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The SCALE Framework: An Applied Methodology for Readiness Monitoring for the Tactical Population—Part 1: The Framework

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Disclaimer: The views in this article represent Alex Redshaw's perspectives and do not reflect those of the Arlington County Fire Department or O2X Human Performance.

Abstract

Readiness monitoring has become a cornerstone of performance management in elite sport, providing coaches with objective and subjective information to optimize training, reduce injury risk, and enhance performance. While these principles have increasingly been adopted within tactical populations, implementation remains challenging due to limited staffing, unpredictable operational demands, and large athlete-to-coach ratios that leave most fire, law enforcement, and military organizations without the resources to run comprehensive monitoring systems across an entire workforce. This article, the first in a two-part series, introduces the SCALE Framework [Start simple; Collect consistently; Analyze trends; Link data to decisions; Expand as resources grow], an applied model for building readiness monitoring systems that progress from simple daily observation and conversation to structured questionnaires, internal load tracking, objective performance testing, and integrated technology. Rather than prescribing a single tool or technology, the framework emphasizes selecting methods that are sustainable, actionable, and appropriate for any organization's available resources, with the underlying goal of improving coaching decisions rather than simply collecting more data.

Introduction

Elite sport has spent decades refining methods to answer a deceptively simple question: "Is this athlete ready to train today?" Although no single metric can fully capture readiness, coaches now recognize that performance is influenced by a complex interaction between physical fatigue, psychological stress, sleep quality, recovery status, illness, and cumulative workload.[1] Consequently, modern readiness monitoring has evolved from tracking isolated physiological variables to integrating multiple subjective and objective measures that collectively provide insight into an athlete's ability to perform.

Now, these principles have expanded beyond elite sport into tactical populations, including firefighters, military personnel, and law enforcement officers.[2] The transfer is logical given that tactical professionals operate in occupations that routinely expose them to high physical workloads, psychological stress, sleep disruption, environmental extremes, and unpredictable work schedules. Many tactical professionals experience physiological demands that rival or exceed those observed in elite athletic competition.

Despite growing interest, implementing readiness monitoring within tactical organizations presents unique challenges. Unlike collegiate or professional sport, where a coach,

along with their potential staff, may oversee a roster of twenty to forty to perhaps a hundred or slightly more athletes, tactical strength and conditioning professionals are often responsible for hundreds or even thousands of personnel. Financial resources, staffing levels, and available technology vary substantially between organizations, so systems built for Olympic, Division 1 athletics, or professional sport are often impractical for fire departments, military units, or law enforcement agencies.

This article proposes an applied framework, specifically the SCALE Framework [Start simple; Collect consistently; Analyze trends; Link data to decisions; Expand as resources grow], for practitioners in tactical populations to implement scientifically informed, operationally feasible, and scalable readiness monitoring systems in these workforces. The SCALE Framework (as seen in Figure 1) was developed by the author of years of training, testing, and adapting, has proven effective for a variety of situations. The SCALE Framework, rather than advocating for a single monitoring tool or technology, presents a continuum of implementation strategies that coaches can adopt based on their available resources.

Why Tactical Coaches Need Readiness Monitoring

Athletes generally compete within structured seasons, with training loads planned months in advance and recovery deliberately programmed. Tactical personnel rarely have these luxuries as firefighters transition from sleep to an emergency response within minutes, police officers face unpredictable confrontations and extended shifts without rest, and military personnel operate under sustained sleep deprivation and physical exertion in unstable environments.

Given the dynamic occupational demands, fluctuations in readiness may extend well beyond the influence of physical training alone. For example, a firefighter arriving for a scheduled conditioning session may have already experienced multiple overnight alarms, accumulated only three hours of fragmented sleep, and completed several hours of physically demanding incident response. Although the prescribed training session remains unchanged, the individual's capacity to tolerate that workload has changed considerably.[3]

This distinction is critical. External training load represents what is prescribed, whereas readiness reflects an individual's ability to respond to that stimulus on a given day.

Research demonstrates that inadequate recovery and accumulated fatigue negatively influence not only physical performance but also cognitive function, reaction time, movement quality, and decision-making.[4,5] For tactical professionals, these impairments extend beyond athletic performance and may directly affect operational safety.

Readiness monitoring, especially for the tactical population, therefore serves a broader purpose than simply optimizing training adaptation. Within tactical populations, it allows practitioners to identify individuals who may benefit from modified training, additional recovery modalities, or further clinical evaluation before fatigue progresses into injury, illness, or burnout.

The objective of readiness monitoring is often misunderstood. It is not designed to eliminate fatigue or reduce training demands, since fatigue is a necessary component of adaptation and tactical occupations require personnel who can perform under fatigue, stress, and uncertainty. Rather, readiness monitoring seeks to distinguish productive training stress from maladaptive fatigue, using that information to apply hard training when appropriate while reducing unnecessary risk when recovery has been compromised.

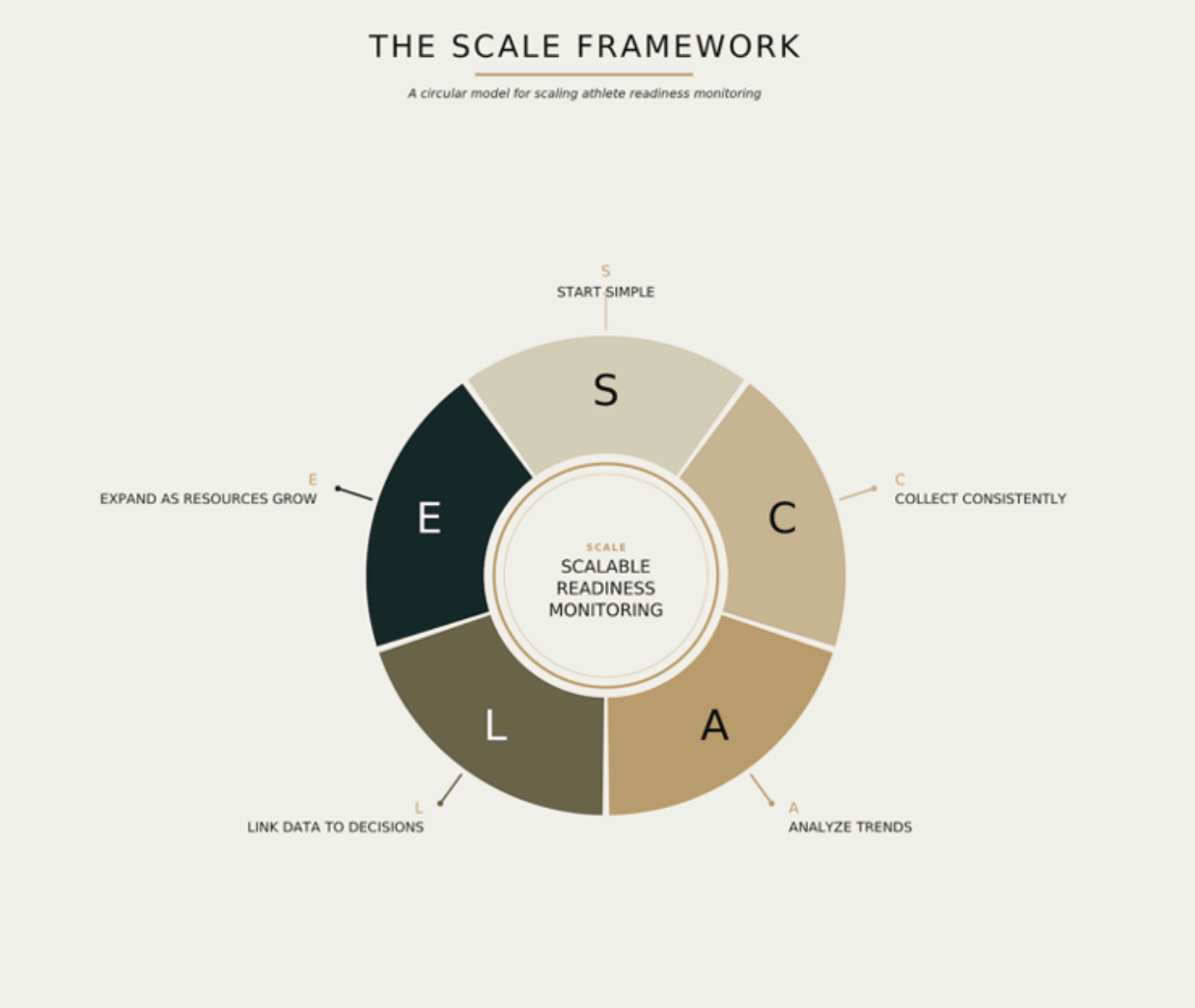


Figure 1—The SCALE framework.

The Readiness Scalability Continuum

One of the biggest misconceptions about readiness monitoring is that meaningful data collection requires expensive technology or sports-science infrastructure. Force plates, wearables, heart rate variability (HRV) monitors, and athlete management systems have become common in professional sport, but they remain inaccessible to many tactical organizations. More importantly, technology alone does not improve performance; better coaching decisions do. A monitoring system should be judged not by how much data it collects, but by its ability to consistently inform decisions that improve training quality, recovery, and long-term performance.

This distinction matters in tactical settings, where a fifty-person rural sheriff's department, a 1,500-person metropolitan fire department, and a military unit with a multidisciplinary human-performance team face vastly different resources and demands. Rather than expecting identical systems everywhere, readiness monitoring should be viewed as a continuum: organizations begin with simple, low-cost strategies and add sophistication as staffing, technology, and experience grow (see Figure 2). Progression is not mandatory or expected: a department at Level 3 making excellent decisions may

outperform one at Level 6 drowning in unused data. The guiding question is always, "Will collecting this information change what I do today?" If not, it will likely not improve performance.

The Levels of the Readiness Scalability Continuum

Level 1: Observing requires no technology, just an attentive coach. Changes in movement quality, enthusiasm, or communication often provide the earliest signs of reduced readiness; though its effectiveness depends heavily on coach experience, coach engagement, athlete familiarity, and coach-to-athlete ratio. A coach responsible for twenty personnel may quickly recognize subtle behavioral changes, whereas a practitioner overseeing 300 firefighters across multiple stations may never observe the same individual twice in a month. Observation is also susceptible to confirmation bias, with coaches naturally focusing on high-performing or struggling individuals while overlooking those whose performance changes are more gradual. Consequently, observation should be viewed as the foundation of readiness monitoring rather than the entire system.

Level 2: Asking using precise questions and brief conversations —such as "How did you sleep?" or "How are you feeling?"—to potentially identify fatigue, stress, and recovery status within seconds. Subjective perceptions often detect accumulating fatigue before objective markers change.[6] Perhaps more important, these conversations build the trust needed for personnel to report concerns early. This conversational approach also acknowledges an important reality within tactical settings: readiness extends beyond physical training. Family stress, emotionally challenging incidents, disrupted sleep, mandatory overtime, and cumulative operational demands all influence an individual's capacity to train effectively. These factors may never appear on a force plate or heart rate monitor but can dramatically influence performance.

However, given that responses are not standardized, comparing them over time or across large groups becomes difficult. In addition, while informal conversations provide valuable context, they also have limitations. Responses may vary depending on how questions are asked, who asks them, and whether the individual feels comfortable reporting fatigue. Depending on the culture, it can easily be the unwritten rule not to voice any concerns of any type of stress (e.g., physical, relational, financial, emotional). These limitations create the need for the next step in the continuum: structured subjective monitoring.

Level 3: Structured subjective questionnaires solve that scalability problem. Brief daily ratings of fatigue, sleep, soreness, stress, motivation, and session rate of perceived exertion (RPE) take under a minute and remain among the most sensitive, cost-effective indicators of training response available.[7] Coaches should interpret these as trends rather than isolated scores: a single poor night's sleep rarely warrants action, but three consecutive days of deteriorating sleep, increasing soreness, elevated stress, and declining motivation usually does. Using these simple tools repeatedly can also help identify who is enrolled in courses, who is going through a divorce, and who is suffering from sleep disorders, that may or may not be identified by using Level 2 in isolation.

Level 4: Internal load reflects the individual's physiological and perceptual response to external load, such as weight lifted, distance ran, number of repetitions performed, or duration of a training session. Given that readiness is influenced by sleep, operational demands, nutrition, illness, and psychological stress, identical external workloads rarely produce identical internal responses. Session RPE, rated effort multiplied by duration, is a simple, equipment-free way to

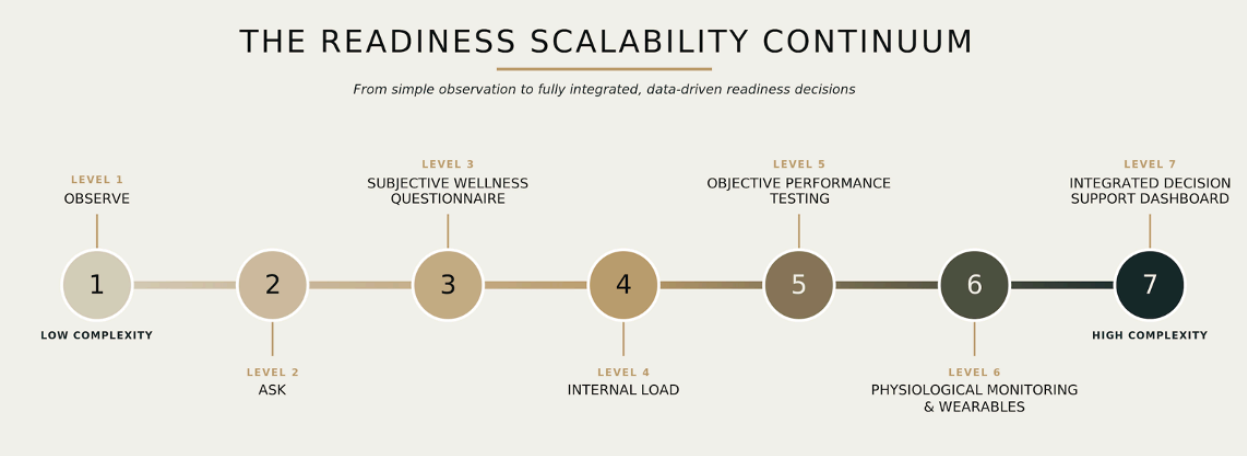


Figure 2—The Readiness Scalability Continuum.

quantify internal load and reveals mismatches between intended and perceived intensity.[8] For example, a forty-five-minute training session rated as an eight out of ten produces a training load of 360 arbitrary units. While this number has little meaning in isolation, repeated collection allows practitioners to monitor workload trends over days and weeks, and it can prove to be another method for identifying someone struggling with matters outside of the profession.

Thus, monitoring internal load becomes increasingly valuable when viewed longitudinally rather than via isolated training sessions. One commonly discussed approach is the Acute:Chronic Workload Ratio (ACWR), which compares short-term workload to longer-term training exposure. For example, if a military Service member's chronic workload, the four-week rolling average of weekly training load, sits at 1,200 arbitrary units, but a week of intense live-fire evolutions pushes that week's acute load to 2,100 arbitrary units, the resulting ACWR of 1.75 reflects a workload spike well above what the individual has recently tolerated. The underlying principle is straightforward. Individuals who experience large spikes in workload relative to what they have recently tolerated may be at greater risk of injury than those whose workloads increase progressively.[9]

Although ACWR has received criticism regarding its statistical methodology and should not be interpreted as a standalone injury prediction tool, it reinforces an important coaching principle: sudden increases in workload are generally less desirable than gradual, progressive loading. Coaches should therefore focus less on achieving a specific ratio and more on identifying meaningful changes in workload patterns that warrant further investigation.

Therefore, workload data should be interpreted alongside other indicators of readiness rather than in isolation. A firefighter reporting high fatigue, poor sleep, elevated stress, and unusually high RPE scores presents a different coaching challenge than an individual reporting high workload but excellent recovery and motivation.

Level 5: Objective performance testing answers a different question than subjective monitoring: not "how do you feel" but "how are you performing." Research has demonstrated that subjective wellness scores and objective performance measures do not always change in parallel.[10,11] An individual may report feeling fatigued while maintaining normal neuromuscular performance, whereas another may feel fully recovered

despite measurable declines in physical output. These discrepancies often provide some of the most meaningful information for coaches.

For example, a firefighter who reports poor sleep following a busy overnight shift but demonstrates normal jump performance may be experiencing predominantly psychological fatigue while maintaining physical readiness. Training may proceed with minor modifications, while the coach remains attentive to motivation, concentration, exercise technique, and perceived effort throughout the session.

When selecting practical objective readiness tests, it is important to ensure the test requires minimal skill, is fatigue-sensitive, reliable, quick, minimally fatiguing itself, and fits into existing warm-ups. Countermovement jump (CMJ) testing satisfies these criteria and has become one of the most widely used neuromuscular monitoring tools. Performed on force plates or jump mats, it yields variables such as jump height, peak power, and reactive strength index (RSI), which reflects eccentric-to-concentric transition speed and lower-body explosiveness; declines across sessions may signal accumulating fatigue. Isolated results are unreliable given normal day-to-day variability, so practitioners should emphasize longitudinal trends over single-day deviations, integrating multiple data sources rather than fixed thresholds.[12,13]

Level 6: Physiological monitoring and wearables are capable of measuring heart rate, HRV, sleep duration and quality, respiratory rate, skin temperature, movement patterns, and training load, which are now widely available and increasingly affordable. For tactical organizations, this expanded monitoring capability is particularly attractive as they extend visibility into recovery that happens outside the gym, including overnight calls, disrupted sleep, and heat exposure.

Among physiological measures, HRV has received considerable attention as a non-invasive indicator of autonomic nervous system function and recovery status. HRV reflects the variation in time between successive heartbeats and is influenced by the balance between sympathetic and parasympathetic nervous system activity. Reductions in HRV have been associated with accumulated fatigue, illness, psychological stress, and inadequate recovery, while stable or improving HRV may reflect successful adaptation to training.[14]

Similarly, advances in wearable technology have improved the ability to monitor sleep quantity and, to a lesser extent, sleep quality. Although consumer devices vary in their accuracy, they can still provide valuable information regarding habitual sleep duration, sleep consistency, and recovery behaviors when interpreted over time rather than on a night-to-night basis.[15] In addition, many physiological variables are influenced by factors beyond training load, including hydration status, caffeine intake, illness, environmental conditions, emotional stress, and measurement error.[16]

Therefore, wearable technology should be viewed as another source of contextual information within a broader monitoring system. For example, a firefighter reporting poor subjective readiness following multiple overnight emergency calls may also demonstrate reduced sleep duration and suppressed HRV. Collectively, these findings strengthen confidence that accumulated fatigue is influencing readiness. Conversely, discrepancies between subjective and physiological measures should prompt further discussion rather than automatic programming changes.

Level 7: Integrated decision support dashboards combine subjective, workload, performance, and physiological data into a single view built for clarity rather than complexity. At this level, practitioners are no

longer evaluating subjective questionnaires, workload data, jump performance, wearable metrics, and coaching observations independently. Instead, these sources are combined to provide a comprehensive picture of readiness that supports informed coaching decisions. Its role is to flag individuals who warrant a conversation, not to make decisions automatically. This distinction reinforces the central philosophy of the Readiness Scalability Continuum.

The SCALE Framework

Collecting readiness data is relatively simple; building a system that consistently informs coaching decisions is considerably more difficult. A department can invest heavily in wearables, force plates, or athlete management software and still see little benefit if practitioners cannot interpret the information or lack the authority to act on it.

Readiness monitoring should therefore be treated as a decision-making framework, not a data collection exercise. The goal is not to label someone "ready" or "not ready," but to determine whether today's training should proceed as planned, be modified, or prompt a conversation first. The SCALE Framework, outlined below, offers a practical model built on that principle: it begins with coaching rather than technology, and each stage builds on the one before it.

Start Simple

Starting Simple addresses the misconception that meaningful monitoring requires expensive equipment. A coach overseeing several hundred firefighters with a five-question wellness survey may gather more useful information than one managing twenty athletes with several underused wearables. A sustainable starting point often includes a brief daily wellness questionnaire, session RPE, informal observation, and short pre-training conversations, together requiring under two minutes per person.

Collect Consistently

Collecting Consistently reflects a simple reality that even a well-designed system has little value if it is used only intermittently. Before implementation, practitioners should ask whether personnel can realistically complete it every shift, whether it disrupts operational duties, and whether it can survive staffing turnover. Consistency also enables meaningful individual baselines, since interpretation should compare a person against their own history rather than an organizational average.[17,18]

Analyze Trends

Analyzing Trends means treating any single score, such as a poor night's sleep, a low jump, a hard session, as noise rather than a true signal of increased risk. Problems typically emerge when several indicators move in the same direction over time. The more useful question is not how someone scored today, but how today compares with the last three weeks, a paradigm shift that lessens overreaction to normal day-to-day variability.

Link Data to Decisions

Linking Data to Decisions addresses the most common failure of monitoring systems, where coaches and practitioners collect information without changing behavior. Every measure should have a predefined purpose, answerable through one question: "If this value changes, what will I do differently?" One poor night might simply prompt a conversation; several nights of poor sleep paired with declining jump performance might justify reduced volume; a spike in operational workload during a military field exercise might warrant scaling back supplemental conditioning. Importantly, modifying training does not always mean making it easier; someone facing several disrupted nights might shift toward technical (e.g., tempo back squats or hang power clean

technique work with a light bar), aerobic (e.g., non-impact conditioning on a bike or in the pool), or movement-quality (e.g., balance, massage, or mobility) work instead of maximal strength efforts (e.g., near-maximal back squats, bench press, or deadlifts).

Expand as Resources Grow

Expand as Resources Grow describes how systems mature over time, from wellness questionnaires toward force plate testing, HRV, wearables, and centralized platforms. Expansion should occur only when new information genuinely improves decision-making, and it requires parallel investment in staff education so coaches can interpret and act on what they collect, not just gather it.

Ultimately, readiness monitoring is not about building the most advanced sports science laboratory. It is about building the most effective coaching environment, one decision at a time.

Conclusion

The SCALE Framework gives the tactical population a starting point for building a readiness monitoring system that fits their organization's actual resources, rather than one only practical for professional sport. Progress through either model is not about reaching the most sophisticated level of monitoring available, but about consistently turning whatever information is collected into better coaching decisions. Part 2 of this series turns from framework to practice: it examines how these principles apply differently across various tactical organizations, the common pitfalls that undermine monitoring systems even when the underlying framework is sound, and real applied case studies from a fire service setting, before closing with practical recommendations for coaches at every stage of implementation.

Author Biography



Alex Redshaw is an accredited Strength and Conditioning (S&C) Coach with the Australian Strength and Conditioning Association (ASCA) who holds undergraduate and postgraduate qualifications from the University of South Australia, where he completed a Bachelor of Exercise and Sport Science (Advanced Exercise Science) and a Master of Research (Health Science). With a decade of experience in the S&C field, working across both athletic and tactical populations, Alex is currently the O2X Human Performance Program Manager with the Arlington County Fire Department, Virginia. His professional focus centers on improving firefighter health, performance, retention, and career longevity while reducing injuries and occupational burnout. His work has included organizational return-on-investment analysis, long-term athlete development models for tactical populations, readiness monitoring, shift work programming, and the application of sport science principles to emergency services. Alex has also contributed to departmental policy development in areas including fatigue management, reproductive health, and return-to-work processes.

References

1. Pitre C. Bourdon, Marco Cardinale, Andrew Murray, Paul Gastin, Michael Kellmann, Matthew C. Varley, Tim J. Gabbett, Aaron J. Coutts, Darren J. Burgess, Warren Gregson, and Noel T. Cable, "Monitoring Athlete Training Loads: Consensus Statement," *International Journal of Sports Physiology and Performance* 12, no. 2 (2017): S2-161–S2-70.

2. Callum Tomes, Ben Schram, and Robin Orr, "Relationships Between Heart Rate Variability, Occupational Performance, and Fitness for Tactical Personnel: A Systematic Review," *Frontiers in Public Health* 8 (2020): 583336.
3. Hugh H. K. Fullagar, Sabrina Skorski, Rob Duffield, Daniel Hammes, Aaron J. Coutts, and Tim Meyer, "Sleep and Athletic Performance: The Effects of Sleep Loss on Exercise Performance, and Physiological and Cognitive Responses to Exercise," *Sports Medicine* 45, no. 2 (2015): 161–86.
4. "Relationships Between Heart Rate Variability, Occupational Performance, and Fitness for Tactical Personnel: A Systematic Review."
5. Jeroen Van Cutsem, Samuele Marcora, Kevin De Pauw, Stephen Bailey, Romain Meeusen, and Bart Roelands, "The Effects of Mental Fatigue on Physical Performance: A Systematic Review," *Sports Medicine* 47, no. 8 (2017): 1569–88.
6. Anna E. Saw, Luana C. Main, and Paul B. Gastin, "Monitoring the Athlete Training Response: Subjective Self-Reported Measures Trump Commonly Used Objective Measures: A Systematic Review," *British Journal of Sports Medicine* 50, no. 5 (2016): 281–91.
7. Ibid.
8. Carl Foster, Jessica A. Florhaug, Jodi Franklin, Lori Gottschall, Larry A. Hrovatin, Suzanne Parker, Peter Doleshal, and Christopher Dodge, "A New Approach to Monitoring Exercise Training," *Journal of Strength and Conditioning Research* 15, no. 1 (2001): 109–15.
9. Tim J. Gabbett, "The Training–Injury Prevention Paradox: Should Athletes Be Training Smarter and Harder?" *British Journal of Sports Medicine* 50, no. 5 (2016): 273–80.
10. Robin T. Thorpe, Andrew J. Strudwick, Martin Buchheit, Greg Atkinson, Barry Drust, and Warren Gregson, "The Influence of Changes in Acute Training Load on Daily Sensitivity of Morning-Measured Fatigue Variables in Elite Soccer Players," *International Journal of Sports Physiology and Performance* 12, no. 2 (2017): S2-107–S2-113.
11. Lluc Montull, Aušra Slapšinskaitė-Dackevičienė, John Kiely, Robert Hristovski, and Natàlia Balagué, "Integrative Proposals of Sports Monitoring: Subjective Outperforms Objective Monitoring," *Sports Medicine – Open* 8 (2022): 41.
12. Martin Buchheit, "Monitoring Training Status with HR Measures: Do All Roads Lead to Rome?" *Frontiers in Physiology* 5 (2014): 73.
13. João Gustavo Claudino, John Cronin, Bruno Mezêncio, Daniel Travis McMaster, Michael McGuigan, Valmor Tricoli, Alberto Carlos Amadio, and Julio Cerca Serrão, "The Countermovement Jump to Monitor Neuromuscular Status: A Meta-Analysis," *Journal of Science and Medicine in Sport* 20, no. 4 (2017): 397–402.
14. Scott Michael, Kenneth S. Graham, and Glen M. Davis, "Cardiac Autonomic Responses during Exercise and Post-Exercise Recovery Using Heart Rate Variability and Systolic Time Intervals—A Review," *Frontiers in Physiology* 8 (2017): 301.
15. Dhruv R. Seshadri, Ryan T. Li, James E. Voos, Jason R. Rowbottom, Celeste M. Alfes, Christian A. Zorman, and Colin K. Drummond, "Wearable Sensors for Monitoring the Internal and External Workload of the Athlete," *npj Digital Medicine* 2 (2019): 71.
16. Stefen Sammito and Irina Böckelmann, "Factors Influencing Heart Rate Variability," *International Cardiovascular Forum Journal* 6 (2016): 18–22.
17. "Monitoring the Athlete Training Response: Subjective Self-Reported Measures Trump Commonly Used Objective Measures: A Systematic Review."
18. "The Influence of Changes in Acute Training Load on Daily Sensitivity of Morning-Measured Fatigue Variables in Elite Soccer Players."

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