



Exercise Rx - Revisiting the Basics & Going Beyond

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Outline and Goals

1. Importance of cardiorespiratory fitness
2. Components of exercise prescription. Emphasis on volume and intensity
3. Markers of intensity and setting intensity
4. Correcting “bad” practices
5. Pushing patients to the next level



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ACSM's
**Clinical Exercise
Physiology**

Second Edition

**Walter R. Thompson
Cemal Ozemek**

 Wolters Kluwer



ACSM'S
**Guidelines for
Exercise Testing
and Prescription**

Eleventh Edition

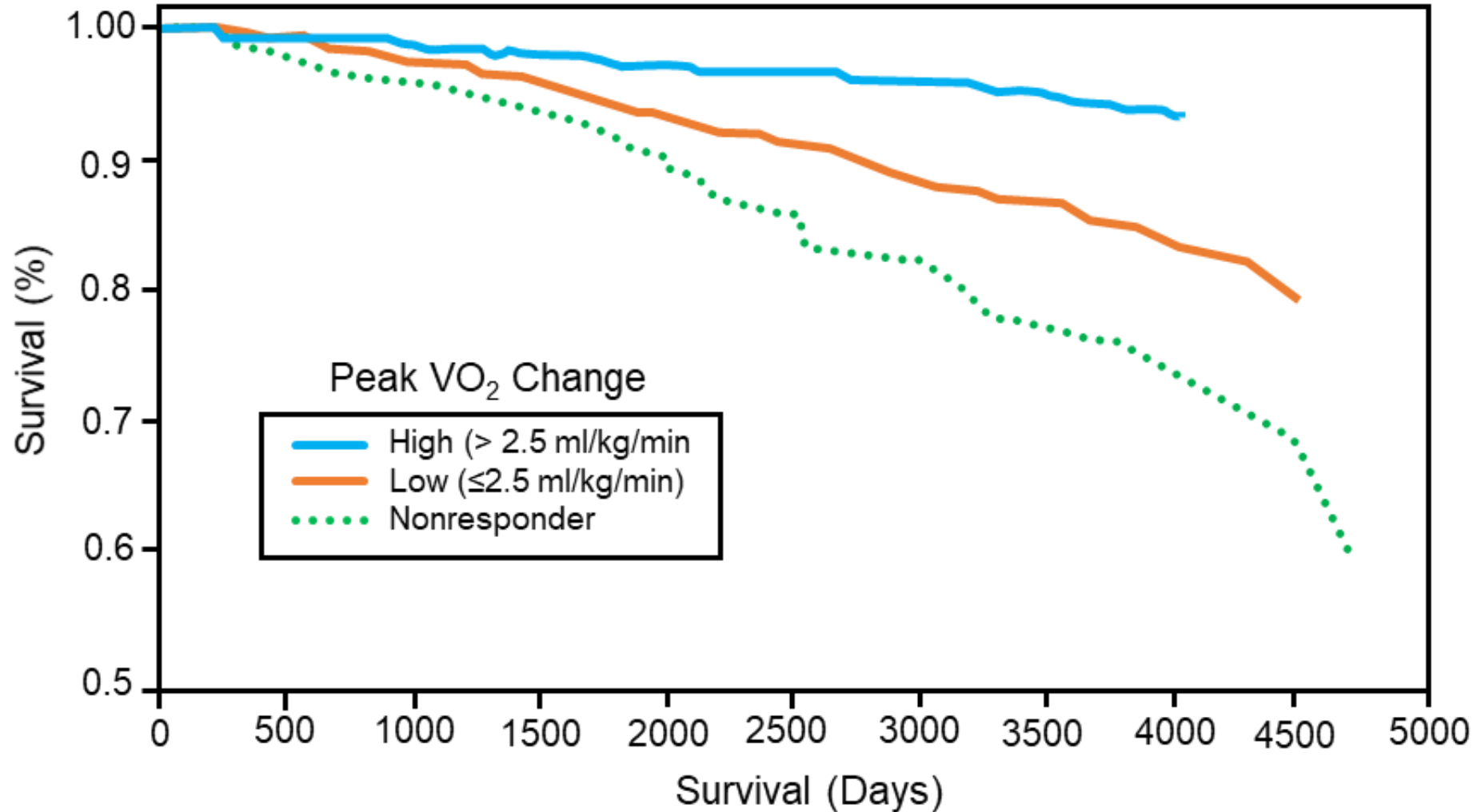
 Wolters Kluwer

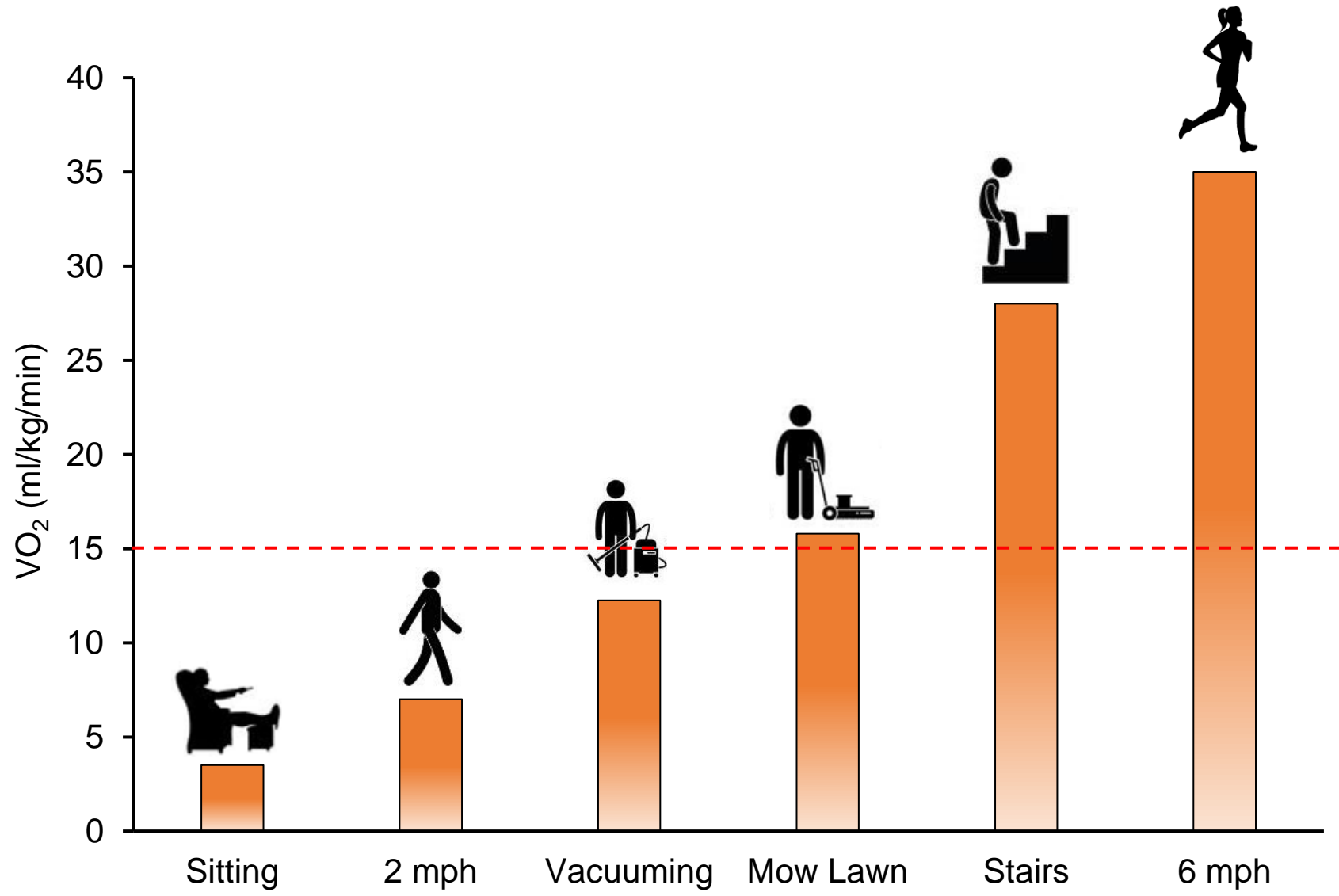




Significance of Improving CRF

1,171 CHD patients referred to phase II CR & completed 36 sessions





Frame of Mind



Exercise Prescription

Volume

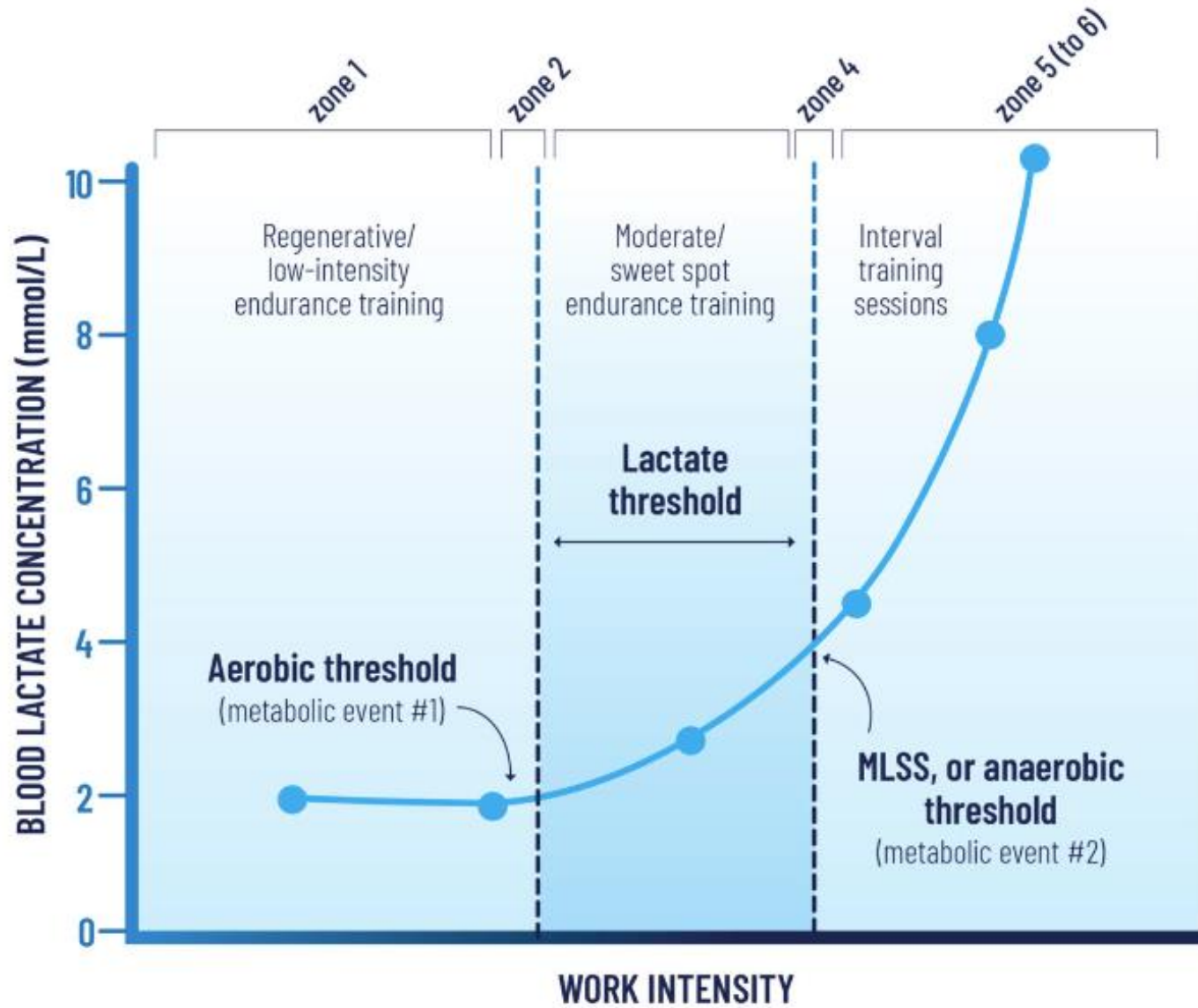
Frequency *Most days of wk*

Intensity *40-80% HRR*

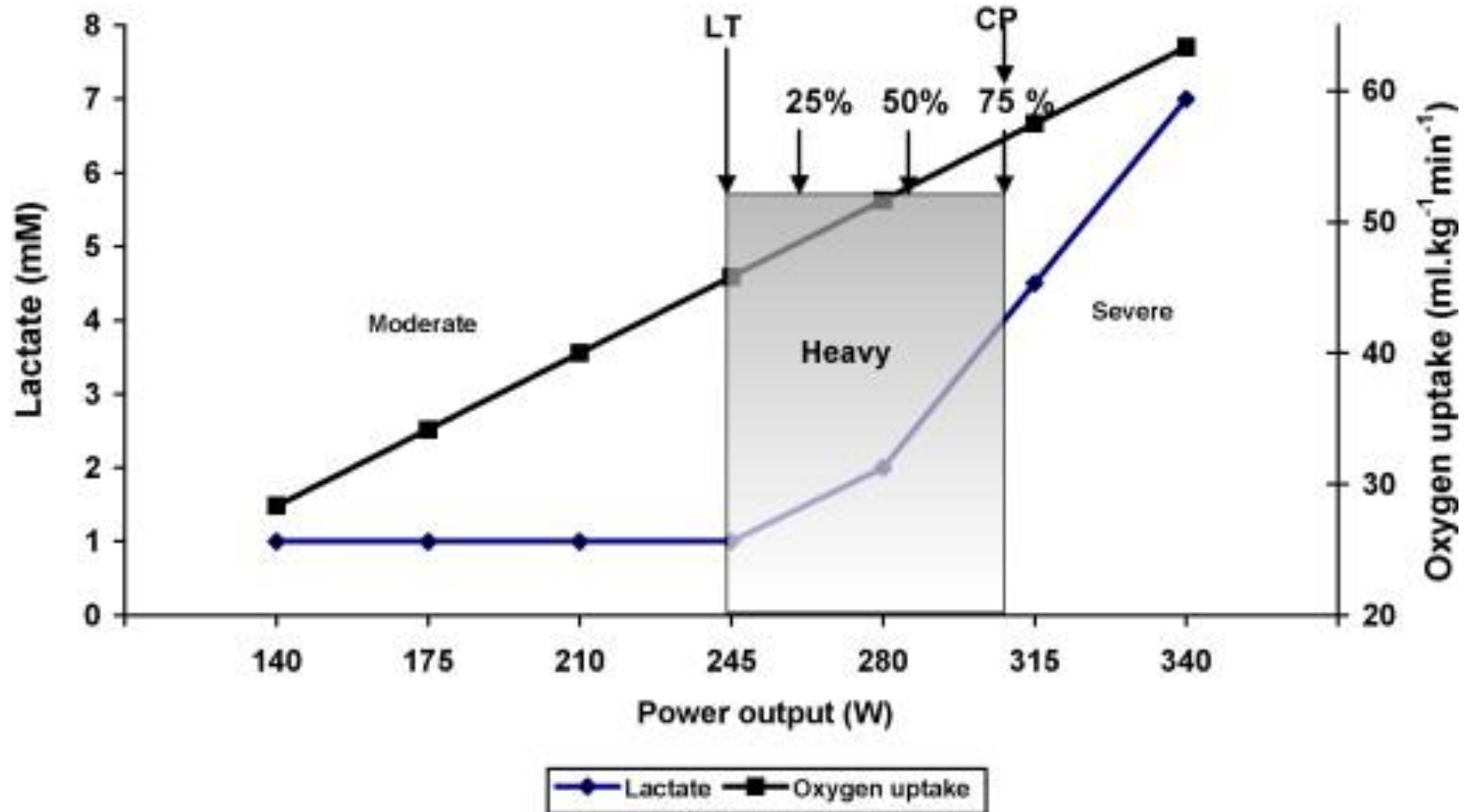
Time *20 – 60 min/sess*

Type *Rhythmic*

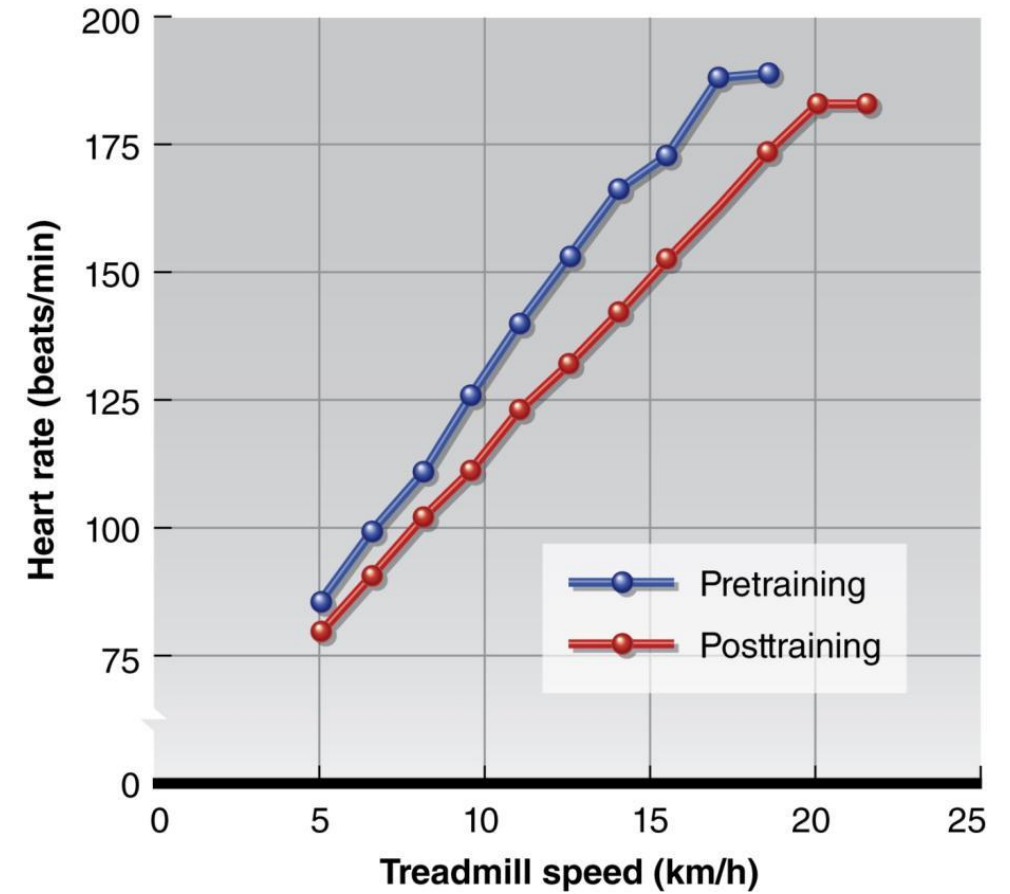
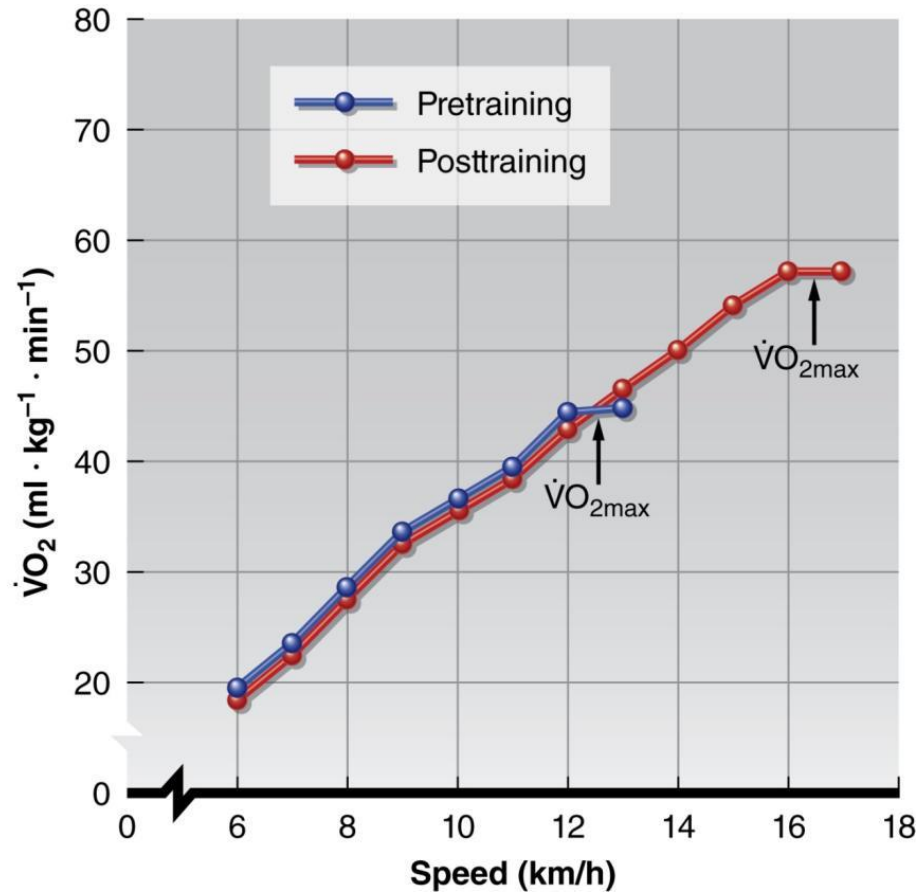
Intensity



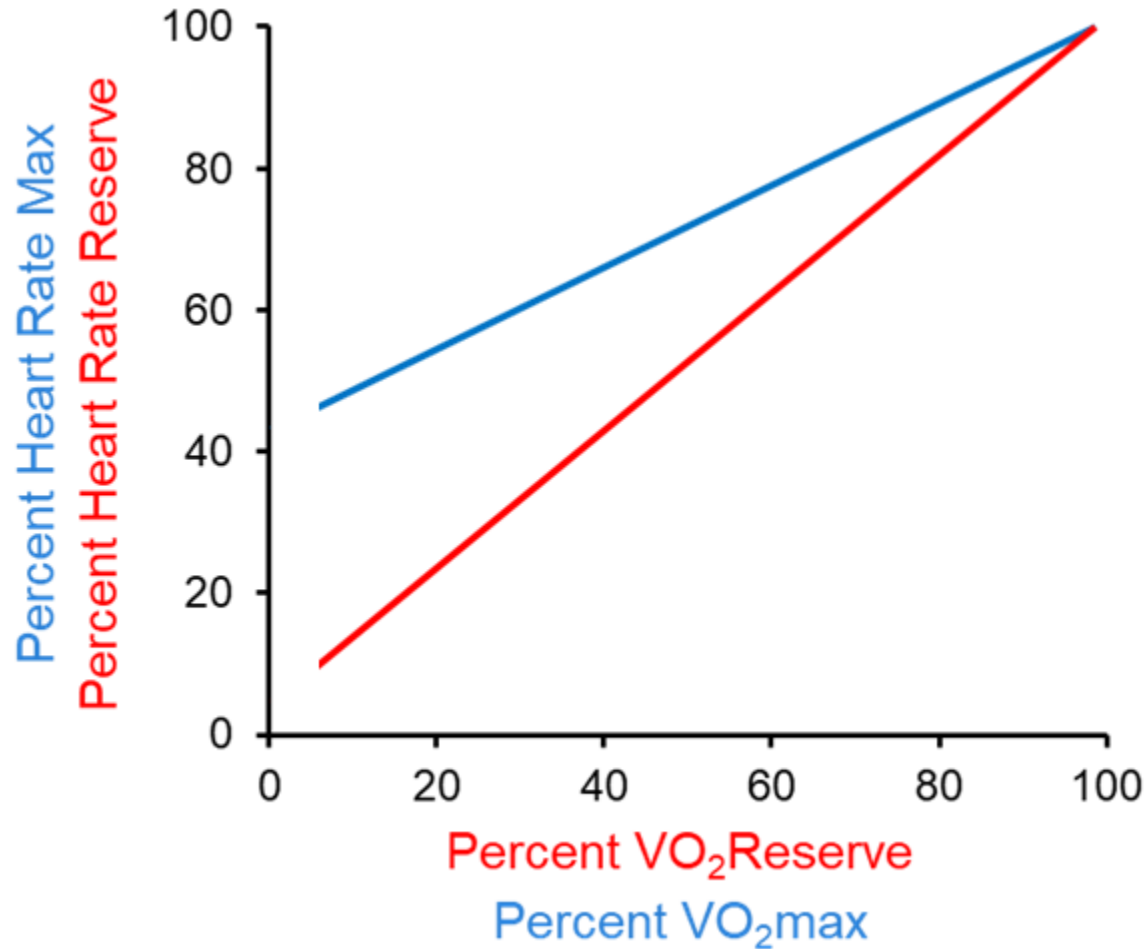
Prescribing Intensity



Prescribing Intensity



Prescribing Intensity



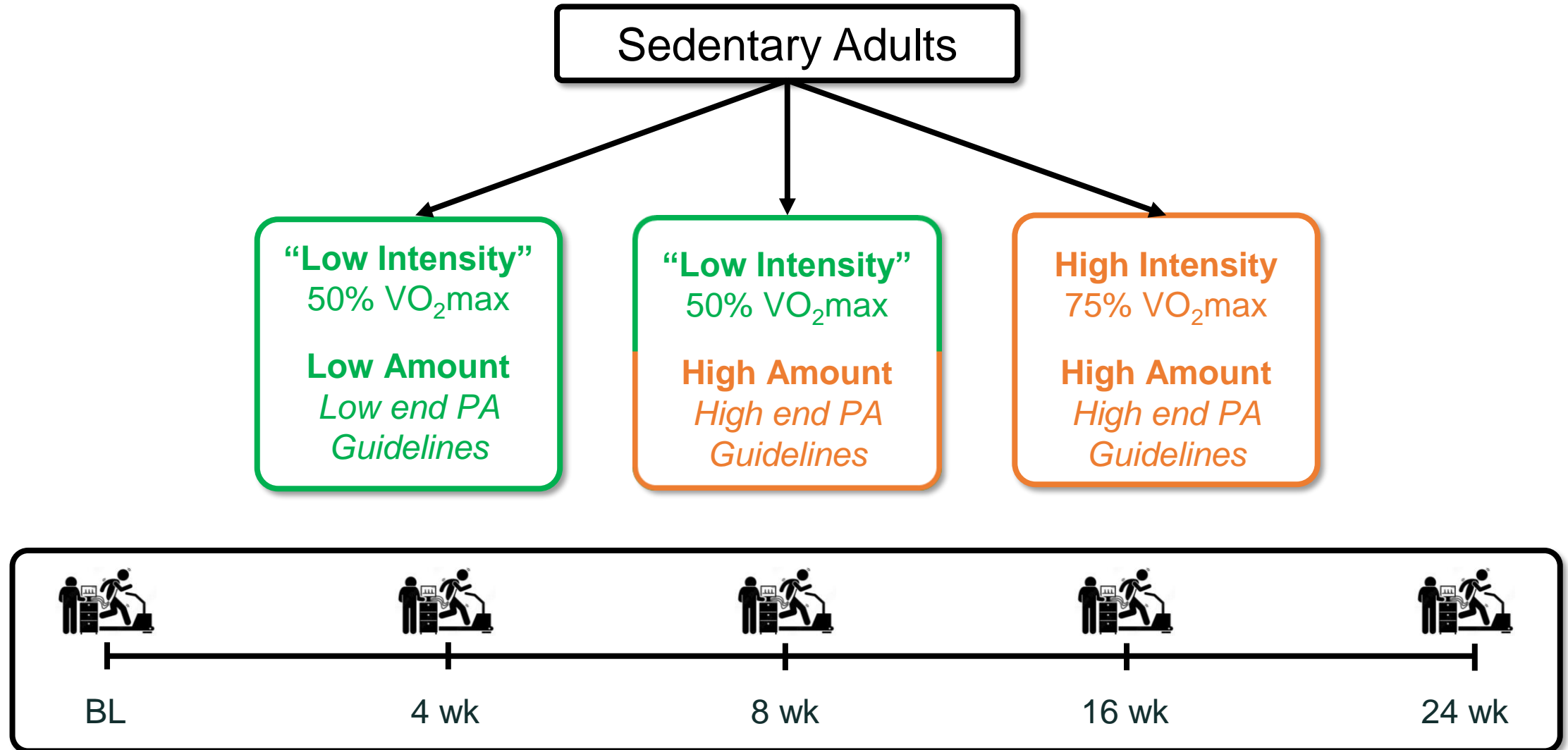
Reserve Method

$$[(\text{Max} - \text{Rest}) \cdot \%] + \text{Rest}$$

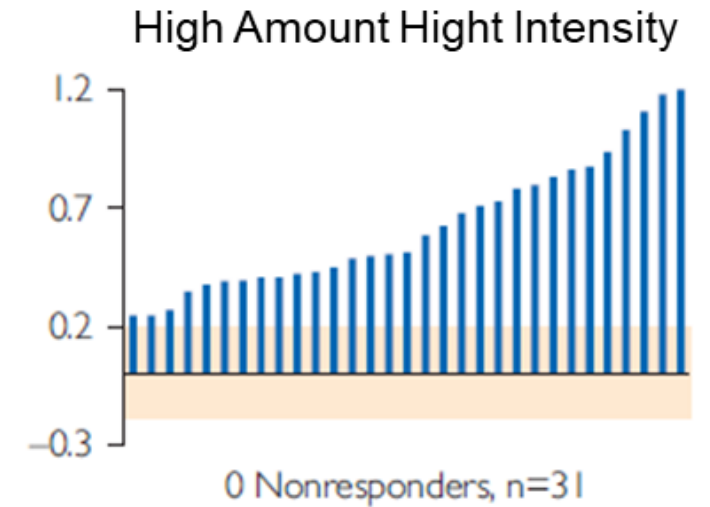
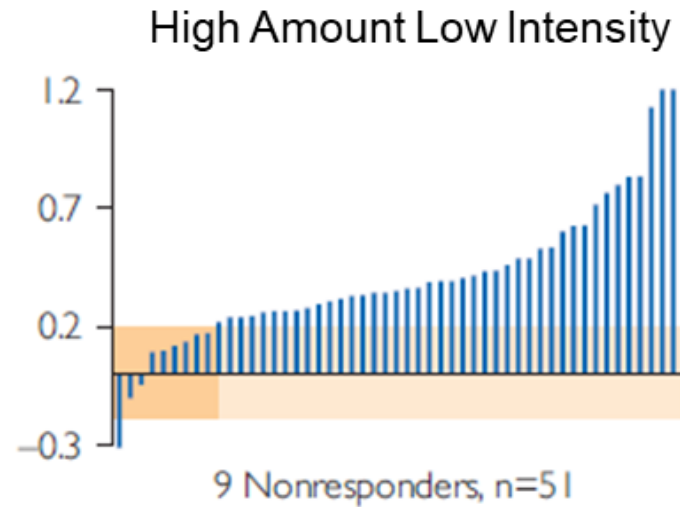
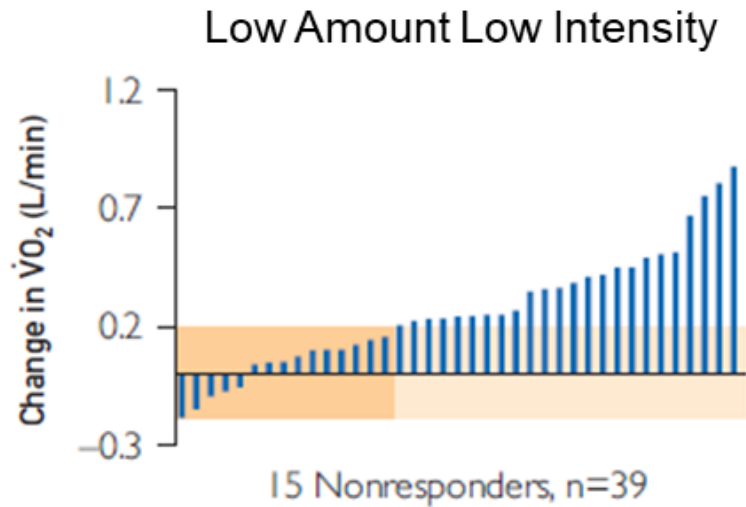
Intensity

Intensity	%VO ₂ max	%HRmax	%VO ₂ R or %HRR	RPE (6-20)
Very light	<37	<57	<30	<9
Light	37-45	57-63	30-39	9-11
Moderate	46-63	64-76	40-59	12-13
Vigorous	64-90	77-95	60-89	14-17
Near maximal	≥91	≥96	≥90	≥18

Importance of Volume and Intensity

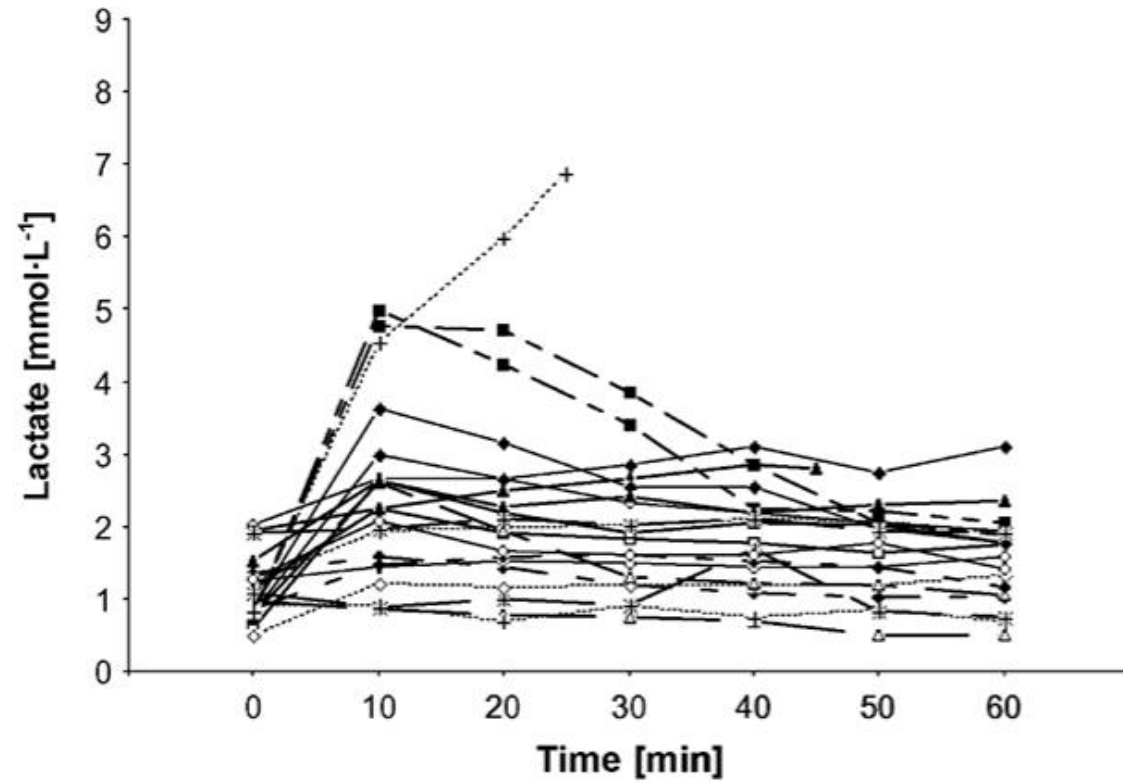


Impact of Volume & Intensity

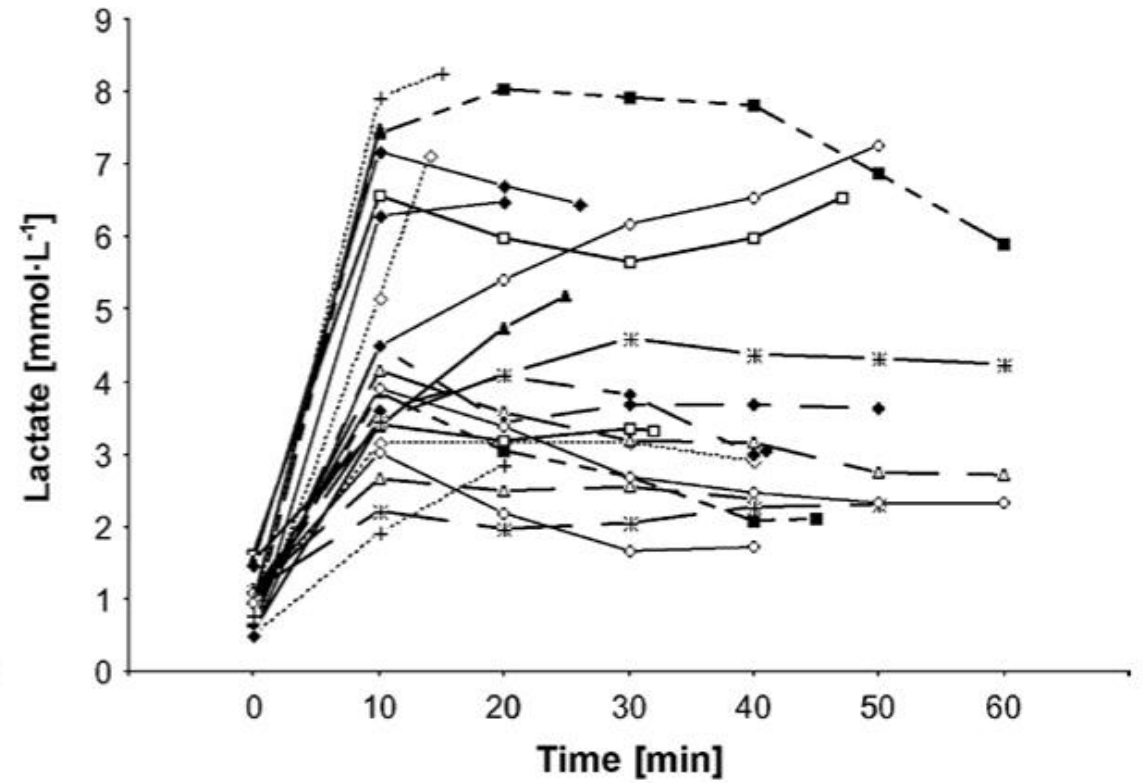


Intensity

60% VO_2max



75% VO_2max



Summary of the Problem

Exercise R_x



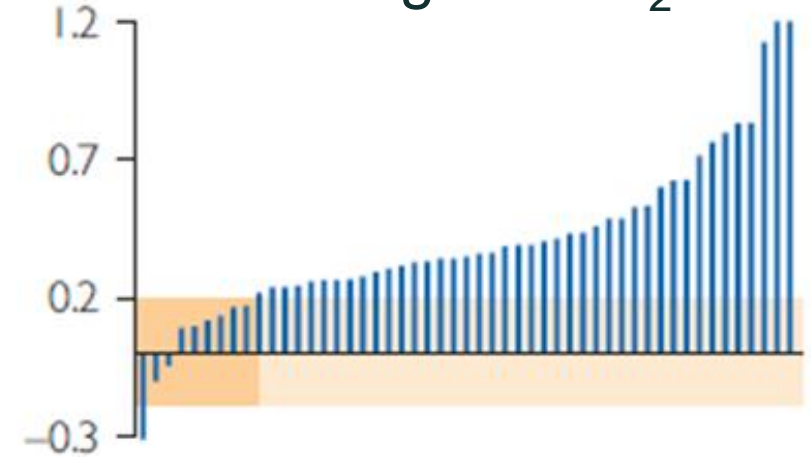
$VO_2 \uparrow$
 $\sim 20\%$

Summary of the Problem

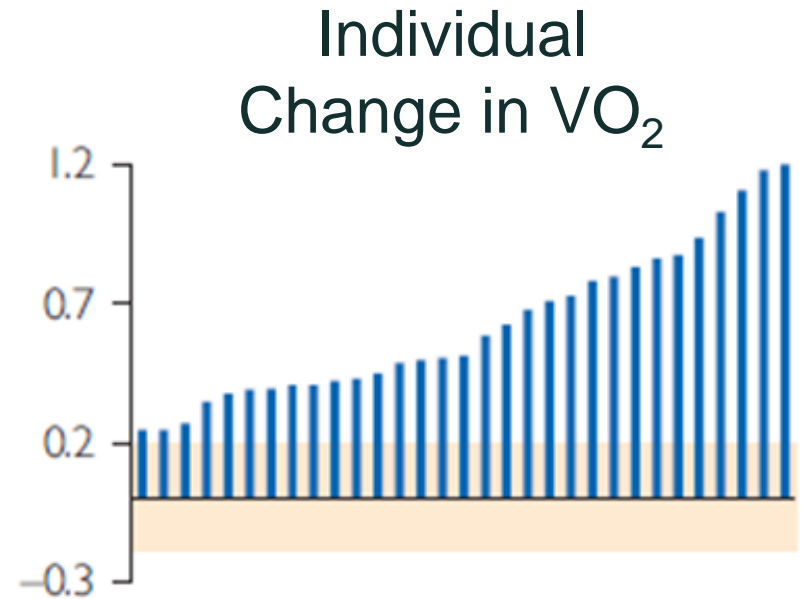
Exercise Rx



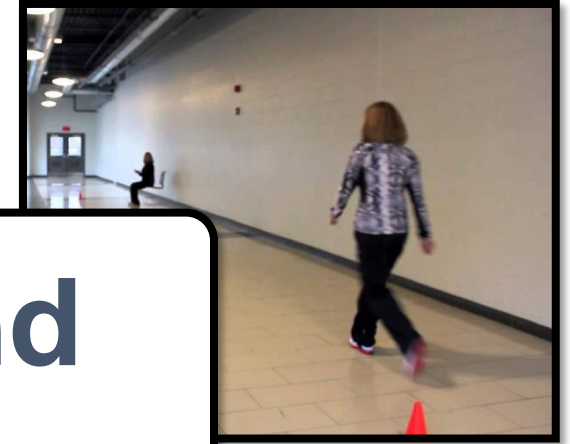
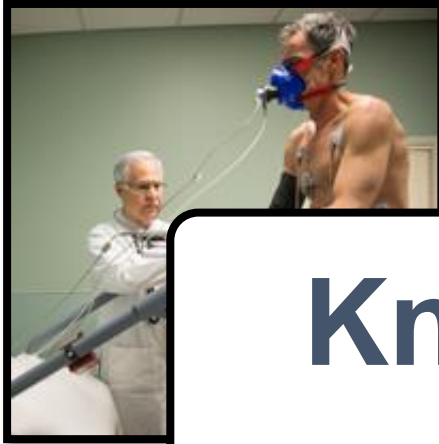
Individual
Change in $\dot{V}O_2$



How We Should Be Thinking



Ex Rx Toolbox

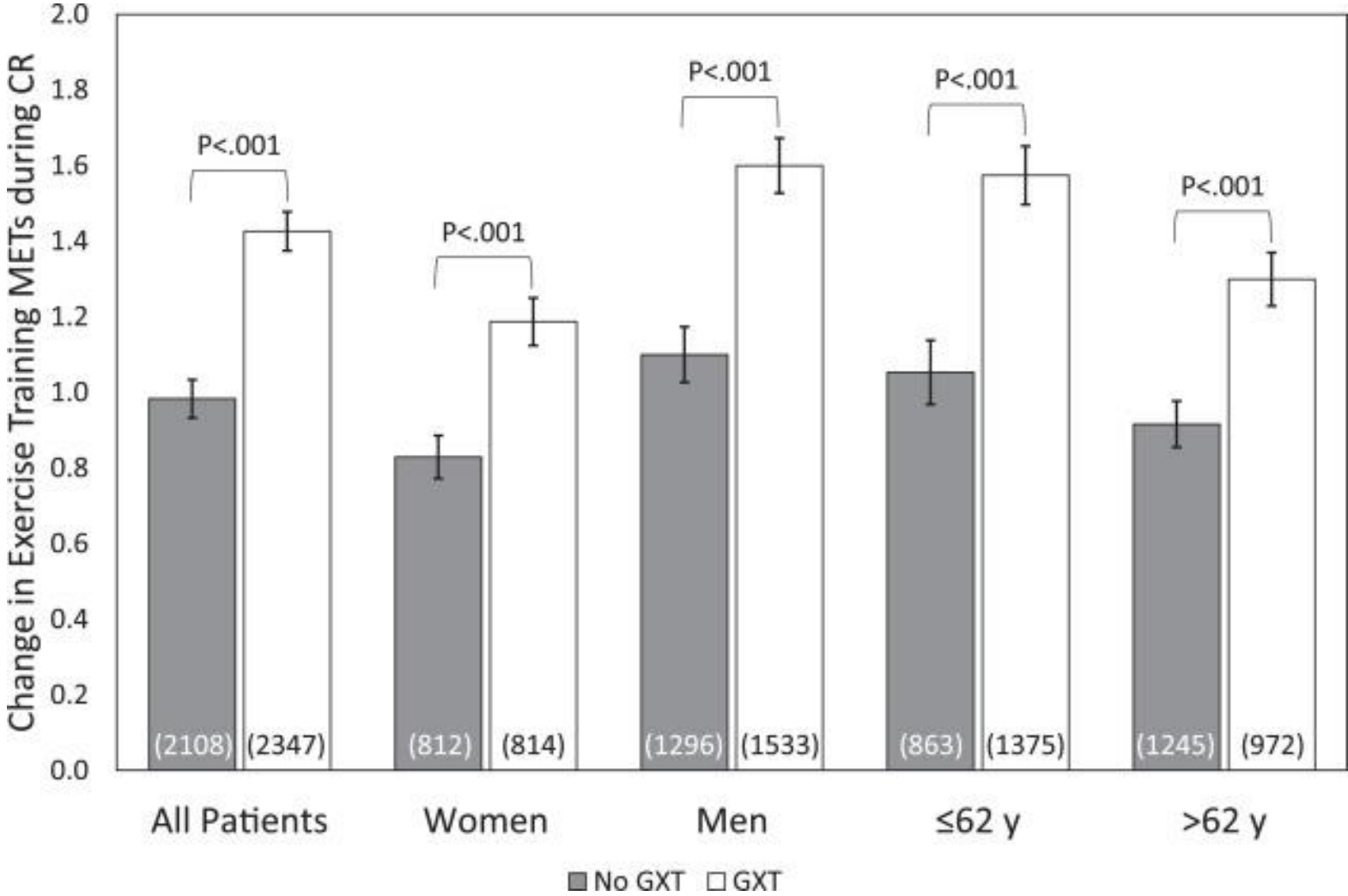


**Know limitations and
adjust accordingly**

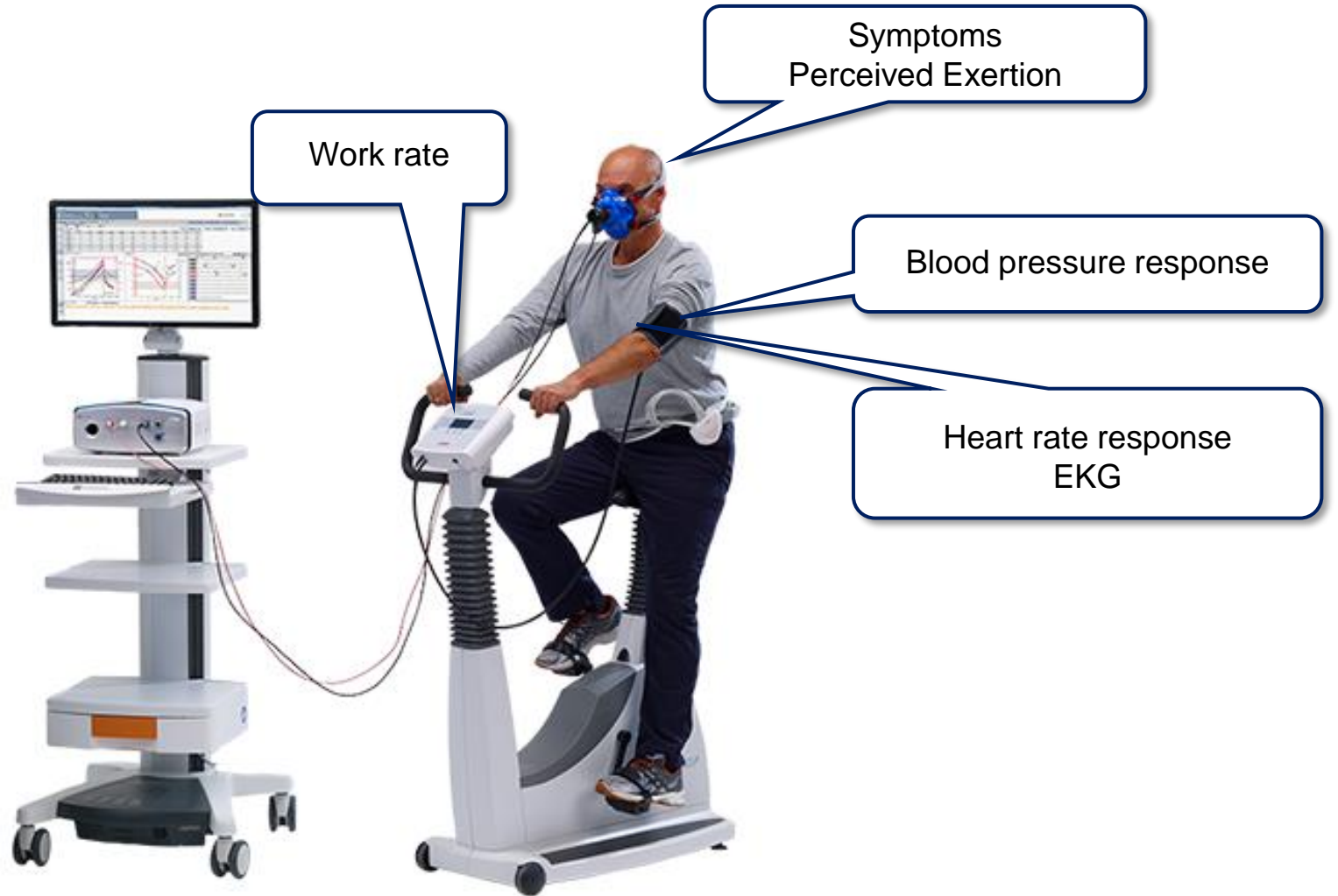
Borg CR10 Scale		Borg CR10 Scale	
rating of perceived exertion		rating of perceived exertion	
0	NOTHING AT ALL	6	NO EXERTION AT ALL
0.5	EXTREME LIGHT	7	EXTREMELY LIGHT
1	VERY LIGHT	8	EXTREMELY LIGHT
2	LIGHT	9	VERY LIGHT
3	MODERATE	10	LIGHT
4	HARD	11	LIGHT
5	HARD	12	SOMEWHAT HARD
6	VERY HARD	13	SOMEWHAT HARD
7	VERY HARD	14	HARD
8	EXTREMELY HARD	15	HARD
9	EXTREMELY HARD	16	VERY HARD
10	MAXIMAL EXERTION	17	VERY HARD
		18	EXTREMELY HARD
		19	EXTREMELY HARD
		20	MAXIMAL EXERTION



Graded Exercise Testing



Graded Exercise Testing



Cardiopulmonary Exercise Testing

VO₂ – O₂ consumption

VCO₂ – CO₂ production

RER– Respiratory
exchange ratio

VE – Ventilation volume

VT – Ventilatory threshold

Work rate

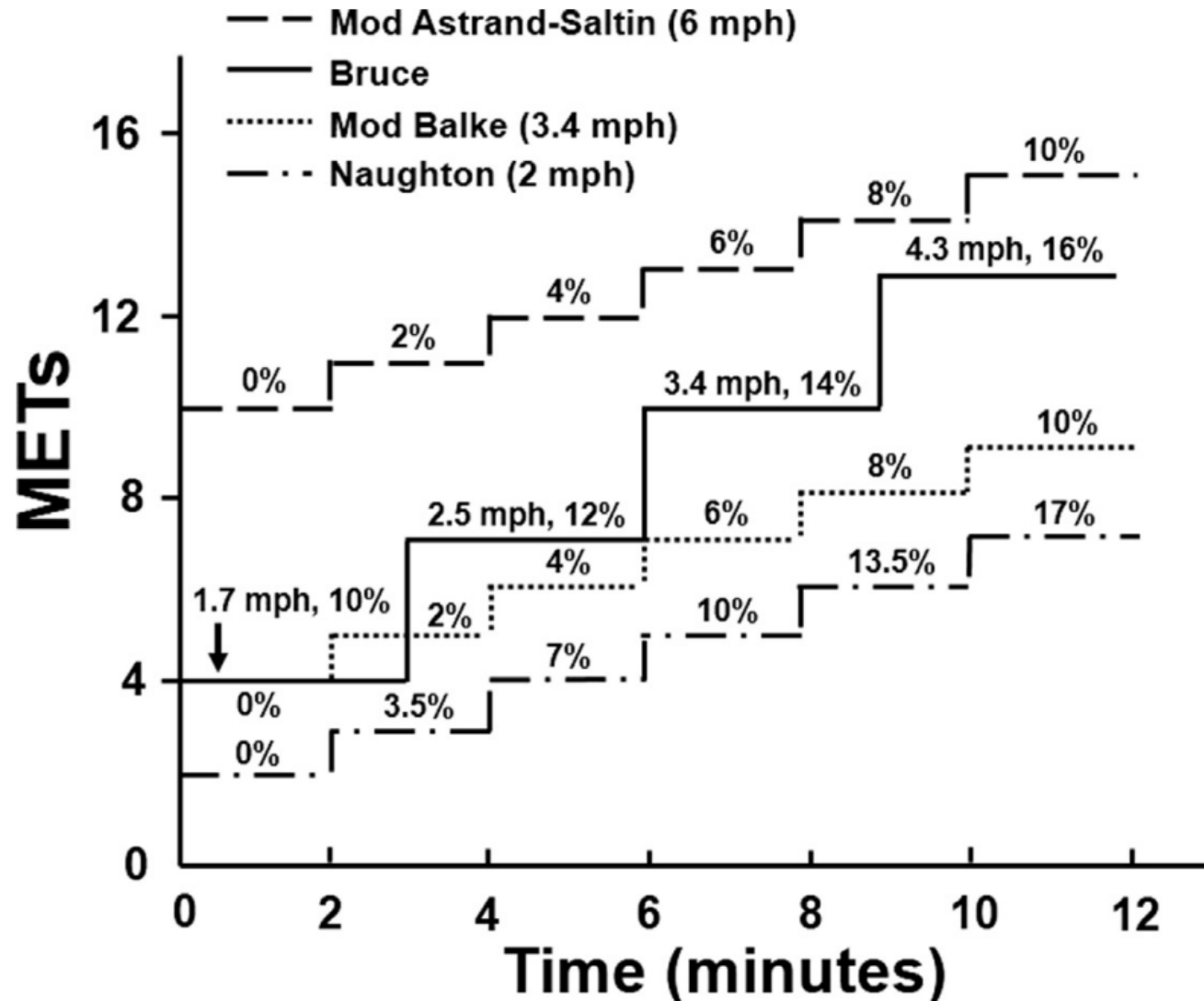
Symptoms
Perceived Exertion

Blood pressure response

Heart rate response
EKG



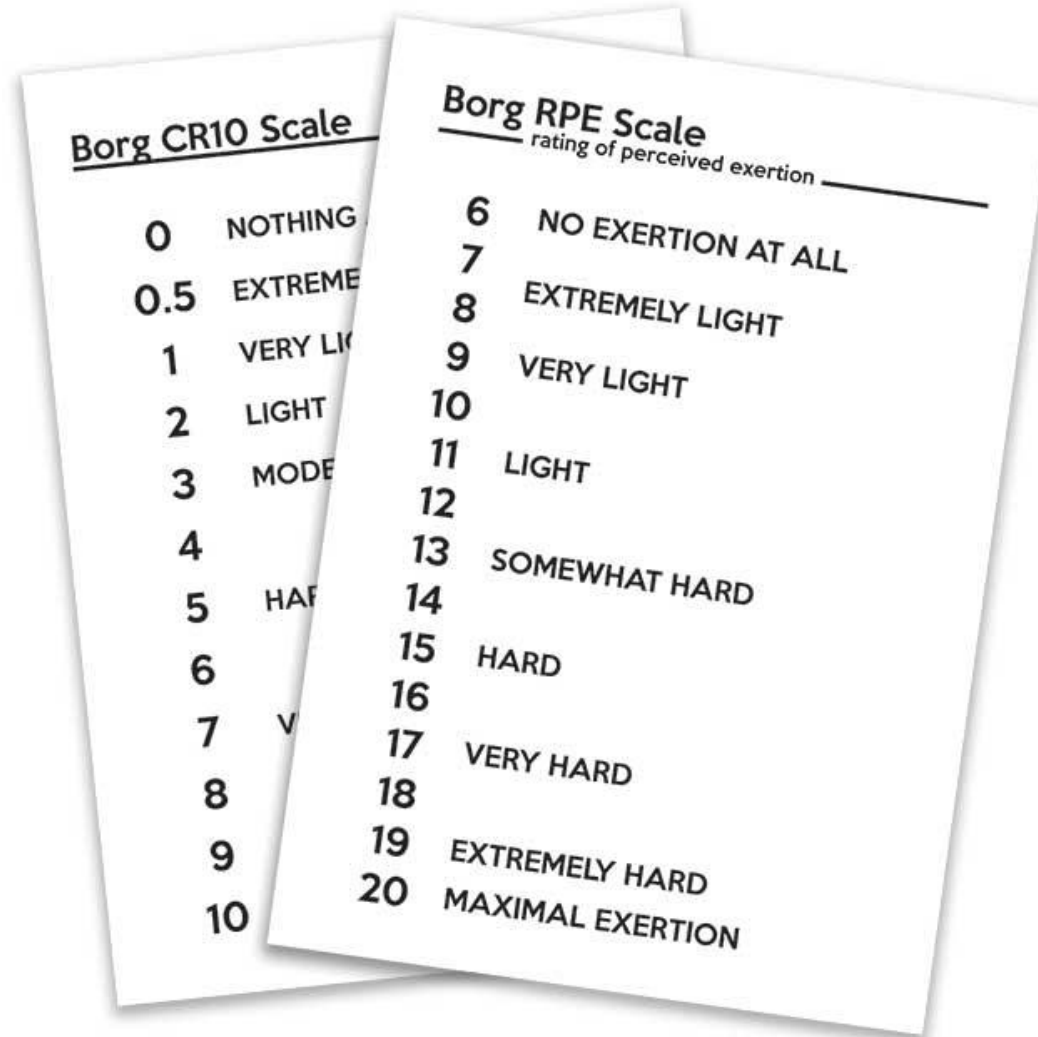
Submaximal Exercise Testing



Individualized Submax Test

1. Pick a brisk speed (RPE = 12-13)
2. Increase grade by 2% every 2-3 minutes
3. Record HR, BP, RPE by the end of each stage
4. Termination criteria
 - Patient request
 - Symptoms
 - Exaggerated BP response (SBP >250 and or DBP >115)
 - Abnormal HR response
 - RPE 15-16 (Hard)
5. Cooldown

Fine Tuning the Prescription



Talk Test

Read a 30-word paragraph (e.g., Pledge of Allegiance)

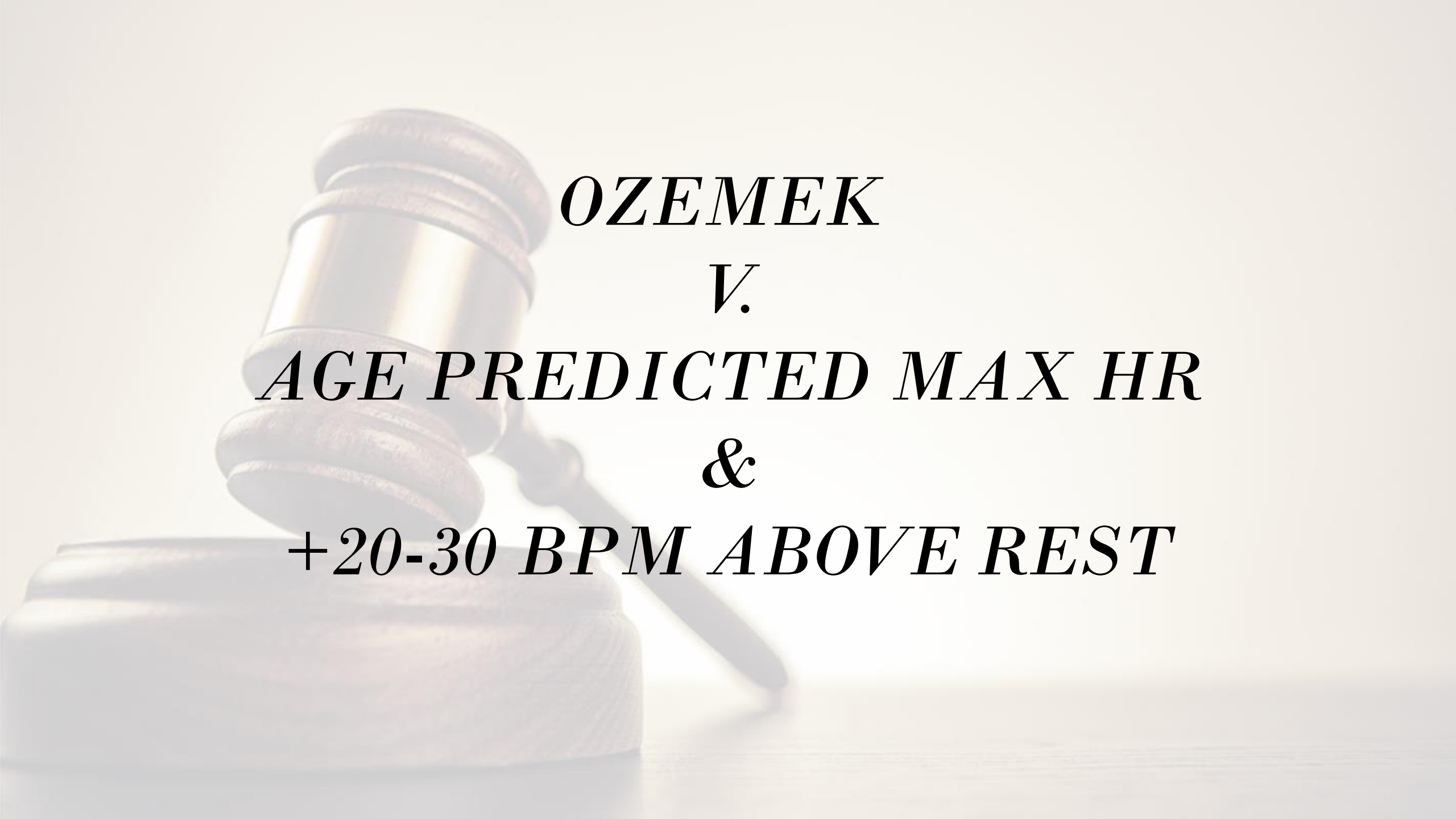
Ask patient, “Can you still speak comfortably?”

“**Yes**” - indicating a positive response = ~**70% HR_{max}**

“**Not sure**” - indicating an equivocal response = ~**77% HR_{max}**

“**No**” - indicating a negative response = ~**84% HR_{max}**

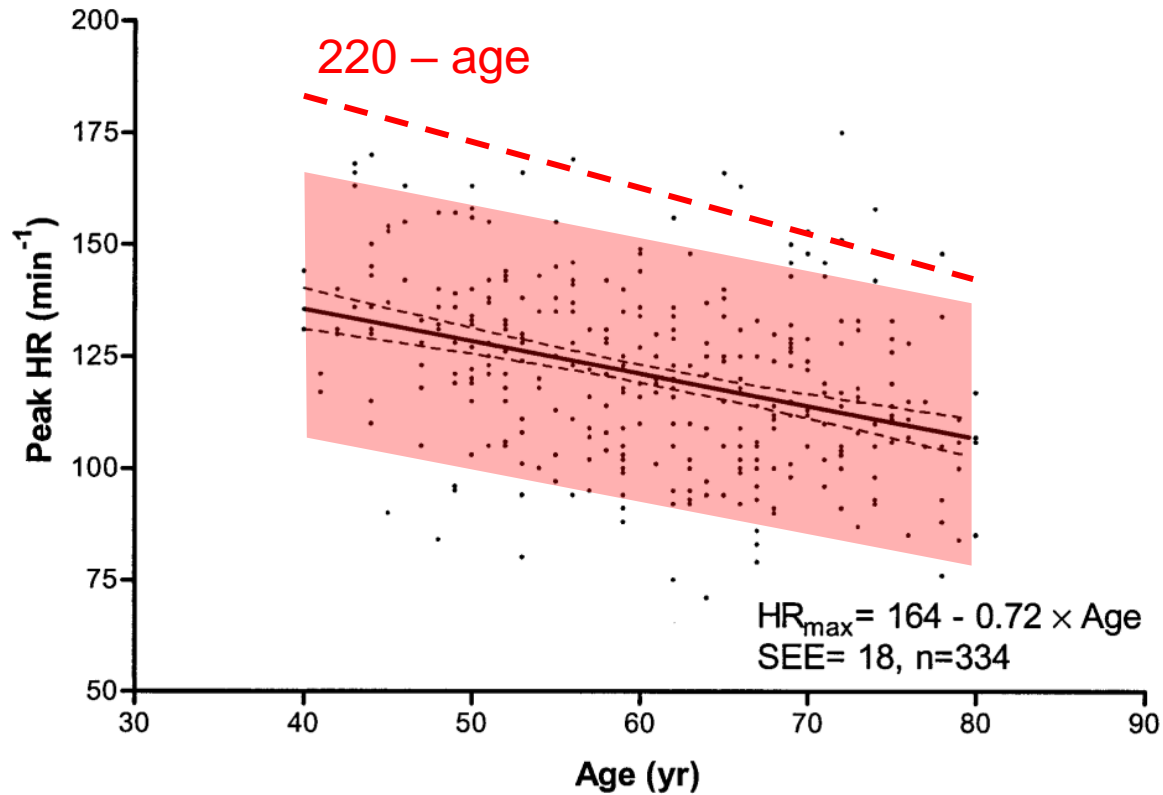
Very Light	Light	Moderate	Vigorous	Near Max
<57%	57-63%	64-76%	77-95%	≥96%



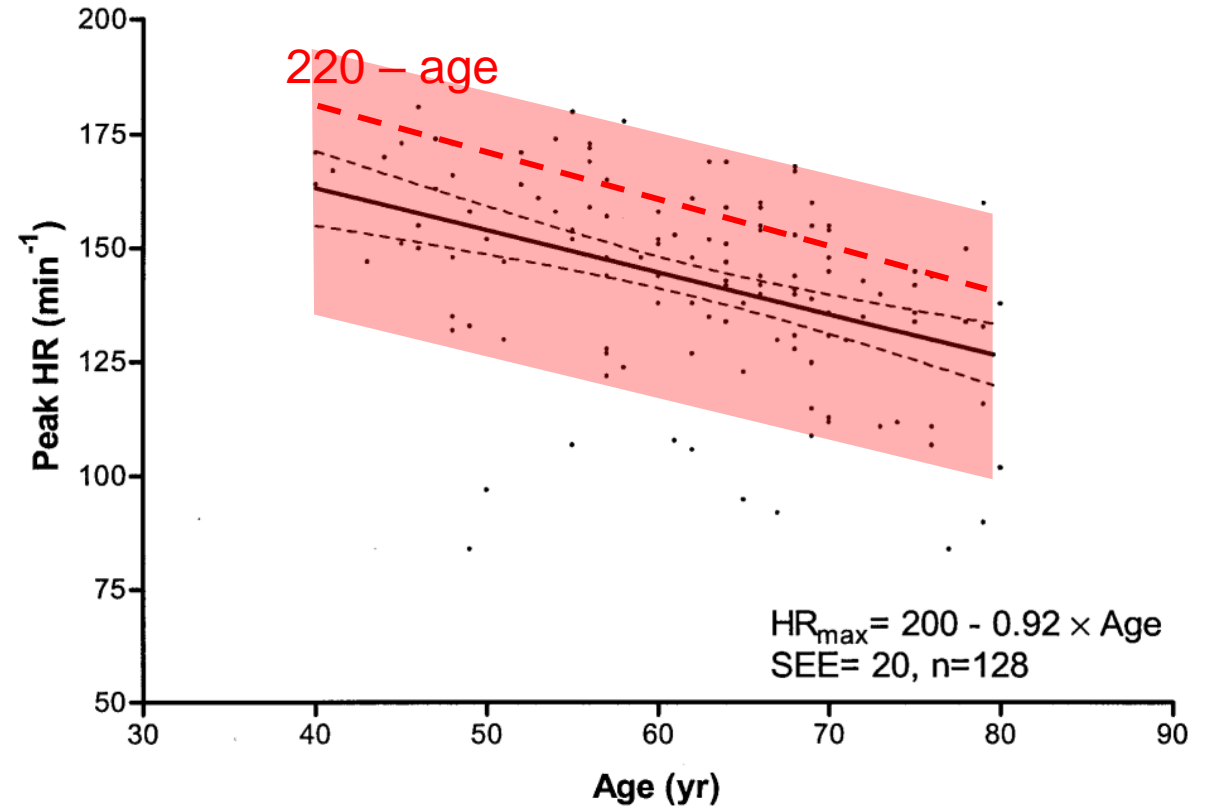
OZEMEK
V.
AGE PREDICTED MAX HR
&
+20-30 BPM ABOVE REST

Age Predicted Maximal HR

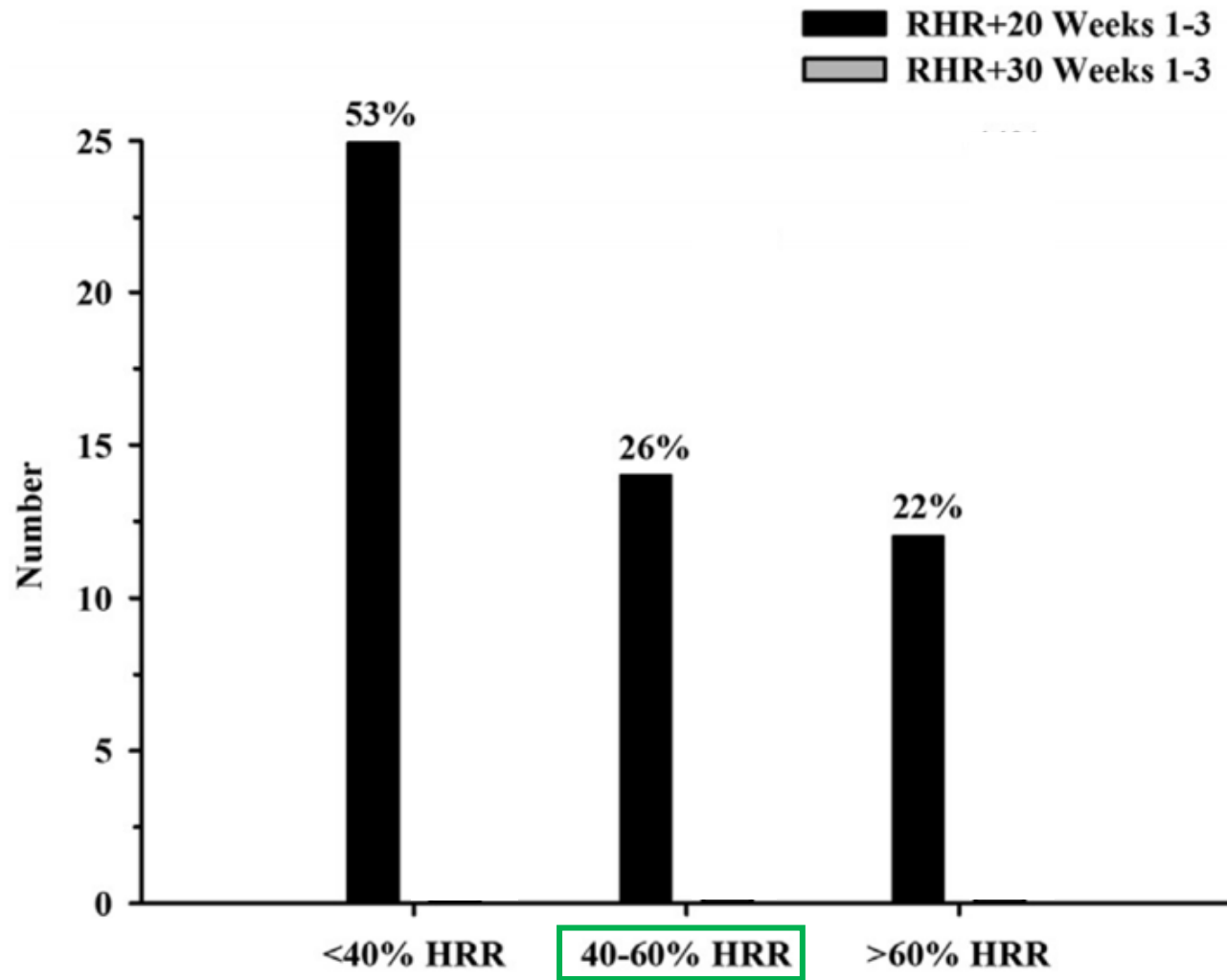
β -blocked



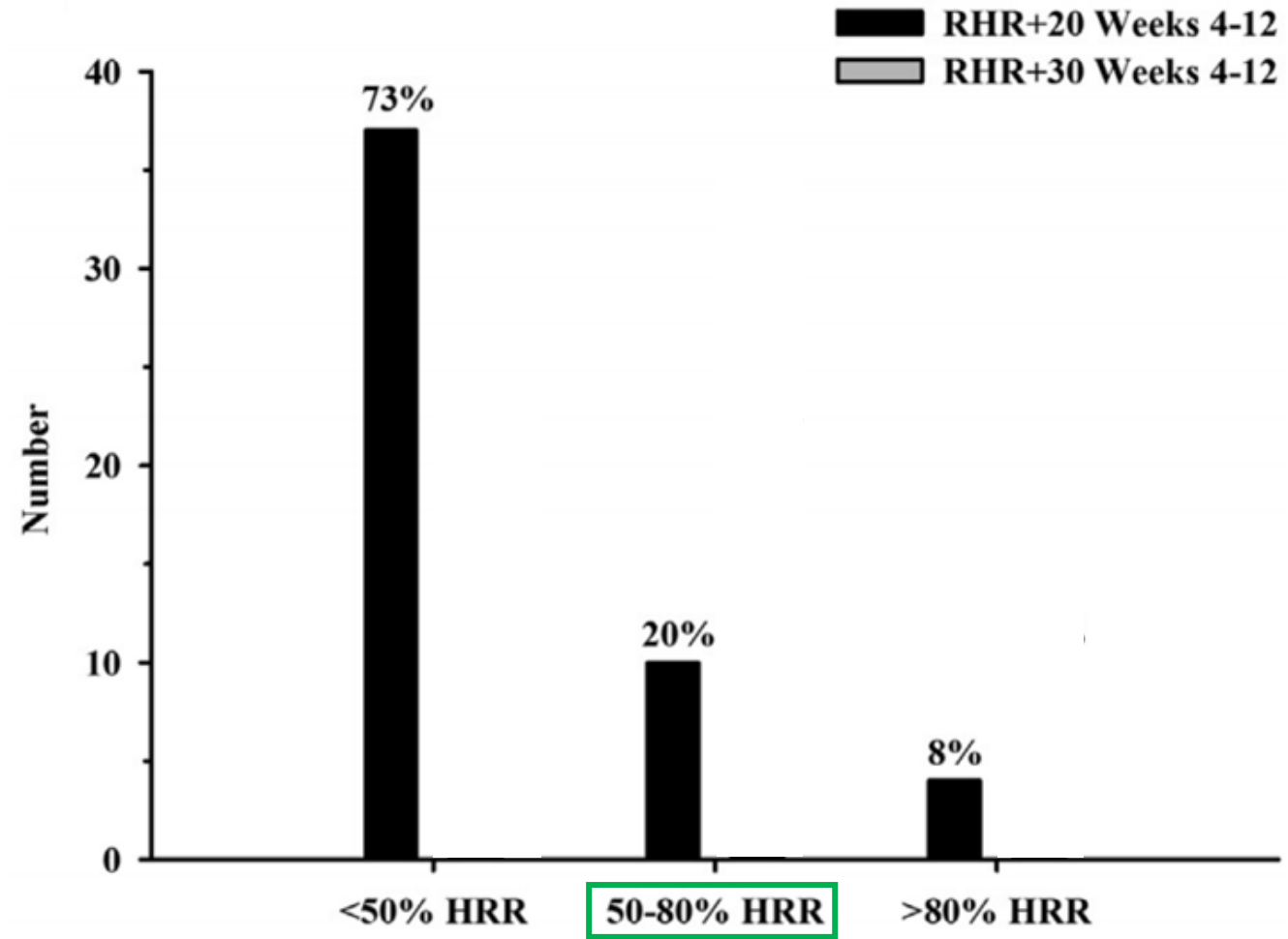
Non- β -blocked



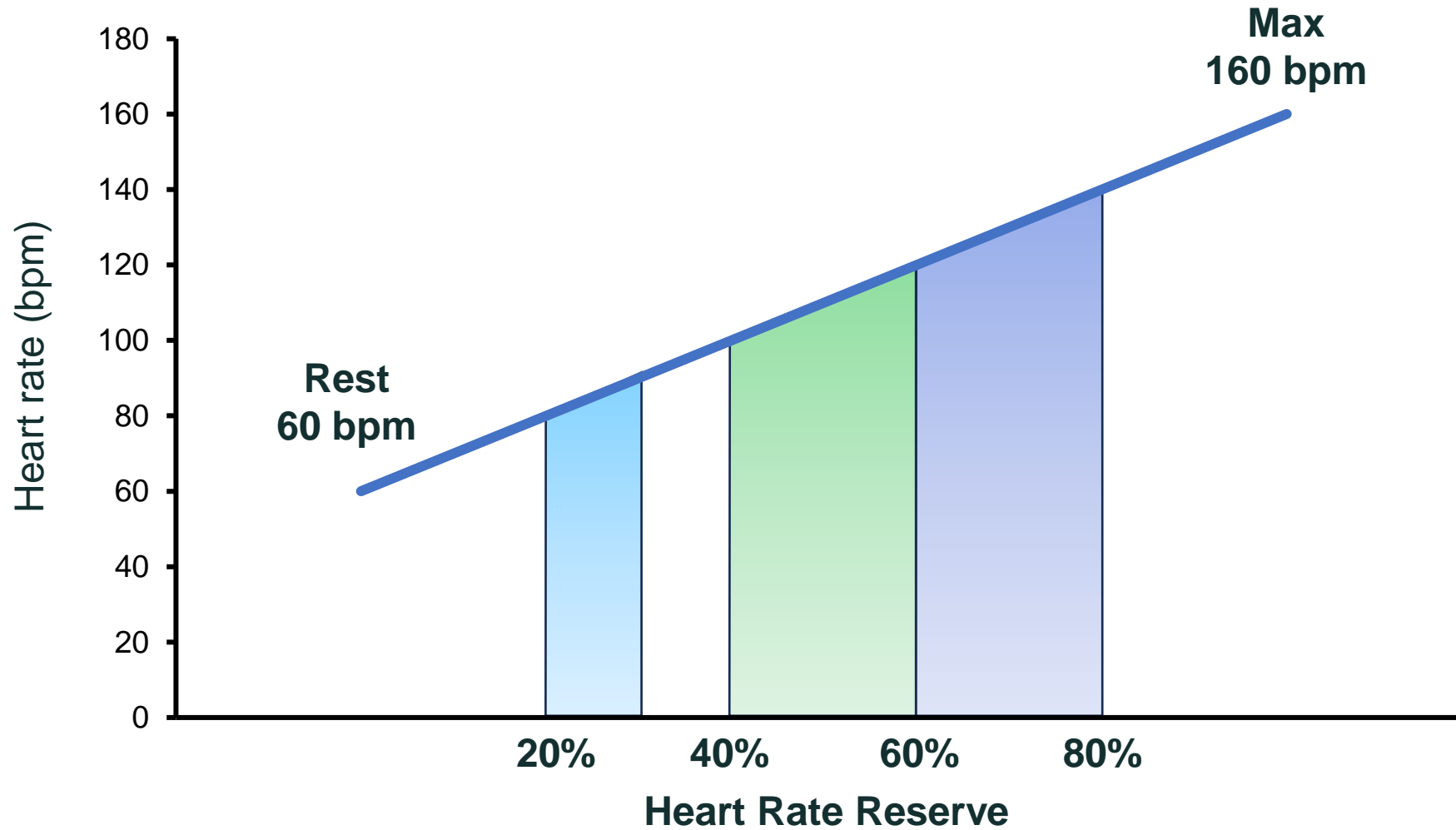
+20 – 30 Method



+20 – 30 Method



+20 – 30 Method





Verdict?

Individually Tailored Ex Rx



Compendium of Physical Activities

Compendium of Physical Activities: Quantifying Physical Activity Energy Expenditure

2024 Compendium of Physical Activities

Published January 17, 2024 in the [Journal of Sport and Health Science](#)

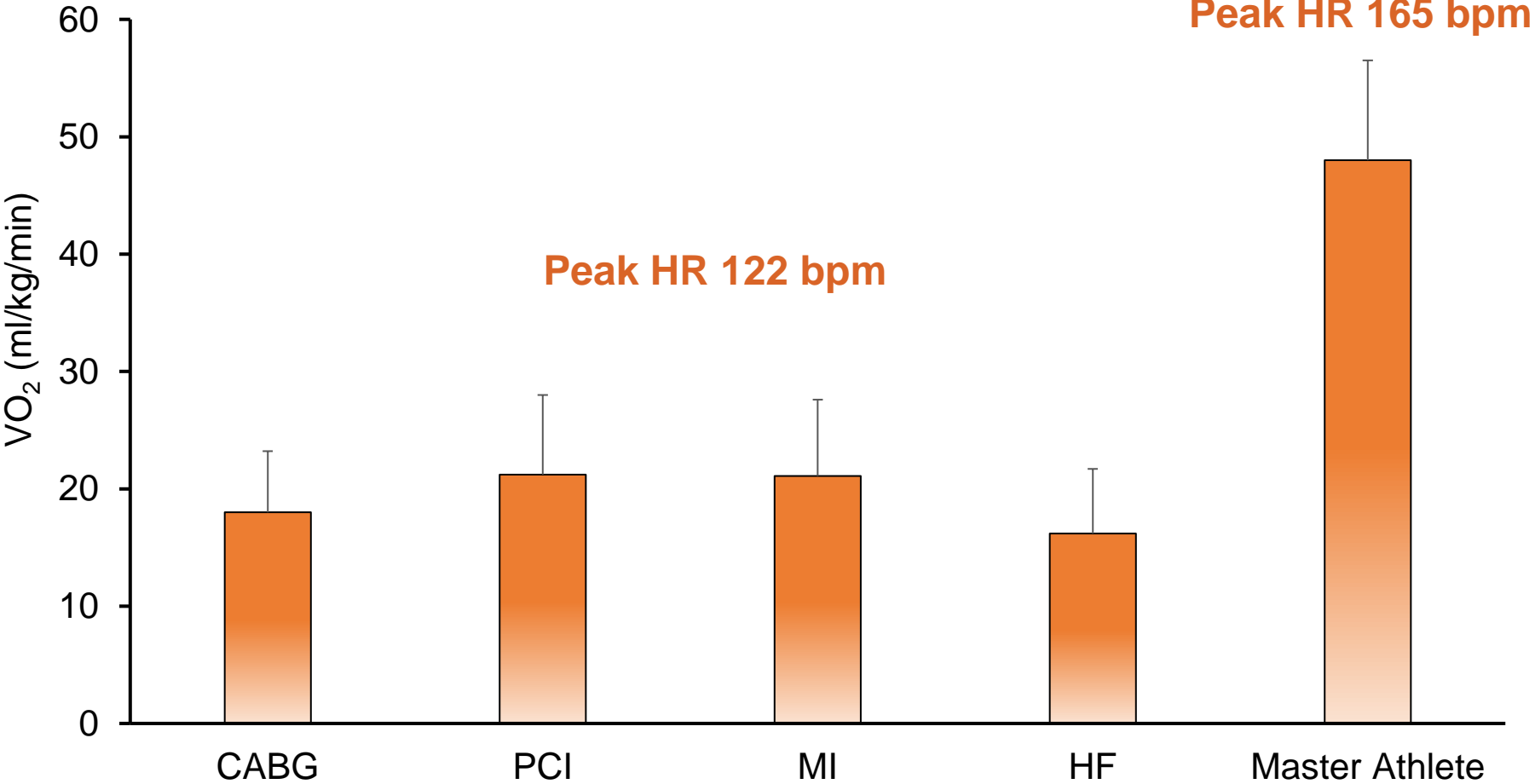
2024 Adult Compendium

2024 Adult Wheelchair Compendium

Older Adult Compendium



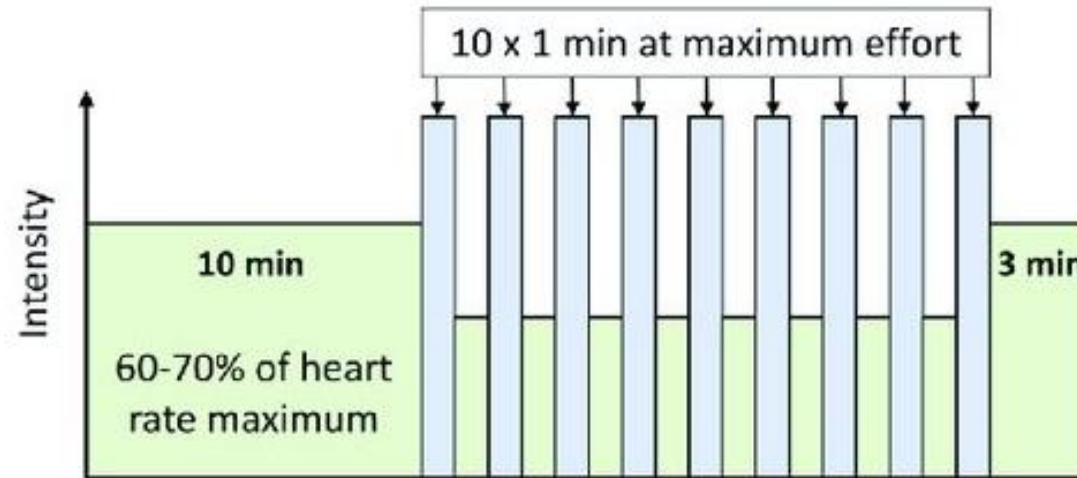
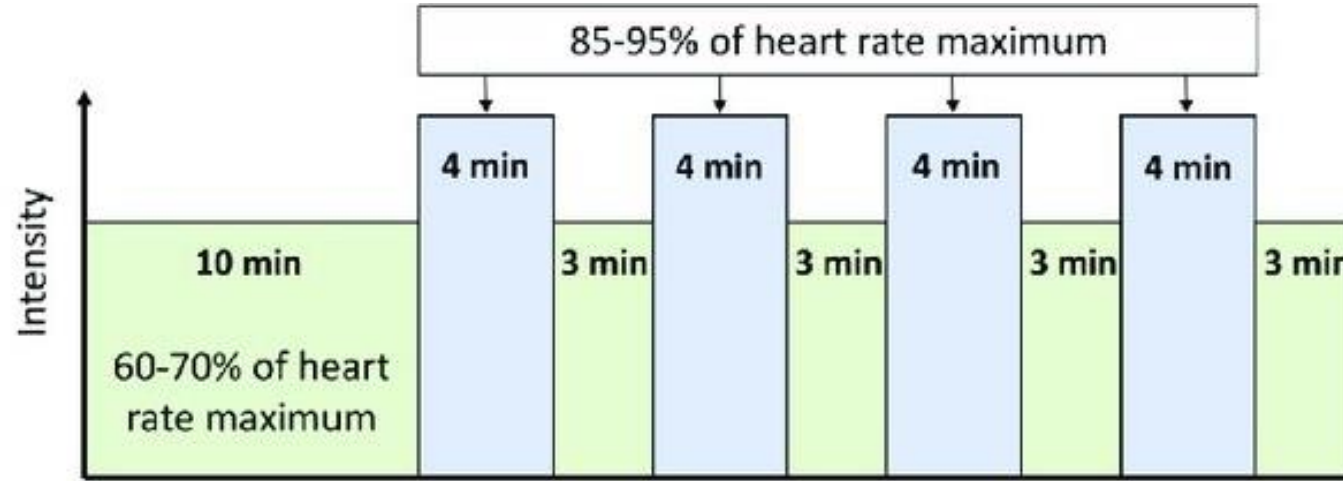
Master Athletes



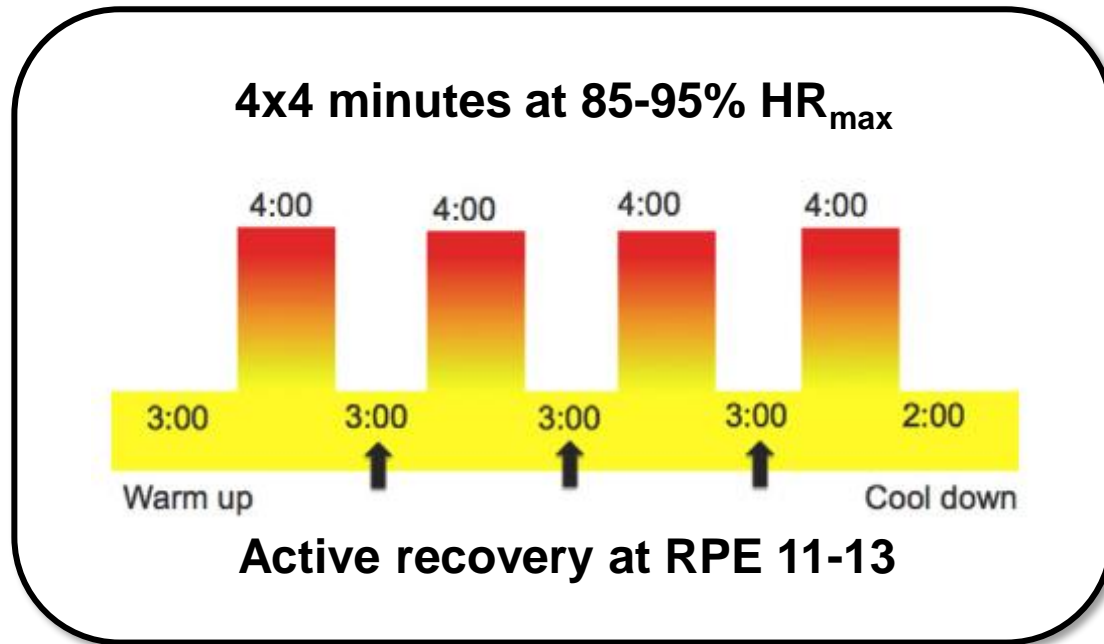
Activity Specificity



High Intensity Interval Training



High Intensity Interval Training



Rating	Perceived Exertion
6	No exertion
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

Start 4 min interval at an RPE of “hard” → Should finish at “very hard”

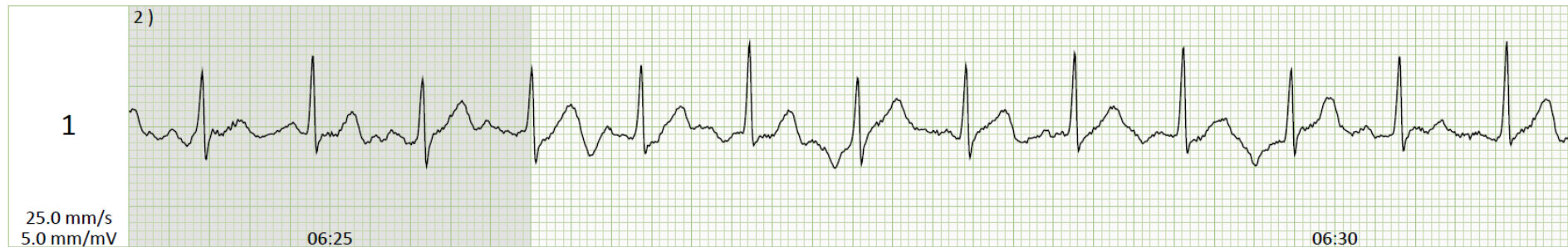
1. First HIT, allow entire 4-minute period to reach target zone
2. Subsequent HIT (i.e., 2nd, 3rd, 4th) allow 2-minutes to reach target zone
3. Validate target zone

Real World Example

- 66 yr old male
- History of MI and DES to LAD
- Avid life-long tennis player
- Activity related anxiety
- Resting HR, BP: 81 bpm, 110/64
- 6MWT distance: 1,595 ft (486m), 3.3 METs
- 6MWT peak HR: 111 bpm



1) 01:04 - 01:06: Rest 81 bpm



2) 06:24 - 06:26: 6MWT 111 bpm

Session #3

Treadmill: 2.5 mph, 2% = 3.6 METs



3) 16:56 - 17:01: TM 97 bpm

Session #4

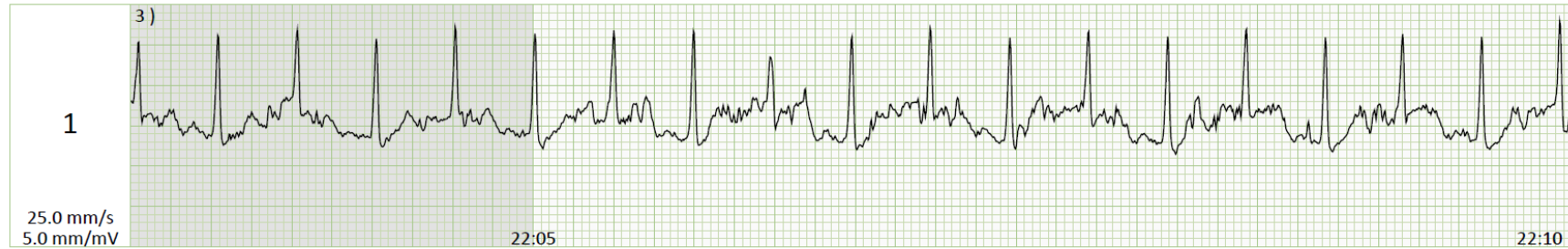
Treadmill: 2.8 mph, 2.5% = 4.1 METs



4) 25:04 - 25:05: Treadmill 125 bpm

Session #15 (14 weeks later)

3.7 mph, 3% = 7.4 METs

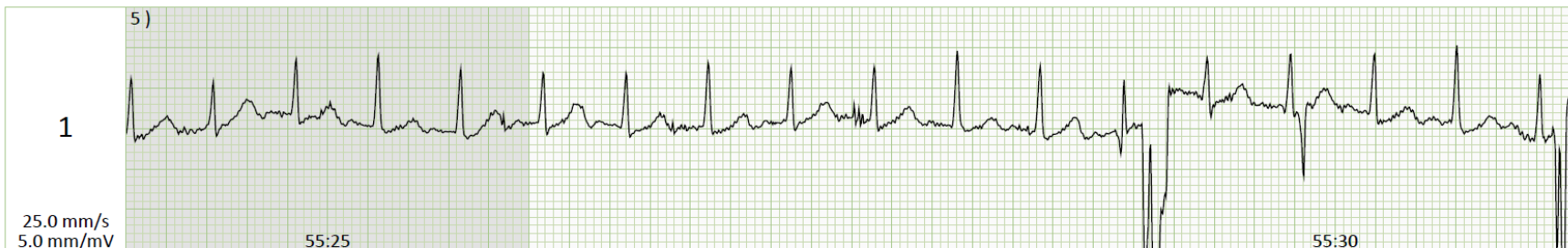


3) 22:03 - 22:05: TM 150 bpm



4) 29:07 - 29:09: Strength/Agility 131 bpm

125 Watts, ~7 METs



5) 55:24 - 55:26: NuStep 147 bpm

Outcomes

- 6MWT improvement from 1,595 ft to 1,800 ft (12.8%)
- 3rd (3.6 METs) – 4th (4.1 METs) session to last session METs (7.4)
- No adverse events or episodes of chest pain
- Normal HR and BP responses – highest exercise SBP 198 on non-med day
- Activity related anxiety resolved
- Regularly plays tennis, active gym goer, outdoor cycling
- Exercise session became much needed psychologic healing time

But what do I put down for our exercise intensity prescription policy?!

Patients with GXT data

1st 3 weeks 40-60% HRR

Subsequent session $\geq 50\%$ HRR

Without GXT data

1st 3 weeks – RPE 12-13

Subsequent sessions RPE ≥ 14

Take Aways

- **Aerobic Exercise Intensity**
 - Be aware of testing strengths/weaknesses
 - Prediction equations are not accurate for everyone
 - Avoid HR cap based on arbitrary policies
- **Previously Active Patients**
 - Reaching previous training volumes does not happen over night
 - Include sport/career specific training
 - Take experience with athletic population and apply to other CR participants

Additional Notes

- **Monitoring**
 - Decrease reliance on telemetry
 - Decrease frequency of BP checks
- **Promote Independence**
 - Mastery of intensity, conditioning protocols, strength training regimen
 - Self-assessment to facilitate self-guided intensity advancement
 - Train patients like athletes, keep pushing them!!

Thank you!

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