



The Science of Heart Rate and Step Tracking



Sally Edwards, MS, MBA

- Founder & CEO Heart Zones, Inc
- Author
- Professional Triathlete
- App Developer
- Wearable / Heart Rate Monitor Expert
- Creator of the Original Heart Rate Training Programs and Zone Training

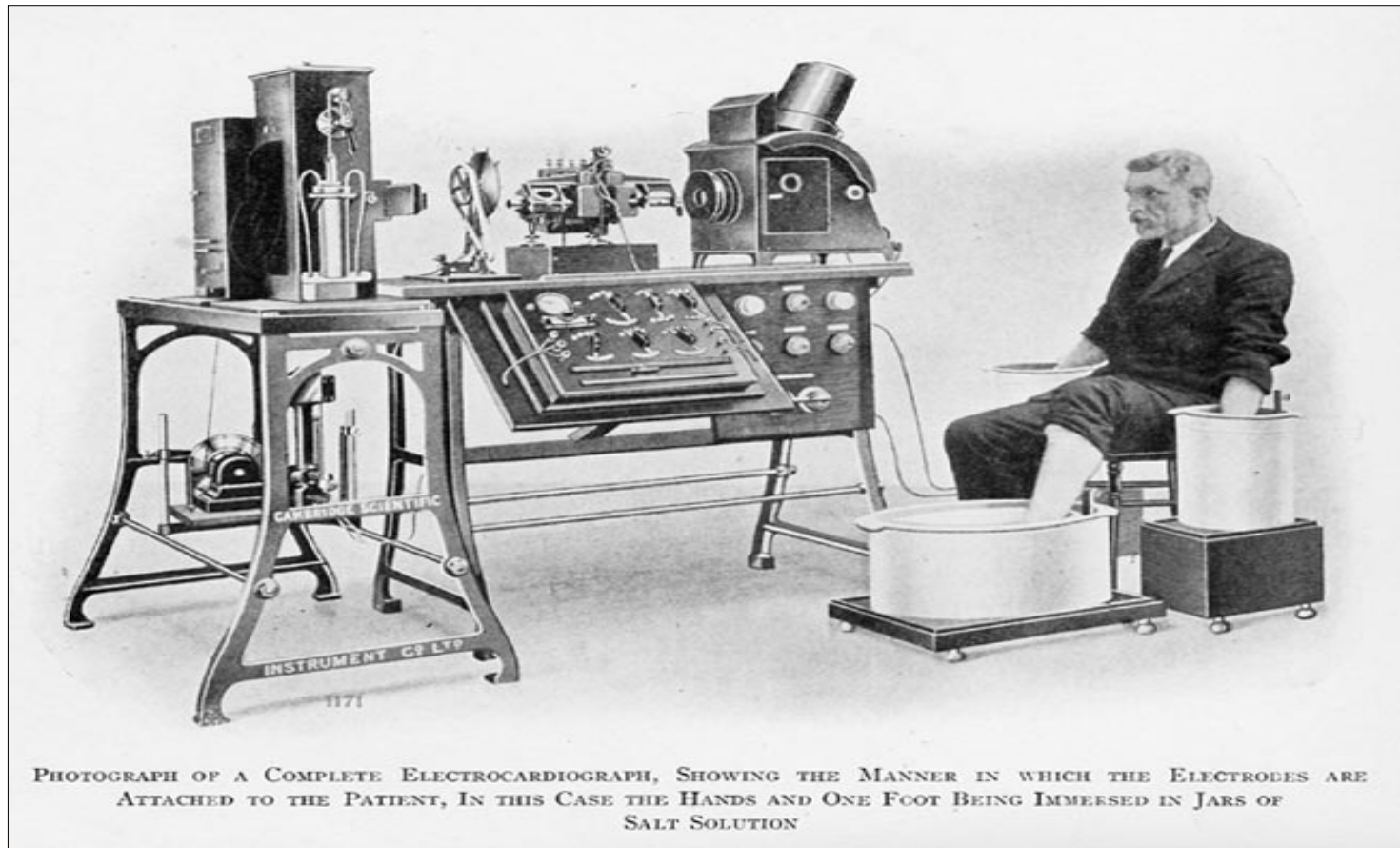


Sally's Personal History

1960	Age 13, decided I wanted to be a PE Teacher
1969	UC Berkeley - before Title IX
1970	Volunteer in Viet Nam during the War
1972-1975	California Physical Education Teacher
1974	Lost a student "on my watch"
1976	Co-Founded Fleet Feet Sport
1990	Wrote First Book on Heart Rate Training
1993	Founded: Heart Zones, Inc.
2013	Transformed the Company into a Technology Company with NPE Engineering & Stillwater School District
2015	First Heart Zones PE Certification-Westonka School District



The Past



An early commercial ECG device circa 1911





The Start of Wearables

<https://www.youtube.com/watch?v=qbk-Bo3k9KQ>



The First Wearable: Finnish Olympic committee contracted an Oulu University in 1977 to provide them with portable heart rate to train Nordic skiers for the Olympics. “TEchnopolis” grew out of this and Polar spun off in 1982



Where Did the Formula Come From?

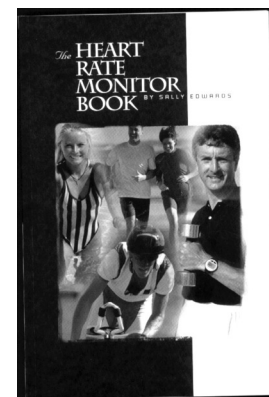
Maximum Heart Rate Age Adjusted Formula
 $220 \text{ Minus Age} = \text{Maximum Heart Rate}$

Sally Edwards Calculation Example:

Tested Max = 195 bpm

$220 - 68 \text{ years} = \underline{152 \text{ bpm}}$

43 BPM ERROR



Maximum heart rate is based on a formula that uses an *average* not individual maximum heart rate

<http://heartzones.com/blog/2011/02/25/remove-max-heart-rate-formulas-from-the-text-books-heart-zones-founder-says-enoughs-enough/>





Myth #1. Formulas for Fitness Work

Bill Haskell, MD



<http://www.thefactsaboutfitness.com/research/max.htm>



The Formula is Useless

GELLISH, RONALD L.; GOSLIN, BRIAN R.; OLSON, RONALD E.; McDONALD, AUDRY; RUSSI, GARY D.; MOUDGIL, VIRINDER K. Longitudinal Modeling of the Relationship between Age and Maximal Heart Rate Medicine & Science in Sports & Exercise. 39(5):822-829, May 2007.

Thus, although the HR max-prediction model of 220 - age has become well established in the medical literature and is used widely in clinical and fitness settings, its validity is uncertain.

<http://www.ncbi.nlm.nih.gov/pubmed/17468581>





Using Max Heart Rate for Kids

Maximum heart rate for children: **The 220-age equation does not predict maximum heart rate in children and adolescents.**

<http://www.ncbi.nlm.nih.gov/pubmed/21569015>
Dev Med Child Neurol. 2011 Sep;53(9):861-4. doi:
10.1111/j.1469-8749.2011.03989.x. Epub 2011 May 13.

<http://www.ncbi.nlm.nih.gov/pubmed/21739069>





What Do We Use to Measure?

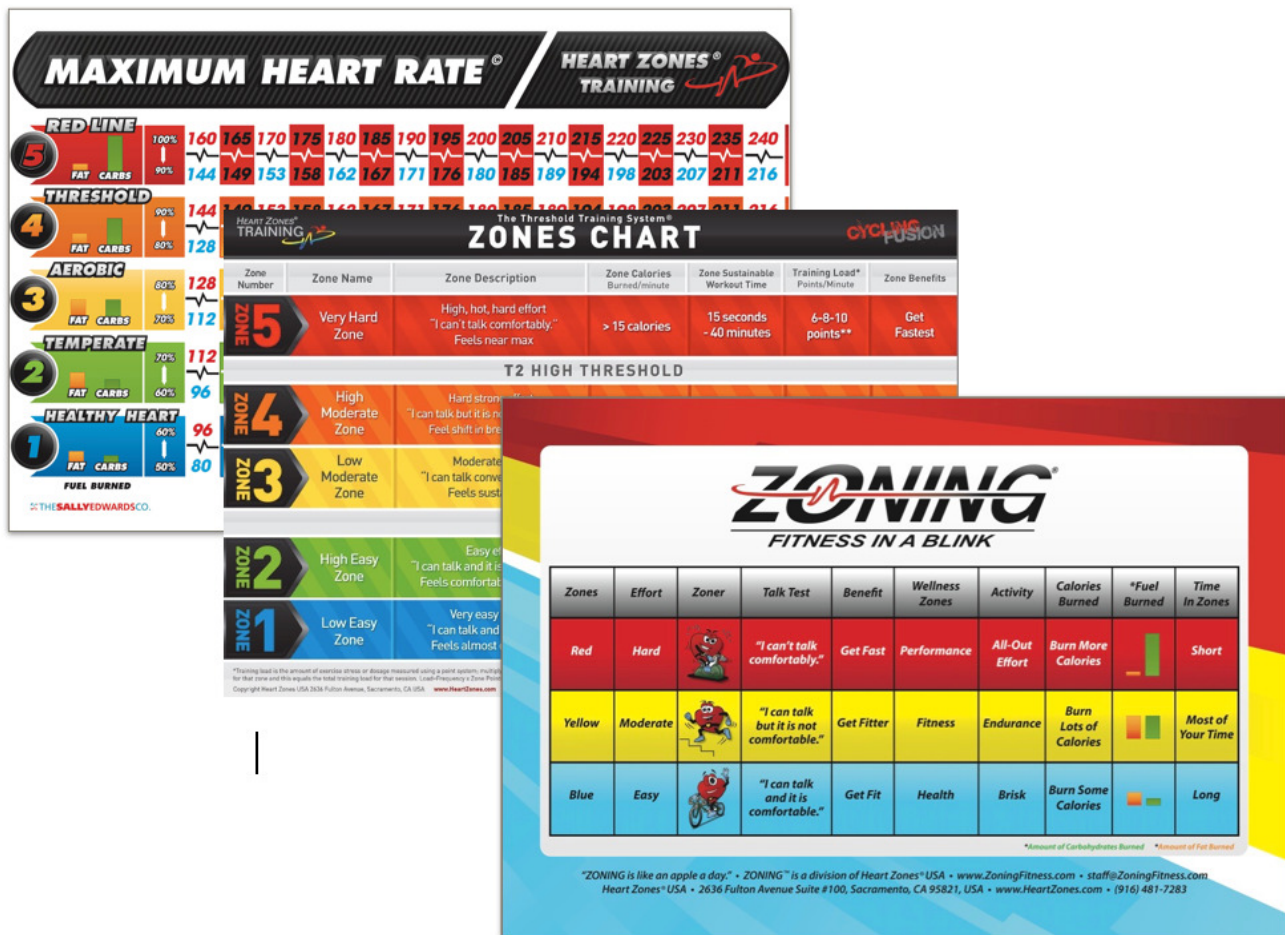
Assess Each Student- Automated

- **Field Tests for Peak Heart Rate**
- **Field Tests for Threshold Heart Rate**



Heart Zones PE Certification: The Science of Heart Rate and Step Tracking Programs

ZONING and Threshold Training

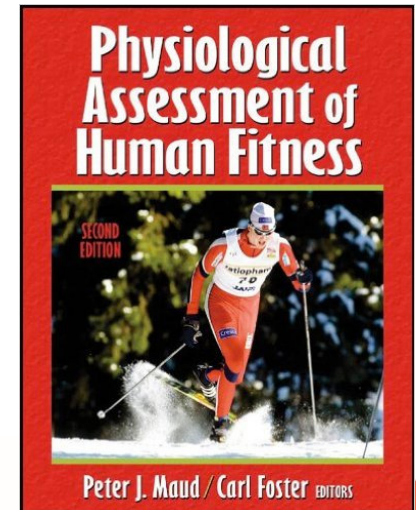
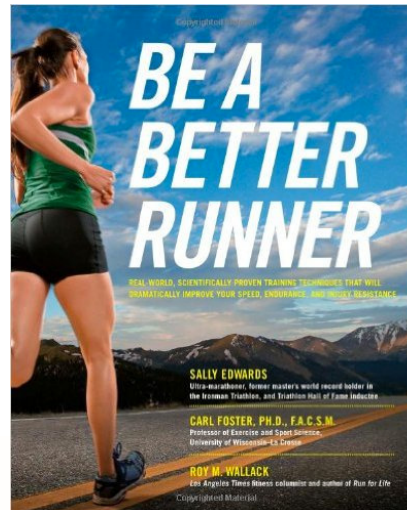


HEARTZONES



Myths

- Exercise Science is Riddled with Myths
- The Power of Science-based Programs
- Carl Foster, Ph.D. Story

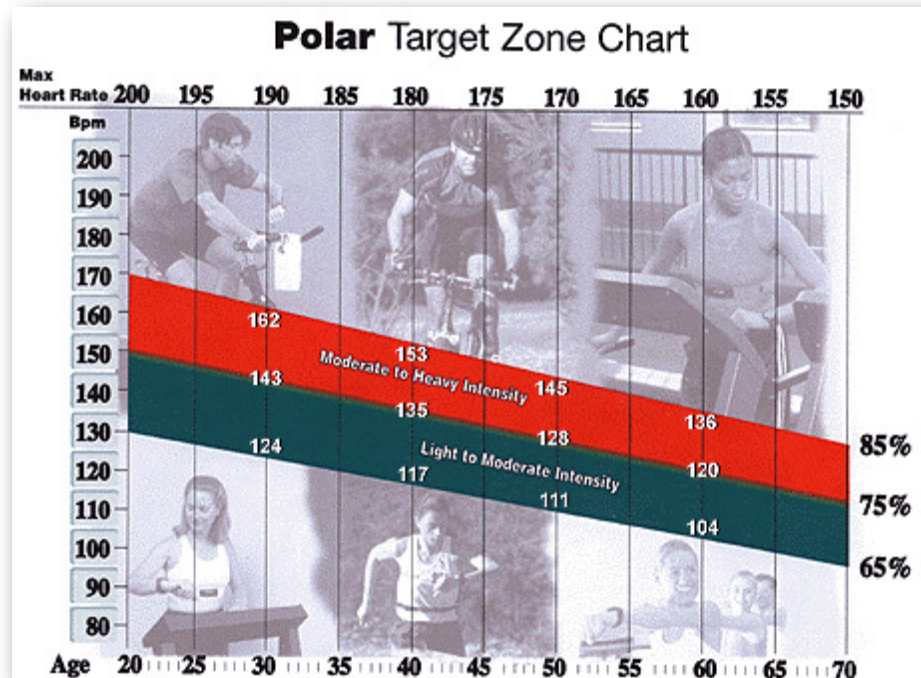




The Myth of the Target Zone

Target Heart Rate



Your Age	Target Range HR 55-65%	Max Heart Rate
20	110-130 bpm	200 bpm
25	107-126 bpm	195 bpm
30	104-123 bpm	190 bpm
35	101-120 bpm	185 bpm
40	99-117 bpm	180 bpm
45	96-113 bpm	175 bpm
50	93-110 bpm	170 bpm
55	91-107 bpm	165 bpm
60	88-104 bpm	160 bpm





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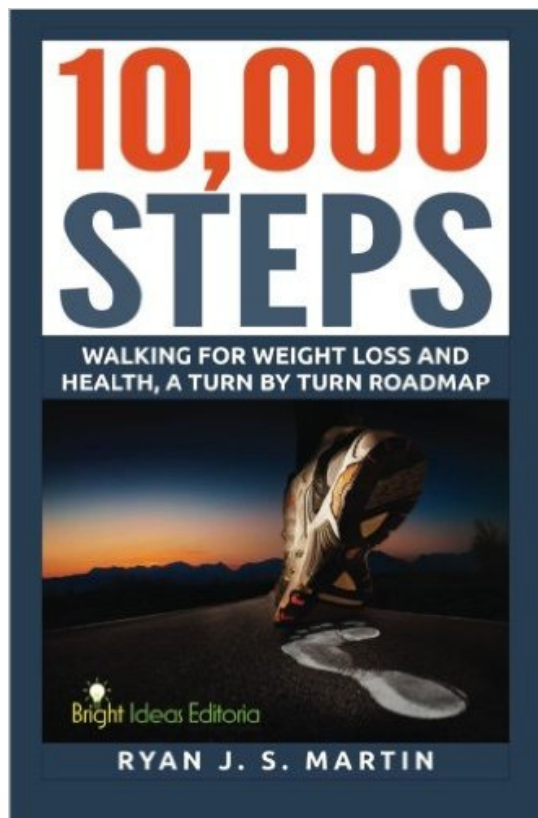
Multiple Zones/Multiple Benefits

<div>HEART ZONES[®] TRAINING </div> <div>The Threshold Training System[®]</div> <div>ZONES CHART</div> <div></div>						
Zone Number	Zone Name	Zone Description	Zone Calories Burned/minute	Zone Sustainable Workout Time	Training Load* Points/Minute	Zone Benefits
ZONE 5	Very Hard Zone	High, hot, hard effort "I can't talk comfortably." Feels near max	> 15 calories	15 seconds - 40 minutes	6-8-10 points**	Get Fastest
T2 HIGH THRESHOLD						
ZONE 4	High Moderate Zone	Hard strong effort "I can talk but it is not comfortable." Feel shift in breathing rate	10-14 calories	40 minutes - 2 hours	4 points	Get Fast
ZONE 3	Low Moderate Zone	Moderate effort "I can talk conversationally." Feels sustainable	7-9 calories	1-3 hours	3 points	Get Fitter
T1 LOW THRESHOLD						
ZONE 2	High Easy Zone	Easy effort "I can talk and it is comfortable." Feels comfortable-enjoyable	4-6 calories	Very, very long time - possibly "all day"	2 points	Get Fit
ZONE 1	Low Easy Zone	Very easy effort "I can talk and it is easy." Feels almost effortless	1-3 calories	Long-lasting	1 points	Get Healthy
<small>*Training load is the amount of exercise stress or dosage measured using a point system; multiply the number of minutes in the zone by the training load points for that zone and this equals the total training load for that session. Load-Frequency x Zone Points x Minutes = Heart Zones Training Points or HZT Points. Copyright Heart Zones USA 2636 Fulton Avenue, Sacramento, CA USA www.HeartZones.com www.cyclingfusion.com</small>						
<small>** 4 Points for the bottom of Zone 5, 8 Points for the middle of Zone 5, 10 Points for the top of Zone 5.</small>						



Myth #3 10,000 Steps*

Back in the early 1960s in Japan a professor at the Kyushu University of Health and Welfare, Dr. Yoshiro Hatano



10,000 steps equals roughly about 5 miles

*Revisiting How Many Steps are Enough? July 2008 - Volume 40 - Issue 7 - pp S537-S543
doi: 10.1249/MSS.0b013e31817c7133

<http://www.ncbi.nlm.nih.gov/pubmed/18562971>





The Science of Heart Rate

- Zones Training: No Target Heart Rate Zone
- Types of Zones: Anchor Points of Max or Threshold
- Biochemistry: Metabolic Rates & Fuel Types
- Physiology: Cardiac Output/Heat/Environment Stressors
- Anatomy: Heart size - Hummingbirds and Elephants

What's Your Maximum Heart Rate?

<http://heartzones.com/blog/2009/04/14/what-is-your-maximum-heart-rate-hummingbird-or-whale/>





Thank You



Sally Edwards

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