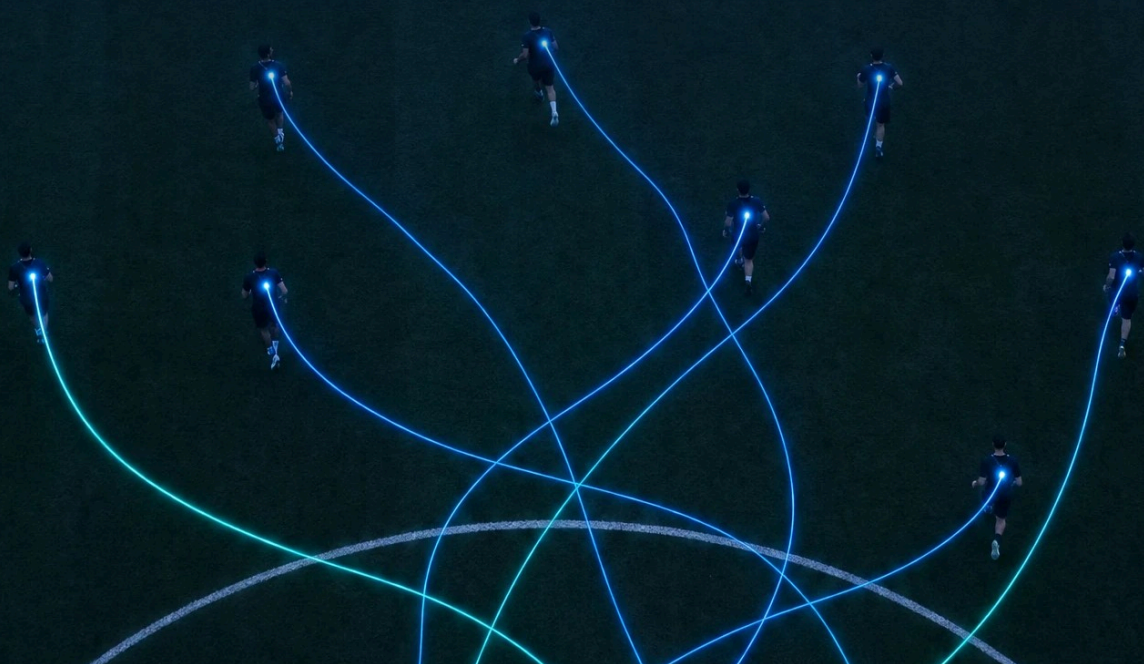


Wearable Technologies Program and Training Module

Erasmus+ Sport Small-Scale Cooperation Partnerships
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Introduction

The programme in brief

Wearable technologies (heart-rate monitors, GPS units, inertial measurement units, smart textiles, and connected dashboards) have become widely available in elite sport over the past fifteen years, and are now reaching grassroots, youth, and para-sport contexts as costs fall. Yet a recurring finding across recent surveys is that the bottleneck to effective use is no longer the hardware. It is the coach's capacity to interpret data and convert it into defensible training decisions. This programme exists to close that gap.

The Wearable Technologies Program and Training Module presents a structured, modular curriculum across five units. Module 1 grounds coaches in sensor types, the device market, and the validity and reliability concepts they need to evaluate vendor claims. Module 2 develops practical data-tracking literacy: distinguishing internal from external load, reading dashboards, computing the core metrics (sRPE, TRIMP, ACWR) on a real session. Module 3 integrates wearable data into periodization and recovery management. Module 4 addresses injury prevention through load management, asymmetry detection, and an early-warning protocol, anchored by five worked case studies spanning professional football, university basketball, endurance sport, para-sport, and grassroots youth. Module 5 operationalises the programme: it walks the coach through data governance, athlete communication, change management within multi-disciplinary staff, and the construction of a personalised 90-day integration plan. Module 5 also documents five flexible delivery pathways (self-paced, instructor-led, blended, microlearning, and train-the-trainer), making this curriculum deployable across very different organisational contexts.

The programme is designed for self-paced study and for instructor-led delivery, with blended options for accredited continuing-education programmes. The modules lead into the WEARCOACH Self-Assessment Toolkit; a mobile application is planned. Inclusion-by-design is structural: the worked cases range from a grassroots youth academy and a university team to a professional club and a para-sport team, ensuring relevance across budgets, sports, and athlete populations.

The programme does not promote any commercial device. Comparisons are organised by category and feature rather than by brand. The emphasis throughout is on evidence-based, transparent, and ethically defensible practice: treating wearable data as one input among many in the coach's professional judgment.

Three ways to follow the programme

The programme supports three main ways of working, plus two further modes described in Module 5. The same programme is online at wearcoach.sports4.eu/learn/, where each module also has its quiz, a video, a spoken version and tools you can use on screen.

Self-paced study. Read each module, answer its reflective prompts, take its quiz online and use the templates (page 32) that go with it. Pace yourself to roughly one module per week, with one practical activity in your own coaching between modules.

Instructor-led workshop. Each module supports a 90-minute session led by a facilitator and built around the slide deck. The facilitator guide (page 53) sets out the flow of each session; the slides can be downloaded from wearcoach.sports4.eu/downloads/.

Blended programme (4 weeks). Coaches read the week's module and take its quiz on their own, then meet for a live session focused on case discussion and applied practice. Modules 1 and 2 share the first week. Suitable for university coach-education programmes and federation continuing-professional-development tracks.

Why this programme exists

Coaching is a craft built on observation, judgment, and the accumulated experience of working with athletes. Wearable technology does not change that. What it changes is the resolution of observation. A coach who can see, in near real time, that a player's heart rate has not recovered between sprints, or that a runner's high-speed distance over the past week is three standard deviations above the chronic average, is in a stronger position to make the next decision well. Wearable technology, used carefully, augments judgment. Used carelessly, it can replace judgment with numbers that are not understood, which is worse than not collecting them at all.

The WEARCOACH project is built on a documented gap. The literature consistently shows that the use made of wearable data lags behind device penetration. Akenhead and Nassis (2016) found that high-level football clubs monitored every training session with GPS and heart-rate devices, yet rated the effectiveness of that monitoring below their expectations, pointing to weak integration with coaches and limited staff. Düking and colleagues (2025) found that all 130 coaches they surveyed used wearables, yet only "somewhat agreed" that the data influenced their decisions. The consensus statement on monitoring athlete training loads (Bourdon et al., 2017) was emphatic that the value of any monitoring system depends entirely on the staff's capacity to act on what it produces. WEARCOACH's research report, built on a survey of 104 coaches in Türkiye, Estonia and Norway with interviews and focus groups, describes the same gap: more coaches have the technology than use it regularly, and fewer than half of those surveyed had received any training in it.

This programme is the project's response. It is not a buyer's guide. It is a competency programme.

Who this is for

The primary audience is practising coaches across sport disciplines and competitive levels, from grassroots youth coaches to professional league head coaches, including parasport coaches and strength-and-conditioning staff. National Sports Governing Bodies (NSGBs), coach educators, and federation continuing-professional-development teams form the secondary audience, who will use this material to train others. Sport-science academics, policymakers, and athlete-development administrators may find the framework useful as a reference for curriculum design and policy alignment.

Scope and limits

The programme covers the coaching of wearable-data interpretation and integration. It does not duplicate medical, physiotherapy, or biomedical-engineering curricula; references to medical decision-making are kept deliberately at the level of “when to refer”, not “how to treat”. It does not endorse specific commercial products. It does not replace the consortium’s research report, self-assessment toolkit, or mobile application: it complements them.

How the programme was developed

Content draws on a literature review of peer-reviewed sport-science publications, the WEARCOACH consortium’s surveys and interviews with European coaches, structured peer review by academic and practitioner contributors, and initial formative feedback from coaches and project partners in Türkiye, Estonia, and Norway. Formal field pilot testing of the training materials, toolkit, and mobile application will be conducted later. All references are cited in APA 7th-edition format and listed under References (page 63).

Pedagogical approach and module architecture

This programme is built on four design principles drawn from adult-learning research.

First, andragogical relevance (Knowles, Holton, & Swanson, 2015). Adults learn best when content is anchored to immediate practical problems, draws on their existing experience, and is self-directed. Every module asks the coach to relate the material to their own setting: with a reflective prompt in Modules 1 to 4, and with the 90-day plan in Module 5.

Second, experiential learning (Kolb, 2015). Each module moves through concrete experience (a case or worked example), reflective observation (in-text prompts), abstract conceptualisation (the theoretical material), and active experimentation (the templates, the quiz, the recommended in-the-field practice). Coaches who use only the theoretical material will get a partial benefit; those who complete the active components will get the full one.

Third, constructive alignment (Biggs & Tang, 2011). Learning outcomes, content, activities, and assessments are designed together so they pull in the same direction.

Each module's quiz is calibrated to its stated objectives; each capstone activity is calibrated to the most demanding objective.

Fourth, Bloom's taxonomy as a progression scaffold (Anderson & Krathwohl, 2001). Module 1 establishes vocabulary and recognition. Module 2 brings these into application. Modules 3 and 4 require analysis and evaluation. Module 5 culminates in creation: the coach designs their own 90-day integration plan.

The five modules are tightly cross-linked: terminology defined in Module 1 is reused throughout; formulas introduced in Module 2 reappear in Modules 3 and 4; GDPR foundations from Module 1 are deepened in Module 5. The glossary (Annex E, page 60) documents this cross-referencing so coaches and translators can navigate the programme as a coherent whole.

Four personas frame the programme: Mehmet (grassroots youth football coach, Türkiye), Anna (university strength-and-conditioning coach, athletics, Northern Europe), Kjell (professional-league head coach with full performance staff, Norway), and Zeynep (wheelchair-basketball coach, Türkiye). Mehmet and Zeynep appear by name in the cases. Together the cases cover grassroots and elite, individual and team, ambulatory and para-sport contexts.

Fundamentals of Wearable Technology

Sensor types, the device market, and the validity and reliability concepts coaches need to evaluate vendor claims.

What you will learn

- Define and classify the main families of wearable technology used in sport and distinguish sensor types by what they measure.
- Explain the journey of data from athlete to sensor to platform to coaching decision.
- Critically evaluate the value and limitations of wearable technology in coaching, applying the concepts of validity, reliability, and ecological validity.
- Apply a multi-criteria selection matrix to a realistic device-choice scenario.
- Recognise baseline ethical and GDPR obligations when introducing wearables to athletes.

This module is also online, with its quiz, a video, a spoken version and tools you can use on screen: wearcoach.sports4.eu/learn/fundamentals/

1.1 A brief evolution of wearable technology in sport

Wearable monitoring has roots in clinical instrumentation rather than sport. The Holter monitor, a portable ECG recorder developed in the 1950s, established the principle that physiological signals could be captured during free-living activity. Mechanical pedometers, popular by the 1960s, did the same for ambulatory activity counts. Heart-rate chest straps reached the consumer sport market with Polar's launch of the Sport Tester in the early 1980s, opening structured heart-rate-based endurance training to recreational and competitive athletes. GPS-based athlete tracking emerged in elite team sport in the early 2000s, initially as backpack-worn units in rugby and Australian football. Inertial measurement units (small packages combining accelerometer, gyroscope, and magnetometer) have followed a similar trajectory from research instrumentation to mainstream coaching tools over the past decade. The next wave includes smart textiles (sensors woven into garments), continuous biochemical monitoring (notably continuous glucose monitors transitioning from clinical to performance contexts), and increasingly sophisticated optical sensing in consumer-grade watches and rings.

The pattern across this 70-year arc is not “technology pushed to coaches”; it is “coaches and researchers asked questions that needed instrumentation to answer”. The implication for the practising coach is simple: when you encounter a new

wearable, ask first what *coaching question* it is trying to answer. If you cannot articulate that question for your own sport and athletes, the device is unlikely to change your practice.

1.2 Sensor types and what they actually measure

Coaches often hear sensors named and conclude they understand them. The deeper competence is knowing what each sensor *physically* measures, and what the device then *derives* from that measurement. The two are often confused, leading to overconfidence in derived metrics whose underlying signal is noisy.

Accelerometers measure linear acceleration along one, two, or three axes. From accelerometer data alone, devices estimate step counts, impacts, and certain composite “load” metrics. The signal is robust but ambiguous: vibration from a vehicle and a footstrike can look similar at low sampling rates.

Gyroscopes measure angular velocity: the rate of rotation about an axis. Combined with accelerometers in a tri-axial IMU, they enable orientation estimation and motion-pattern recognition (jumping, change of direction, gait phases).

Magnetometers measure the local magnetic field, used as a compass reference and to correct drift in orientation estimates. They are sensitive to nearby ferrous metal and electronic noise, which limits their reliability in indoor sport environments.

Optical photoplethysmography (PPG) sensors shine green or infrared light into tissue and measure the variation in reflected light caused by pulsatile blood flow. Wrist-based watches and arm-band heart-rate monitors use PPG. The signal is sensitive to motion artefacts, skin tone, peripheral vasoconstriction, and the tightness of the device against the skin.

Electrocardiogram (ECG) electrodes measure the electrical activity of the heart directly. Chest-strap heart-rate monitors typically use a one-lead ECG approach. The signal is generally more accurate than PPG, especially during dynamic exercise, but requires direct skin contact and tolerance of the strap.

GPS/GNSS receivers triangulate position from satellites. Accuracy depends on the number and geometry of visible satellites, the receiver’s chipset quality, atmospheric conditions, and the local environment (open field versus urban canyon versus indoors). GPS-derived metrics such as total distance and high-speed running distance are robust in open outdoor sport; they degrade or fail indoors.

Surface electromyography (sEMG) sensors measure the electrical activity of muscle through the skin. Used to estimate muscle activation and fatigue, though signal quality is highly sensitive to electrode placement, skin preparation, and motion.

Temperature sensors and galvanic skin response sensors capture skin temperature and electrodermal activity, used in some recovery- and stress-monitoring devices.

A practical clarifying distinction:

Measured quantity, derived metric and inferred construct

Concept	What it is	Example
Measured quantity	The raw physical signal a sensor captures	Acceleration on three axes (m/s ²)
Derived metric	A processed output computed from measured quantities	PlayerLoad, total distance, sprint count
Inferred construct	A coaching concept the metric is taken to represent	“External load”, “neuromuscular fatigue”

The further you travel from measured quantity toward inferred construct, the more layers of assumption you accumulate. When two devices report “different” PlayerLoad values for the same drill, the answer is usually that they are using different proprietary derivation formulas, not that one is wrong and one is right.

1.3 Mapping the device market: category-based comparison

Rather than ranking brands, the most durable way to teach the device market is by category. The table below is indicative; specific models change quickly, but the categories and the questions they invite are stable.

Device categories compared by use, price, strengths and limitations

Category	Typical use	Typical price band (per unit)	Strengths	Limitations
Chest-strap HR monitor (ECG)	Endurance training, group HR monitoring	€40-120	High accuracy in dynamic exercise; affordable	Athlete comfort; requires direct contact
Optical wrist HR / consumer multi-sport watch	Endurance, everyday monitoring, sleep	€150-700	Comfort; integrated GPS, sleep, HRV	Accuracy in high-motion activity is variable
GPS team vest (single-sport, professional)	Outdoor team sport monitoring	€800-2,500/unit + platform fees	High-quality GNSS; integrated dashboards	Cost; lock-in to platform
IMU patch / pod	Asymmetry, jump analysis, gait	€150-600	Targeted biomechanics; portable	Narrower use case; software dependent
Smart textile (HR or EMG-enabled garment)	HR + EMG in dynamic sport	€200-1,500	Garment-integrated; comfortable	Durability; washing; sensor quality varies
Sleep- and recovery-focused ring or band	Continuous HRV, sleep	€200-500 + subscription	Continuous wear; HRV trends	Sleep-stage accuracy vs. PSG is partial
Smartphone-based monitoring	Grassroots, low-budget contexts	€0-50 (apps)	No additional hardware	Accuracy depends on phone sensors

1.4 Validity and reliability for coaches who are not researchers

Three plain-language definitions every coach needs:

Validity asks whether a device measures what it claims to measure. A GPS unit that reports total distance is valid for that purpose if it agrees with a gold-standard reference (a measured track, for example) within an acceptable margin.

Reliability asks whether a device gives consistent results when conditions are stable. A device that gives different total-distance readings for the same athlete running the same route on two consecutive days is unreliable.

Ecological validity asks whether validity and reliability established in a laboratory hold up in real coaching conditions: wind, sweat, contact, indoor versus outdoor, gripped objects, weather.

Research evidence. Sperlich and Holmberg (2017) wrote a brief but influential editorial in the *British Journal of Sports Medicine* warning that “wearable, yes, but able...?” The gap between marketed performance and validated performance is often large. Dürking, Hotho, Holmberg, Fuss, and Sperlich (2016) reviewed commercially available wearables and found that the accuracy, reliability, or validity of only nine devices had been evaluated scientifically. Akenhead and Nassis (2016) documented that coaches’ decisions about monitoring tools are made under significant uncertainty about validation status.

How to read a validation study abstract in five minutes. Look for: (a) sample: who was tested, in what sport, at what intensity; (b) gold standard: what the device was compared against; (c) statistic: mean bias and limits of agreement, not just correlation; (d) ecological match: were conditions like yours? If a device was validated only at slow treadmill speeds, do not assume it generalises to sprint training.

1.5 First-look ethics and GDPR: the consent baseline

What every coach must understand before turning a device on.

Under the European Union’s General Data Protection Regulation (Regulation 2016/679), personal data is any information relating to an identifiable natural person. Health data (heart rate, biomechanical data, sleep, training load) is treated under Article 9 as a *special category* of personal data, requiring stricter handling. The minimum operational implications:

- You must have a clear lawful basis for processing the data (Article 6) and an explicit basis for processing the health data (Article 9), most commonly *explicit consent* in a sport-coaching setting that is not a medical context.
- Consent must be informed (the athlete understands what is collected, why, with whom it is shared, for how long) and freely given (no coercion from selection pressure).
- Minors require additional protections: parental or guardian consent, simpler explanations adapted to the athlete’s age.

- You must apply *data minimisation*: collect only what you need.
- You must define and communicate retention periods (how long the data is kept).
- You must have a plan for what happens if there is a breach: under GDPR, certain breaches must be reported within 72 hours.

Module 5 deepens the operational treatment of governance. For Module 1, the operational rule is simple: do not deploy a device without an informed consent process in place.

Reflective prompt

Take five minutes. Write down: (a) one wearable device you currently use or are considering, (b) the sensor(s) it contains and what physical quantity each measures, (c) one coaching question this device should help you answer, and (d) one limitation of the device for your sport and athletes. Keep this note; you will refer to it in Module 5.

Assess yourself

Before moving to Module 2, use the Module 1 section of the Self-Assessment Toolkit to rate your confidence with sensor terminology and device selection.

Areas you score below 3/5 are worth a re-read.

wearcoach.sports4.eu/toolkit/self-evaluation/

Templates for this module

- A1 Consent and data governance statement (page 33)
- A2 Device selection matrix (page 37)

2 Module 2

Real-Time Data Tracking

Internal and external load, reading dashboards, and computing the core metrics (sRPE, TRIMP, ACWR) on a real session.

What you will learn

- Distinguish internal from external load and select appropriate metrics for a given sport.
- Compute sRPE, TRIMP, and ACWR from raw session data using the formulas given.
- Interpret the five canonical visualisations used in monitoring dashboards.
- Diagnose common data-quality issues and apply basic filtering rules.
- Decide what information to share with athletes in real time and what to defer.

This module is also online, with its quiz, a video, a spoken version and tools you can use on screen: wearcoach.sports4.eu/learn/data-tracking/

2.1 Internal load versus external load: the Impellizzeri-Marcora framework

The single most important conceptual distinction in modern athlete monitoring is between *external load*: what the athlete *did*, measured in physical terms (kilometres covered, sprints, accelerations, weight lifted, repetitions), and *internal load*: the biological cost the athlete *experienced* in doing it (heart rate, perceived exertion, hormonal response). External load is the dose prescribed by the coach. Internal load is the body's response to that dose.

Research evidence. Impellizzeri, Marcora, and Coutts (2019) revisited their original framework fifteen years on and emphasised that monitoring systems built only on external load metrics miss the individual variability that determines training adaptation and injury risk. Two athletes performing the same prescribed session experience different internal loads depending on fitness, fatigue, sleep, environment, motivation, and a dozen other factors. The coach who tracks only external metrics is tracking only half the picture.

The framework has direct practical consequences:

- Comparing two athletes' responses to "the same session" using only external metrics is misleading; you are comparing prescription, not response.

- Tracking internal load over time (sRPE, HR-derived TRIMP) lets you see when a previously well-tolerated dose has become a strain.
- The internal-external comparison is in itself diagnostic: an external load that is *unchanged* but produces a *higher* internal load is one of the clearest early signals of accumulated fatigue.

2.2 Live data feeds: what dashboards actually offer

Modern team-monitoring platforms provide real-time feeds that follow a common architecture: GPS and accelerometer signals stream from athlete-worn devices to a base station, are processed locally and/or in the cloud, and surface on the coach's tablet within seconds. Brand-specific implementations (Catapult OpenField Live, STATSports Apex Live, Polar Team Pro Live, and others) vary in detail; the generic features a coach should expect are:

- Per-athlete live metrics (HR zones, total distance, high-speed running, accelerations/decelerations, PlayerLoad-type composite).
- Customisable thresholds that trigger visual alerts (colour change, audible alarm).
- Drill or period segmentation so post-session analysis aligns with the session plan.
- Export of raw and processed data for further analysis.

The honest reality: not every “live” metric is reliable enough to act on within seconds. Heart rate, distance, and impacts update with sufficient stability. Composite metrics with smoothing windows (some PlayerLoad variants, some asymmetry indices) are more meaningful as session totals than as live readouts. As a rule of thumb: in real time, trust simple metrics; trust composites at session debrief.

2.3 Dashboard literacy: reading five visualisation families

Most dashboards use a recurring set of visualisations. Coaches who can answer the same question (“what is this picture telling me?”) across the five families are dashboard-literate.

Time series. The horizontal axis is time; the vertical axis is a metric (e.g. heart rate). Strengths: shows trends, peaks, recoveries. Watch for: y-axis scaling that exaggerates or suppresses variation.

Heat map. Spatial intensity, most often used in field sport (zones of the pitch where activity was concentrated). Strengths: spatial coverage, tactical insight. Watch for: heat maps include both running with the ball and running without; they do not reflect tactical intent on their own.

Radar (spider) chart. Multi-axis comparison of metrics for one athlete or one session, often used for athlete profiles. Strengths: at-a-glance multidimensional view. Watch for: arbitrary axis scaling that visually distorts apparent strengths.

Box plot. Distribution of a metric across the squad, with median, quartiles, and outliers. Strengths: surfaces outliers immediately. Watch for: small squad sizes make box plots unstable; treat with caution under $n = 10$.

Scatter plot. Two metrics plotted against each other to surface relationships (e.g. weekly sRPE versus session HR). Strengths: shows correlation and outliers in two-dimensional space. Watch for: correlation is not causation; never act on a scatter pattern alone.

2.4 Data quality, anomalies, and the discipline of scepticism

Before any decision is made on a metric, the coach checks the data. The most common quality issues:

- **GPS dropout indoors and in dense environments.** Indoor halls or stadiums with heavy steel structures produce intermittent satellite signal. A drill where a player apparently covered 50 metres in 10 minutes was almost certainly indoors; treat the metric as missing.
- **Motion artefact in optical HR.** Wrist-based PPG sensors give erratic readings during gripping tasks, vibrations, and short high-intensity bursts. If a player's HR shows a 20-bpm jump and drop within five seconds, scepticism is warranted.
- **Sensor drift.** Long sessions, hot conditions, or sweat-saturated chest straps produce gradually distorted readings. Compare end-of-session HR with start-of-session HR at similar effort.
- **Time-sync issues across devices.** When data from multiple devices are aligned, small clock offsets can confuse derived metrics.
- **Missing or partial files.** A coach who learns to spot a 73-minute file labelled "90 minutes" before computing weekly load is a coach whose weekly reports are more trustworthy.

The discipline: a metric that looks too good, or too bad, to be true probably is.

2.5 Real-time feedback to athletes: the timing question

Just because a coach can see a metric live does not mean the athlete should see it live. Three questions:

What? Some metrics are actionable in real time (HR for pacing, distance covered for substitution decisions). Others are not (HRV, sleep: these are pre-session inputs). Share what is actionable.

When? During a drill, the athlete is executing; metric talk is a distraction. Between drills or at the end of a block, brief metric-anchored feedback ("your HR didn't come down between reps; rest longer next time") is well placed. Trend feedback ("your HRV has been declining for a week") belongs in a one-to-one debrief, not on the touchline.

How? Frame metrics as information, not verdicts. "Your sprint count was high today, let's protect tomorrow" lands differently from "You overworked." Negative-news framing scripts are covered in Module 5.

Practical lab: Stat Pack #1

Worked computation. A 60-minute training session for an athlete returns:

- Total distance: 6,800 m
- High-speed running (>19.8 km/h): 720 m
- Average HR: 152 bpm; Max HR observed: 188 bpm; Resting HR: 56 bpm
- RPE (Borg CR-10): 7

Computed metrics:

- **sRPE** = RPE × duration (min) = 7 × 60 = **420 arbitrary units (AU)**
- **TRIMP (Banister, simple form)** = duration × HR fraction × weighting, where HR fraction = $(HR_{avg} - HR_{rest}) / (HR_{max} - HR_{rest})$. HR fraction = $(152 - 56) / (188 - 56) = 96 / 132 = 0.727$. Using a typical weighting factor that accounts for non-linear HR response (Banister's exponential form), TRIMP for this session approximates **94 AU**. (See Banister, 1991, for the full equation; commercial implementations vary in the exponential factor.)
- **ACWR**. Suppose this athlete's chronic load (28-day rolling average of weekly sRPE) is 2,400 AU. This week's acute load (7-day total sRPE) is 3,300 AU. $ACWR = 3,300 / 2,400 = 1.375$. This sits at the upper edge of the often-cited "sweet spot" ($\approx 0.8-1.3$) and warrants attention; whether it warrants intervention depends on the athlete's individual history and the surrounding context (see Module 4 for full treatment, including critiques of the framework).

Practical tip. The first time you compute ACWR by hand, it feels laborious. A spreadsheet template (Template A4, page 42) automates this for a squad. The point of doing it by hand once is to internalise *what the number means*, not to make hand calculation a habit.

Reflective prompt

- Take last week's heaviest session. What were its sRPE and ACWR, and what decision, if any, would those numbers have changed?
- Which live metric would you refuse to act on within seconds, and why?
- One sentence you will use with an athlete to frame an unfavourable number as information rather than a verdict.

Coaches who write nothing down complete the course. Coaches who write something down change their practice.

Templates for this module

- A4 Load calculation sheet (page 42)

Integrating wearable data into periodization and recovery management.

What you will learn

- Establish an individualised athlete baseline and define personalised reference ranges.
- Integrate wearable-derived metrics into linear, block, and undulating periodisation at micro-, meso-, and macrocycle levels.
- Interpret recovery indicators (HRV, sleep, perceived wellness, CMJ) and synthesise them into a recovery judgment.
- Design a wearable-informed tapering plan for a competition peak.
- Evaluate the marginal value of adding a new metric against the cost of measurement burden.

This module is also online, with its quiz, a video, a spoken version and tools you can use on screen: wearcoach.sports4.eu/learn/performance/

3.1 Building an athlete baseline that is actually meaningful

A baseline is not a single number. It is a distribution. To say “this athlete’s resting HRV is 70 ms” is uninformative; to say “this athlete’s resting HRV averages 70 ms with a standard deviation of 6 ms over the past four weeks” is the start of a useful reference.

The protocol that delivers usable baselines:

- Collect data for at least 4-6 weeks before drawing inferences.
- Standardise measurement conditions (HRV: first thing in the morning, supine, controlled breathing, before caffeine; sleep: same wearable each night).
- Compute the individual mean and standard deviation for each metric.
- Define personalised reference ranges, typically ± 1 SD from the individual mean for “within normal range”, and ± 2 SD for “anomaly worth investigating”.

Research evidence. Plews, Laursen, Stanley, Kilding, and Buchheit (2013) demonstrated that HRV interpretation must be rooted in the individual: population norms are misleading because between-athlete variability dwarfs within-athlete day-to-day variability for the athletes whose training adaptation matters most. The principle generalises across metrics: *compared to themselves, not to the squad.*

Practical tip. A useful structure is a one-page “individual athlete profile” (Template A3, page 40) that displays the mean, SD, and current value for each tracked metric, with a traffic-light indicator. This document is the coach’s morning-meeting reference.

3.2 Wearable data inside periodisation frameworks

Classic periodisation models (linear, block, undulating, conjugate) were designed before continuous monitoring. They are not replaced by wearables; they are *augmented*.

Microcycle (one week). Wearables enter the microcycle through *daily readiness*. Each morning, the coach reads HRV, sleep, and wellness; categorises the athlete as green, amber, or red; and adjusts the day’s session accordingly. The decision rules are pre-defined (see Template A8, page 47) so the call is not improvised under pressure.

Mesocycle (3-6 weeks). Wearables enter the mesocycle through *progressive overload management*. The coach plans week-by-week increases in load (typically 5-10% per week within a block). Weekly load reports compare planned versus actual external load and observed internal-load response, allowing the coach to see whether the planned progression is being tolerated.

Macrocycle (one season). Wearables enter the macrocycle through *long-arc adaptation tracking*: for example, declining resting HR at the same training load suggests cardiorespiratory adaptation; stable CMJ height across a heavy block suggests neuromuscular preservation under load.

The principle: data does not write the plan. Data tells you whether the plan you wrote is doing what you intended.

3.3 Recovery metrics: what they show and what they do not

Three recovery domains, none sufficient on its own.

Heart rate variability (HRV). HRV reflects autonomic nervous system status: broadly, the balance between sympathetic (mobilisation) and parasympathetic (recovery) input to the heart. Higher resting HRV, in general and over time, indicates parasympathetic dominance consistent with recovered status. Lower HRV, particularly a sustained downward trend, indicates accumulated stress. Caveats: HRV is sensitive to alcohol, illness, life stress, and the measurement protocol; a single day’s reading should never trigger action: the trend over 5-7 days is what matters.

Sleep. Total sleep time, sleep efficiency (time asleep divided by time in bed), and time in each sleep stage are reported by most consumer wearables. Total sleep time and sleep efficiency are reasonably reliable in research validation against polysomnography (PSG); stage classification (deep, REM, light) is less accurate from consumer devices, and coaches should be cautious about acting on stage-level data. The actionable rule: track total sleep time and efficiency; treat stage data as suggestive, not definitive.

Research evidence. Walsh, Halson, Sargent, Roach, and colleagues' 2021 expert consensus on sleep and the athlete provides the most current and authoritative practitioner reference. Coaches should be familiar with its core recommendations: pursue 7-9 hours nightly as a baseline; protect sleep on competition eve; treat persistent sleep disturbance as a wellbeing issue requiring intervention.

Subjective wellness. A simple morning questionnaire (five items rated 1-5: sleep quality, fatigue, soreness, mood, stress) costs nothing and adds the athlete's own experience to the picture. Saw, Main, and Gastin (2016) showed that subjective measures often outperform objective ones for tracking acute training response. Coaches who rely only on devices and never ask the athlete are missing the most informative signal.

The discipline of *triangulation*: never act on one metric alone. HRV down, sleep fine, wellness fine = monitor, perhaps a single life-stress event. HRV down, sleep declining, wellness declining = intervene.

3.4 Tapering with wearable confirmation

Tapering reduces accumulated fatigue while preserving fitness, allowing peak performance at a competition. Mujika and Padilla's (2003) reviews remain the foundational reference; a later meta-analysis (Bosquet, Montpetit, Arvisais, & Mujika, 2007) supplies the figures: optimal taper typically reduces training *volume* by 41-60% over 8-14 days, while maintaining or even slightly increasing *intensity*, and reducing *frequency* only modestly.

Wearable data adds confirmation, not redesign. During a well-executed taper, expect:

- **HRV** to rise as parasympathetic recovery exceeds training-induced sympathetic load.
- **Subjective wellness** to improve (mood up, fatigue down, soreness down).
- **CMJ height** to rise modestly as neuromuscular freshness returns.
- **Resting HR** to drift down slightly.

If the data shows the opposite (HRV declining, wellness worsening) during the taper, the plan is not working. The coach should investigate: is residual fatigue greater than expected? Is the athlete sleeping poorly? Is life stress confounding the picture? The intervention is not "ignore the plan"; it is "diagnose and adjust".

Worked example. A 14-day taper for an 800-metre runner: volume reduced from 60 km/week (baseline block) to 30 km/week at day –14, then 22 km/week at day –7, then 12 km/week in the final week. Intensity preserved: race-pace work continued at full effort, reduced in volume. Through the taper, the athlete’s HRV moved from 65 ms (baseline mean) to 71 ms by day –5; CMJ height rose from 38 cm to 40 cm; subjective wellness composite rose from 3.6/5 to 4.2/5. The data confirmed the taper was working. On race day, the athlete ran a personal best.

3.5 The measurement-burden trade-off

The most-ignored design question in monitoring is: *what is the cost of measuring this?*

- Athlete time (morning HRV measurement adds 5 minutes per day per athlete).
- Equipment cost and maintenance.
- Staff analysis time.
- Risk of *number anxiety*: athletes becoming preoccupied with their own metrics in unhelpful ways. This risk is non-trivial, particularly among adolescents and athletes prone to perfectionism.

Before adding any metric, ask honestly: *what decision will this change?* If the answer is “none”, the metric should not be in the system. A small set of well-used metrics outperforms a large set of unused ones.

Reflective prompt

- Name one metric you currently collect that has never changed a decision. What will you do about it this month?
- For one named athlete: their individual mean, their SD, and the value that would make you modify a session.
- Where in your week will the morning readiness reading actually be read: by whom, and before which decision?

These three answers become the “metric selection” section of your 90-day plan in Module 5.

Templates for this module

- A3 Individual athlete profile (page 40)
- A8 Daily decision rules (page 47)

4

Module 4 Injury Prevention

Load management, asymmetry detection and an early-warning protocol, anchored by five worked case studies.

What you will learn

- Identify modifiable injury risk factors detectable through wearable data and link each to its evidence base.
- Compute ACWR, training monotony, and training strain, applying defensible thresholds while acknowledging current debates.
- Detect biomechanical asymmetries from IMU data and prescribe corrective intervention or referral.
- Construct an early-warning system for a chosen sport with clear escalation protocols.
- Manage return-to-play progression using wearable confirmation alongside clinical judgment.

This module is also online, with its quiz, a video, a spoken version and tools you can use on screen:
wearcoach.sports4.eu/learn/injury-prevention/

4.1 Injury epidemiology and the role of monitoring

Injury rates in sport are sport-specific. In professional football, time-loss injury incidence is typically reported around 6-9 per 1,000 hours of exposure, with hamstring strains the single largest category in most studies. In running, lower-limb overuse injuries dominate, with annual incidence among recreational runners often above 20%. In contact and combat sport, the profile shifts toward acute joint injuries.

What matters for the coach is the distinction between modifiable and non-modifiable risk factors. Non-modifiable factors include age, prior injury history, anatomical features. Modifiable factors include training load progression, sleep, asymmetry, recovery practices, and conditioning level. Wearable monitoring affects the modifiable factors; it does not change the non-modifiable ones. A coach who understands this distinction sets realistic expectations: monitoring reduces risk, it does not eliminate it.

4.2 Load management and the injury-training paradox

Research evidence, and the current debate. Gabbett's 2016 *British Journal of Sports Medicine* paper, "The training-injury prevention paradox", remains the most cited single article in this domain. Its core argument: under-prepared athletes are at risk, *and* over-loaded athletes are at risk; the relationship between training load and injury is U-shaped or inverted-U. The Acute:Chronic Workload Ratio (ACWR), the ratio of the last 7 days' load to the rolling 28-day average, was proposed as a practical tool, with the often-cited "sweet spot" of approximately 0.8-1.3.

Subsequent work has both supported and challenged this framework. Bowen, Gross, Gimpel, Bruce-Low, and Li (2020) found, in three seasons of English Premier League data, that ACWR spikes were associated with a 5-7-fold injury risk. Drew and Finch (2016) systematically reviewed the broader load-injury literature with broadly consistent findings. However, Impellizzeri, Tenan, Kempton, Novak, and Coutts (2020) raised conceptual and statistical objections, arguing that ACWR's mathematical properties (it is a ratio with overlapping numerator and denominator) can produce spurious associations, and that schedule confounding (heavy weeks tend to follow heavy weeks for non-load reasons) can distort the apparent relationship. Bornn, Ward, and Norman (2019), in a causal analysis, made a similar argument.

The honest synthesis for a practising coach: **ACWR is a useful prompt, not a verdict.** Spikes are worth investigating. Sustained ACWR > 1.5 warrants caution. But do not treat a single ACWR number as a yes/no injury predictor. Use it alongside the athlete's history, the subjective wellness picture, and your own knowledge of the training context.

Two further metrics from Foster (1998):

Training monotony = mean daily load / standard deviation of daily load (over a week). Higher monotony means a more uniform load pattern; lower means more variation. Sustained high monotony, especially at high mean load, has been associated with elevated illness and overreaching risk.

Training strain = weekly load × monotony. Combines volume and uniformity into a single index. Useful as a tracking metric over weeks; less useful as a single-week decision input.

4.3 Asymmetry and movement-quality red flags

Inertial measurement units placed on the lower limbs, or instrumented force plates, can quantify side-to-side differences during standardised tests:

- **Jump-landing asymmetry.** A countermovement jump performed on dual force plates (or with two unilateral IMUs) reveals the percentage difference in vertical ground reaction force, contact time, or jump height between the dominant and non-dominant leg. Asymmetries above approximately 10-15% are commonly flagged for follow-up.

- **Sprint asymmetry.** Step length, contact time, or impulse differences between legs during sprinting, captured by IMUs.
- **Deceleration mechanics.** Asymmetric braking force at change of direction, particularly relevant for ACL injury research.

The coach's role with asymmetry data is *triage*: identify, document, and refer for fuller assessment if the asymmetry is large, persistent, or accompanied by symptoms. Coaches without specific biomechanics training should not attempt corrective prescription from asymmetry data alone.

4.4 Designing an early-warning system

A useful early-warning system is sport-specific, has a small number of high-signal inputs, defines thresholds in advance, and assigns pre-decided actions to each threshold.

Step 1: Choose 3-4 inputs. For an outdoor team sport: ACWR (load), sRPE-based weekly strain, sleep duration, subjective wellness. For an endurance individual sport: ACWR, HRV trend, sleep, subjective wellness. For an indoor team sport without GPS: sRPE-based weekly load, ACWR computed from sRPE, sleep, subjective wellness.

Step 2: Set personalised thresholds. Use the individual baseline approach from Module 3. A drop of one standard deviation in HRV is one yellow flag; two standard deviations is orange; three is red. Set thresholds for each chosen input.

Step 3: Define escalation tiers. A single yellow flag may warrant only observation. A combination of yellow flags across multiple inputs warrants intervention. An orange or red on any single input warrants immediate review.

Step 4: Pre-decide actions. For each tier, agree in advance what happens. Yellow: monitor, ask the athlete. Orange: modify the session (reduce intensity or volume by a predetermined amount), discuss with the athlete. Red: substitute the session, escalate to medical staff for review. The point of pre-deciding is that you remove improvisation from the moment of pressure.

Step 5: Brief everyone. Athletes and staff are told the system. When an orange flag fires, the athlete already knows the response is “modify, not punish”. This removes resistance and embeds the system in the squad culture.

A working early-warning checklist is provided as Template A9 (page 49).

4.5 Five worked case studies

Each case illustrates the framework in a different context. All cases are anonymised; data shapes are realistic and consistent with the published literature.

Case 4.5.1. Hamstring strain reduction in a professional football club via GPS-informed load management

Context. A second-division European football club with a squad of 28 senior players, full GPS team monitoring (10 Hz units), and an integrated S&C and medical staff.

Hamstring strains had accounted for 41% of soft-tissue absences over the previous two seasons, typical of the sport, but high in the club's view.

Intervention. Across the new season, the medical and S&C staff defined individualised high-speed running (HSR; >19.8 km/h) caps for each player based on a 28-day rolling chronic exposure. Weekly HSR was constrained to no more than 1.5× each player's chronic average. Players in the "high-risk window" (returning from injury, accumulated fatigue) received tighter caps. The intervention required substantive coaching-staff buy-in, because some players' training volumes were reduced, including occasional substitution decisions during matches when individual caps were approached.

Outcome. Across the season, hamstring time-loss incidence fell from the prior season's baseline, with no observable decrement in match physical output at the team level. The staff was honest in their internal review: squad turnover, schedule density, and routine variability also changed across seasons, so a single-season comparison cannot isolate the load-cap intervention. The case is presented here not as proof of causation but as an illustration of the system in operation.

Coaching takeaway. Load management requires individual thresholds, predefined actions, and staff buy-in across coaching and medical functions. It also requires intellectual honesty about what an internal evaluation can and cannot establish.

Case 4.5.2. University basketball: HRV early-warns overtraining in a starting point guard

Context. A North American Division-I women's basketball team. The starting point guard, in her senior year, wore an HR-and-HRV-capable chest strap nightly for resting HRV measurement. Baseline HRV averaged 78 ms with a standard deviation of 7 ms across the preseason.

Presenting data. During a three-week stretch with five matches and a heavy practice schedule, HRV trended downward week over week: week 1 mean 71 ms, week 2 mean 65 ms, week 3 mean 58 ms, a 25% drop from baseline. Concurrent inputs: subjective wellness composite declined from 4.2 to 3.4; sleep efficiency declined from 92% to 84%; CMJ height fell from 42 cm to 38 cm.

Decision. The S&C coach, in consultation with the head coach, reduced conditioning volume by approximately 40% across the following week, increased active recovery sessions, and protected the player's sleep window by adjusting travel itinerary for an away game. No match minutes were reduced.

Outcome. Within ten days, HRV returned to 73 ms (within one SD of baseline); wellness, sleep, and CMJ returned to baseline ranges. The player completed the remainder of the season without symptomatic overreaching.

Coaching takeaway. Triangulation matters. HRV alone might have been treated as noise; HRV plus sleep plus wellness plus CMJ formed a coherent picture. Pre-emptive volume reduction was less costly than a forced absence would have been.

Case 4.5.3. Triathlete avoiding non-functional overreaching through integrated sleep and HRV monitoring

Context. A national-level age-group triathlete in a 16-week competition build, with a peak race at week 16. Monitoring: nightly HRV (chest strap), continuous sleep tracking (wrist device), daily sRPE, weekly subjective wellness questionnaire.

Presenting data. In weeks 9-11 of the build, sleep efficiency declined from a baseline of 91% to 82% over three weeks; HRV trended down from a 56 ms baseline to 47 ms; subjective wellness fell from 4.0 to 3.2; sRPE for prescribed sessions began to drift upward: the same prescribed session was producing higher perceived effort.

Decision. Coach and athlete implemented an unplanned 7-day deload at week 12: volume reduced by 50%, intensity preserved at lower volume, sleep window protected. The athlete pushed back at first (“I’m losing fitness”); the coach used the data to explain the rationale.

Outcome. By the end of the deload week, sleep efficiency returned to 89%, HRV recovered to 53 ms, wellness rose to 3.9. The athlete resumed the build through weeks 13-15 with a moderately reduced volume target, then tapered into week 16. Race performance was a personal best.

Coaching takeaway. Wearables enabled an *informed* deload rather than a forced one. The athlete’s resistance was anticipated and answered with evidence, not authority.

Case 4.5.4. Para-sport application: shoulder overuse monitoring in a wheelchair basketball team

Context. Zeynep’s wheelchair basketball team: twelve senior athletes in the Türkiye national league. Critical insight: in wheelchair sport, the propulsive joint is the playing joint. Shoulder injury risk profiles differ structurally from ambulatory sport (Goosey-Tolfrey & Leicht, 2013). Monitoring: IMU-derived stroke counts during training and matches; weekly shoulder-pain scales (0-10); subjective wellness; sRPE.

Presenting data. Across weeks 12-17 of the league season, three players showed concurrent increases in weekly stroke counts (above their 8-week chronic averages) and increases in shoulder pain scales (2 → 5, 1 → 4, 3 → 6 respectively). One player’s wellness composite also began to decline.

Decision. The coaching staff implemented player-specific stroke-volume caps for training (matches were not modifiable). One player whose pain scale reached 6 was held from the next match for medical assessment. Recovery interventions (manual therapy, mobility work) were intensified across the squad.

Outcome. Pain scales for two players returned to baseline within three weeks. The third player was diagnosed with subacromial impingement, treated, and returned to competition six weeks later. The team’s overall shoulder-injury time-loss across the second half of the season was lower than the comparable period in the previous season.

Coaching takeaway. Para-sport requires adapted monitoring frameworks, not the application of ambulatory templates. The combination of objective load and

subjective symptom report was decisive; either alone would have missed at least one case.

Case 4.5.5. Grassroots youth academy: effective load management on €1,200

Context. Mehmet's youth football academy: twenty players aged 12-16. Total monitoring budget: €1,200. Equipment: 20 chest-strap HR monitors (€60 each), one shared GPS pod for selected sessions, paper sRPE logs for daily training.

Intervention. Across one season, the academy implemented:

- Weekly sRPE tracking for every training session and match.
- Computation of weekly load, monotony, and ACWR (using sRPE as the load metric, in the absence of GPS data for every session).
- A simple traffic-light early-warning system: any player with ACWR > 1.5 or with two consecutive weeks of declining wellness composite received modified training the following week.

Outcome. Two players were flagged in the first half of the season; both had load reductions and avoided what coaching staff (in retrospective discussion) believed would have been overuse injuries based on accumulated complaints. Overall acute injury time-loss across the season was lower than the comparable period in the prior season, though the comparison is informal.

Coaching takeaway. Monitoring is a discipline, not a budget. The most expensive system that is not used outperforms nothing, but the cheapest system that *is* used outperforms the most expensive system unused. Grassroots and youth contexts can adopt structured monitoring meaningfully.

Reflective prompt

- Who, by name, will sign off your escalation tiers before the season starts?
- Write the exact sentence you will say to an athlete when an orange flag fires before an important fixture.
- What would make you conclude that your early-warning system is producing more noise than value?

The third question is the one most coaches skip. It becomes your “stop conditions” in the 90-day plan.

Templates for this module

- A9 Early-warning checklist (page 49)

Integration into Coaching Practice

Data governance, athlete communication, change management within staff, and a personalised 90-day integration plan.

What you will learn

- Design a 90-day wearable-integration plan tailored to their context, using the Plan-Do-Check-Act cycle.
- Develop a written data-governance policy covering consent, access, retention, sharing, and breach response.
- Communicate wearable data to athletes (and parents) with appropriate framing.
- Manage change among staff and stakeholders who resist data-driven practice.
- Choose and operationalise the most appropriate delivery pathway for disseminating wearable competence within their organisation.

This module is also online, with its quiz, a video, a spoken version and tools you can use on screen: wearcoach.sports4.eu/learn/integration/

5.1 The Plan-Do-Check-Act integration framework

Deming's PDCA cycle (Plan, Do, Check, Act) was originally developed for manufacturing quality control but applies cleanly to wearable integration in coaching.

Plan. Define one specific question that wearables will help you answer this season. Examples: "Will player-individualised load caps reduce hamstring incidence?" "Will daily HRV monitoring improve our taper decisions?" "Can we identify overreaching in our endurance group two weeks earlier?" The plan also specifies the metrics that will answer the question, the population (one player, one cohort, the whole squad), the timeline, and the success criterion.

Do. Implement at small scale first. One cohort, one season. Resist the temptation to roll out across the whole organisation in week one: the data-governance, training, and cultural work has not yet been done.

Check. Evaluate against the success criterion. Did the question get answered? Did the metrics behave as expected? Were there unintended consequences (athlete anxiety, staff workload, inter-staff friction)?

Act. Scale, adjust, or stop. The most important option is the last one: a coach who is willing to stop a monitoring effort that did not deliver value earns credibility and

resources for the next attempt. Monitoring should serve coaching, not the other way round.

5.2 Data governance and GDPR in coaching practice

This section is the deepening of Module 1's introduction to GDPR. Module 1 told you the rules exist. Module 5 builds your operational compliance.

A defensible club-level data-governance policy should cover, at minimum, the following components.

Lawful basis (GDPR Article 6). Most sport-coaching contexts will rely on either consent (Article 6(1)(a)) or legitimate interests (Article 6(1)(f)). For wearable data specifically, consent is usually the cleanest basis because the processing is identifiable, optional from the athlete's view, and not strictly required to deliver the service.

Special-category basis (GDPR Article 9). Health data (including heart rate, biomechanical data, sleep) requires an additional basis under Article 9. The most common in sport coaching is *explicit consent* (Article 9(2)(a)), supplemented by appropriate organisational safeguards.

Informed consent. Athletes must be told, in plain language, what data is collected, why, who can access it, with whom it is shared, for how long it is retained, and how they can withdraw. Template A1 (page 33) provides a starting point, requiring local legal review before adoption.

Minors. Athletes under 16 (or the relevant national age threshold under GDPR Article 8) require parental or guardian consent. Even where the legal threshold is lower, best practice is to involve guardians for all athletes under 16, and to provide age-appropriate explanations to the young athlete themselves.

Access controls. Define explicitly who can see what. The head coach, S&C coach, performance analyst, and medical staff have different legitimate access. The opposition scout does not. The athlete agent does not. Sponsors do not. Document access permissions and audit them.

Retention periods. How long do you keep data? GDPR requires retention only as long as necessary for the stated purpose. A defensible default for in-season operational data is the duration of the athlete's affiliation plus a defined post-affiliation period (e.g., 24 months); for research-purpose data, longer retention with stronger anonymisation may apply. Document the policy and follow it.

Third-party sharing. When data is shared with a federation, a national team, a research project, or any external entity, that sharing requires its own consent and data-sharing agreement.

Breach response. Under GDPR Article 33, certain breaches must be reported to the supervisory authority within 72 hours. The coach is not the data-protection officer, but the coach should know the chain of escalation: a lost laptop with athlete data is a breach; report it immediately.

Athlete rights. Athletes have the right to access their data, to correct inaccuracies, to request erasure (the “right to be forgotten”) subject to limitations, and to withdraw consent. Building these rights into your workflow from the start is far easier than retrofitting them later.

5.3 Talking to athletes about their numbers

The technical competence to interpret data is necessary but not sufficient. The harder competence is delivering data-based feedback in a way that supports the athlete.

Frame metrics as information, not verdicts. “Your HRV is suggesting your body is still recovering, let’s adjust today’s session” is information that invites collaboration. “Your HRV says you’re not ready” is a verdict that invites resistance. The factual content can be identical; the framing changes the conversation.

Preserve agency. The athlete owns their body. The coach provides expertise. Data is a tool that supports a shared decision. When this principle is communicated and lived, athletes engage with their data; when it is violated, they game it or withdraw.

Negative-news scripts. When the data is unfavourable and a session must be reduced, a script the coach has prepared in advance is worth more than ten improvised conversations. A sample structure:

- 1 Acknowledge the athlete’s effort and commitment.
- 2 Share the data observation in plain terms.
- 3 Connect the observation to the decision.
- 4 Invite the athlete’s perspective.
- 5 Confirm the path forward together.

Avoid number-anxiety. Some athletes (particularly adolescents, particularly those prone to perfectionism) can become preoccupied with their own metrics in unhelpful ways. Watch for it. Limit athlete-facing metrics where this risk is present. Talk about feelings as well as numbers.

5.4 Integrating into a multi-disciplinary staff

In any team of meaningful size, wearable data crosses staff functions: head coach, assistant coaches, S&C, physiotherapy, sport psychology, performance analysis. A RACI matrix (Responsible, Accountable, Consulted, Informed) clarifies who does what for each data domain. Template A10 (page 51) provides a starting structure. The point is not bureaucracy; it is to prevent the two failure modes of multi-staff data:

- *Multiple staff making conflicting decisions* because nobody owns the data domain.
- *Data sitting unanalysed* because everyone assumed someone else was responsible.

A weekly performance meeting, with a defined agenda anchored to the previous week’s monitoring outputs, makes the system stick.

5.5 Delivery pathways: the operational meta-layer

This subsection is the operational signature of Module 5: it documents *how to deliver this entire programme* in five flexible modes, depending on the audience and context.

Self-paced pathway: ≈ 6 weeks, individual coaches. One module per week. Coach reads the module, completes the quiz, downloads the templates, applies one practical activity to their setting. Total commitment ≈ 4 hours per module including application. Best for: individual coaches, geographically dispersed audiences, asynchronous learning preferences. Delivered through the project website (wearcoach.sports4.eu/learn/) and, once it is released, the WEARCOACH mobile application.

Instructor-led pathway: 2-day intensive, cohort settings. Day 1: Modules 1, 2, 3 (90 minutes each, with breaks and applied exercises). Day 2: Modules 4, 5 (90 minutes each), plus capstone-plan workshop. Cohort sizes 12-24. Facilitator profile: an experienced coach with foundational sport-science training; the facilitator guide (page 53) sets out the flow of each session. Best for: federations, NSGBs, club-staff training days.

Blended pathway: 4 weeks, accredited continuing-education contexts. Each week: 3 hours asynchronous (reading + quiz) followed by a 2-hour synchronous session (case discussion, applied practice). Modules 1 and 2 combined in week 1, then Modules 3, 4, 5 across weeks 2, 3, 4. Best for: university coach-education programmes, federation CPD tracks.

Microlearning pathway: 30 days, mobile-first. Each day: one 10-minute unit inside the mobile app (a concept, a question, a micro-exercise). Best for: time-pressed coaches, grassroots audiences, mass dissemination at low commitment. Delivered through the mobile application, once it is released.

Train-the-trainer (TOT) pathway: 3 days. Equipping master coaches to deliver the programme to other coaches. Day 1: programme content mastery review. Day 2: adult-learning facilitation skills. Day 3: practice teaching with feedback. Best for: scaling the programme across federations and national contexts.

A decision aid for choosing among pathways: if your audience is individual and dispersed, choose self-paced or microlearning. If your audience is a cohort and you have facilitator capacity, choose instructor-led or blended. If your goal is to scale the programme itself, invest in TOT first.

Capstone: The 90-Day Wearable Integration Plan

Every coach completing Module 5 produces, using Template A5 (page 44), a written 90-day integration plan covering:

- **Context analysis.** Sport, level, athlete numbers, current monitoring practice, available resources, staff structure.
- **The PDCA question.** One specific question wearables will answer this season.
- **Metric selection.** 3-5 metrics, with personalised thresholds for one named athlete.

- **Governance.** A short data-governance statement covering consent, access, retention.
- **Communication plan.** How will athletes (and parents, where applicable) be briefed?
- **Success criteria.** What does success look like at day 30, day 60, day 90?
- **Review checkpoints.** Calendar dates for honest review.
- **Stop conditions.** What would cause you to stop or substantially modify the plan?

In instructor-led settings, plans are peer-reviewed in cohort. In self-paced settings, the rubric (page 59) supports honest self-review.

Templates for this module

- A1 Consent and data governance statement (page 33)
- A5 90-day integration plan (page 44)
- A10 Staff roles for data (RACI) (page 51)

Conclusion and next steps

Wearable technology is no longer optional for the modern coach, but how it is used remains, and should remain, a coaching choice. The five modules form a structured competency programme: the fundamentals of devices and sensors; the practical literacy of data tracking; the integration of data into performance and recovery management; the use of data in injury prevention; and the operational integration of all of this into a coach's daily, weekly, and seasonal practice.

The programme is not a buyer's guide and does not endorse commercial products. It is a competency programme, designed to outlast the specific devices and platforms that happen to be on the market today. Sensors will improve; dashboards will be redesigned; algorithms will be revised. The coach's capacity to ask the right question, evaluate the answer critically, and integrate the result into a judgment that supports the athlete is the durable competence.

Three next steps for every coach completing the programme:

- 1 **Complete the Wearable Technologies Self-Assessment Toolkit** (wearcoach.sports4.eu/toolkit/). It identifies your strongest and weakest competency areas across the five modules and supports targeted re-study.
- 2 **Access the WEARCOACH mobile application once it is released.** It will provide the digital version of the templates, microlearning content, and a community space to discuss applications with other coaches. Until it is available, use the templates (page 32) and the facilitator guide (page 53) in this manual.
- 3 **Implement your 90-day integration plan** (page 44). The Module 5 capstone is the most important single artefact of this programme. The coach who completes the programme without writing the plan has learned the content; the coach who writes and implements the plan has changed practice.

The WEARCOACH consortium would value feedback on the programme. The formal pilot-testing phase will capture coach and athlete experience with the training materials, self-assessment toolkit, and mobile application in real coaching settings. Its findings will be used to refine the final versions of the WEARCOACH resources. How to send feedback is described at wearcoach.sports4.eu/contact/.

A

Annex A Templates

The templates keep the numbers the programme gave them, which is why the list goes from A5 to A8; there is no Template A6 or A7. The annexes keep their letters in the same way: A, B, C and E.

- A1 Consent and data governance statement (page 33)
- A2 Device selection matrix (page 37)
- A3 Individual athlete profile (page 40)
- A4 Load calculation sheet (page 42)
- A5 90-day integration plan (page 44)
- A8 Daily decision rules (page 47)
- A9 Early-warning checklist (page 49)
- A10 Staff roles for data (RACI) (page 51)

A1 Consent and data governance statement

Tells athletes in plain language what you collect, why, who sees it, how long you keep it and how to withdraw, with a consent block to sign.

Please note: This is a starting point. Have it reviewed against your national law before you use it.

Read about it: 1.5 First-look ethics and GDPR: the consent baseline (page 10); 5.2 Data governance and GDPR in coaching practice (page 27)

Try it online: Data governance self-audit (wearcoach.sports4.eu/learn/integration/)

How to use it

- 1 Describe what your club really does today, not what it intends to do.
- 2 Have the text reviewed locally before you adopt it.
- 3 Brief athletes, and guardians of athletes under 16, before any device is switched on.
- 4 Collect the signatures and keep them with your club records.
- 5 Read the statement again at the end of each season. Policies drift as staff and platforms change.

Example

What we tell the athlete

What we collect: Session RPE after each training session, on paper. Heart rate during training, from chest straps. Position data in selected sessions, from one shared GPS pod.

Why we collect it: To see how hard each week was for each player, so that we can avoid sudden jumps in training load.

Who can see it: Coaches only.

Who we share it with: Nobody.

How long we keep it: Until the player leaves the club, plus 24 months. Then it is deleted.

How to withdraw: Tell the head coach. We stop collecting, and you can ask us to delete what we hold. It changes nothing about selection.

For the club's records

Lawful basis (GDPR Article 6): Consent, Article 6(1)(a).

Basis for health data (GDPR Article 9): Explicit consent, Article 9(2)(a).

The example answers are those of a grassroots youth academy, as in case 4.5.5 of Module 4 and the grassroots football example of the 90-day integration plan (page 44).



A1 Consent and data governance statement

What we tell the athlete

Write each answer in plain language, adapted to the athlete's age.

Club or organisation

What we collect

Each kind of data and the device or form it comes from. Collect only what you need.

Why we collect it

The coaching question the data helps to answer.

Who can see it

Name roles, not people. Scouts, agents and sponsors are not on the list.

Who we share it with

A federation, a national team or a research project needs its own consent and a written agreement. Write "nobody" if that is the case.

How long we keep it

Only as long as the purpose needs.

How to withdraw

Who to tell and what happens next. Saying no must not cost the athlete their place.

Who to ask

One named role and how to reach them.



A1 Consent and data governance statement

Your rights

You can ask to see your data and to have mistakes corrected. You can ask to have your data deleted, within the limits the law sets. You can withdraw your consent.

Consent

Athlete's name

Athlete's signature and date

Parent or guardian (athletes under 16)

Check the age threshold in your country.

Guardian's signature and date

☐

The young athlete received an explanation suited to their age



A1 Consent and data governance statement

For the club's records

Not part of what the athlete signs. It shows that the statement rests on a decision.

Lawful basis (GDPR Article 6)

For wearable data, consent is usually the cleanest basis.

Basis for health data (GDPR Article 9)

Who is told first if data is lost

Certain breaches must be reported to the supervisory authority within 72 hours. A lost laptop counts.

Reviewed against national law by, and on

Next review

A2 Device selection matrix

Compare your options criterion by criterion, so that you can show a board, a parent or a federation why you chose what you chose.

Read about it: 1.3 Mapping the device market: category-based comparison (page 9); 1.4 Validity and reliability for coaches who are not researchers (page 10)

Try it online: Choosing a device on a real budget (wearcoach.sports4.eu/learn/fundamentals/)

How to use it

- 1 Write the coaching question first. A device that does not help to answer it is unlikely to change your practice.
- 2 Set how much each criterion matters to you, from 0 to 5. Add your own criteria if you need them.
- 3 Score each option on each criterion, from 0 to 5.
- 4 Multiply each score by the weight of its criterion and add them up: that is the weighted score.
- 5 Read the trade-off of the winner before you decide. The point of the matrix is not the winner, it is the reasoning.

Example

Before you compare

Sport, level and number of athletes: Youth football, twenty players aged 12 to 16.

Budget for the season: €1,200

Criteria and weights

Criterion	Weight (0-5)
Fits the budget	5
Accuracy in your sport	4
Athlete comfort and compliance	3
Staff time to run it	3
Data you can export	2

Options

Option	Category	Scores	Weighted score	Trade-off
Paper sRPE logs		5, 3, 4, 4, 3	67	Free and always available; depends entirely on honest daily reporting.
20 chest-strap HR monitors at €60		4, 5, 2, 3, 4	63	Accurate in dynamic work; some youth athletes dislike the strap.
One shared GPS pod, rotated weekly		4, 4, 4, 2, 4	62	Good outdoor data for one player at a time; scheduling overhead.
Consumer watches, athlete-owned		5, 2, 5, 2, 1	56	No purchase cost, but mixed models, mixed accuracy and export limits.
GPS team vests for the full squad		0, 5, 3, 2, 5	45	Best data by far, and roughly fifteen times the available budget.

The example is Mehmet's choice in the device selection exercise of Module 1 on the project website, with the default weights of that exercise.



A2 Device selection matrix

Before you compare

The coaching question the device should help you answer

Sport, level and number of athletes

Budget for the season

Criteria and weights

Criterion	Weight (0-5)

A2 Device selection matrix

Options

One row for each option. Score each criterion from 0 to 5, in the order of the table above. For the category, use the device categories of Module 1.

Option	Category	Scores	Weighted score	Trade-off

Before you buy, read the validation study

Ask the vendor for a peer-reviewed study and look for four things.

- ☐ Sample: who was tested, in what sport, at what intensity.
- ☐ Gold standard: what the device was compared against.
- ☐ Statistic: mean bias and limits of agreement, not just correlation.
- ☐ Ecological match: were the conditions like yours?

A3 Individual athlete profile

One page for one athlete: the mean, SD and today's value of each metric you track, with a flag. Your morning-meeting reference.

Read about it: 3.1 Building an athlete baseline that is actually meaningful (page 16)

Try it online: Baseline and reference-range builder (wearcoach.sports4.eu/learn/performance/)

How to use it

- 1 Collect data for at least 4 to 6 weeks before you fill in the baseline. A baseline built on five days is noise.
- 2 Keep the measurement conditions the same every day, and write them down here.
- 3 For each metric, compute the athlete's own mean and standard deviation (SD).
- 4 Each morning, enter today's value and read the flag against the athlete's own range, not against the squad.
- 5 Never act on one metric alone. Read the flags together.

Reading the flag

- **Green:** within one SD of the athlete's mean. Train as planned.
- **Yellow:** one SD below. Monitor and ask the athlete how they feel.
- **Orange:** two SD below. Modify the session by a predetermined amount.
- **Red:** three SD below. Substitute the session and escalate for review.

The flags are written for a metric where a drop is the warning sign, such as HRV. Where a rise is the warning sign, such as a pain scale or stroke counts, read "above" for "below". For HRV, one day's reading never triggers action on its own: the trend over 5 to 7 days is what matters.

What each flag leads to is written in your daily decision rules (Template A8, page 47).

Example

Athlete and baseline

Measurement conditions: HRV on waking, lying down, controlled breathing, before caffeine. Sleep: the same wearable every night.

Tracked metrics

Metric	Unit	Mean	SD	Normal range (mean $\pm$ 1 SD)	Today	Flag
Morning HRV	ms	69	4.2	64.8 to 73.2	58	Orange

The example row uses the ten readings of the baseline builder, a tool of Module 3 on the project website (mean 69 ms, SD 4.2 ms) and its value for today (58 ms). Ten readings keep the example short; a real baseline needs 4 to 6 weeks.

A3 Individual athlete profile**Athlete and baseline****Athlete**

Initials or a code are enough on a sheet that others can see.

Sport and position**Baseline period**

Dates of the 4 to 6 weeks the baseline is built on.

Measurement conditions**Tracked metrics**

Three to five metrics are enough. A small set of well-used metrics outperforms a large set of unused ones.

Metric	Unit	Mean	SD	Normal range (mean $\pm$ 1 SD)	Today	Flag

Context**What else is going on**

Alcohol, illness, exams, life stress. HRV reacts to all of them.

Baseline last recomputed on

A4 Load calculation sheet

A squad sheet that turns each session's RPE and duration into session load, weekly load and ACWR for every athlete.

Read about it: Practical lab: Stat Pack #1 (page 15); 4.2 Load management and the injury-training paradox (page 21)

Try it online: Load calculator: sRPE, TRIMP and ACWR (wearcoach.sports4.eu/learn/data-tracking/)
The spreadsheet for this template can be downloaded from wearcoach.sports4.eu/downloads/

How to use it

- 1 Compute one session by hand first, so that you know what the numbers mean. Then let the spreadsheet do it.
- 2 After every session, enter each athlete's duration in minutes and RPE (0 to 10).
- 3 If a value is missing, leave the cell empty. A zero says "no load"; an empty cell says "we do not know".
- 4 Read the weekly summary once a week, with the athlete's wellness and your knowledge of the week beside it.

What the spreadsheet computes

- **Session load (sRPE)** = RPE × duration in minutes, in arbitrary units (AU).
- **This week (acute load)** = the total session load of the last 7 days.
- **Chronic load** = the 28-day rolling average of weekly load.
- **ACWR** = acute load ÷ chronic load.
- **Monotony** = mean daily load ÷ standard deviation of daily load, over the week.
- **Strain** = weekly load × monotony.

Reading the numbers

ACWR is a useful prompt, not a verdict. The often-cited range is about 0.8 to 1.3. A spike is worth investigating, and a ratio that stays above 1.5 warrants caution. Do not treat a single number as a yes or no injury predictor: read it with the athlete's history, their wellness and what you know about the week.

Sustained high monotony, especially at high mean load, has been associated with a higher risk of illness and overreaching. Strain is useful to track over weeks, less useful as a single-week decision.

Example

Session log

Date	Athlete	Duration (min)	RPE (0-10)	Session load (AU)
Tuesday	A	60	7	420

Weekly summary

Athlete	This week (AU)	Chronic load (AU)	ACWR	Monotony	Strain	Note
A	3,300	2,400	1.375			Upper edge of the often-cited range. Look at why the week was heavy.

The example is the worked computation of Module 2 (60 minutes at RPE 7; acute load 3,300 AU against a chronic load of 2,400 AU). In the spreadsheet the single sessions are illustrative, built so that the totals equal those of the manual.



A4 Load calculation sheet

Session log

Date	Athlete	Duration (min)	RPE (0-10)	Session load (AU)

Weekly summary

Athlete	This week (AU)	Chronic load (AU)	ACWR	Monotony	Strain	Note

A5 90-day integration plan

Fill each field; the examples are a guide.

Examples

1. Context analysis

Grassroots football: Grassroots youth football academy; 20 players aged 12-16; budget €1,200; paper sRPE logs + shared GPS pod.

Para sport: Wheelchair-basketball team; 12 senior athletes; national league; IMU stroke counts + weekly shoulder-pain scales.

2. PDCA question

Grassroots football: Can weekly sRPE-based load flags reduce avoidable overuse complaints this season?

Para sport: Can stroke-count + shoulder-pain monitoring catch overuse two weeks earlier?

3. Metrics (3-5) + personalised thresholds for one named athlete

Grassroots football: Weekly sRPE, monotony, ACWR (from sRPE), wellness. Flag: ACWR>1.5 or 2 wks wellness decline.

Para sport: Weekly stroke count vs 8-wk chronic, shoulder-pain (0-10), wellness, sRPE. Flag: pain ≥ 4 or +1 SD strokes.

4. Governance statement (consent, access, retention)

Grassroots football: Guardian consent (minors), coach-only access, retain 24 months post-season (Template A1, page 33).

Para sport: Explicit athlete consent, medical+coach access, retention per club policy (Template A1, page 33).

5. Communication plan (athletes / parents)

Grassroots football: Brief players + parents at season start; frame flags as 'modify, not punish'.

Para sport: Brief athletes; pain scales collected privately; framing as shared decision.

6. Success criteria at Day 30 / 60 / 90

Grassroots football: D30: logs complete >90%. D60: flags reviewed weekly. D90: fewer overuse complaints vs baseline.

Para sport: D30: monitoring routine embedded. D60: 2 early flags acted on. D90: lower shoulder time-loss.

7. Review checkpoints (calendar dates)

Grassroots football: ___ / ___ / ___ (fill dates)

Para sport: ___ / ___ / ___ (fill dates)

8. Stop conditions

Grassroots football: Stop if logging burden causes drop-off or players show number anxiety.

Para sport: Stop if monitoring adds no decision value or increases athlete anxiety.

**A5** 90-day integration plan**1. Context analysis****2. PDCA question****3. Metrics (3-5) + personalised thresholds for one named athlete****4. Governance statement (consent, access, retention)**

**A5** 90-day integration plan**5. Communication plan (athletes / parents)****6. Success criteria at Day 30 / 60 / 90****7. Review checkpoints (calendar dates)****8. Stop conditions**

A8 Daily decision rules

Your rules for the morning, written before the season: what each flag means for today's session, so the call is not improvised.

Read about it: 3.2 Wearable data inside periodisation frameworks (page 17); 3.3 Recovery metrics: what they show and what they do not (page 17)

How to use it

- 1 Decide which inputs you read each morning. HRV, sleep and wellness are the usual three.
- 2 For each flag, write what happens to the session. If you cannot name the action, the rule does not exist yet.
- 3 Agree the rules with your staff and tell the athletes before you use them.
- 4 Never act on one metric alone. A yellow flag on one input with the others stable is a question to ask, not a session to change.

Example

The morning check

What we read each morning: Morning HRV, sleep duration, and five wellness items rated 1 to 5: sleep quality, fatigue, soreness, mood, stress.

Who reads it, and by when: The S&C coach, before training.

The rules

Flag	What you see	What happens to today's session	Who is involved
 Green	HRV, sleep and wellness within the athlete's normal range.	Train as planned.	
 Yellow	One input one SD below the athlete's baseline, the others stable.	Monitor. Ask the athlete how they feel. No change to the session.	Coach and athlete.
 Orange	Two SD on one input, or yellow flags on several inputs together.	Reduce intensity or volume by a set amount (for example 30%). Discuss with the athlete.	Coach, S&C coach, athlete.
 Red	Three SD on any input, or the athlete reports symptoms.	Substitute the session. Escalate to medical staff for review before the next exposure.	Coach, S&C coach, medical staff.

Green is the line of the baseline builder, a tool of Module 3 on the project website. Yellow, orange and red are the tiers, actions and people of Module 4 (section 4.4, slide 40) and of its early-warning system builder, also on the website.



A8 Daily decision rules

The morning check

What we read each morning

Who reads it, and by when

The rules

Module 3 speaks of green, amber and red. This sheet uses the four flags of the tools on the project website, so that it matches your athlete profile and your early-warning checklist.

Flag	What you see	What happens to today's session	Who is involved
 Green			
 Yellow			
 Orange			
 Red			

Agreed

Agreed with (staff), on

Athletes briefed on

A9 Early-warning checklist

Your early-warning system on one page: a few inputs, a threshold for each and the action for each flag, agreed with medical staff.

Read about it: 4.4 Designing an early-warning system (page 22)

Try it online: Early-warning system builder (wearcoach.sports4.eu/learn/injury-prevention/)

How to use it

- 1 Work through the five steps in order. Do not leave with a blank one.
- 2 Walk the finished page past your medical or physiotherapy contact and have them sign it.
- 3 Brief athletes and staff before the first flag fires.

Example

Inputs and thresholds

Input	Threshold	Where the number comes from
ACWR (sRPE-based)	Spike above 1.5	Load calculation sheet (Template A4, page 42)
HRV trend	1, 2 or 3 SD below the individual mean	Athlete profile (Template A3, page 40)
Sleep duration	Below 7 hours for 3 consecutive nights	Wearable
Subjective wellness (5 items)	Drop of 1 point or more from baseline	Morning questionnaire

Tiers and actions

Tier	Trigger	Pre-decided action	Who is involved
 Yellow	One input, one SD below the individual baseline.	Monitor. Ask the athlete how they feel. No change to the session.	Coach and athlete.
 Orange	Two SD on one input, or yellow flags across several inputs.	Reduce intensity or volume by a set amount (for example 30%). Discuss with the athlete.	Coach, S&C coach, athlete.
 Red	Three SD on any input, or symptoms reported.	Substitute the session. Escalate to medical staff for review before the next exposure.	Coach, S&C coach, medical staff.

The examples are the inputs, thresholds and actions of the early-warning system builder, a tool of Module 4 on the project website.

A9 Early-warning checklist

The five steps

- ☐ Inputs chosen: three or four, fitted to our sport. Four is the ceiling.
- ☐ Thresholds set for each input, from each athlete's own baseline.
- ☐ Escalation tiers defined: what counts as yellow, orange and red.
- ☐ Actions decided in advance for each tier, in writing.
- ☐ Everyone briefed: athletes know that an orange flag means "modify, not punish".

Inputs and thresholds

Examples by setting. Outdoor team sport: ACWR, weekly strain from sRPE, sleep duration, subjective wellness. Endurance sport: ACWR, HRV trend, sleep, wellness. Indoor team sport without GPS: weekly sRPE load, ACWR from sRPE, sleep, wellness.

Input	Threshold	Where the number comes from

Tiers and actions

Tier	Trigger	Pre-decided action	Who is involved
 Yellow			
 Orange			
 Red			

Sign-off

Squad and season

Reviewed by (medical or physiotherapy contact),
on

Athletes and staff briefed on

Next review of the system

A10 Staff roles for data (RACI)

Who does what with each kind of data, so that no two people decide against each other and no data sits unread.

Read about it: 5.4 Integrating into a multi-disciplinary staff (page 28)

How to use it

- 1 List the kinds of data your staff really handles. Cross out the rows you do not need.
- 2 For each row, write one letter in each column: R, A, C, I, or leave it empty.
- 3 Check every row against the two ways this fails. Several staff make conflicting decisions because nobody owns the data domain. Data sits unanalysed because everyone assumed someone else was responsible.
- 4 Put the weekly performance meeting in the calendar. It is what makes the system stick.

Example

The matrix

Data domain	Head coach	S&C coach	Analyst	Medical	Assistant coaches	Sport psychology
Daily readiness screen	I	R	C	C		
Weekly load report	A	R	R	I		
Early-warning flags	A	R	I	C		
Red flag and referral	I	C	I	R		
Consent and retention	A	I	C	C		

The example is the matrix shown in the training slides for Module 5.

A10 Staff roles for data (RACI)

The four letters

- **R, Responsible:** does the work.
- **A, Accountable:** owns the decision.
- **C, Consulted:** is asked before the decision.
- **I, Informed:** is told afterwards.

The matrix

Data domain	Head coach	S&C coach	Analyst	Medical	Assistant coaches	Sport psychology

Suggested rows: Daily readiness screen; Weekly load report; Early-warning flags; Red flag and referral; Consent and retention

Weekly performance meeting

Day and time

Who attends

Agenda

Anchor it to last week's monitoring outputs.

B Annex B

Facilitator guide

How to run the programme with a group: the shape of a session, what to prepare, and for each module the timing, the questions to put to the room and the group task.

Facilitator	An experienced coach with foundational sport-science training.
Group size	12 to 24 coaches. Below 12, merge the small-group tasks into one plenary discussion.

The shape of a session

Concept 15 min	Worked example 30 min	Applied activity 30 min	Debrief 15 min
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Close every session with the reflective prompt. Coaches who write nothing down complete the course; coaches who write something down change their practice.

Course formats

Instructor-led course **2 days**

Day 1: Modules 1, 2 and 3. Day 2: Modules 4 and 5, then the capstone workshop. Each module is one 90-minute session, with breaks and applied exercises.
Best for: Federations, national governing bodies and club staff training days.

Blended programme **4 weeks**

Each week the coaches read the module and take its quiz on their own, then meet for a live session built on the slides. Modules 1 and 2 are combined in week 1; Modules 3, 4 and 5 follow in weeks 2, 3 and 4.
Best for: University coach-education programmes and federation CPD tracks.

Train the trainer **3 days**

Prepares master coaches to deliver the programme to other coaches. Day 1: programme content mastery review. Day 2: adult-learning facilitation skills. Day 3: practice teaching with feedback.
Best for: Scaling the programme across federations and national contexts.

Before the course

- Read the module and try its tools yourself before you teach it.
- Print the templates of the session, or make sure everyone can open them.
- Ask the coaches to bring: a device or platform they use or are considering; the durations and RPE of last week's sessions; if they have them, a few weeks of readings for one athlete.
- Agree with the group that examples from their own squads stay in the room, and that athletes are named by initials only.

The slide deck can be downloaded from wearcoach.sports4.eu/downloads/.

To open the course

Which persona is closest to your own setting? Keep that answer for the capstone plan.

Session 1: Fundamentals of Wearable Technology

Slides: 5-14

Templates: A1 Consent and data governance statement, A2 Device selection matrix

Concept 15 min Slides 6-9	■ What each sensor physically measures, and what the device derives from it. ■ Measured quantity, derived metric, inferred construct: the further from the measurement, the more assumptions. Ask the room: Name one wearable you already use, and say out loud what physical quantity it actually measures.
Worked example 30 min Slides 10-12	■ The device market, read by category rather than brand. ■ Cost is a design constraint, not a quality ranking: what will we actually use every week? ■ Validity, reliability and ecological validity; the four things to read in a validation abstract. Work through together: Mehmet's choice on a season budget of €1,200. Change the weights in front of the group and watch the ranking move. Tool: Choosing a device on a real budget (wearcoach.sports4.eu/learn/fundamentals/)
Applied activity 30 min	Group task: In small groups, each coach fills in the device selection matrix for their own budget. The group challenges the weights, not the winner. Template: A2 Device selection matrix (page 37)
Debrief 15 min Slides 13-14	■ The consent baseline: do not deploy a device without an informed consent process in place. Reflective prompt: Write down one device you use or are considering, the sensors it contains, one coaching question it should answer, and one limitation for your sport. Keep this note. Module 5 needs it. Self-check: Which of these is a measured quantity rather than a derived metric: total distance, linear acceleration, PlayerLoad, sprint count?

Discussion

- One limitation of your device for your sport, your athletes and your conditions.

Between sessions

- Interactive unit 1 on the project website, about 15 minutes: sensor matching and the device selection matrix.
- Rate your confidence with sensor terminology and device selection in the self-assessment toolkit (wearcoach.sports4.eu/toolkit/self-evaluation/). Anything below 3 out of 5 is worth a re-read before Module 2.

Session 2: Real-Time Data Tracking

Slides: 15-25

Templates: A4 Load calculation sheet

Concept 15 min Slides 16-18	■ External load is the dose prescribed by the coach. Internal load is the body's response to that dose. ■ Always read external and internal load side by side. The same dose at a higher internal cost is an early sign of accumulated fatigue.
Worked example 30 min Slides 19-23	■ What live dashboards offer, the five visualisation families, and the usual data-quality problems. ■ Stat Pack #1, by hand, on the board: sRPE 420 AU, HR fraction 0.727, TRIMP about 94 AU, ACWR 1.375. ■ Reading the ACWR: what it does well, and what it cannot do. Work through together: Compute the three metrics of the worked session with the group, then check them in the calculator. Tool: Load calculator: sRPE, TRIMP and ACWR (wearcoach.sports4.eu/learn/data-tracking/)
Applied activity 30 min	Group task: Each coach computes sRPE for last week's sessions and, if they have four weeks of data, ACWR. Then, in groups, go through the weekly report with seven rows and decide which rows you would not put into the load total. Tool: The weekly report that nearly went out wrong (wearcoach.sports4.eu/learn/data-tracking/) Template: A4 Load calculation sheet (page 42)
Debrief 15 min Slides 24-25	■ Real-time feedback to athletes: what, when and how. Reflective prompt: Take last week's heaviest session and compute sRPE, TRIMP and ACWR by hand. Then ask what decision, if any, those three numbers would have changed. Self-check: Which live metric would you refuse to act on within seconds, and why?

Discussion

- One sentence you will use with an athlete to frame an unfavourable number as information rather than a verdict.

Between sessions

- Interactive unit 2 on the project website, about 20 minutes: the load calculator and the weekly report check.
- Screenshot one dashboard view from your own platform and label it: which of the five visualisation families is it, and what is it hiding?

Session 3: Performance Optimization

Slides: 26-33

Templates: A3 Individual athlete profile, A8 Daily decision rules

Concept 15 min Slides 27-29	- A baseline is a distribution, not a number: collect 4 to 6 weeks, standardise the conditions, compare athletes to themselves. - Where wearables enter the plan: the week, the block and the season. Ask the room: At which of the three levels does your own club already have a working routine, and at which is the data collected but never read?
Worked example 30 min Slides 30-31	- Recovery metrics: what HRV, sleep and wellness show, and what they do not. - Triangulation: never act on one metric alone. - Tapering with wearable confirmation. Work through together: The triathlete in week 11. Take the decisions with the group, one stage at a time. Tool: The triathlete in week 11 (wearcoach.sports4.eu/learn/performance/)
Applied activity 30 min	Group task: Each coach builds an individual athlete profile for one athlete. Coaches without data use the ten readings of the baseline builder. In groups, compare the flags and what each coach would do about them. Tool: Baseline and reference-range builder (wearcoach.sports4.eu/learn/performance/) Template: A3 Individual athlete profile (page 40)
Debrief 15 min Slides 32-33	The measurement-burden trade-off: before adding a metric, ask what decision it will change. Reflective prompt: Name one metric you currently collect that has never changed a decision. What would it take to either use it properly or remove it this month? Self-check: An athlete's HRV is 8 ms below their individual mean, SD is 6 ms. Yellow, orange or red, and what do you do about it?

Discussion

- Where in your week will the morning readiness reading actually be read: by whom, and before which decision?

Between sessions

- Interactive unit 3 on the project website, about 20 minutes: the baseline builder and the triathlete case.
- Write your daily decision rules (Template A8, page 47).

Session 4: Injury Prevention

Slides: 34-44

Templates: A9 Early-warning checklist

Concept 15 min Slides 35-38	- What monitoring can change and what it cannot: modifiable and non-modifiable risk factors. - Load management and its critics: ACWR is a useful prompt, not a verdict. - Monotony and strain. Asymmetry: identify, document and refer.
Worked example 30 min Slides 39-43	- An early-warning system in five steps, and the escalation tiers. - Five worked cases in five contexts. Work through together: The point guard, three weeks out. Take the decisions with the group, one stage at a time. Tool: The point guard, three weeks out (wearcoach.sports4.eu/learn/injury-prevention/)
Applied activity 30 min	Group task: In groups by type of sport, complete the early-warning checklist for one squad. Three or four inputs, a threshold for each, and the action attached to each tier. Tool: Early-warning system builder (wearcoach.sports4.eu/learn/injury-prevention/) Template: A9 Early-warning checklist (page 49)
Debrief 15 min Slide 44	Reflective prompt: Write the three inputs your early-warning system will use, and the exact action attached to each tier. If you cannot name the action, the tier does not exist yet. Self-check: An athlete shows ACWR 1.6 with stable wellness and sleep. What do you do first, and what would change your mind?

Discussion

- Who, by name, will sign off your escalation tiers before the season starts?
- Write the exact sentence you will say to an athlete when an orange flag fires before an important fixture.
- What would make you conclude that your early-warning system is producing more noise than value?

Between sessions

- Interactive unit 4 on the project website, about 25 minutes: the early-warning system builder and the branching case.
- Walk your early-warning checklist (page 49) past your medical or physiotherapy contact before the next module.

Session 5: Integration into Coaching Practice

Slides: 45-53

Templates: A1 Consent and data governance statement, A5 90-day integration plan, A10 Staff roles for data (RACI)

Concept 15 min Slides 46-48	- Plan, do, check, act. The most important option is the last one: stop. - The components of a defensible data-governance policy.
Worked example 30 min Slides 49-50	- Talking to athletes about their numbers: information invites collaboration, a verdict invites resistance. - The five steps of a negative-news conversation: acknowledge, share, connect, invite, confirm. - Who does what with each kind of data. Work through together: Read the staff matrix of the slide with the group and ask where each coach's own staff would differ. Template: A10 Staff roles for data (RACI) (page 51)
Applied activity 30 min	Group task: Each coach answers the governance self-audit for their organisation as it is today. Then, in pairs, practise a negative-news conversation with the five steps and swap roles. Tool: Data governance self-audit (wearcoach.sports4.eu/learn/integration/)
Debrief 15 min Slides 51-53	- The five delivery pathways, for coaches who will run the programme themselves. - The eight fields of the 90-day plan. Reflective prompt: Return to the note you wrote in Module 1. Does the device you named still answer the coaching question you wrote beside it? If not, say so in your plan. Self-check: Which single stop condition would you be most reluctant to write down, and what does that reluctance tell you?

Between sessions

- Interactive unit 5 on the project website, about 30 minutes: the governance self-audit and the plan builder.
- Take the checklist of the self-assessment toolkit again at day 30 and day 90, and record it in its progress tracking (wearcoach.sports4.eu/toolkit/).

Capstone workshop

After Module 5. In the two-day course, at the end of day 2.

- Each coach drafts the 90-day integration plan: eight fields, at least six of them filled.
- Plans are peer-reviewed in the cohort. The rubric (page 59) can guide the review.
- Each coach books the review dates of the plan before leaving. A review that is not in the calendar does not happen.

Bring the plan to the next cohort session, or review it yourself with the rubric (page 59) within two weeks.

The question bank, 60 questions with answers and explanations, is online: wearcoach.sports4.eu/trainers/question-bank/

C Annex C

Review your plan

Read your plan field by field and rate each one. Be honest: the rating is for you, or for a colleague who reviews your plan in a course.

0 Not yet **1** Partly **2** In place

90-day integration plan	In place	Partly	Watch for	Your rating
1. Context analysis	States the sport, the level, the number of athletes, what is monitored today, the resources available and who is on the staff.	Names the setting, but says nothing about current practice or current workload.	Most plans fail by ignoring the current workload.	
2. PDCA question	One specific question that wearables will answer this season, and that can be answered yes or no by day 90.	A theme, or several questions at once.	If it cannot be answered yes or no by day 90, it is a theme, not a question.	
3. Metrics (3-5) + personalised thresholds for one named athlete	Three to five metrics, with personalised thresholds for one named athlete.	Metrics are listed, but there are more than five, or the thresholds are missing or not personalised.	Use the mean and SD of your athlete profile (Template A3, page 40).	
4. Governance statement (consent, access, retention)	Says how consent is obtained (from guardians too, for athletes under 16), who has access, how long the data is kept, and who owns each.	Covers consent, but leaves access or retention open.	Start from the gaps your governance self-audit flagged; the self-audit is a tool of Module 5 on the project website.	
5. Communication plan (athletes / parents)	Says how athletes (and parents, where applicable) will be briefed, and when.	A briefing is planned, but only after the system has started, or without saying how.	Brief before the system runs, not after the first flag fires.	
6. Success criteria at Day 30 / 60 / 90	Says what will be true at day 30, at day 60 and at day 90 if the plan is working.	Describes success in general terms, or for day 90 only.	Day 30 is usually about compliance, day 60 about data quality, day 90 about decisions changed.	
7. Review checkpoints (calendar dates)	Calendar dates for review, booked, with the people who will sit in the room.	Intervals without dates.	A review that is not in the calendar does not happen.	
8. Stop conditions	Names what would cause you to stop or substantially change the plan.	A general intention to review if needed.	The field most coaches leave blank, and the one that protects your credibility.	

- The plan is usable when at least six of the eight fields are filled in, whether you rate them “Partly” or “In place”.
- In a course, plans are reviewed by a peer in the cohort. On your own, review your plan within two weeks of writing it.

E

Annex E

Abbreviations, terms and formulas

- Terminology defined in Module 1 is reused throughout. Module 1 (page 7); Module 2 (page 12); Module 3 (page 16); Module 4 (page 20); Module 5 (page 26)
- Formulas introduced in Module 2 reappear in Modules 3 and 4. Practical lab: Stat Pack #1 (page 15); Module 3 (page 16); Module 4 (page 20)
- GDPR foundations from Module 1 are deepened in Module 5. 1.5 First-look ethics and GDPR: the consent baseline (page 10); 5.2 Data governance and GDPR in coaching practice (page 27)

Abbreviations

Abbreviation	Meaning	First used in	Modules
ACWR	Acute:Chronic Workload Ratio	Module 2	2, 4
CMJ	Countermovement Jump	3.2	3, 4
CV	Coefficient of Variation		
EACEA	European Education and Culture Executive Agency		
ECG	Electrocardiogram	1.1	1
EMG	Electromyography	1.3	1
GDPR	General Data Protection Regulation	1.5	1, 5
GNSS	Global Navigation Satellite System	1.2	1
GPS	Global Positioning System	1.1	1, 2, 4
HR	Heart Rate	1.3	1, 2, 3, 4
HRV	Heart Rate Variability	1.3	1, 2, 3, 4, 5
HSR	High-Speed Running	4.5	4
ICCE	International Council for Coaching Excellence		
IMU	Inertial Measurement Unit	1.2	1, 4
LMS	Learning Management System		
NSGB	National Sports Governing Body	5.5	5
PDCA	Plan-Do-Check-Act	5.1	5
PPG	Photoplethysmography	1.2	1, 2
PSG	Polysomnography	1.3	1, 3
RPE	Rating of Perceived Exertion	Module 2	2
RTP	Return-to-Play		
sEMG	surface Electromyography	1.2	1
sRPE	Session Rating of Perceived Exertion	2.1	2, 4
S&C	Strength and Conditioning	4.5	4, 5
TRIMP	Training Impulse	2.1	2
WCAG	Web Content Accessibility Guidelines		

Terms

Validity

Validity asks whether a device measures what it claims to measure.

1.4 Validity and reliability for coaches who are not researchers (page 10) Used in Modules 1, 3

Reliability

Reliability asks whether a device gives consistent results when conditions are stable.

1.4 Validity and reliability for coaches who are not researchers (page 10) Used in Modules 1, 2, 3

Ecological validity

Ecological validity asks whether validity and reliability established in a laboratory hold up in real coaching conditions: wind, sweat, contact, indoor versus outdoor, gripped objects, weather.

1.4 Validity and reliability for coaches who are not researchers (page 10) Used in Module 1

Special category of personal data

Health data (heart rate, biomechanical data, sleep, training load) is treated under Article 9 as a special category of personal data, requiring stricter handling.

1.5 First-look ethics and GDPR: the consent baseline (page 10) Used in Modules 1, 5

Data minimisation

You must apply data minimisation: collect only what you need.

1.5 First-look ethics and GDPR: the consent baseline (page 10) Used in Module 1

External load

External load is the dose prescribed by the coach.

2.1 Internal load versus external load: the Impellizzeri-Marcora framework (page 12)

Used in Modules 1, 2, 3

Internal load

Internal load is the body's response to that dose.

2.1 Internal load versus external load: the Impellizzeri-Marcora framework (page 12)

Used in Modules 2, 3

Baseline

A baseline is not a single number. It is a distribution.

3.1 Building an athlete baseline that is actually meaningful (page 16) Used in Modules 1, 3, 4

Triangulation

The discipline of triangulation: never act on one metric alone.

3.3 Recovery metrics: what they show and what they do not (page 17) Used in Modules 3, 4

Tapering

Tapering reduces accumulated fatigue while preserving fitness, allowing peak performance at a competition.

3.4 Tapering with wearable confirmation (page 18) Used in Modules 3, 4, 5

Number anxiety

Risk of number anxiety: athletes becoming preoccupied with their own metrics in unhelpful ways.

3.5 The measurement-burden trade-off (page 19) Used in Modules 3, 5

Asymmetry

Inertial measurement units placed on the lower limbs, or instrumented force plates, can quantify side-to-side differences during standardised tests

4.3 Asymmetry and movement-quality red flags (page 21) Used in Modules 1, 2, 4

Yellow, orange and red flags

A drop of one standard deviation in HRV is one yellow flag; two standard deviations is orange; three is red.

4.4 Designing an early-warning system (page 22) Used in Module 4

PDCA cycle

Deming's PDCA cycle (Plan, Do, Check, Act) was originally developed for manufacturing quality control but applies cleanly to wearable integration in coaching.

5.1 The Plan-Do-Check-Act integration framework (page 26) Used in Module 5

Informed consent

Athletes must be told, in plain language, what data is collected, why, who can access it, with whom it is shared, for how long it is retained, and how they can withdraw.

5.2 Data governance and GDPR in coaching practice (page 27) Used in Modules 1, 5

RACI matrix

A RACI matrix (Responsible, Accountable, Consulted, Informed) clarifies who does what for each data domain.

5.4 Integrating into a multi-disciplinary staff (page 28) Used in Module 5

Formulas**Session RPE (sRPE)**

$$\text{sRPE} = \text{RPE} \times \text{duration (min)}$$

Practical lab: Stat Pack #1 (page 15) Used in Modules 2, 4

HR fraction

$$\text{HR fraction} = (\text{HR}_{\text{avg}} - \text{HR}_{\text{rest}}) / (\text{HR}_{\text{max}} - \text{HR}_{\text{rest}})$$

Practical lab: Stat Pack #1 (page 15) Used in Module 2

Training impulse (TRIMP)

$$\text{TRIMP (Banister, simple form)} = \text{duration} \times \text{HR fraction} \times \text{weighting}$$

Practical lab: Stat Pack #1 (page 15) Used in Module 2

Acute:chronic workload ratio (ACWR)

the ratio of the last 7 days' load to the rolling 28-day average

4.2 Load management and the injury-training paradox (page 21) Used in Modules 2, 4

Training monotony

$$\text{Training monotony} = \text{mean daily load} / \text{standard deviation of daily load (over a week)}.$$

4.2 Load management and the injury-training paradox (page 21) Used in Module 4

Training strain

$$\text{Training strain} = \text{weekly load} \times \text{monotony}.$$

4.2 Load management and the injury-training paradox (page 21) Used in Module 4

Personal reference range

Define personalised reference ranges, typically ± 1 SD from the individual mean for "within normal range", and ± 2 SD for "anomaly worth investigating".

3.1 Building an athlete baseline that is actually meaningful (page 16) Used in Modules 3, 4

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