

Zephyr™ PSM Training



Introduction

The Zephyr™ Physiological Status Monitoring (PSM) Training system takes the market leading BioHarness™ technology and integrates it with Zephyr's OmniSense™ software delivering team measurement and analysis capabilities. Using heart rate, breathing rate, accelerometry, posture, activity and skin temperature in a single solution gives high visibility and context for performance monitoring and analysis.

PSM Training Applications

With real-time monitoring of up to 28 people simultaneously the PSM Training system offers unparalleled visibility of squads during training, as well as the ability to compare, contrast and analyze performances after the event. Designed for managing multiple athletes, the PSM Training system allows the configuration of hundreds of individuals for data collection, analysis and reporting as part of a team, or individually.

PSM Training Advantage

The comprehensive data gathered combines physiological and motion-based parameters to give context to performance analysis. Zephyr's BioSense™ algorithms combine the BioHarness™ sensors to allow automatic detection of ventilatory threshold, jump height, max acceleration and heart rate recovery, while the visibility provided by the whole system also allows simple real-time interpretations for conditions such as dehydration, heat stroke risk, and fatigue.

Who Uses PSM?

PSM Training is used by coaches and athletes in a variety of applications including:

- Strength & Conditioning
- Soccer
- Football
- Basketball
- Gyms – spin classes and fitness assessment
- Ice and Field Hockey
- Lacrosse
- Biking
- Running
- Defense & First Responder Training & Selection
- And Any Endurance or Extreme Sporting Events



Zephyr™ PSM Training



How is PSM Used?

PSM Training helps coaches get the most out of their players. By effectively training with heart rate, breathing rate, activity, skin temperature and posture to manage training intensity and volume of training.

Coaches can execute this in three simple steps:

1. **Baseline** your athletes with any in field fitness test. Use the baseline fitness indicator test results to identify evidence-based training effect in all activities. Repeat the fitness test to gauge improvement or over training.
2. Train with Zephyr's patented **BioGauge™** using Red Orange and Green alarm target zone that use heart rate and breathing rate together as an indicator for proper recovery and work out intensity.

During training activities use PSM technology to monitor stress with Heart Rate, Effort, HRR and HRVT real time indicators. Analysis of parameters such as max heart rate vs. effort; average heart rate vs. effort; activity vs. effort can yield insight into candidates that are "efficient" in their movement and activities versus those that struggle. "Efficiency" – and the lack of it - is not always visible or evident during the training session.

3. Manage training with our **Group Report**. This report captures data in a easy to use method that indicates training effort and training volume in a simple color coded red orange and green system that indicates the over and underachiever.



	Start Date/Time	Duration	Effort Avg	HR Avg	HR Max	HRR Avg	HR Avg	Time at VT	Skin Temp Avg	Total Calories
Name										
Demo Subject 5	10/11/2008 10:56	0:03:13	3.21	133.83	163	-	32.08	0:02:14	31.30	44
Demo Subject 6	10/11/2008 10:56	0:03:13	7.05	165.78	179	-	38.85	0:03:22	27.35	69
Demo Subject 7	10/11/2008 10:56	0:03:13	7.87	181.59	197	-	39.06	0:02:55	30.41	88
Average			6	160	179	-	37	0:02:30	30	57
Standard deviation			2	24	18	-	4	0:00:22	2	12
SIGNIFICANTLY HIGH:			9	185	197	-	41	0:02:52	32	69
SIGNIFICANTLY LOW:			2	136	161	-	33	0:02:09	28	45
Training Monotony (Mean/STDEV)			2.78			-				

Zephyr^{IM} PSM Training

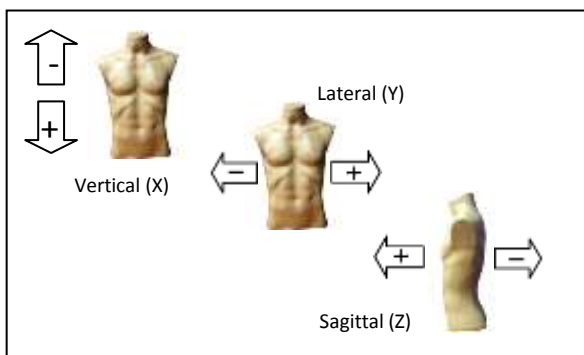


Training, Fitness & Exercise

PSM Training is a one stop solution to monitor and detect your player's wellbeing in the field focusing on training effectiveness and injury prevention.

Accelerometry

The Zephyr PSM Training solution provides coaches and athletes with a way to measure acceleration in a field setting; using a 16g tri-axial 3D accelerometer, displaying (and recording) live streaming data at 50 Hz (sampled at 125Hz).



Data is displayed independently for each axis.

The embedded accelerometry is used to measure explosive power which is an important attribute for athletes in many different sports. Measuring this outside of a laboratory environment is typically a difficult task.

PSM Training leverages the BioHarness™ native capabilities allowing strength and conditioning coaches to measure G Force when executing a:

- Sprint/Dash Start
- Vertical Jump Test

Sprint / Dash

The time to cover the first 10 yards of a 40 yard dash test has been used to indicate how explosive an athlete is from a standing start. Typically, however, the difference in athlete times over this distance is almost the same as the timing error in making these measurements.

The Zephyr PSM Training Solution provides coaches and athletes a way to gauge explosiveness off the line with much greater certainty. Utilizing a 16g tri-axial / 3D accelerometer and proprietary algorithms, the Zephyr PSM solution calculates the peak g (acceleration) achieved by an athlete in the first second following a sprint start.



Testing on elite athletes has shown that this peak acceleration output can vary between athletes by up to 5 g (a range of 6-11g).

The Peak g metric from Zephyr's PSM Training system enables coaches to see differences between athletes, and to coach athletes to improve their technique and results in real-time, while being able to re-visit data for more in-depth analysis after training.

ZephyrTM PSM Training



Vertical Jump Test

Measuring an athlete's vertical jump height is known to be an indicator of power generation which is an important absolute metric for many sports

The Zephyr PSM Training Solution calculates a number of additional metrics from the vertical jump test that provide coaches and athletes a better picture of their capabilities.

These new metrics include:

- Jump Time
- Peak (Vertical) Gs
- Jump Height.



Injury Avoidance

The PSM Training System will give the coach(es) and the physician the actual real time status of the player. Real time PSM can improve the length of training and subsequent effectiveness of the teams. Payback can be quantified through increased player performance; faster recovery, better stamina all focused on the sole objective of winning more competitions.

Teams often train in extreme heat conditions for example, 90° F heat stress index environments, ambient temperature plus humidity) or for certain sports extreme cold. Various uniforms ensembles prevent the evaporative cooling effect of airflow across the skin.

Heat injuries are caused by a combination of work load, ambient temperature, humidity, hydration, conditioning equipment load, uniform (as an insulator), physical condition, and activity. These include previous heat injury, viral infections, sleep deprivation, certain medications (including commonly used non-steroidal anti-inflammatory drugs like ibuprofen) and poor nutrition.

Measurement of body core temperature as an indicator of heat injury is not practical in the field. Indirect measurements of rising core temperature, however, can be made by the BioHarnessTM that indicate the body's reaction to elevated core temperature. These indicators can be a predictor of heat injury and include increased heart rate (cardiac drift) increased breathing rate, reduced heart rate recovery, and decreased movement (late in the game).

Motivation

The player's natural competitive spirit is maximized during training when instant results and feedback is shared from the coaching staff.

Zephyr™ PSM Training



PSM Training's System Components

The System comprises three building blocks allowing teams to operate independently or as part of a networked force.

- BioHarness™: chest strap or shirt
- Long range Antenna
- OmniSense™ PC software

BioHarness™

Components are a BioModule™ and BioStrap™ (shown) or a BioShirt™ option. Measures:

- Heart Rate,
- Breathing Rate
- Temperature (skin)
- Activity (stationary, walking or running)
- Posture (laying or standing)
- Effort, Dehydration, heat stress and risk

Operating Modes:

- Streaming/LIVE
- Logging



Charging

The BioModule™ battery is rechargeable and lasts up to 24hrs. It charges to full capacity in 3hrs and to 90% capacity in 1hr. The chargers are available in:

- Single module configuration or
- Four module configuration

The chargers not only recharge the batteries – they are also used to download log files from the BioModule™ to OmniSense software



Radio Communications

Since most team sports utilize a larger area, an extended range antenna is available supporting distances up to 150 meters.



Zephyr™ PSM Training



OmniSense™ Software

PSM Training's data is presented by using Zephyr's OmniSense™ software. There are two applications encompassed by OmniSense™:

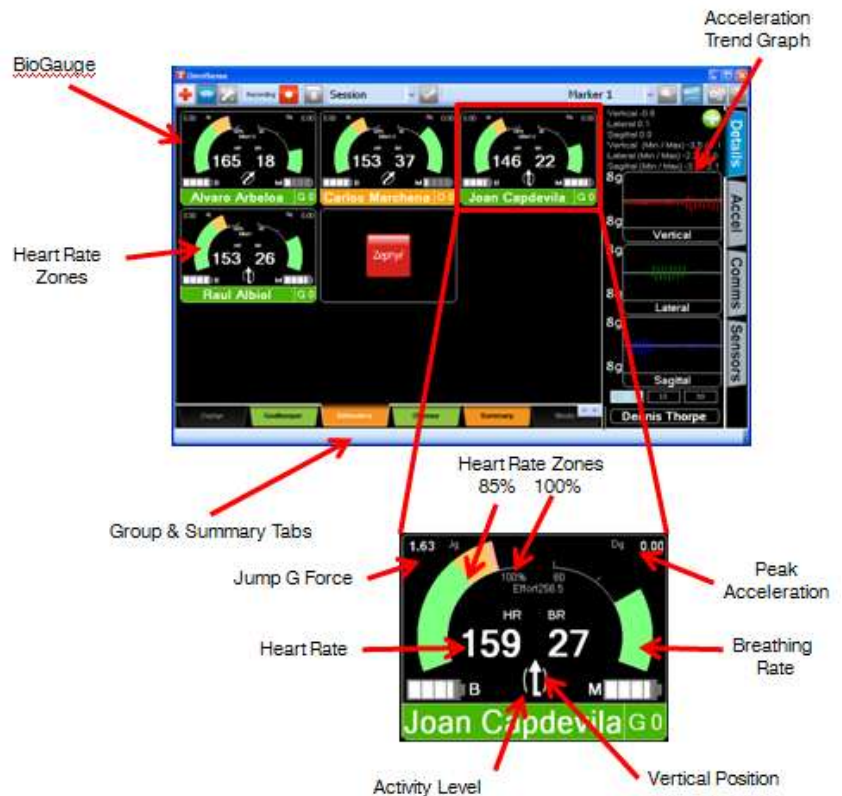
- OmniSense™ Live – Displays real time information on the individual and team's physiological status.
- OmniSense™ Analysis – Used for review and assessment after the completion of a training scenario or live operation.

OmniSense™ Live

Our interface has been designed in conjunction with Academic Researchers and Strength & Training Coaches. A click of icon provides instant access of the entire team's sports readiness.

Easy to interpret screens provide:

- **Summary** screen of the entire team
- **Deployment Tool** to add and organize team members
- **Team** based viewing of operational groups
- **Status** summary for each individual Red-Orange-Green with configurable settings.
- **BioGauge™** view for instantaneous physiology update of individuals.
- **Trends** for time based accelerometry display

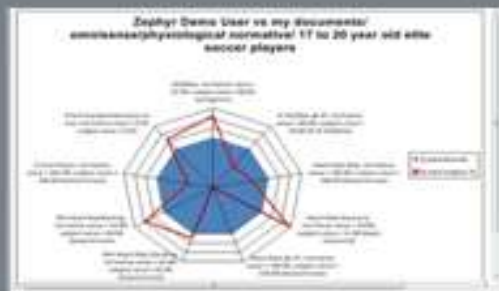
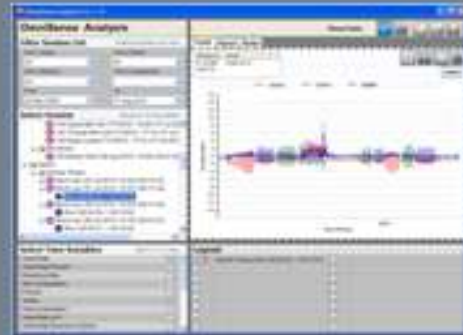


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OmniSense™ Analysis

- A. Post event software that provides:
- Team fitness assessment of entire team simultaneously in the field
 - Team analysis of a scenario
 - Individual analysis between events over time
 - Auto update of personnel baseline information
 - After action reviews
- B. Fitness Test
- Used to perform a baseline measurement of team members
 - Import actual data – Max heart rate, breathing rate, heart rate recovery and a myriad of other important personal parameters
- C. Reports
- Training time
 - Red-Orange-Green heart rate zones
 - Heart rate maximum
 - Heart and breathing rate
 - Effort
 - Group fitness
- D. Radar Plots
- Display of up to ten Fitness Parameters
 - Comparison of Normalized Group Data to Your Fitness Levels
 - Output to Excel



ZephyrTM PSM Training



Zephyr Background

Zephyr Technology is a global leader in real-time performance and biomechanical monitoring or "Physiological Status Monitoring" (PSM) solutions for Defense, First Responder, Training and the Academic Research markets. Zephyr Technology leverages a world class team of engineers, scientists, physiologists and business experts.

Founded in 2003, Zephyr Technology has been a pioneer in the use of PSM in training and high stress operational environments. The company's ongoing collaboration with fire departments, NASA Ames Research Center, National Guard Civil Support Teams, and US Special Operations Forces has been invaluable in the development and validation of Zephyr's technology and its application in the most extreme operating environments to

Measure Life . . . Anywhere

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