HIIT for Clinical Conditions

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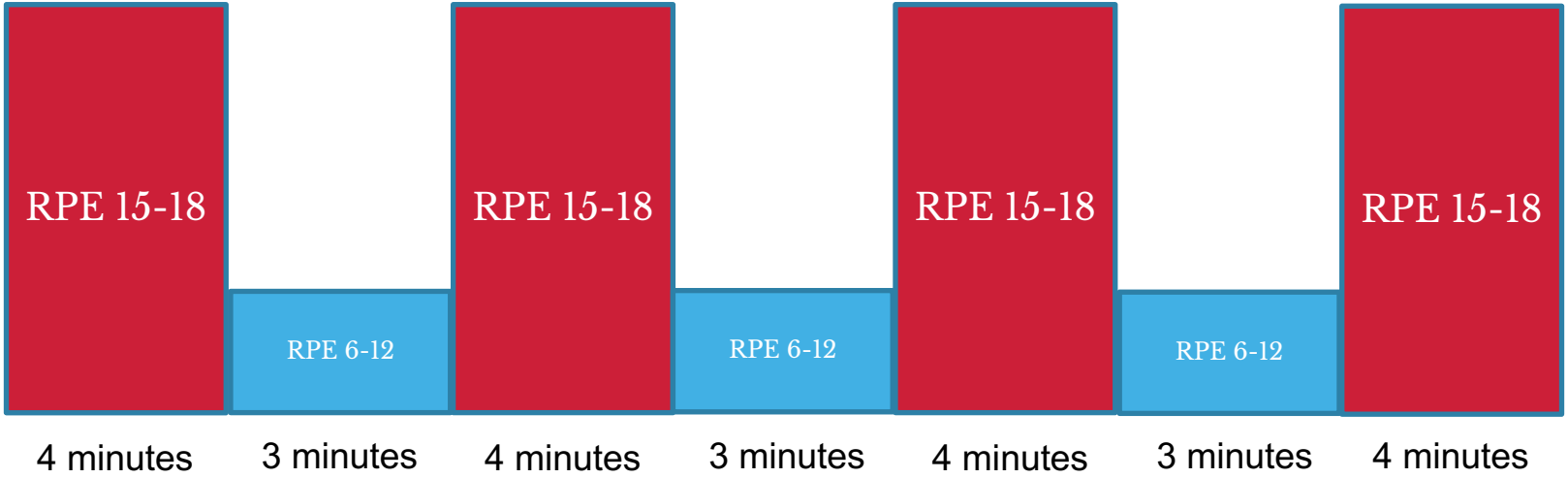
HIIT Example



Taylor JL et al (2020) Short-term and Long-term Feasibility, Safety, and Efficacy of High-Intensity Interval Training in Cardiac Rehabilitation The FITR Heart Study Randomized Clinical Trial *JAMA Cardiol* 5:1382

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Introduction

- There is no universal criteria or framework for delivery of HIIT in clinical populations
- Safety concerns remain a common barrier for implementing HIIT as standard care
- Still unclear what the optimal dose of HIIT is for maximizing health outcomes
    - High volume (4 x 4 min)
    - Low volume (1 x 4 min)
    - Low volume (10 x 1 min)
    - Sprint/Exercise Snacks (20s sprint separated by long durations)

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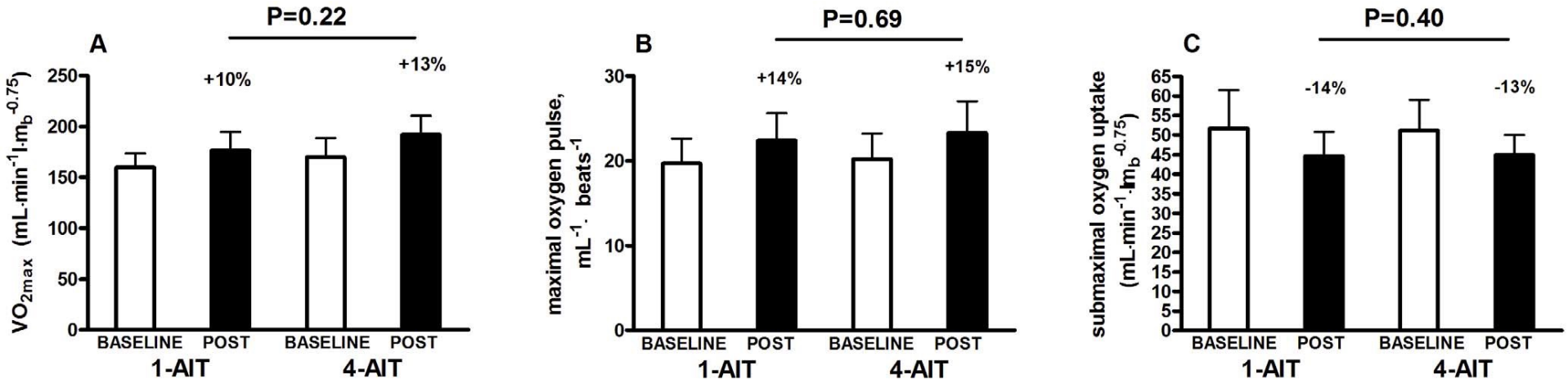
Short-Intervals as good? Healthy



4-AIT improved cholesterol and % BF to a higher degree compared with 1-AIT

Tjønna AE, Leinan IM, Bartnes AT, Jenssen BM, Gibala MJ, et al. (2013) Low- and High-Volume of Intensive Endurance Training Significantly Improves Maximal Oxygen Uptake after 10-Weeks of Training in Healthy Men. PLoS ONE 8(5): e65382. doi:10.1371/journal.pone.0065382

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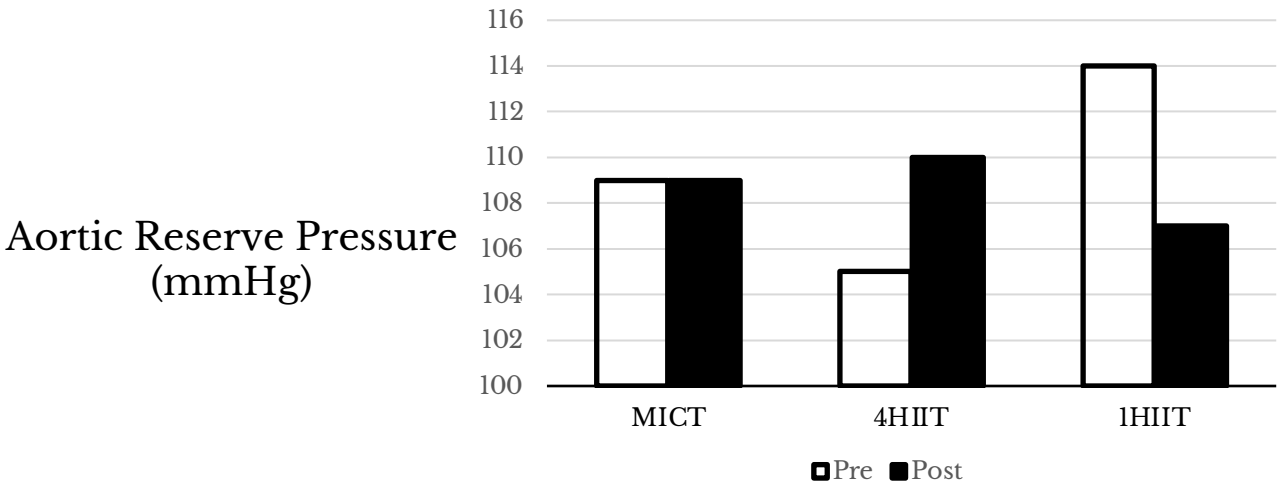
Short Intervals as good? MetS



Ramos JS et al. (2016) 12min/week of high-intensity interval training reduces aortic reservoir pressure in individuals with metabolic syndrome: a randomized trial. J Hypertension 34:1977–1987

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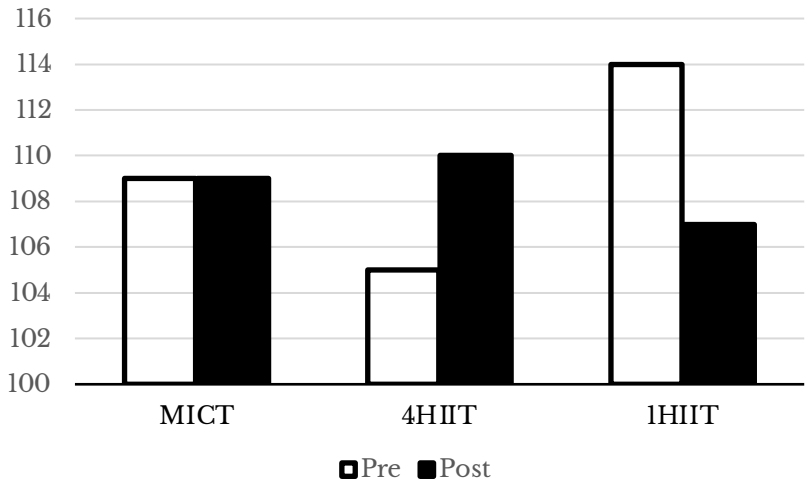
Short Intervals as good? MetS

Aortic Reserve Pressure (mmHg)



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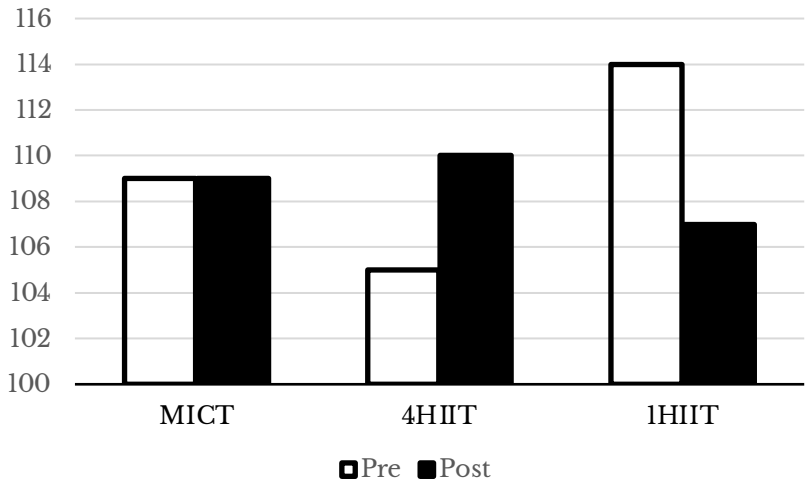

MetS risk factors	MICT		4HIIT		1HIIT		ALL	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Metabolic syndrome risk factors, median (range), *n*	3 (3–5)	3 (2–5)[a]	5 (3–5)	4 (2–5)	4 (3–5)	4 (2–5)	4 (3–5)	4 (2–5)
Patients with metabolic syndrome, *n*	17/17	16/17	15/15	12/15	18/18	14/18	50/50	42/50[a]
Separate variables, *n*								
Fasting glucose	13/17	11/17	11/15	9/15	14/18	13/18	38/50	33/50
High-density lipoprotein cholesterol	10/17	10/17	13/15	13/15	13/18	11/18	36/50	34/50
Triglycerides	10/17	9/17	14/15	12/15	12/18	10/18	36/50	31/50
Waist circumference	17/17	17/17	15/15	14/15	18/18	17/18	50/50	48/50
Brachial SBP	14/17	12/17	12/15	11/15	14/18	13/18	40/50	36/50
Brachial DBP	15/17	12/17	13/15	12/15	13/18	12/18	41/50	36/50

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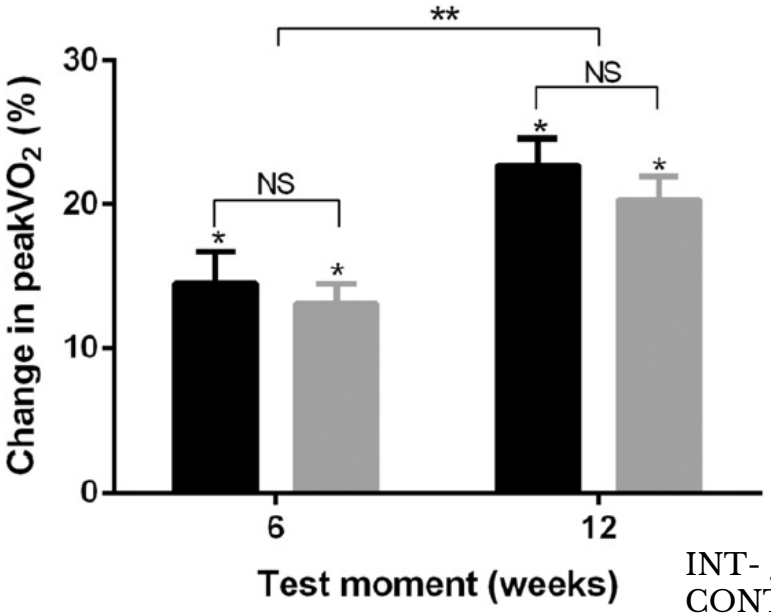
Intensity is key

CONT group trained at average intensities of 80% of peak HR (above prescribed)

Average intensity of the INT group was 88% of peak HR (lower than prescribed)



INT- grey
CONT- black

Conrads VM et al (2015) Aerobic interval training and continuous training equally improve aerobic exercise capacity in patients with coronary artery disease: The SAINTEX-CAD study. Int J Cardiol 179:203–210

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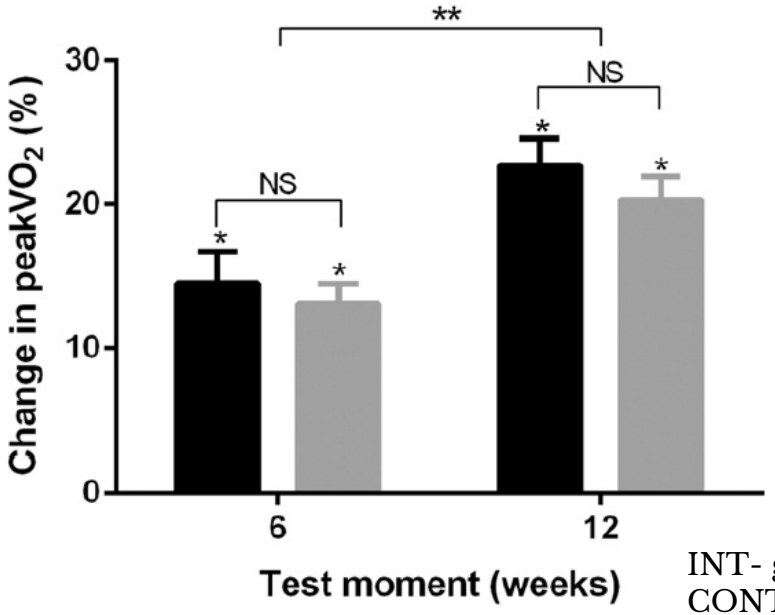

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- MUST be above 90% for High-Intensity interval.
- Is this feasible for subjects with CAD?

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How do we reconcile all of this?

Step 1
Measure or Estimate HRmax

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Formulae for estimating HRmax

- If not taking beta blocker = 211 – (0.64 x age)
- If taking beta blocker = 164 – (0.7 x age)

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Measure from symptom limited graded exercise test

Step 1
Measure or Estimate HRmax

Step 2
Calculate HR target zone
85 to 95% HRmax

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Step 3
Validate HR zone during exercise
training session

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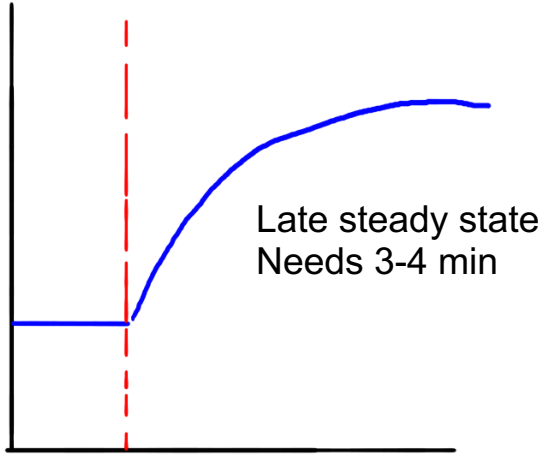
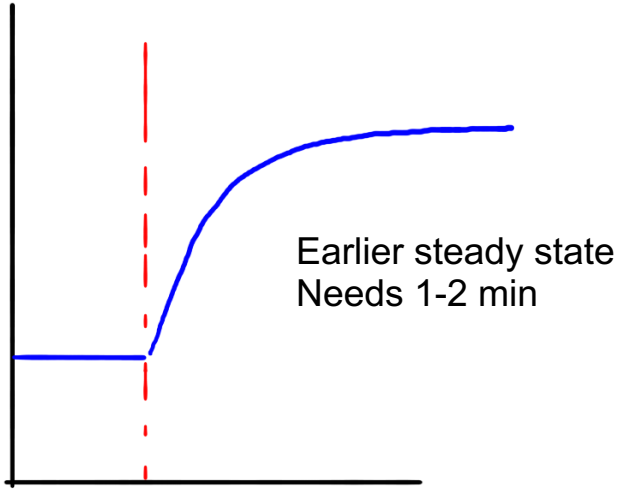
Step 3
Validate HR zone during exercise training session

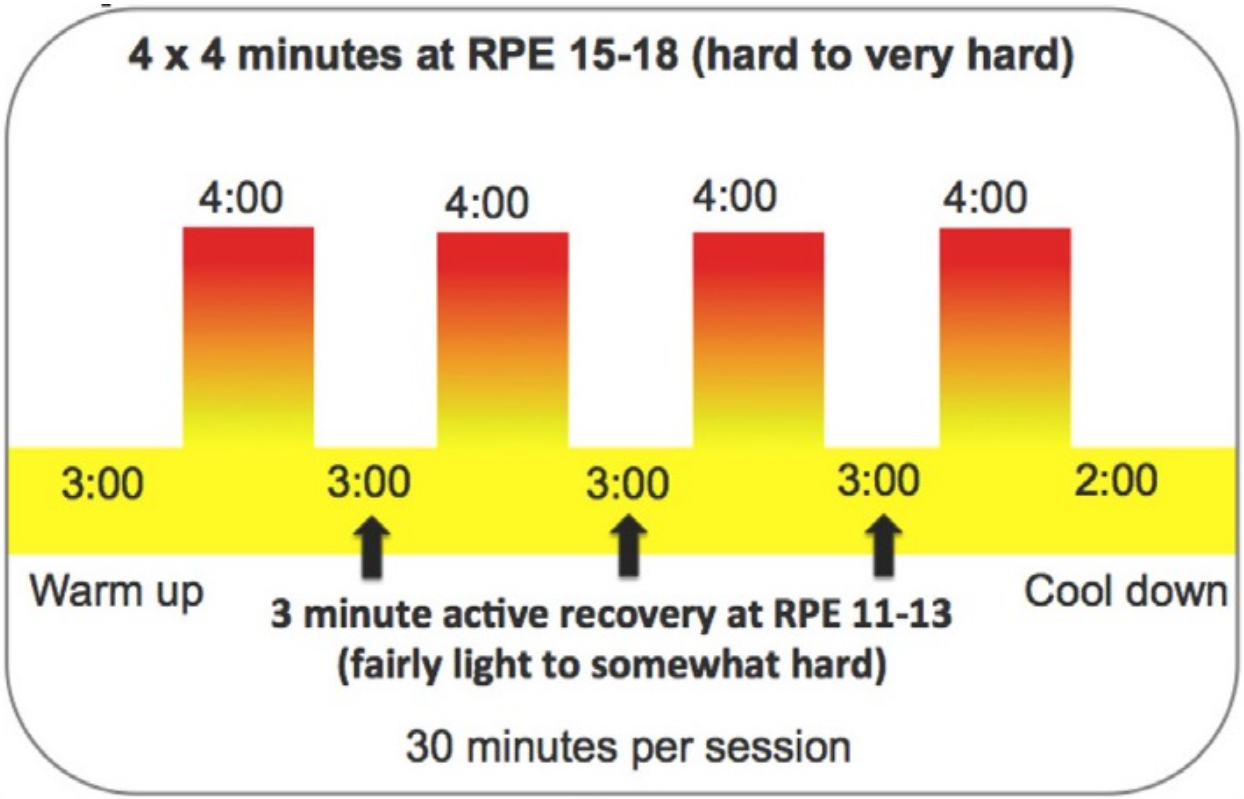
Start 4-minute high intensity interval at RPE 15 (Hard)
Finish high intensity interval at RPE 17-18 (Very Hard)
Check HR throughout using HR monitor
For the first high intensity interval, allow the entire 4-minute period to reach the HR target zone.
For subsequent high intensity intervals (i.e. 2nd, 3rd, and 4th), allow 2-minutes (halfway) to reach the HR target zone.

HR kinetics





Total Sessio



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Step 1
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85 to 95% HRmax

Step 3
Validate HR zone during exercise
training session

Step 4
Validated HR target zone

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Step 4
Validated HR target zone

If HR remains in target HR zone during validation – excellent

- Monitor
- Progress

If there is an indication of inaccurate HR target zone:

- Repeat maximal exercise test and recalculate HR target zone
- Estimate new HRmax and recalculate HR target zone
- Use RPE to guide intensity

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Monitoring, Progression and Safety

- Goal is to increase workload (e.g. was on a bike or speed and/or incline on a treadmill) on a weekly basis.
- Progression should be modest to reduce risk of exhaustion or inability to complete entire 4-minute interval (e.g. you might only increase speed for 1st and 2nd intervals, and use previous speed for 3rd and 4th intervals).

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- To inform progression:
    - Record highest HR achieved during each high intensity interval
    - Ask for highest RPE during each high intensity interval

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- Monitor for symptoms before, during, and after session
- Monitor blood pressure during last 2 minutes of high intensity interval

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Clinical Considerations

Initial Assessment

- Pre-screening medical condition
- Medical history (check for exclusions)
- Co-morbidities (e.g. diabetes, hypertension)
- Medication regimen (including dose and timing)
- Relevant clinical data (e.g. resting blood pressure and heart rate, fasting blood glucose, oxygen saturation)
- Treating physicians and general practitioner
- Current or previous physical activity level
- Factors that may impact exercise participation (e.g. injury)

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Clinical Considerations

Absolute Contraindicators

- Obstructive left main artery disease/Unstable angina/Uncontrolled cardiac arrhythmia
- Acute endocarditis, myocarditis or pericarditis
- Moderate to severe aortic stenosis
- Decompensated heart failure
- Acute pulmonary embolism, or deep vein thrombosis
- Aortic dissection
- Higher degree heart block
- Hypertrophic obstructive cardiomyopathy
- Recent stroke or transient ischemic attack
- Uncontrolled diabetes/Retinopathy/Severe autonomic or peripheral neuropathy
- Acute or chronic renal failure
- Pulmonary fibrosis
- Recent myocardial infarction (<4 weeks), coronary artery bypass surgery (<4 weeks), or percutaneous intervention (<3 weeks).

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Clinical Considerations

Monitoring Checklist

- How is the patient feeling today
- Medical updates or changes to health status
- Recent symptoms (e.g. angina, light-headedness)
- Prescribed medications taken within the past 24 hours
- Medication regimen changes (dose/timing)
- Resting blood pressure and heart rate
- Resting and post-exercise blood glucose in patients taking insulin or other oral hypoglycemic agents
- Monitor fluid overload in patients with HF (for >2kg change in 1-3 days) and signs/symptoms of hypovolemia (e.g. dizziness, weakness, fatigue)

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Clinical Considerations

Indications for avoiding HIIT

- Feeling unwell
- Current angina, light-headedness, or dyspnea
- Resting heart rate >120bpm (or >100bpm supine in patients with HF)
- Presence of any atypical arrhythmia (detected via telemetry or pulse)
- Resting blood pressure > 180/110mmHg
- Hypoglycemic event in the past 24hours that required assistance from another individual to treat the event
- Blood glucose <4.0mmol/L
- Blood glucose >15.0mmol/L with symptoms of hyperglycemia

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Clinical Considerations

Indications for ceasing HIIT (adapted from ACSM34)

- Symptoms such as angina, dyspnea, light-headedness, confusion, or signs of poor perfusion.
- Oxygen saturation < 88%
- Rise in blood pressure > 220/105mmHg
- Drop in systolic blood pressure >10mmHg from baseline during high intensity interval.
- Slowing heart rate with higher workload or development of any atypical arrhythmia

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Guidelines for the delivery and monitoring of high intensity interval training in clinical populations☆

Jenna L. Taylor [a,b,*], David J. Holland [a], Jemima G. Spathis [c], Kassia S. Beetham [c], Ulrik Wisløff [a,d], Shelley E. Keating [a], Jeff S. Coombes [a]

Progress in Cardiovascular Diseases 62 (2019) 140–146

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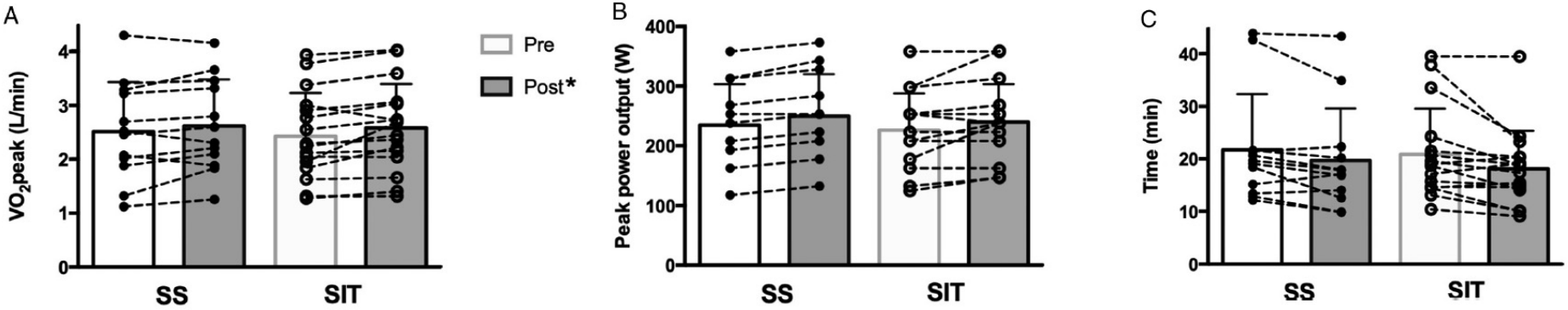
Exercise Snacks?



SS – 3 20s all-out performed 1-4 hr apart

SIT – 3 x 20s all-out interspersed with 3 min rest

Islam H, Gibala MJ & Little JP (2022) Exercise Snacks: A Novel Strategy to Improve Cardiometabolic Health. Exerc Sport Sci Rev 50:31–37

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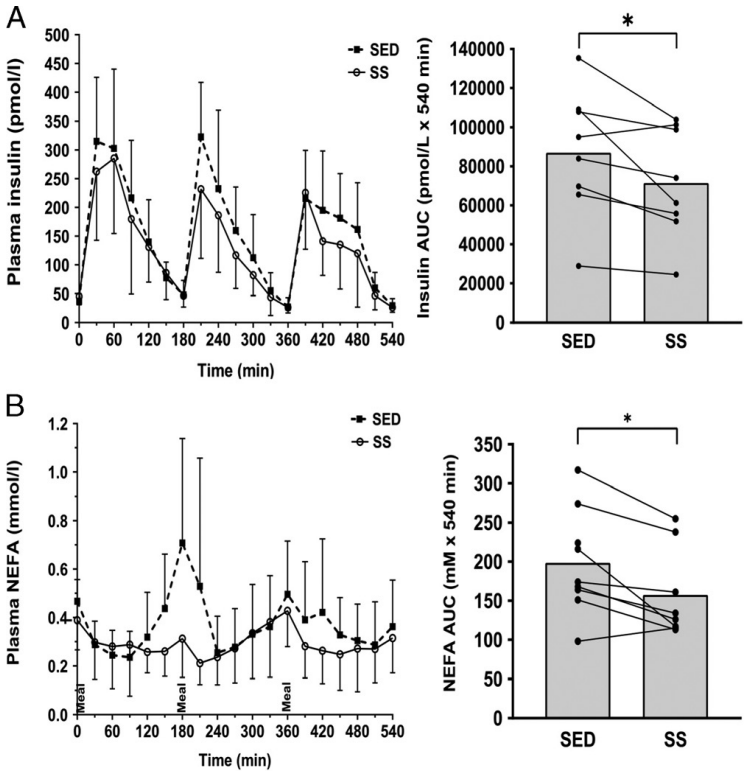
Exercise Snacks

- Sedentary, but not clinical



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Should we do HIIT in clinical populations?

Questions

HIIT for Clinical Conditions

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