

MIKE BEWLEY


Heart Rate Technology & E.S.D.
Programming

“Explosive Strength and Power”

Instagram: @mike_bewley

HEART RATE TECHNOLOGY & E.S.D. PROGRAMMING

Michael Bewley
MA, CSCS, SSC, SPN, FMS, USAW
Strength and Conditioning Coach
Certified Specialist in Sports Nutrition
Director of Basketball Strength & Conditioning



CLEMSON BASKETBALL ATTITUDE | ENERGY | EFFORT

TRYING TO ADD IN MATH CLASS




ADDING UP PLATES IN THE GYM



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A FAVORITE QUOTE

“Anyone can make an athlete stronger. Anyone can make an athlete tired. Not everyone can make an athlete better.”



Coach Roy Benson
Exercise Scientist
High School Cross Country Coach 1993-2008
Marist High School, GA
16 State Championships
21 Individual State Titles

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TEAM TELEMETRY SYSTEM BENEFITS

- To observe the work efforts of multiple athletes at the same time.
- To see who is working harder and who is in better shape.
- Can use heart rate data to help athletes work out sensibly, progressively, and safely.



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TEAM TELEMETRY SYSTEM BENEFITS

- To ensure that the fittest athletes are working hard and getting fitter; who are the least fit athletes?
- To gather data -- preseason and early season monitoring, during game situations, giving unique insights into the effort and heart rate responses in both training and competitive environments.



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TEAM TELEMETRY SYSTEM BENEFITS

- Their greatest value may be in their ability to guide recovery.
- The greatest challenge: getting a head coach to buy what you're selling.
- Moral: team telemetry system data is only as good as the head coach willing to listen to the data it reveals.



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CONFUSION CREEPS IN WHEN...

1. What is the aerobic versus anaerobic breakdown of your sport?
2. How do you allocate a representative amount of time to aerobic and anaerobic work based on your metabolic breakdown?
3. What heart rate zones should you exercise at to cause adaptation and challenge the desired energy system?



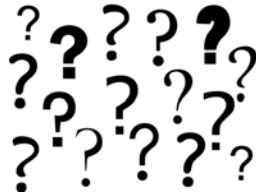
THREE ENERGY SYSTEMS

Energy systems	Duration (in seconds)	HR Monitoring
ATP-PC	1-15	Recovery
Anaerobic glycolysis	15-90	Recovery
Aerobic	>90	% MHR

Chart adapted from Benson, R., et al (2011). *Heart Rate Training* [Adobe Digital Editions]. Retrieved from <http://www.HumanKinetics.com>

CONFUSION CREEPS IN WHEN...

4. Should you consider any nutritional intervention to enhance your energy system performance?
5. What recovery heart rates should you be looking for between intervals or after other shorter periods of high intensity?



Heart Rate Phases

HR zone	Effort Index	Effort Level	Pace	Fuel Source	Fuel System	Fitness Component
I	60-75%	Easy	Slow	Primarily fats	Aerobic	Endurance
II	75-85%	Moderate	Moderate	Carbs & fats	Aerobic & Anaerobic	Stamina
III	85-95%	Difficult	Fast	Primarily carbs	Anaerobic	Economy
IV	95-100%	Very hard	Sprint	All carbs	ATP-PC	Speed

Chart adapted from Benson, R. et al (2011). *Heart Rate Training* (Adobe Digital Editions). Retrieved from <http://www.HumanKinetics.com>

BASIC MODEL FOR TRAINING

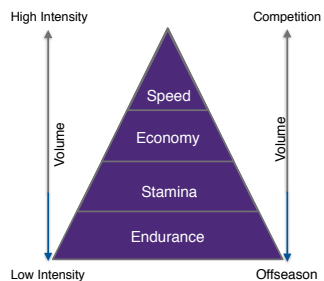


Chart adapted from Benson, R. et al (2011). *Heart Rate Training* (Adobe Digital Editions). Retrieved from <http://www.HumanKinetics.com>

KEEPING DATA IN PERSPECTIVE

“Gathering numbers & mounds of data is the easy part. Knowing what to do with the data is another. I am seeing profound conclusions being drawn regarding performance with absolutely no understanding of the context of how the numbers were generated. We need to be able to use technology & meaningful data to expand our capabilities not limit them. Numbers are one dimensional. Performance is multi-dimensional.”



Vern Gambetta
Gambetta Sports Training Systems

CULTURE CHECKLIST

- Does your coaches (head coach) embrace the technology data?
- Do your coaches understand this technology is not 100% perfect?
- Do you have coaches blessing to "inconvenience" athletes for the greater good?
- Will everyone embrace your effort to modify prescribed training base on data?



DATA REPORT CHECKLIST

- Whose going to collect data (you, assistant, manager)?
- Whose going to teach athletes how to use the technology (daily, pre/post practice/game schedule)?
- Whose going to hold athlete's accountable when technology logistics are not followed?
- What's the plan for analyzing data and giving coaches feedback?



INTERNAL VS EXTERNAL LOAD

- Utilize Polar Team Pro EVERY training session and games.
- Capable of looking at heart rate, distance, acceleration/deceleration data, hours of recovery.
- Spend 95% of time looking at heart rate and recovery; most experience and researched to date.



WHAT HEART RATE REVEALS

1. Correct intensity for aerobic system development.
2. Correct intensity for anaerobic system development.
3. Correct durations for time spent in appropriate heart rate training zones.
4. Appropriate recovery periods during interval training.



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WHAT HEART RATE REVEALS

5. Appropriate recovery periods between exercise sessions.
6. Effective evaluation of adaptations to training programs.
7. Early warning signs of over-training/under-resting.



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AVOID POSSIBLE INJURY

- Individualizing workouts using HR data helps keep skill development sessions from turning into efforts that much harder than necessary.
- An arbitrary standard in a time trial may force athletes to work harder than necessary and, in the process, risk injury or burnout.

AVG 85% MHR

Athlete A
TEST: 2-Miles
TIME: 13m 45s

AVG 95% MHR

Athlete B
TEST: 2-Miles
TIME: 13m 45s

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FITNESS VO₂MAX CLASSIFICATIONS

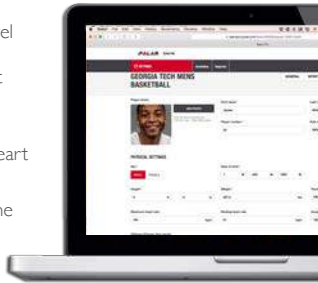
Male	Age	Poor	Fair	Average	Good	Excellent
	15-19	≤52	53-57	58-65	66-69	≥70
20-29	≤52	53-59	60-69	70-77	≥78	
	Level I		Level II		Level III	

Female	Age	Poor	Fair	Average	Good	Excellent
	15-19	≤48	49-54	55-61	62-67	≥68
20-29	≤49	50-54	55-62	63-71	≥72	
	Level I		Level II		Level III	

Chart adapted from Benson, R, et al (2011). *Heart Rate Training* (Adobe Digital Editions). Retrieved from <http://www.HumanKinetics.com>

POST TEST ANALYSIS

- Assign an athlete a Fitness Level based 1-minute HR recovery (anaerobic/power athletes; not VO₂max).
- Record athlete's resting heart rate (Sleep Cycle app), max heart rate and recovery heart rate.
- Enter all the above values in the Polar athlete profile.



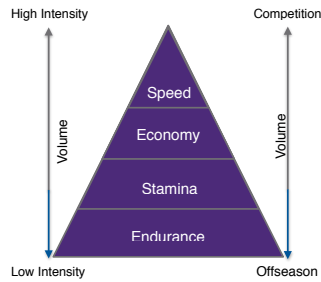
RECOVERY HR FITNESS CLASSIFICATIONS

Low	Fair	Average	Good	Excellent	Elite
< 10 bpm	11-20 bpm	21-30 bpm	31-40 bpm	41-50 bpm	> 51 bpm
Level I		Level II		Level III	

- For Anaerobic, Anaerobic Glycolytic; power dominate sports, we use heart rate recovery to gauge fitness NOT VO₂max.
- Ascribe Fitness Level based on one minute beats per minute (bpm) heart rate recovery.

SPORT FITNESS COMPONENTS TRAINING

- The ability to stay fast for the entire game (endurance).
- The ability to sprint back and forth for several plays in a row (stamina).
- The ability to go at race pace while using the least amount of oxygen and energy (economy).
- The leg speed to be the first to get to the ball or ball carrier (speed).



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E.S.D. MACROCYCLE

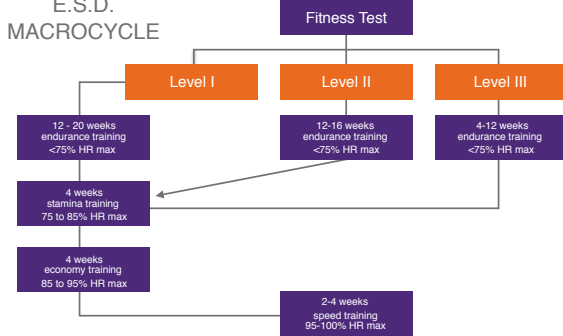


Chart adapted from Benson, R, et al (2011). Heart Rate Training [Adobe Digital Editions]. Retrieved from <http://www.HumanKinetics.com>

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E.S.D. MICROCYCLES

July 23-28	July 16-22	July 9-15	July 2-8	July/Jun 25-1	Jun 18-24	Jun 11-17	Jun 4-10	Jun/May 28-3	May 2-8
Speed Phase Week 2	Speed Phase Week 1	Economy Phase Week 4	Economy Phase Week 3	Economy Phase Week 2	Economy Phase Week 1	Stamina Phase Week 4	Stamina Phase Week 3	Stamina Phase Week 2	Stamina Phase Week 1

- Profile Example: Clemson High School Football Player
- After evaluate Fitness Level, determine Endurance Training intensity, duration, frequency before beginning ESD phases.
- Endurance is foundation for all other levels of fitness (60% to 75% MHR).

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HEART RATE DATA COLLECTION

- Record & monitor Resting HR & Exercise HR response to a given workload as often as possible — should be documented over days, weeks, and months.
- Understand how athlete's heart rate should respond both at rest & during exercise as they train.
- Make sure it is increasing and decreasing as you would expect.



MONITOR DEFINITIVE CHANGES

Athlete	Stage	Heart Rate (bpm)	Max Heart rate	VO2 (ml/kg/min)	L-Lactate Recovery (bpm)													
Phillip Green	0	130	165	139	144	180	185	183	186	34.06	36.06	33.14	36.06	38	39	38	41	
	1	132	166	163	154													
	2	138	169	164	166													
	3	149	177	170	163													
	4	175	181	176	170													
	5	179	186	185	175													
	6	181	191	180														
	7	186	199	185														
	8																	
	9																	
	10																	
	11																	

- Perform Fitness Test once every 8-10 weeks and compare data
- HR at the fixed load decreases because the heart muscle is now stronger and can move more blood with each beat. (improved stroke volume).
- Faster HR recovery demonstrates improves performance and fitness level.

MAX HEART RATE CHANGE

- Will coincide with chronic training.
- As total blood volume increases, max stroke volume will increase and HR will begin to decrease sub-maximally and maximally.
- Vagal tone will increase both resting to maximally (Dr. Mike Martino - Georgia College).
- Exercise economy will also improve as you address movement literacy approach.



YEAR ROUND PERIODIZATION

- We utilize TeamPro in the basketball offseason for fitness classification assessment and sport-specific energy system development.
- In the pre-season, we use TeamPro to periodize training intensity, load and duration so they mimic in-season play.
- In-season play, we use TeamPro to gauge individual, position, and team-specific loads to optimize training efficiency and recovery for peak game-time performance.



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POLAR M400 DATA TRACKING



- Use M400 as a daily fitness tracker (much like a FitBit).
- BONUS: Measures sleep quality and quantity.
- Heart Rate Zone athlete guidance
- Works with Polar Beat App.
- Syncs with TeamPro account.

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SYSTEM CHALLENGES

- The greatest challenge: getting a head coach to buy what you're selling.
- Moral: team telemetry system data is only as good as the head coach willing to listen to the data it reveals.



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COACH FEEDBACK: MARKERS

- Add markers for each practice session drill and analyze which create greatest amount of HR load.
- Share that with coaches and discuss ways to manipulate load, intensity, duration arrangement of drills.



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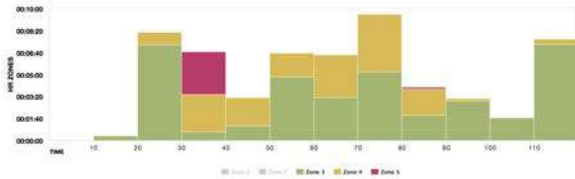
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COACH FEEDBACK: HR LOADS

SESSION PROFILE

HR ZONES 5 MIN 15 MIN

ADAM SMITH



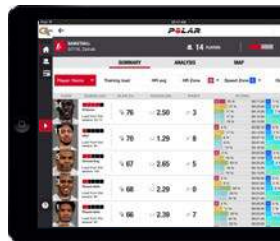
- Review with staff which practice drills result in the highest and lowest physiological loads so we can periodize volume and intensity for a given week/month/season/pre-game/post-game.

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COACH FEEDBACK: TRAINING LOAD

- Recovery status helps optimize the timing of intensive or exhaustive training sessions.
- Helps keep total training volume in control and when adequately recovered to receive a new training stimulus
- Ensures all players are receiving a sufficient training stimulus to maintain aerobic fitness.



Stagno, K.M. et al (2007). A modified TRIMP to quantify the in-season training load of team sport players. Journal of Sports Sciences, April 2007, 25(e): 629 – 634

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COACH FEEDBACK: PLAYER RPE

- Athlete weighs in and gives practice readiness.
- After practice, athlete weighs out and give practice intensity (rate of perceived exertion).
- Reference with Training Load and Training Effect.

PRACTICE INTENSITY	
1	Really easy
2	Easy
3	Moderate
4	Sort of Hard
5	Hard
6	
7	Really Hard
8	
9	Really, Really Hard
10	Coach Tired To Kill Us

Weigh-in/Weight-out/Readiness/Intensity Scale

	Date		Date		Date		Date		Date	
	Weight Before/After	Scale Before/After	Weight Before/After	Scale Before/After	Weight Before/After	Scale Before/After	Weight Before/After	Scale Before/After	Weight Before/After	Scale Before/After
Maxwell	/	/	/	/	/	/	/	/	/	/
Adam Smith	/	/	/	/	/	/	/	/	/	/
Adalberto Garcia	/	/	/	/	/	/	/	/	/	/
Ben Lattinens	/	/	/	/	/	/	/	/	/	/
Charles Mitchell	/	/	/	/	/	/	/	/	/	/
Conroy Hayward	/	/	/	/	/	/	/	/	/	/
James White	/	/	/	/	/	/	/	/	/	/
Josh Heath	/	/	/	/	/	/	/	/	/	/
Marcus Hunt	/	/	/	/	/	/	/	/	/	/
Nick Lewis	/	/	/	/	/	/	/	/	/	/
Quenton Stephens	/	/	/	/	/	/	/	/	/	/
Rand Rouseff	/	/	/	/	/	/	/	/	/	/
Sylvester Okunribido	/	/	/	/	/	/	/	/	/	/
Trae Jackson	/	/	/	/	/	/	/	/	/	/
Travis Johnson	/	/	/	/	/	/	/	/	/	/

PRACTICE READINESS	
1	I Feel Completely Rested
2	I Feel Pretty Rested
3	I Feel Good
4	I Feel Sort of Good
5	I Feel Alright
6	
7	I Feel Tired
8	
9	I Feel Really Tired
10	I Feel Completely Exhausted

PRACTICE INTENSITY	
1	Really easy
2	Easy
3	Moderate
4	Sort of Hard
5	Hard
6	
7	Really Hard
8	
9	Really, Really Hard
10	Coach Tired To Kill Us

THANK YOU!

Michael Bewley

MA, CSCS, SSC, SPN, FMS, USAW
 Strength and Conditioning Coach
 Certified Specialist in Sports Nutrition
 Director of Basketball Strength & Conditioning
 mbewley@clemsn.edu



DATA COLLECTION RESOURCES

Thought you might like these resources at <http://www.lynda.com>. Essentially, it's how I taught myself Excel and how to manage and analyze all the data I collect from HR monitors, technology and more:

Setting Up Excel Database
<http://www.lynda.com/Excel-tutorials/Setting-Up-Database-Excel-2013/165254-2.html>

Excel Pivot Tables In Depth
<http://www.lynda.com/Excel-tutorials/Excel-2013-Pivot-Tables-Depth/114891-2.html>

Creating Interactive Excel Dashboards
<http://www.lynda.com/Access-tutorials/Creating-Interactive-Dashboards-Excel-2013/374773-2.html>



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DATA COLLECTION RESOURCES

Excel Charts In Depth
<http://www.lynda.com/Excel-tutorials/Excel-2013-Charts-Depth/135358-2.html>

Other Good Stuff - High Level
<http://www.lynda.com/Excel-tutorials/Excel-Data-Analysis-Forecasting/153775-2.html>

<http://www.lynda.com/Excel-tutorials/Excel-2013-Advanced-Formulas-Functions/126129-2.html>

<http://www.lynda.com/Excel-tutorials/Excel-2013-Tips-Tricks/167361-2.html>



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BASKETBALL TRAINING RESOURCES

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