Normalizing Activity Time for Training Load Calculation

1. Problem with raw activity time:

* Two athletes can perform for the same clock duration but experience very different physiological stress.
* Example: 60 minutes of HRR-based Zone 2 for Athlete A vs 60 minutes of HRR-based Zone 4 for Athlete B. Same duration, very different load.

1. Importance of context:

* Raw duration ignores intensity.
* Raw duration ignores athlete-specific fitness and adaptation.

1. Weighted time approaches:

* HRR-weighted time: Assigns weight to each minute based on heart rate zone. Formula: Effective duration = Σ(time in zone × zone weight)
* Exponentially weighted TRIMP time: Minutes at higher intensities grow disproportionately, similar to Garmin EPOC-based load.

1. Implementation for your project:

* Treat duration not as a raw feature but scaled by intensity.
* This ensures that training load metrics reflect true physiological demand rather than just elapsed time.

1. Key takeaway:

* Training load is additive in time × intensity, not time alone.
* Scaling time is essential for accurate load estimation, just as scaling heart rate is essential.