

GETTING STARTED WITH

WORKLOAD MANAGEMENT



A Practical Guide to
Workload Management
& Injury Prevention
in Sport

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AthleteMonitoring®

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Part 1 – The Key Concepts

Sport-related health problems such as burnout (aka overtraining), illnesses and injuries are a widespread issue in competitive sports. In the U.S. alone, 1.5 million high school and college athletes are injured every year^{12,18}.

The cause of overtraining and injuries is multifactorial, but recent research has identified poor workload management as a major contributor^{2,3,4,9}.

This article will present evidence-based workload management strategies to reach and maintain top performance, while reducing the risk of illness and injury.

Workload management: a key to better performance, and fewer injuries

Excessive fatigue plays a key role in sport injuries, as it impairs decision-making ability, coordination and neuromuscular control¹³. The risk of injury increases when the external load exceeds the capacity of the athlete¹³.

For example, in professional ice hockey, a player's average playing time per game is a significant predictor of concussion²³, and in soccer, central fatigue contributes directly to anterior cruciate ligament (ACL) injuries²⁴.

Most injuries and illnesses occur when:

- 1) Athletes are psychologically and/or physically unfit to tolerate the prescribed workload (undertrained or not adequately prepared for the specific task)⁴, or;
- 2) Athletes are fit and well-trained but in need of rest¹³.

An effective workload management program helps to reduce the risk of injury by detecting excessive fatigue, identifying its causes, and constantly adapting rest, recovery, training and competition loads, based on the athlete's current levels of fatigue (physical and psychological), wellness, fitness, health and recovery¹³.

Definitions

Load (or workload) is the combination of sport and non-sport stressors¹³. Load is more than training load alone and also includes competition, work, recreational activities, family, homework, etc. According to the concept presented by Impellizzeri³² (now adopted universally), Load can be divided in two sub-categories: external load and internal load.

External load

External load is the external stimulus applied to the athlete¹³. It is the physical work (number of sprints, weight lifted, total distance, etc.) performed by the athlete during competition, training and daily life.

Internal Load

Internal load is the individual physiological and psychological response to the external load. It is influenced by genetic factors combined with daily life stressors, environmental and biological factors¹³.

Internal Load vs. External Load

While external load provides information about the work completed and the athlete's performance capacity¹³, internal load is the trigger of training-induced adaptations¹⁶.

The daily monitoring of internal load can help identify recovery needs, predict performance decrements, anticipate health issues and adjust training, and competition programs. It forms the cornerstone of an effective workload management program.

Term	Definition
Load / Workload	Combination of sport and non-sport stressors
External load	External stimulus applied to the athlete
Internal load	Physiological and psychological response to external loads, combined with non-sport stressors

How to Measure Internal Load

Internal load is usually measured by indirect measures, such as heart rate and blood lactate concentration, as well as subjective measurements, such as perceived effort (i.e., ratings of perceived exertion).

The Session-RPE Method

A simple, effective and scientifically validated method of measuring internal load is to use the session-rating of perceived exertion (sRPE) scale developed by U.S. sport scientist Dr. Carl Foster^{2,3}. This technique requires the athlete to rate each session's overall difficulty on a 10-point scale. The multiplication of the session difficulty by the session duration (in minutes) provides the "Load" for that session in arbitrary units (Load=RPE x Duration in minutes).

The sRPE method does not require equipment and has been validated for monitoring internal loads in most sports, training and competition activities.

The modified RPE Scale used to rate the difficulty of sessions³

Rating	Descriptor
0	Rest
1	Very, very easy
2	Easy
3	Moderate
4	Somewhat hard
5	Hard
6	*
7	Very hard
8	*
9	*
10	Maximal

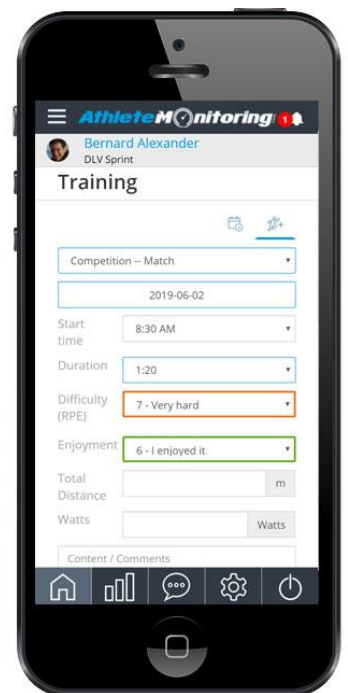


Figure 1 - Post-session RPE data collection app (courtesy of AthleteMonitoring.com)

The original calculations used by the sRPE method ³

1. Session Load = session RPE x duration (minutes)
2. Daily Load =sum of all Session Loads for the entire day
3. Weekly Training Load =sum of all Daily Training Loads for the entire week
4. Monotony= standard deviation of Weekly Training Load
5. Strain= Daily or Weekly Training Load x Monotony

Heart Rate Methods

Heart rate (HR) monitoring is frequently used to estimate internal load. This method requires the use of a heart rate monitor.

While the method is scientifically sound, heart rate based internal load monitoring has important limitations:

- 1) It's based on the linear relationship between HR and the rate of oxygen consumption (VO₂) during steady-state exercise³⁰. This relationship only exists during submaximal efforts (< 85% or VO₂max), thereby limiting the effectiveness of heart rate monitoring to aerobic activities.
- 2) Heart rate monitoring underestimates internal load during short-duration high-intensity/anaerobic activities²⁷ (sprints, strength training, etc.).
- 3) HR fluctuates daily during rest, submaximal and maximal exercise²⁹ (by up to 6.5 % for submaximal HR³⁰). Without a regular calibration of individual HR training zones, HR-derived internal load calculations will likely be inaccurate.

While heart rate monitoring can provide additional physiological insights for aerobic sessions or events, it cannot be used to accurately quantify internal load during the many explosive, short duration activities performed by athletes during training and competition.

The sRPE method is simpler and provides an accurate quantification of internal load ²⁵ that can be applied to a much broader range of sports, as well as to training and competition activities ²⁷.

How to Measure External Load

External load is usually quantified using various measurement devices such as global position system (GPS), chronometers, accelerometers, dynamometers, etc.

Activity Trackers / GPS / Accelerometers

Activity tracking devices (GPS, accelerometers, etc.) can provide useful information regarding the external load (work performed) during training sessions and competitive events.

For example, with a GPS or an accelerometer device, it's possible to count the number of accelerations or decelerations, the total covered distance, the number of sprints, etc. performed during a competition or a training session.



Figure 2 - GPS trackers (courtesy of ASI-FieldWiz)

With this information, it becomes much easier to prescribe training programs that mimic the external load demands of the competitive event, to guide rehabilitation programs, and to detect spikes in external load, which may increase the risk of injury.

Internal load should be the #1 focus

Many factors outside the external load impact the athlete's response (stress, pre-training fatigue, motivation, family issues, etc.), and a direct correspondence between external load and the internal response can rarely be assumed³¹.

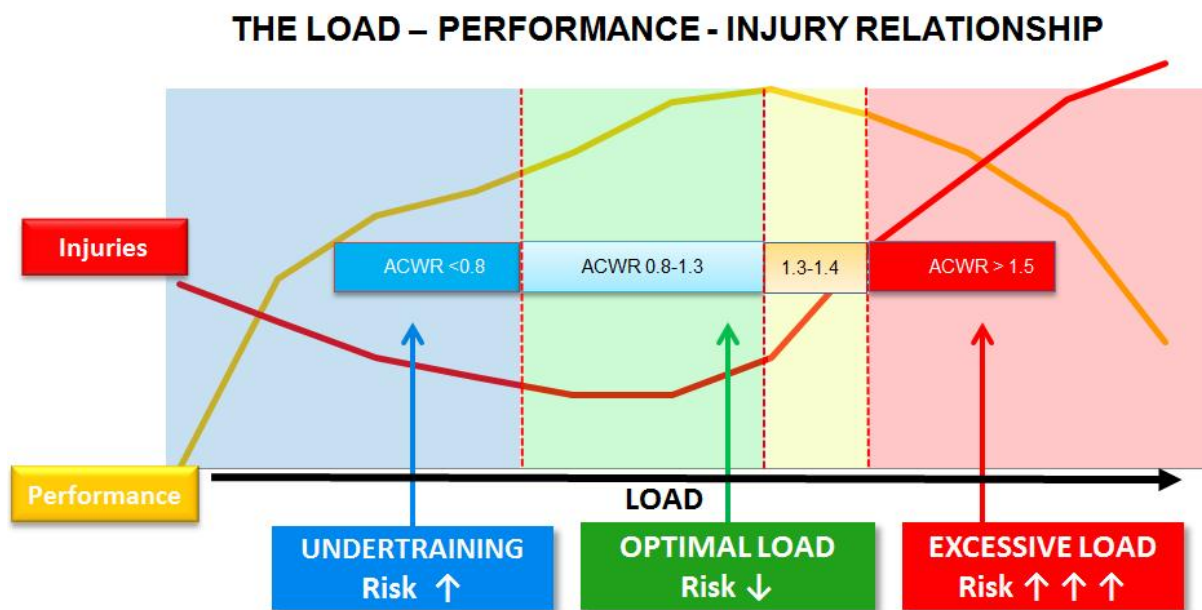
While tracking devices do simplify the quantification of external loads, they do not measure how athletes are coping with and adapting to the external load³¹. Only internal load measures, such as the session-RPE (sRPE), can provide this information.

Thus, while external load monitoring is now easy to do with the adequate equipment and provides useful information, monitoring the internal load should be the main priority, when the ultimate goal is to keep athletes healthy and performing at their best.

How to find the "optimal" workload

The "optimal" workload is a moving target. It differs for every athlete and changes constantly based on multiple factors, including age, health status, period of the year, training status, fatigue and recovery levels, non-sport stressors, etc.

Finding the optimal workload and constantly adapting training programs to the changing capacity of each athlete is both an art and a science. It's a continuous process that usually requires the daily monitoring of internal load, at least a measure of external load (often duration or distance), the tracking of wellness metrics and the use of these measures to adjust the athlete's training program, recovery and rest.




Adapted from: Gabbett TJ., The training—injury prevention paradox: should players be training smarter and harder?, Br J Sports Med, 50:273–280, 2016

Figure 3 - Load-Performance-Injury Relationship

The key metrics

Despite decades of scientific research and athlete experience, no single marker of elevated risk of injury or overtraining has been identified¹³.



Today, a multifaceted approach to workload and recovery management is considered best practice^{12,13}. This includes the collection and analysis of both subjective and objective measures, and the careful monitoring and optimization of selected metrics.

Note: Most metrics below are applicable for both internal (session-RPE) and external load measures collected via GPS trackers / accelerometers.

While thresholds and indicators presented in this article are published in the scientific literature, they should be used as guideline and not as “magic” numbers. Large inter-individual variations exist.

Chronic Load (CL)

This is the average weekly load, typically calculated over the previous four weeks, but sometimes over a longer period. Usually, the higher the Chronic Load, the fitter and more robust the athlete is. In some situations, Chronic Load can be calculated using exponentially weighted moving averages.

Acute Load (AL)

The Acute Load represents the cumulative load of the current week. Usually, the higher the acute load (compared to chronic load), the more tired the athlete. In some situations, AL can also be calculated using shorter periods (e.g., three days).

Freshness Index (FI)

Similar to the Training stress balance proposed by Andrew Coogan¹⁷, the Freshness Index represents the difference between chronic and acute load (CL-AL) or between “fitness” and “fatigue.” A positive Freshness Index indicates an unloading phase when low fatigue and good performance levels are to be expected.

Monotony

The Monotony Index proposed by Carl Foster³ measures the fluctuation of daily loads within the week. Intensive training combined with a high Monotony Index (>2) becomes an important risk factor for illness and overtraining³.

Strain

Early work by Foster demonstrated that 89% of illnesses and injuries could be explained by spikes in individual Strain in the 10 days preceding the incident³. Thus, monitoring the Strain variable can be a valuable technique for controlling individual adaptation to training load and preventing workload-related illness and overtraining³.

Acute:Chronic Workload Ratio

The Acute:Chronic Workload Ratio (ACWR)^{4,9,18} measures the relationship between acute load (current week load) and chronic load (average load of the last four weeks). The ACWR is a useful tool to detect spikes in load, for both internal and external load measures.

Monitoring ACWR helps to keep an athlete’s workload in the high-load, low-risk zone (0.8-1.3). When ACWR is too low (less than 0.8) or too high (1.5 or more), risk increases and workload may need to be adjusted.

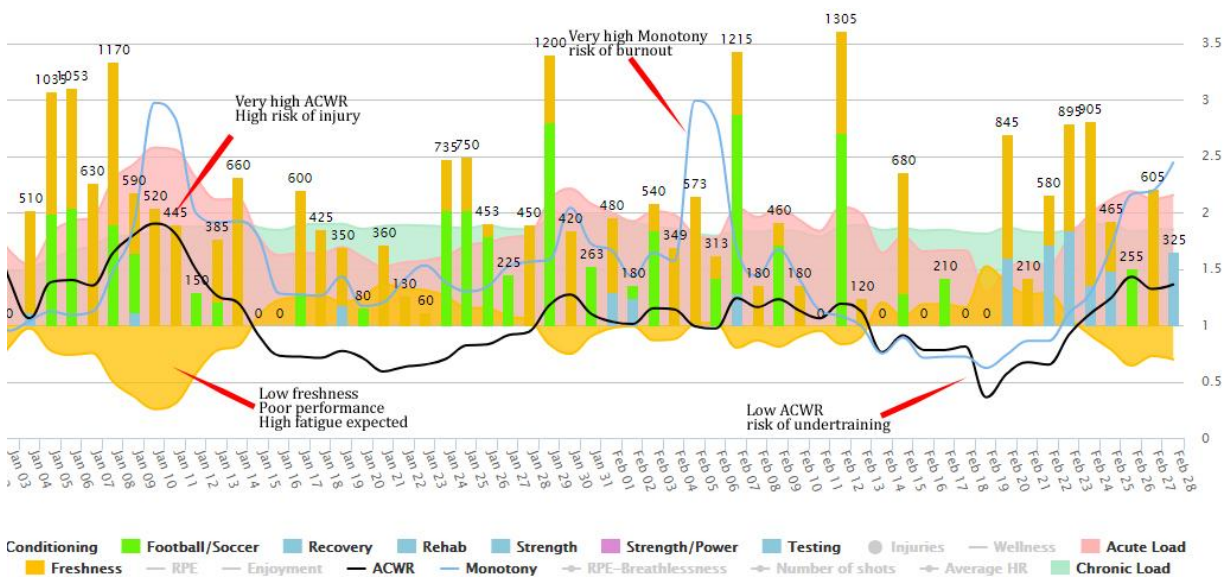


Figure 4 - A peak in Monotony can increase the risk of overtraining during 7-10 days, even if ACWR is in the optimal range

Weekly Load Increase

This represents the percentage of load increase from one week to the next. It is a major injury risk factor; studies have shown that many injuries are associated with rapid changes or spikes in weekly loads^{9,4,3}. When load increases by $\geq 15\%$ from the preceding week, the risk of injury increases by up to almost 50%⁴. Monitoring week-to-week changes in load helps detect spikes in load and plays a crucial role in injury prevention.

Weekly training hours

Recent research²⁶ conducted by Neeru Jayanthi, an expert on youth sports injuries, indicates that when young athletes train or compete more hours per week than their age (e.g., when a 12-year-old trains or competes 18h/week), the risk of overuse injury can increase by up to 70%.

Using an athlete's age to guide the weekly training and competition volume is a simple and effective approach that can help maximize performance while promoting effective and injury-free athletic development.

Wellness measures

Asking athletes to complete a self-reported wellness questionnaire is a reliable and accurate method to identify their readiness to train and to measure the impact of non-sport stressors on the recovery process^{5,7,11}.

Collegiate ice hockey players are reporting their post-session feedback on AthleteMonitoring.com

Poor wellness scores indicate potential psychological or physical under-recovery and may point to needed adjustments in the training or competition program. Self-reported wellness questionnaires are key injury prevention

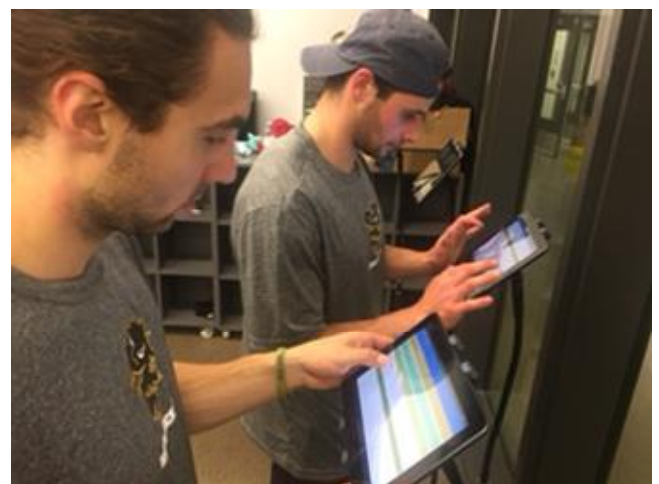


Figure 5 - Athletes can use tablets to complete their daily wellness questionnaire (courtesy of AthleteMonitoring.com)



tools and should be used to guide the adaptation of training and competition loads¹³.

Personal feedback

Personal oral and/or written feedback from an athlete can help identify potential issues with motivation, stress, fatigue, and training. This is crucial information often overlooked by busy coaches. When an athlete reports negative feedback, it must be taken very seriously as it may reveal motivational problems and larger underlying issues.

Enjoyment with training

Enjoyment with training and competition activities should be carefully monitored and maximized for two main reasons: 1) Enjoyment is an important determinant of intrinsic motivation, which directly predicts effort and persistence¹⁹; and; 2) a lack of enjoyment is associated with staleness and burnout¹. To maximize athlete engagement, motivation and performance, coaches are encouraged to create environments that allow athletes to have an enjoyable sport experience.

Other useful measures

When adequate equipment is available, additional daily tests of neuromuscular fatigue and recovery, such as Counter Movement Jump (CMJ) and musculoskeletal tests can provide useful information about neuromuscular recovery and/or injury²⁰. Results of these tests allow coaches to manage athletes on an individual basis, according to their training and recovery status.

Part 2- Getting Started with Workload Management

An effective workload management program can be implemented fairly easily, by following the steps below:

Establish a relationship of trust and open communication

Because self-reported information is used extensively to quantify internal load, pre-training wellness and readiness, for your monitoring program to work, you must first establish a relationship of trust and open communication between the athletes, the coaching team, and the medical staff.

Ensuring athletes collaboration, and having the performance and medical teams working together to monitor and manage load, are crucial components of a successful workload management program²¹.

Use a specialized software such as AthleteMonitoring

Free monitoring tools (Excel, Google Forms, etc.) can be used but they usually are less time-efficient, less secure, require extensive programming work, and are unable to centralize large amount of data from multiple sources.

AthleteMonitoring (website www.athletemonitoring.com) is a simple, yet robust workload and athlete data management software that will simplify day to day workload management and maximize athlete and staff buy-in.

AthleteMonitoring will help you to:

- 1) Collect quality and meaningful data from the athlete with minimal effort;
- 2) Monitor wellness, internal and external load metrics and centralize your data;
- 3) Facilitate the interpretation of key metrics in a time-effective manner.

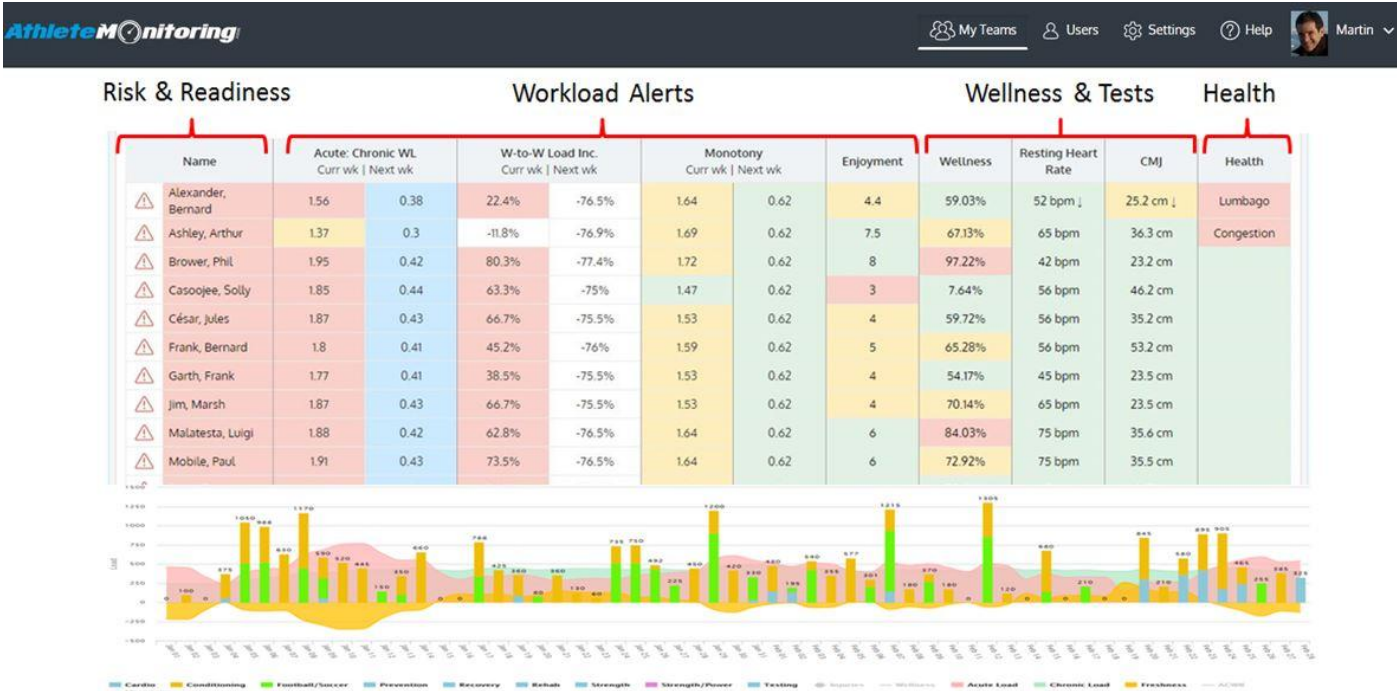


Figure 6 - AthleteMonitoring dashboard illustrates the integration of all metrics and individual alerts that simplifies workload management decision-making based on evidence-based methods.

To maximize athlete's compliance with data collection, set up a protocol that will allow athletes the time to input their data (ie: at the end of every training or match during cool down).

Configure AthleteMonitoring to automatically send SMS reminders 30 minutes after training and matches, or have athletes place an alert on their phones. Data consistency is key.

Focus on the essentials

To maximize athlete and staff engagement with your workload management program, focus on the essentials.

Only measure what's truly have an impact on health and performance (leave the nice-to-have tools), and keep your monitoring program as simple as possible.

Trying to implement a full-scale athlete monitoring program right away will likely overwhelm athletes and staff, and result in waste of time and poor buy-in across the organization.

The section below presents a suggested four-stage implementation process, for an athlete monitoring program that focuses on performance and injury prevention.



Daily wellness monitoring

Purpose: Identify training readiness issues; detect excessive fatigue; lifestyle issues

Tools: Daily wellness questionnaire

When to start: Immediately

Health monitoring

Tools: Injury self-report form or weekly health survey/OSTRC questionnaire

Purpose: Identify important health and readiness issues; improve communication between athletes and the medical and coaching teams. Detect early stages of overuse injuries and illnesses (as soon as they impact the ability to train or compete), before they become bigger issues that lead to medical attention or time loss; improve injury prevention and epidemiology.

When to start: After 4-6 weeks or when compliance with wellness monitoring is satisfactory

Internal load monitoring

Tools: Post-session RPE & enjoyment self-report form

Purpose: Measure individual response to external load; Detect spikes in loads for internal load measures; prevent overtraining; reduce spikes in load; Collect personal feedback and detect motivational issues.

When to start: After 4-6 weeks or when compliance with wellness monitoring and injury self-reporting are satisfactory

External load monitoring

Tools: GPS, jump tracker, etc.

Purpose: Detect spikes in loads for external load measures; ensure training and external loads matches the demands of the competitive task.

When to start: Immediately or when compliance with wellness monitoring and injury self-reporting are satisfactory

Educate coaches and staff

Coach endorsement is crucial. Help coaches to understand the usefulness of your workload management program by, organizing a coaches' seminar.



Figure 7 - Education seminar for players (courtesy of Antonio Calado)

During the first seminar, you will explain how the monitoring process works. The value of monitoring external and internal load, how to rate the session's difficulty (sRPE), how load is calculated, and how to detect at-risk athletes using wellness measures and load metrics. Also explain what to do when athlete are identified as being at risk.

After the initial educational seminar, add coaches to your AthleteMonitoring platform so they can see and track their athletes and utilize the athlete data.

Don't forget to regularly present positive results at coaches meetings. Use tables, charts and graphs to demonstrate positive team results, reduce injury rates, etc. And include comments from athlete training logs in regards to strengths and weakness of their team training and game-day performances.

Educate athletes

Organizing a formal app educational seminar for athletes and parents (if you work with youth athletes) is a proven way to boost compliance rates.

Encourage athletes to bring their mobile devices and present the app during an interactive tutorial. Use a projector and large screen. Log in as an athlete online and walk the athlete through demonstrations of how to complete the daily wellness questionnaire, record training log data, report an injury, and record a session.

In youth programs, subjective measures should include enjoyment as well as how hard players find training and game play from a technical and tactical perspective. Explain how to rate session-RPE after each session.

All this information needs to be explained clearly and in very simple terms, especially in regards to what an RPE is.



Figure 8 - Education seminar for athletes and parents (courtesy of Caroline Robins)

Putting it All Together: The Workload Management Workflow

The flowchart below illustrates the integration of all metrics and the decision-making process. This model may be used as a general template for a practical and evidence-based workload management program.

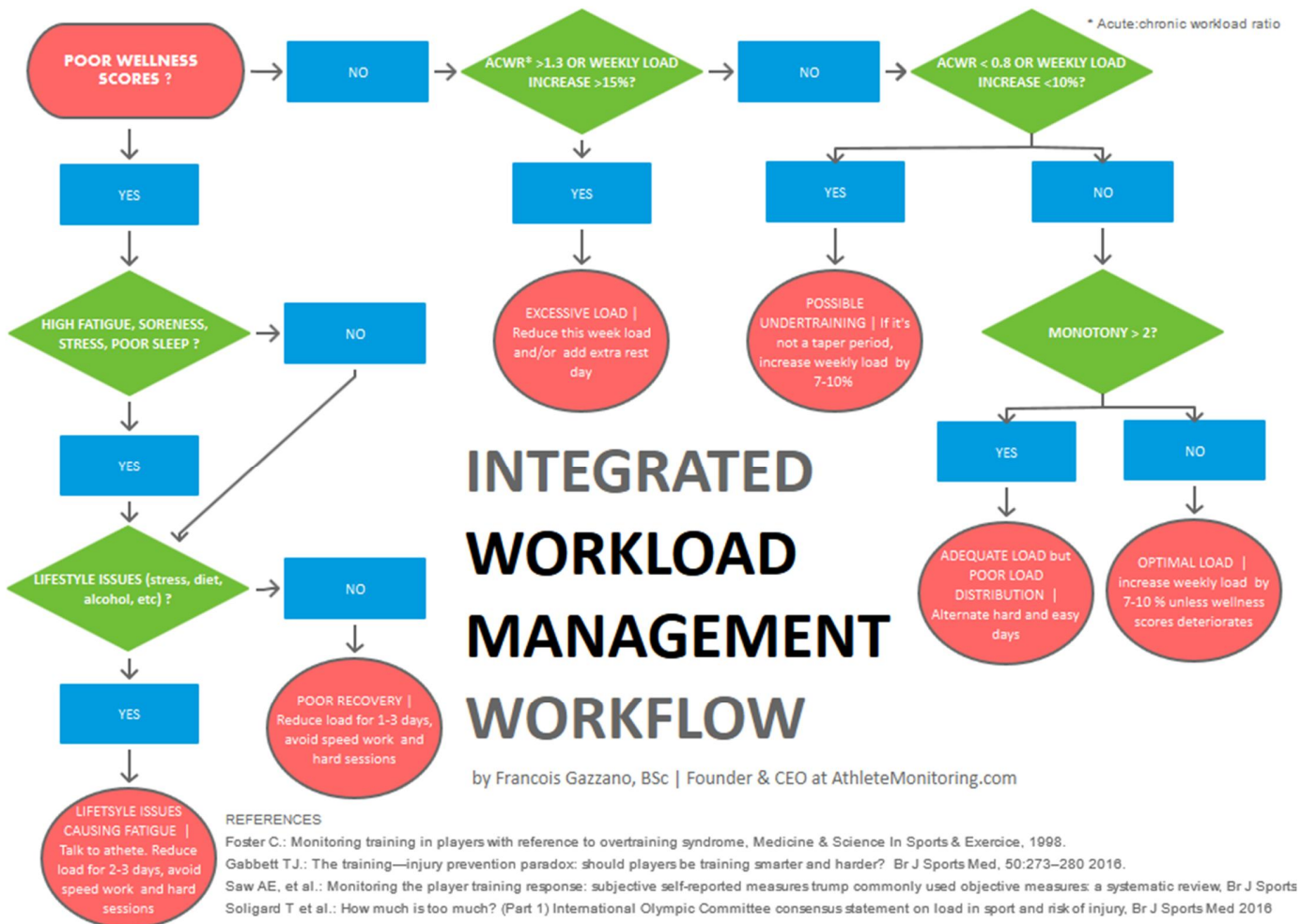


Figure 9 - Proposed workload management workflow using evidence-based metrics and methods

Part 3 – Avoiding Common Workload Management Errors

This section presents simple and effective workload management strategies that will help you build stronger athletes, and keep them fit, healthy, ready to win.

Make sure athletes are adequately prepared to sustain the requested workload

Athletes are often injured in the last part of a game, see their performance drop during tournaments, make tactical errors at the end of a race, or become sick at the end of an intensive training camp.

Many times, these issues are entirely predictable. They occur because athletes are not adequately prepared for the physical and psychological demand imposed by the training or competitive task^{3,4}. This lack of readiness produces

excessive fatigue, which in turn reduces motor control, impairs concentration, and makes athletes more vulnerable to injuries and infections^{2,4,5}.

What to do

To ensure athletes are adequately prepared for the task at hand, follow these steps:

- 1) Accurately assess the competitive or training task and identify the key performance indicators (KPI). KPIs are both objective (how many sprints, how many throws, magnitude and duration of power output, etc.) and subjective (what the athlete is finding the hardest to do during the targeted event).
- 2) Administer KPI-specific tests to compare the athlete's current levels of fitness and performance with the task requirements.
- 3) Progressively increase load to enhance the athlete's performance capacity, up to the level required by both the overall competitive task and specific KPI's
- 4) Monitor the Acute:Chronic Workload Ratio carefully for both internal and external load (one to two key sport-specific metrics), and make sure that it remains in the 0.8-1.3 range². A ratio higher than 1.3 indicates that the athlete's weekly load is much more than what he/she is prepared for and will significantly increase the risk of injury or illness.

Increase weekly load VERY slowly

A fast increase in workload is a major risk factor for injuries. The risk is particularly high when athletes:

- 1) Return to sports following an injury
- 2) Return to full training after a long period of inactivity (e.g., the off-season)
- 3) Are subjected to an unusual, quick and steep increase in load (e.g., tournament, training camp, congested schedules, etc.)

Spikes in injury rates are consistently observed during periods of increased training volume following breaks from organized training²⁰. For example, a recent Norwegian study¹ has demonstrated that all athletes who return to sport less than five months after an ACL reconstruction suffered a knee reinjury¹.

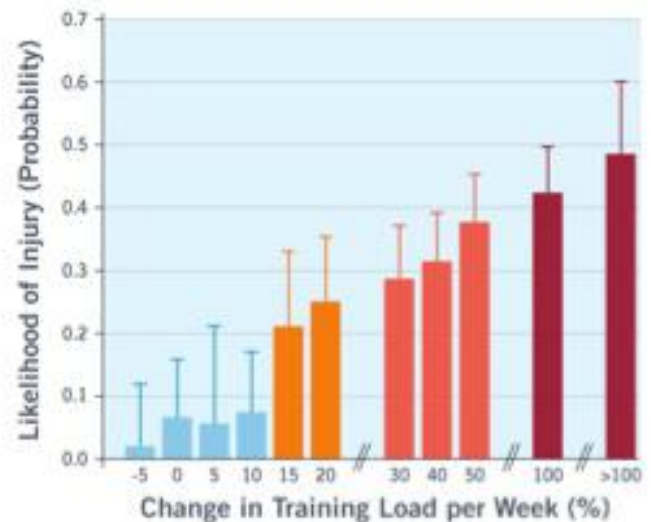


Figure 10 - Likelihood of injury with different weekly changes in load (from reference 3)

Another study from Gabbett² has demonstrated that when workload increases by 15% or more from one week to the next, the risk of injury jumps by up to 50%. Increasing load too fast is therefore a major risk factor.

What to do

To reduce the risk, return-to-sport decisions should be based on the latest sports medicine research and, even when external pressures are mounting for a faster return to competition, should allow the injured athlete the recommended recovery time.

Increase workload progressively (<10%/week), using the athlete's feedback and perceived wellness scores to guide load progression³.

One of the best preventive measures for athletes returning from the off-season is to have athletes continue to train and stay fit through the off-season.

Plan your off-season training program so that the load of the last week of the off-season will be about 15-20 % lower than the first week of the pre-season. In this case, the change in load will be in the moderate risk zone and will make return to pre-season training much less risky.



Figure 11 - NCAA Div 1 volleyball seasonal injury rates. From reference 20

When athletes are reluctant to train during the off-season, a fitness testing session scheduled at the first pre-season session can act as a strong motivator. In any case, keep week-to-week load increases under 15% to keep risk to minimal levels.

Use age appropriate workloads

When overall training and/or competition load exceed the athlete's recovery capacity, burnout and overuse injuries are likely to occur. This often affects young athletes competing on multiple teams or in multiple sports.

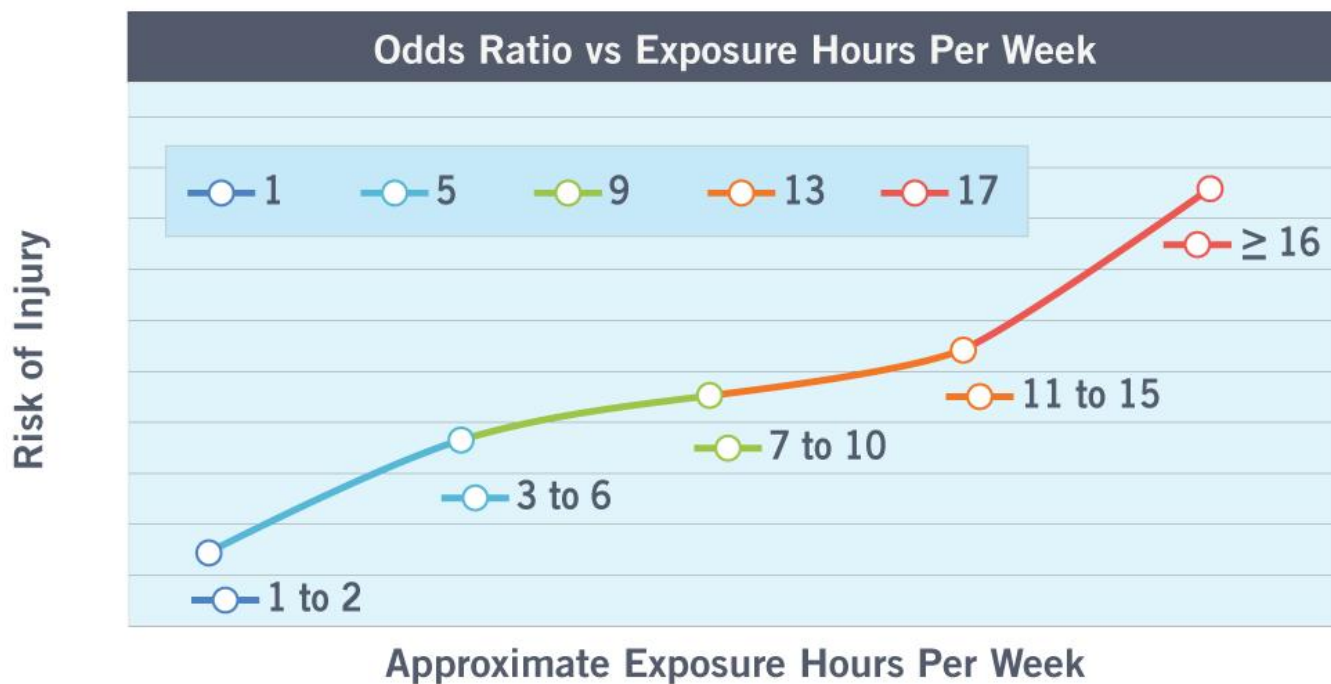


Figure 12 - Relationship of injury to exposure hours in high school athletes (from reference 17)

Recent research⁶ indicates that when young athletes train or compete more hours per week than their age (e.g.: when a 12-year-old trains or completes more than 12h/week), the risk of overuse injury can increase by up to 70 %.

Although the ability to sustain high loads while staying healthy is a prerequisite to reach top performance, building tolerance to high loads takes time. This a multi-year process, and trying to rush this process will likely lead to negative outcomes.

Also, the ability to sustain high workloads decreases with age. Older athletes (even at the professional level) are often less able to tolerate the high workloads they used to do a few years earlier. While most can still perform extremely well, make sure to adjust the workload individually, based on their internal load response and wellness scores.

What to do

Monitor training and competition weekly volume (in hours), rest days, and daily wellness. Ensure that weekly schedules include at least one day of complete rest. Because intensive training combined with a high Monotony Index (>2) is an important risk factor for illness and overtraining⁷, alternate hard, easy, rest, and moderate days.

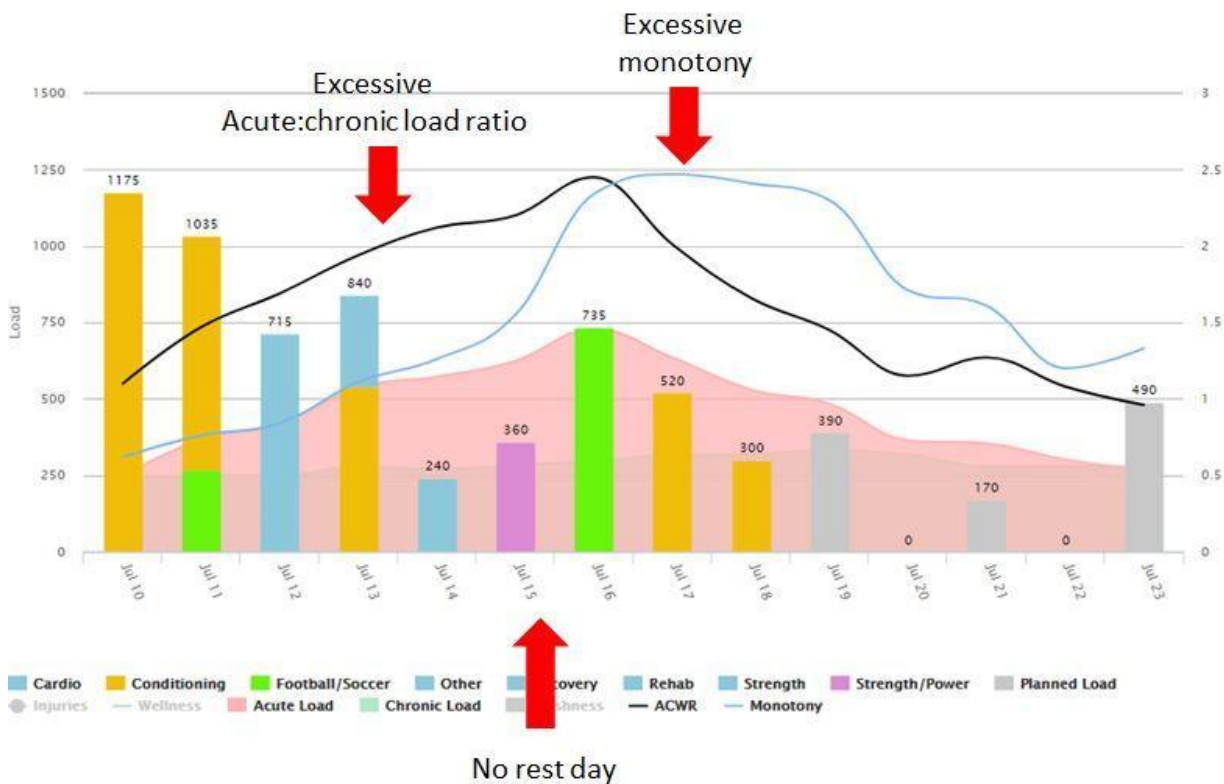


Figure 13 - A recipe for injury - Excessive acute:chronic workload ratio, high monotony and lack of rest day.

Increase weekly training volume gradually over the course of several months but ONLY when wellness measures are reflecting a positive adaptation to load (no excessive fatigue, good sleep quality, low stress, stable mood state, etc.).

In the case of young athletes, use the athlete's age to guide the weekly training and competition volume. This is a simple and effective approach to maximize performance while preserving the athlete's health.

Finally, proactively reduce training load (by 40-50%) during exam period, back-to-school season, and other stressful periods of which you are aware.

Last, but not least, educate athletes, coaches and parents about the risks associated with too much or too little training and the need to keep weekly loads to age-appropriate levels. You can do this during meetings, by explaining the impact of excessive loads or undertraining on injuries, fatigue, and underperformance using printed material, slide shows or Internet sites.

Adjust workloads on a daily basis

Without the daily monitoring of response to load and subsequent program adjustments, even the most carefully crafted training program will have a strong chance of producing unexpected negative outcomes.

The reason is simple: each athlete's tolerance to load fluctuates on a daily basis and is affected by multiple factors, such as training level, fitness, health, nutrition, sleep, stress, fatigue, etc. When loads are not adjusted daily, large differences between planned and real training effects are likely to occur. This discrepancy will often translate into athletes getting sick before or after a competition, getting injured, or failing to achieve peak performance as planned.

What to do

As coaches, we often forget that non-sport activities and external stressors³ (such as work, friends, school, financial challenges, and family-related stressors) play a large role in determining an athlete's pre-training fatigue, sleep quality, recovery, motivation, and, ultimately, performance.

	5	4	3	2	1
FATIGUE	Very fresh	Fresh	Normal	More tired than normal	Always tired
SLEEP QUALITY	Very restful	Good	Difficulty falling asleep	Restless sleep	Insomnia
GENERAL MUSCLE SORENESS	Feeling great	Feeling good	Normal	Increase in soreness/tightness	Very sore
STRESS LEVELS	Very relaxed	Relaxed	Normal	Feeling stressed	Highly stressed
MOOD	Very positive mood	A generally good mood	Less interested in others &/or activities than usual	Snappiness at teammates, family and co-workers	Highly annoyed/irritable/down

Figure 14 - Example of wellness questions (from reference 18)

A simple, reliable and scientifically validated solution to identify non-sport stressors^{8,9,10} is to ask athletes to complete a short daily wellness questionnaire and use the wellness scores to adjust daily load^{3,8,9,10}.

To maximize compliance, use a short questionnaire that contains five to six questions associated with symptoms of overreaching (mood changes, poor sleep quality, soreness, excessive fatigue, etc.). Once athletes have completed the questionnaire, analyze the answers to detect athletes who are in need of recovery and rest; also identify those who are adapting well to the workload.

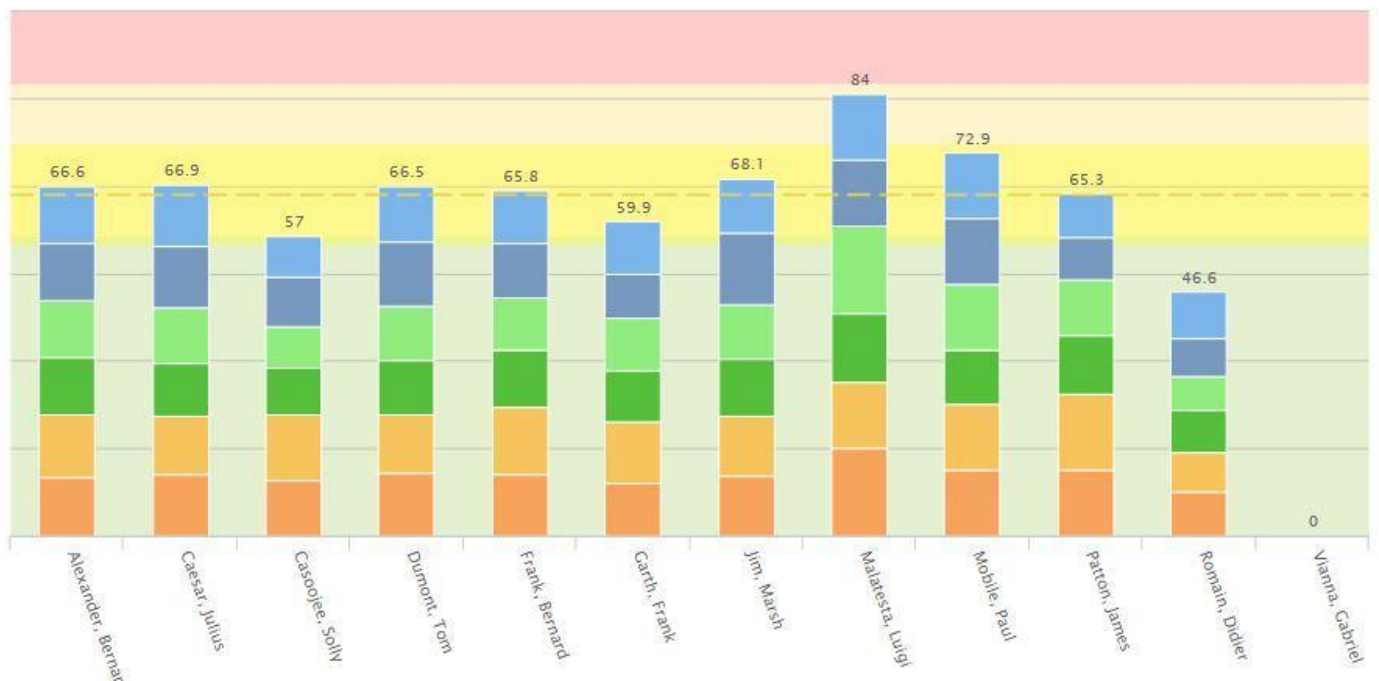



Figure 15 - Visualization of daily wellness results (courtesy of AthleteMonitoring.com)



When an athlete reports poor wellness measures, reduce the planned daily load (e.g., replace a hard session with an easy one, reduce the number of intervals, etc.). If symptoms persist for more than two to three days, reduce load by 40-50% for the next seven to 10 days and have a discussion with the athlete to identify potential lifestyle, training, or environmental stressors. When an athlete's wellness scores are good and reflect a positive adaptation to workload, increase the next week's load slightly (4-5%).

Don't forget the fun factor

Young athletes have identified "lack of fun" as the number one reason for quitting their sport¹². Coaches often focus on the technical, tactical and physiological aspects of training and physical preparation but sometimes forget that enjoyment is a crucial determinant of intrinsic motivation, which is a direct predictor of effort and persistence¹³.

Peak performance requires athletes to be fit, motivated, and ready to compete, both physically and mentally. Enjoyment plays a large part in the performance equation. Regardless their age and level of performance, when athletes dislike what they do, they will not be motivated to train hard, and will not be able to train and compete to the best of their ability.

What to do

A simple way to maximize athletes' engagement, motivation, and performance is to ask them to self-report enjoyment of training sessions and then tweak your programs and sessions to allow them to have an enjoyable sport experience.

Work with the highest professional standards, but do not take yourself too seriously. Smile often, chat (but do not fraternize) with athletes, be open to last-minute program changes, and add some fun to your sessions. Adding fun to a session does not have to result in elaborate changes. Fun can take the form of warm-up games, a challenge, team relays, or athlete-directed cool-downs at the end of the session.

Be careful when using extremely hard workouts, circuits, and army-like workouts. They can be motivating once in a while, but they are rarely fun for all, are mentally hard, and increase the risk of injury and illness, including rhabdomyolysis, significantly¹⁹. If you must use them, these extreme workouts should be used sparingly AND only with very fit athletes who are adequately prepared for them.

Actively seek feedback from athletes, coaches and health professionals

The success of any monitoring program depends on collaboration among the athletes, coaches and the medical team, including a willingness to share feedback. Without athletes' will to provide honest and regular feedback and your openness to adapt programs based on their suggestions, your monitoring program will not work¹⁴.

We have much to learn from athletes, coaches and health professionals. Experienced athletes often have more training and direct competition experience than most sport scientists and strength and conditioning coaches. Experienced athletes and head coaches know what works well for them and what does not. Their feedback and suggestions will make your program better and more effective. It should be actively sought.

When athletes share personal feedback and you do not act upon it, or if the information provided is used against them (through punishment, mockery, shunning during team selection, etc.), they will stop sharing it. When head coaches share feedback, recommendations, or suggestions with you and you do not respond adequately, they might start looking for someone else to replace you

What to do

A robust athlete monitoring program depends on honesty, trust, mutual respect, and open communication. To receive meaningful feedback, which is the only information from which you can derive useful insight, you should trust athletes, coaches, health professionals, and they should trust you. If they stop cooperating, your monitoring efforts are doomed.

Athletes must know why you are collecting feedback and asking them questions: to help them perform better and stay healthy as long as possible. Once trust is established, and they know that they can provide personal feedback and suggestions without fearing negative consequences, they willingly share information with you.

Then, when they tell you they are tired, did not like some sessions, etc., make sure to tweak your program to include their remarks (after having discussed the planned tweaks with the sport coach). They will be grateful to you and will be even more committed to the team's success.

Focus on what truly matters

In the age of sport technology, wireless sensors, and powerful marketing campaigns by device manufacturers, it is easier than ever before to focus on the wrong metrics, and to become overwhelmed by a flow of meaningless data. Paying attention to the wrong data will lead to incorrect load management decisions, and a waste of time and resources.

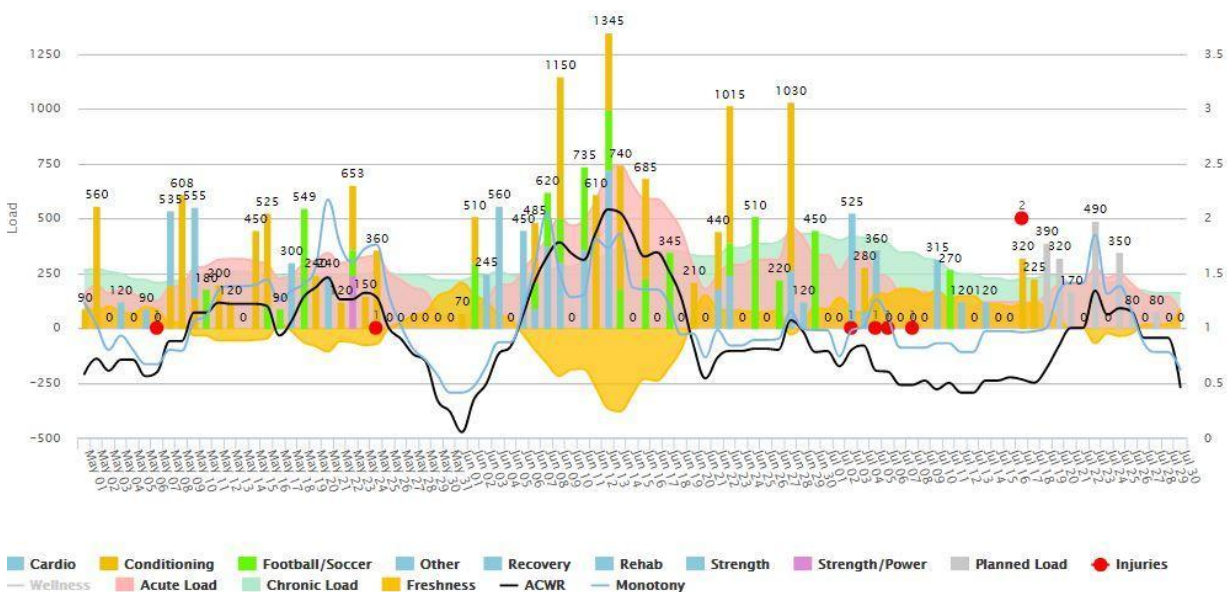


Figure 16 - Comprehensive monitoring of objective and subjective measures (courtesy of AthleteMonitoring.com)

Here are 3 examples on how to pick useful workload management metrics in specific situations:

GPS for soccer

If you track the volume of a soccer player's high-speed running (HSR) with an accurate GPS tracker, you'll be able to monitor detect spikes in HSR load, which may increase the risk of injury. That's a useful measure.

Session-RPE for running

If several athletes are performing the same running workout, and some find the session much harder than others (due to different fitness levels, pre-training fatigue, etc.), this will have an impact on their post-session recovery needs.

Activity trackers will not detect these individual differences, and are unable to measure how the high-speed running was truly tolerated by each athlete. The session-RPE method is the tool of choice to measure the athlete's internal load.

Heart rate monitoring for volleyball

Similarly, using heart rate to measure the internal load of volleyball players often leads to erroneous load estimations. The reason is simple: heart rate measures underestimate the internal load of short-duration, high-intensity/anaerobic activities (such as volleyball)¹⁶. They cannot accurately measure the internal load of volleyball players. The session-RPE method will be more effective. Additionally, a measure of external load (e.g.: number of jumps, spikes, etc.) will be an useful addition.

What to do

Use tech tools for what they are designed for: measuring external load, or internal load (usually heart rate monitors) but only for specific situations (aerobic activities of 3 minutes or more). Using them for other purposes will likely generate meaningless data and lead to wrong decisions.

To monitor the athlete's individual response to external load in most sports, the session-RPE method is one the best tool available today.

Conclusion

Managing workload and optimizing athlete performance while promoting injury-free participation is relatively simple. To optimize performance and minimize injury risk:

1. Start with the right tools
2. Monitor the key metrics
3. Increase weekly loads progressively
4. Avoid spikes in load
5. Alternate hard, moderate, and easy training days
6. Use the athlete's wellness data to guide daily load adjustments
7. Proactively manage training and competition loads during stressful periods
8. Make sure athletes have an enjoyable sport experience

About the author



Francois Gazzano is a performance coach and athlete monitoring specialist who graduated from the Université de Montreal with a degree in Exercise Science. As a full-time strength and conditioning coach and performance consultant in Europe and North America for more than 15 years, François has helped dozens of youth, elite and professional athletes across a wide range of sports reach their highest performance goals. Francois is the founder & CEO of AthleteMonitoring.com (<http://www.athletemonitoring.com>), an evidence-based athlete data management and workload optimization system used elite sport organizations worldwide.

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