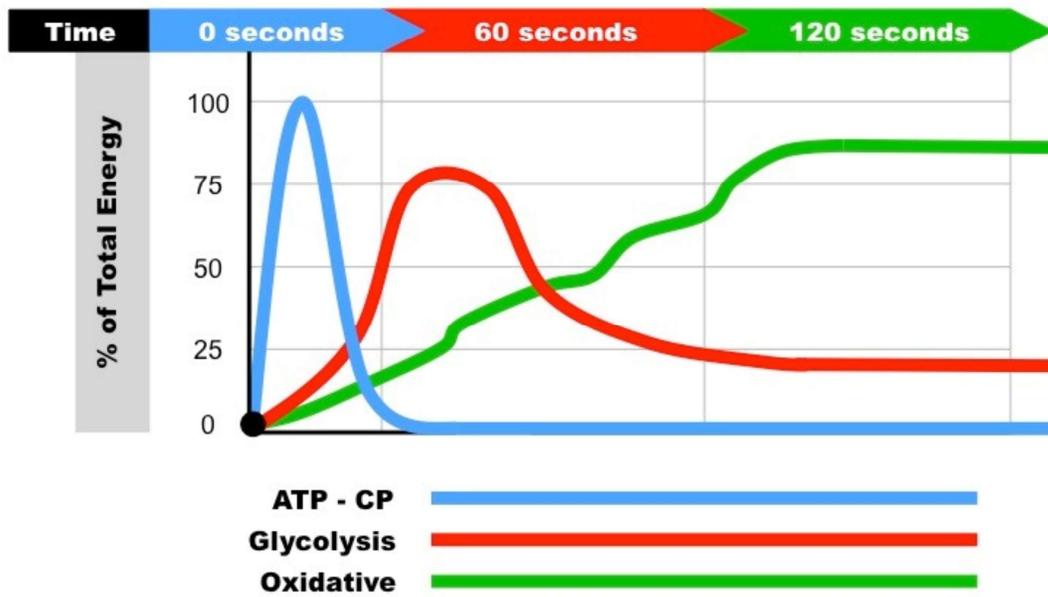


Anaerobic - Acid Buffering

- The body's ability to counteract some of the byproducts of exercise and intense energy use
- Trainable, but more difficult to experience and to recover from
- Very useful for our sport as it allows for the continuation of high strength and speed for that period of time without a drop in strength or performance
 - Hitting "The Wall"
- Lack of buffering leads to a change in our pH. Changes the action of enzymes, nerves, and muscle fibers



Energy Systems



Signs to Watch For - Performance

- Aerobic

- Breathless - Above VO₂ Max. Talk test.
- Foot slapping - Lack of control due to pH change
- Discoordinated (Also consider Growth Spurts)



- Anaerobic

- Decreased coordination - Body compensating for lack of fine control and enzyme changes
- Sluggish movement - Unable to draw on full strength or power
- Burning pain - Wincing with easy movements

Signs to Watch For - Performance

- Combination

- Complete change in technique or loss of power - Nervous system fatigue (DANGER)
- Lack of Recovery on normal time frames - Overtaxed system without recovery, leading to overall lack of control and strength. (DANGER)
- Jumps - One of the best signs of nervous system status as it requires a powerful coordination of most of the body. Nervous system fatigue will show here first
- Can't hold postures - Base or flyers



Signs to Watch For - Lifestyle

- Decreased or Disturbed Sleep
 - Keeping in mind age and status of the athlete (Teenage years, etc.)
 - Importance of sleep and recovery
 - If this persists, significantly impacts training recovery and performance
- Large change in Appetite or Diet
 - Intentional choices fall into a different category
 - Literally the fuel our body needs to train and continue
 - Quality matters as well



Signs to Watch For - Personality

- Decreased social interaction - Withdrawal
- Increased volatility and mood changes
- Irritability
- Coaches know their athletes



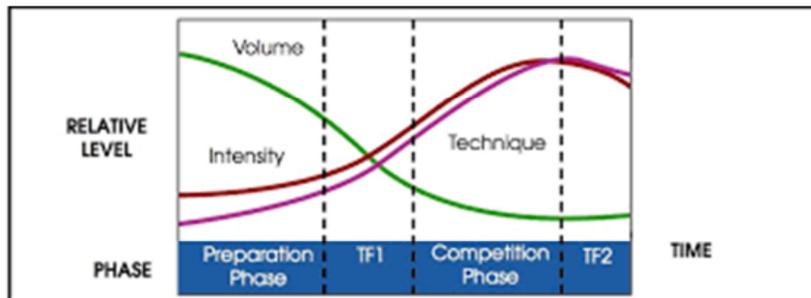
Why Do We Get Injured?

- Repetitive Strain
 - Lack of recovery, Training outside of current capacity (Working above thresholds)
- Lack of Control
 - Changes in pH, Enzyme function, Nervous system fatigue
- Overwhelmed by Forces
 - Technique faults, sometimes caused by energy problems
 - Consequence of decreased capacity and strength



The Case For Prevention

- Unlike many organized sports, one person being injured significantly limits the ability of the team to practice. Typical soft tissue healing time frames average 6-8 weeks, combined with the hectic pace of the competition schedule in the normal year, means that we often have to make difficult decisions or restructure the routine
- Planning in such a way as to reduce the risk of injury pays off in a big way



The Case for Prevention:

Unlike many organized sports, a single injury affects the whole team in a significant way. Since the typical soft tissue healing timeframes range from 6-8 weeks, this creates a significant issue where the entire routine has to be restructured or someone pushes through an injury in way that is perhaps unsafe. After an injury has occurred is unfortunately too late to make the changes needed that could have prevented it.

Long distance runners and other high-volume athletes understand the need for planning out their training and working their competitions into their peak performance times. Think about off season vs. on season.

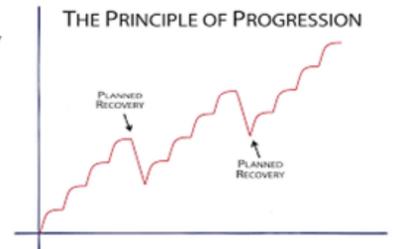
Performance-based sports such as cheerleading, dance, and gymnastics could learn something from this idea. Pictured in the graph above we see Volume, Intensity, and Technique. During the preparation phase or off season, there is room for a lot of volume because there is no immediate competition or need to be at 100%. We can strive for high level performance during this time, but it is more flexible overall. The intensity and technique starts lower as bodies and athletes adapt to the stresses of training.

As we move towards the competition side of a season we know that both technique and intensity will reach a peak. This represents the competitions and performances that the season is scheduled around. What is important to note is that the volume cannot keep up as the other two factors increase. Trying to keep all 3 lines at their maximum will lead to some amount of burn-out and injury, almost guaranteed. Having someone injured seems to

necessitate extra practices and extra attempts to fix issues with new substitutes, but is often a losing battle. Instead, a planned taper of activity as the demands of performance increase can allow us to keep up with competition without leading to further injury. Planning in such a way as to reduce risk of injury pays off, particularly during competition season.

Structuring Training For Injury Prevention

- Develop VO2 Max
 - Steady state cardio (Any modality) done to the appropriate intensity
 - Creates the capacity for speedy recovery
- Develop Acid Buffering
 - More efficient after developing VO2 Max
 - Creates the capacity for our style of performance
- Develop General Strength
 - Often left to individual athletes to plan and implement, but an important component
- Planned Recovery and Tapering
 - As things get busier, we often ramp up training and practice, either because of injury or until injury occurs



Here are some general concepts that could help an athlete attain their goals while decreasing their risk of injury.

First, develop the VO2 max or cardiovascular fitness. This is achieved by performing steady state cardio exercise (running, swimming, cycling, etc.) done at the appropriate intensity (for them). The talk test that was mentioned earlier in the presentation is a good rough measure for the level of intensity. The athlete should be able to talk, but not sing. Exercise done at this boundary of their current VO2 max help to cause that adaptation they're looking for. The higher cardiovascular fitness allows the athlete to operate at a higher percentage of their performance for a longer period of time before running out of steam. This aerobic capacity also provides the energy needed to refuel our other energy systems. A good foundation here will set the stage for better performance and can be done independently and in the off season with minimal supervision.

Second, development of the anaerobic system and its acid buffering capability. This system gets much easier to train after improving VO2 max and the aerobic system. This is the type of training that more vigorous conditioning is trying to target, but is often done beyond what the athlete is capable of. The athlete cannot perform to their best when their aerobic system is incapable of charging their battery between sessions or sets. While we can develop the ability to handle higher intensity activity and exercise through repeated bouts of anaerobic training, it would work better if the aerobic system was there to support it.

Third, the development of general strength. This section is often left to the individual athletes to plan and implement and is quite different than the conditioning or anaerobic

training. This is done when the body is fresh and full of energy, pushing to current limits to spur adaptation and growth. General strength training also provides education in body movement patterns and coordination, which can be highlighted during performance. Those who are new to strength training will require guidance and an individualized plan to avoid conflicting with practice and their other goals. General strength ties nicely into the previous points as stronger athletes will use less of their overall energy to perform the same skills/exercises as a weaker athlete, saving energy and requiring less downtime. Stronger people are also generally harder to injury overall.

Lastly, Planned recovery and tapering. As mentioned on the previous slide, the planning of volume and intensity is very important. As things get busier and as people get injured, the training pace often accelerates towards competition season and the end of the year. By thinking ahead and understanding how the body utilizes its energy, we can spend the time to give the athletes what they need to be most successful.

Conclusions

- We need to develop the basics of Aerobic and Anaerobic training
- We need to watch our athletes closely
- We need to RESPOND to what we see
- We can minimize the injuries that typically slow us down

We need to develop the basic of Aerobic and Anaerobic training. This is unlikely to be rolled easily into standard practices and will require dedicated effort. These two pillars of training allow athletes to spend more time working on skills with less downtime.

We need to watch our athletes closely. Coaches know a lot about their athletes, and if something seems wrong, they are likely to notice.

We need to RESPOND to what we see. If we don't feel like we know what to do, we should start a conversation to protect the athletes.

We can minimize the injuries that typically slow us down by planning ahead and working together.

Questions

