Exercise for Health and Recreation in Patient with CHF

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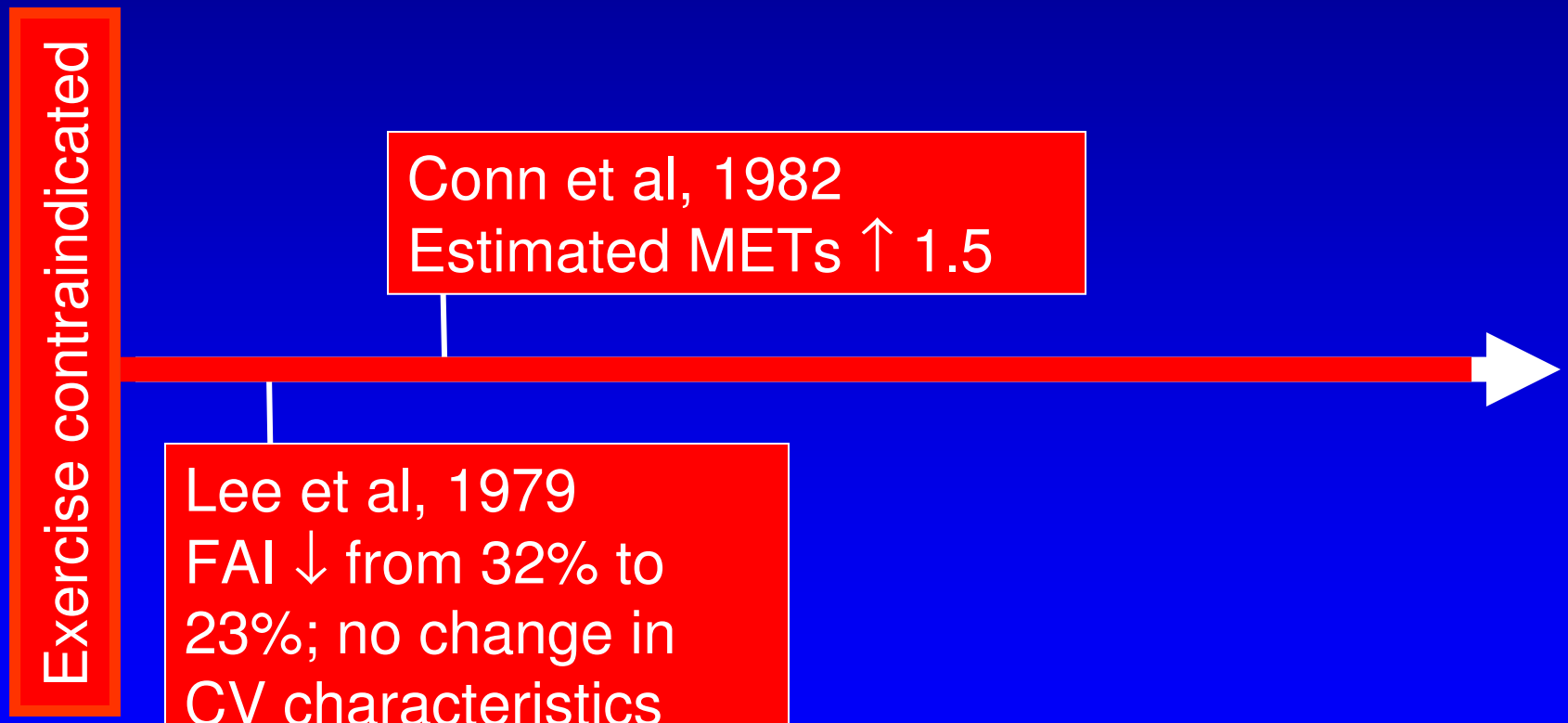
History of Exercise Training in Patients with CHF



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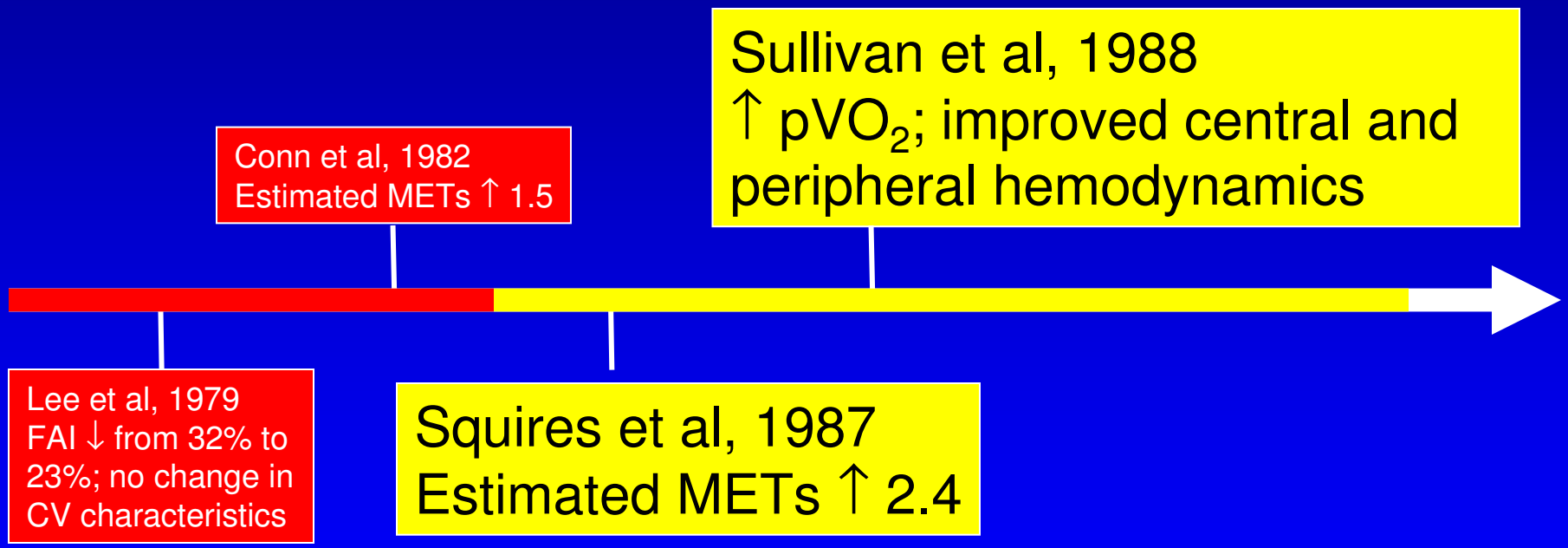

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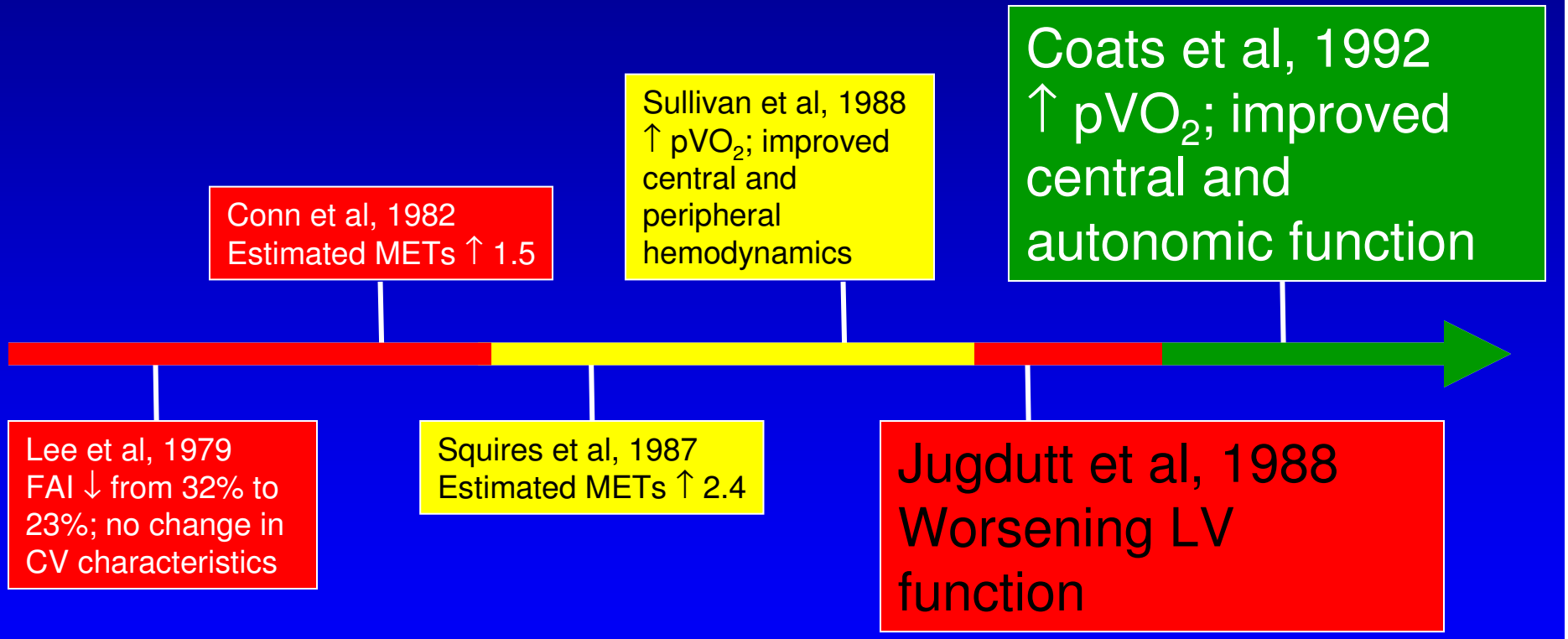


Exercise and Heart Failure: Summary of Benefits

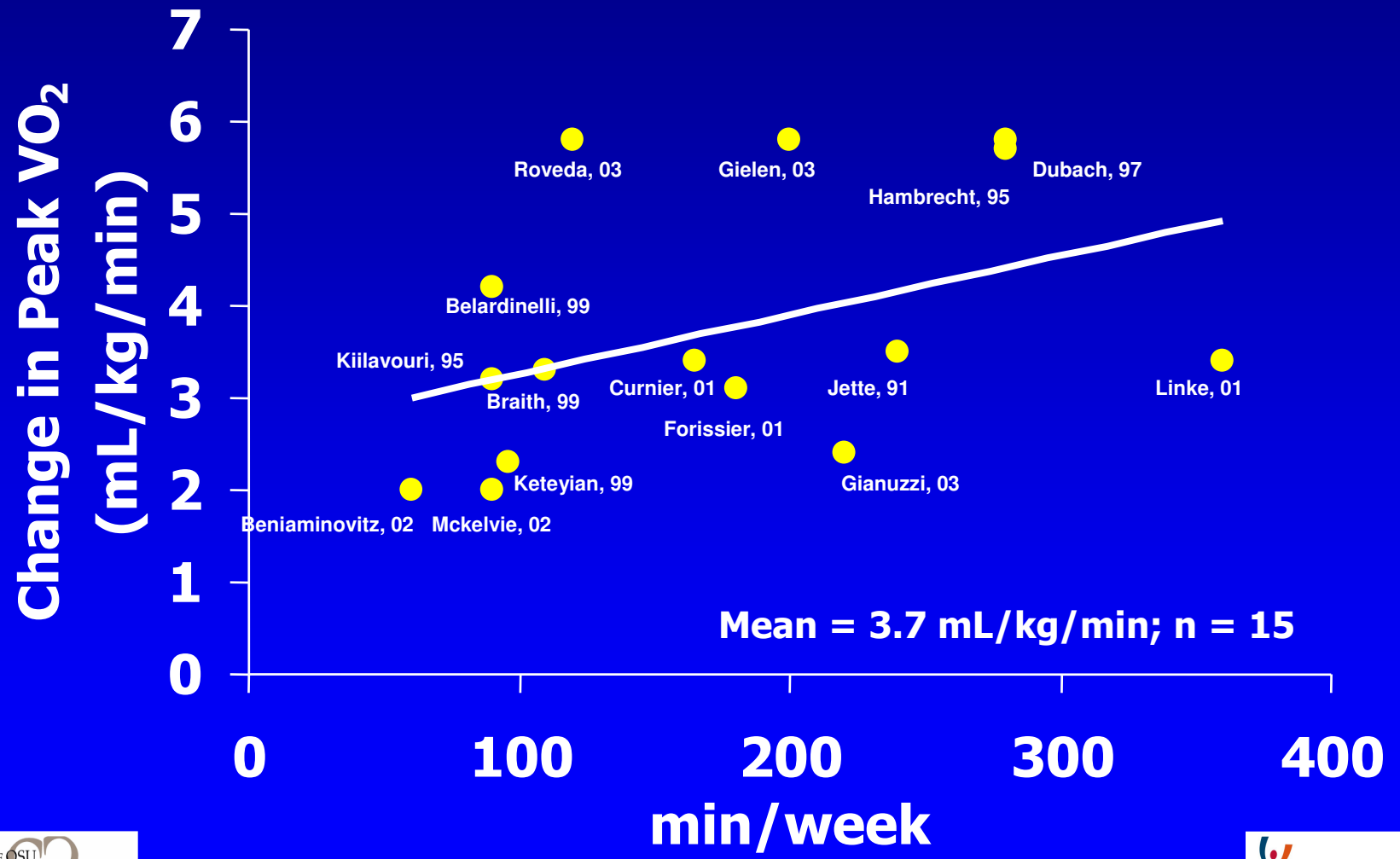
- 1990 – present:
  - Improved exercise capacity
  - No worsening of LV geometry or function
  - Improved neuro-humoral axis
  - Anti-inflammatory effect
  - Improved endothelial function
  - Improved skeletal muscle function
  - Improved quality of life
  - Improved clinical outcomes??

Single-Center Randomized Trials and Change in Peak VO_2 with Exercise Rehabilitation

The OSU Heart Center

The Ohio State University Medical Center

Exercise Training in Heart Failure:
Dose-Response of Peak VO_2



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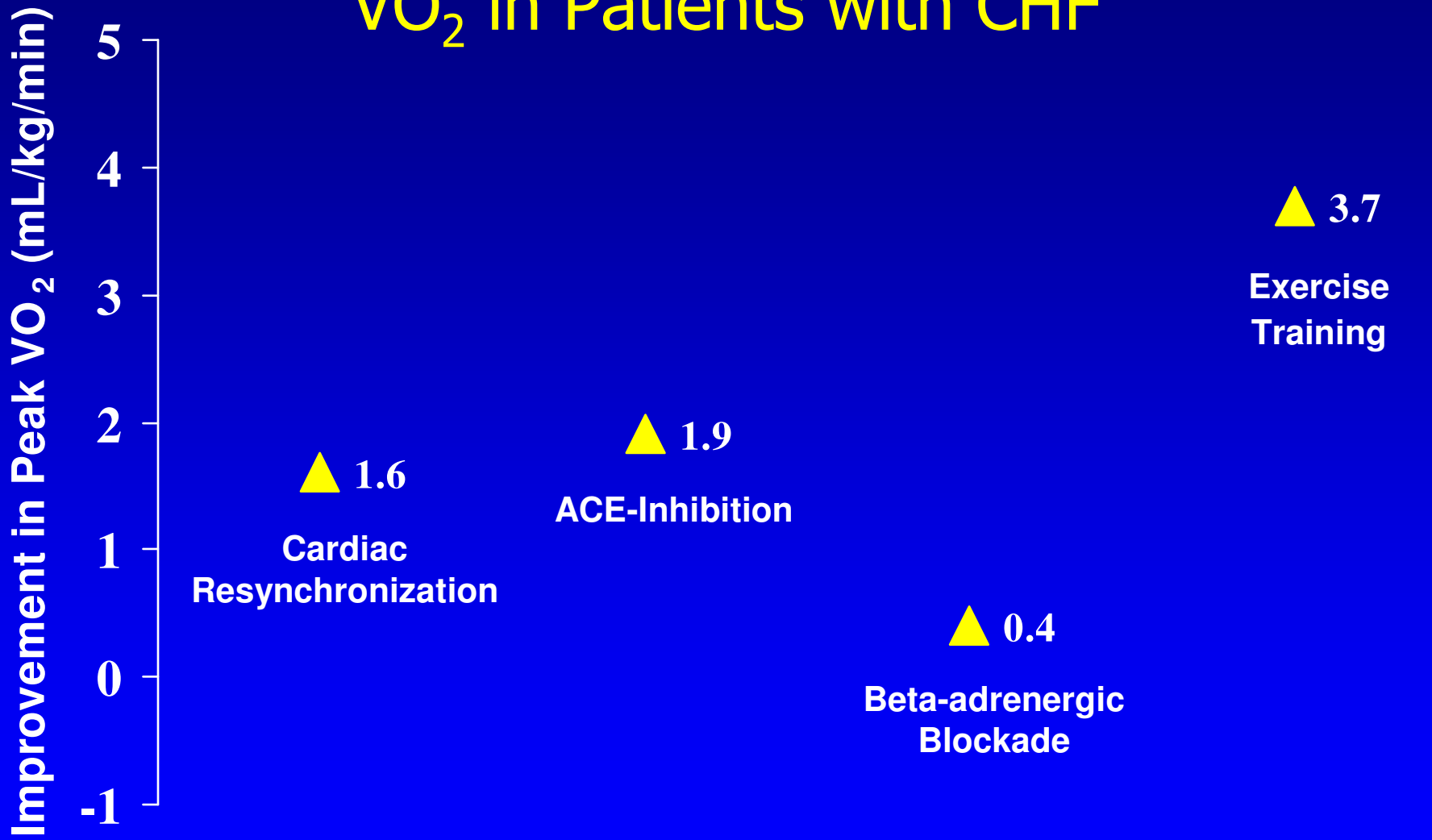
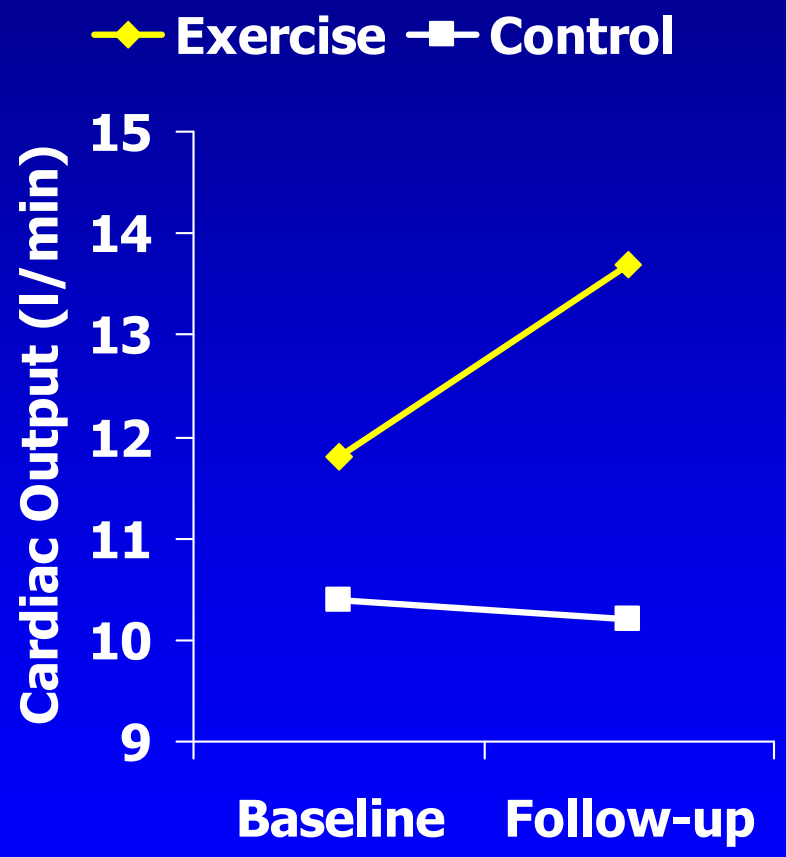
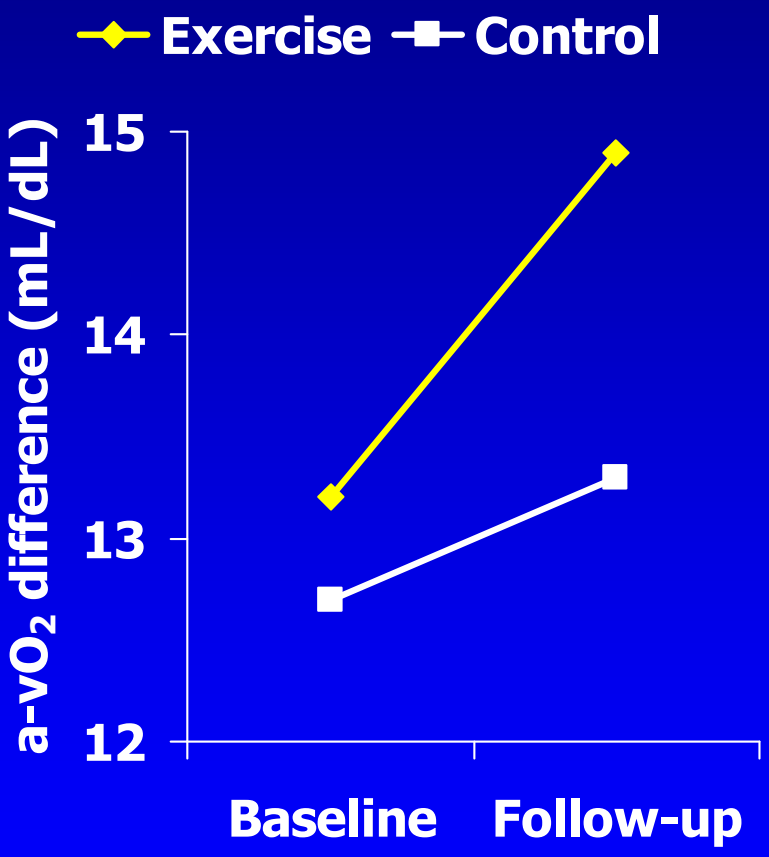
Effects of Various Therapies on Peak VO_2 in Patients with CHF



Exercise Training in Heart Failure:
Effects on Central Hemodynamics

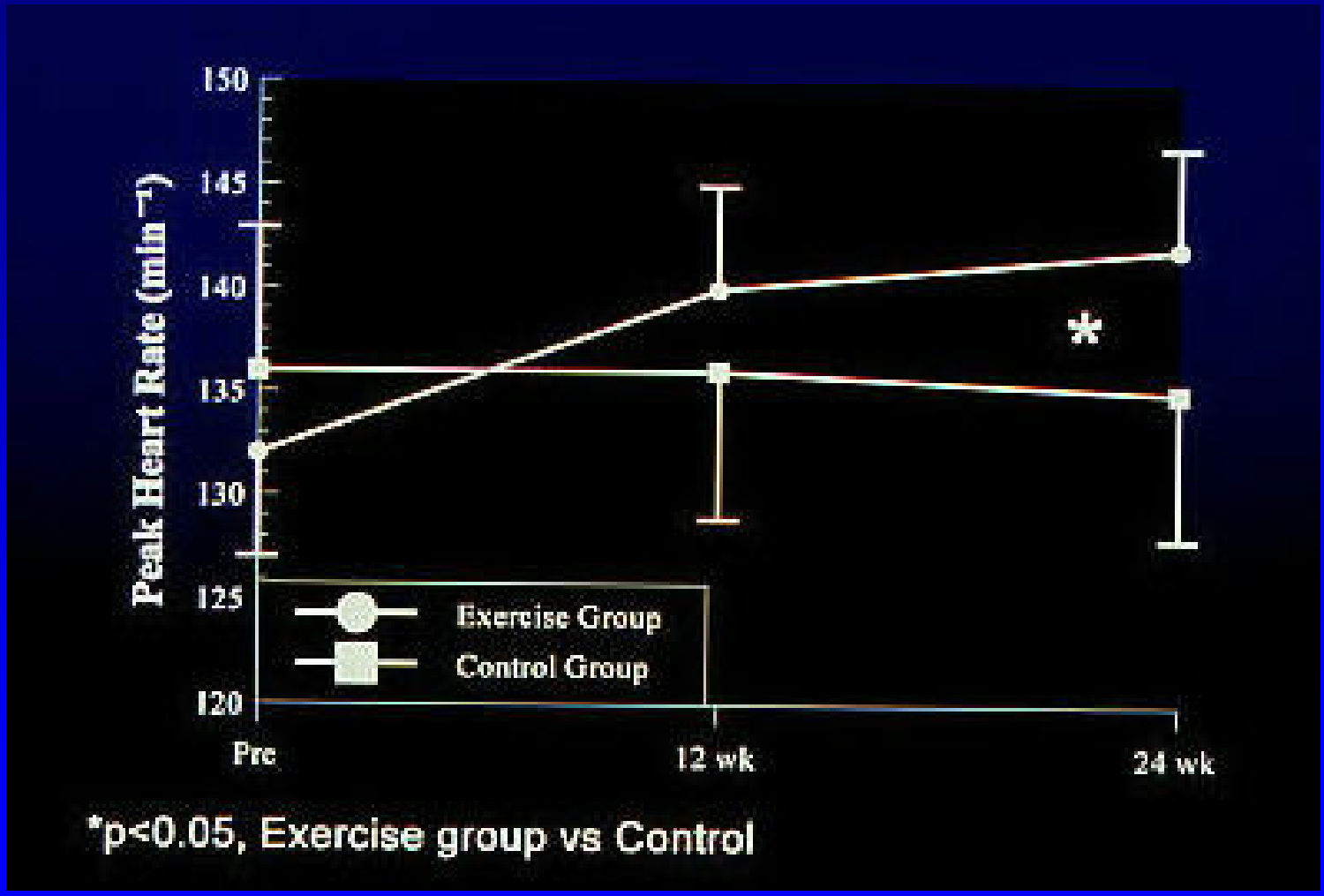




Dubach et al., JACC 1997

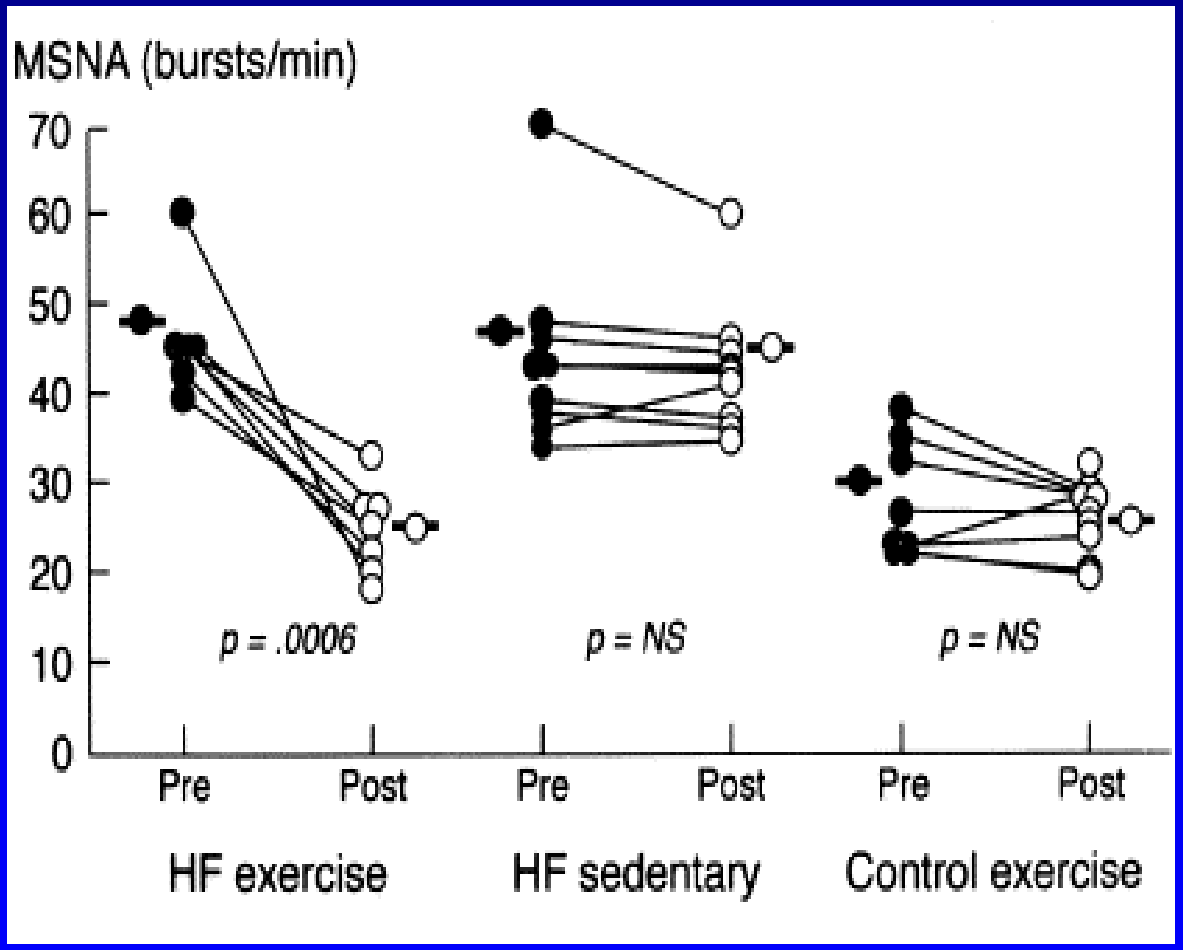
n=24, 2 mo, 70-80 of peak HR

Exercise Training in Heart Failure:
Partial Reversal of Chronotropic Incompetence



Keteyian et al., 1996 and 1999.

Exercise Training in Heart Failure:
Improved Autonomic Function

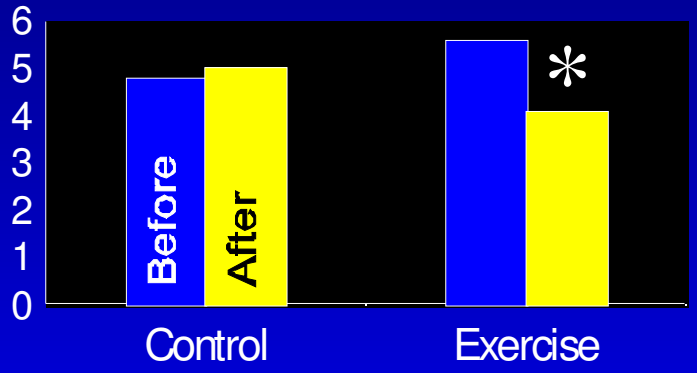


Roveda et al., JACC 2003

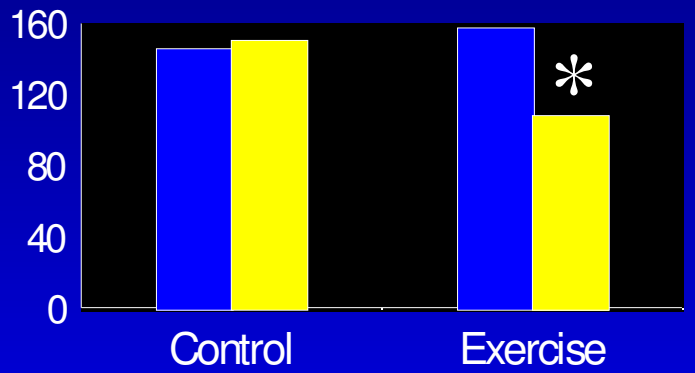
4 mo of training, 60 min, 3x/wk

Exercise Training in Heart Failure:
Effect on Plasma Neurohormones

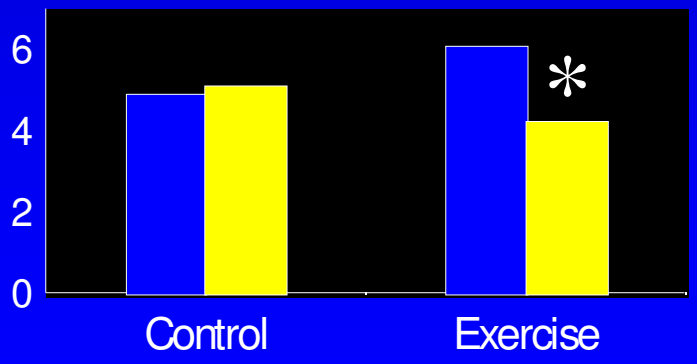
Angiotensin II



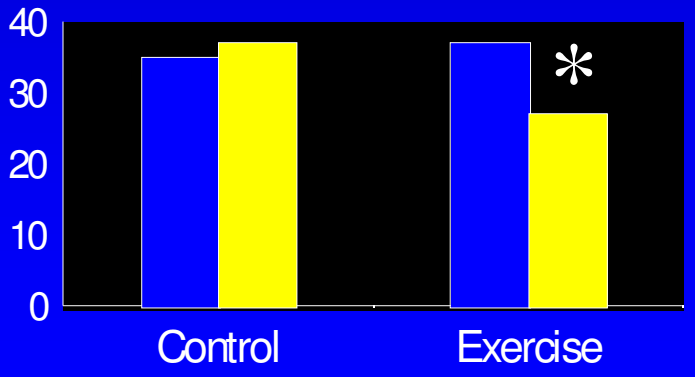
Aldosterone



Vasopressin



Atrial Natriuretic Peptide



Braith, et al., JACC 1999; 34:1170-1175

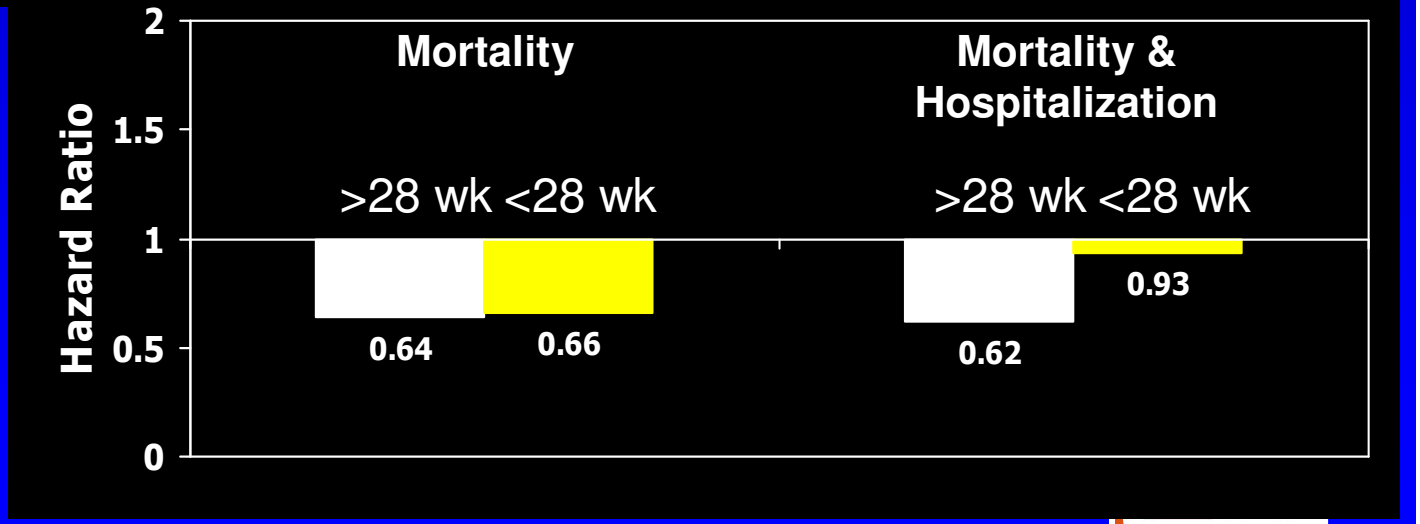
n = 19, 16 wk

Exercise Training in Heart Failure:
Improved Skeletal Muscle Function

- Increased Cytochrome-C oxidase activity (~20%-30%)
- Increased Citrate synthetase (~25-77%)
- Increased Fiber area (~10%-24%)
- ? re-shift in % type I fibers
- Decreased iNOS expression (~50%)

ExTraMATCH Collaborative:
Duration of Training and Clinical Outcomes

- n= 9 trials
- Mean: 150 min/wk (range = 66-280 min/wk)
- Mean: 30 wk (range = 8-60 wk)



Piepoli et al., BMJ 2004

The OSU Heart Center

Summary of Exercise Prescription for Aerobic Training in Patients with HF

- Intensity: Just below ventilatory threshold or 60 - 75% of HR reserve
- Frequency: Increase to 5-6 times per week
- Duration: Increase to 30-45 min (may need intermittent training)
- Type: Large motor activities
- Unique issues: Interrupted care, etiology of disease and additional fatigue

Heart Failure - A Controlled Trial Investigating Outcomes of Exercise TraiNing

If you exercise patients with HF, do they safely live longer (or die sooner)?

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Scope of HF-ACTION

- Sponsoring Agency = NIH/NHLBI
- > 80 participating sites in North America and France
- $37 M, project proposed in March 1998
- Started in October 1, 2002
- Trial period over six years

HF-ACTION: Inclusion Criteria

- Stable NYHA classes II-IVa
- EF $\leq$ 35%
- Encourage ACE and β-adrenergic blocking agent (6 weeks), or must be drug intolerant or with physician specified request to not be on the drug
- Regular exercise < 2 times/wk

Study Design

- Randomized (n = 3,000) to:
  - Usual care group (UC) = ACE inhibitor and ß-adrenergic blockade
  - Intervention group = UC plus 36 sessions of cardiac rehabilitation, followed by up to 1-4 yr of 5 d/wk home walking or cycling training (Intensity = 60-70%; 3-40 min)
  - Similar education/ testing exposure
- Endpoints
  - All-cause mortality and all-cause hospitalization
  - Safety, QOL, cost-effectiveness and influence of ß-blockade and etiology of illness

Summary

- Regular exercise training can partially reverse the central and systemic physiologic abnormalities common to patients with systolic heart failure
- More information is needed relative to the effect of exercise training on clinical outcomes, including the minimal dose needed to achieve any such effect
- Await the results of HF-ACTION

Exercise and CHF: Cases

Exercise and CHF: Case 1

- JM, 42-year-old man
- Newly diagnosed heart failure due to idiopathic dilated cardiomyopathy
- Limited by dyspnea and fatigue with mild exertional activity (NYHA class III)
- Physical examination: mild JVD, clear lungs, 3rd heart sound, murmur of mitral regurgitation, trace-1^{+} peripheral edema
- LV ejection fraction - 25%

What are the goals of therapy in this patient with class III heart failure?

1. Alleviate symptoms
2. Improve functional status
3. Improve LV function
4. Reduce morbidity and mortality
5. All of the above

Answer: All of the above

- These complimentary goals of heart failure therapy can be met using a contemporary pharmacological management algorithm
- Symptom relief can be achieved with hemodynamic interventions including diuretics and digoxin
- Disease progression can be slowed by neurohormonal interventions such as ACE inhibitors and beta-blockers

Should exercise be recommended at this time?

1. Yes
2. No

Answer: No

- Patient is volume overloaded and on no pharmacological therapy for CHF
- Safety of exercise in this setting is unknown

Which agent should be prescribed as initial pharmacological treatment of JM's heart failure?

1. Diuretic
2. Digoxin
3. ACE Inhibitor
4. Beta-blocker
5. A and B

Answer: Diuretic

- First step in the pharmacological management of patients with systolic heart failure and signs/ symptoms of ECF volume excess
- A loop diuretic is generally preferred due to its greater potency compared to the thiazides
- "The most useful approach to selecting the dose of, and monitoring the response to, diuretic therapy is by measuring body weight, preferably on a daily basis."

Case 1 Continued

- A loop diuretic is started producing resolution of edema
- JM improves but remains mildly symptomatic
- Physical examination reveals compensated heart failure with a blood pressure of 110/70 and a persistent 3rd heart sound

Which agent should now be prescribed?

1. Digoxin
2. ACE Inhibitor
3. Beta-blocker
4. Angiotensin II Receptor Blocker
5. A and B

Answer: ACE Inhibitor

- More than 7,000 patients have been evaluated in placebo-controlled trials
- Reduce mortality by 20-25% and combined morbidity and mortality by 25-30%
- “All patients with heart failure due to LV systolic dysfunction should receive an ACE inhibitor unless they have been shown to be intolerant to or have a contraindication to the use of this class of drugs.”

Following initiation and up-titration of an ACE inhibitor, which agent should next be prescribed?

1. Digoxin
2. Beta-blocker
3. Angiotensin II Receptor Blocker
4. Nitrate
5. A and B

Answer: Beta-blocker

- Approximately 10,000 patients have been evaluated in placebo-controlled trials
- Reduce mortality by 30-35% and combined morbidity and mortality by 35-40%
- “All patients with stable NYHA class II or III heart failure due to LV systolic dysfunction should receive a beta-blocker unless they have a contraindication to its use or have been shown to be unable to tolerate treatment ...”

Case 1 Continued

- Following target-dose ACE inhibition, carvedilol initiated and up-titrated to 25 mg twice daily
- 6 months after the initiation of pharmacological treatment, JM has returned to a fully active lifestyle (NYHA class I)
- LV ejection fraction - 39%

Exercise and CHF: Case 2

- FR, 59-year-old man
- LV dysfunction due to remote anterior wall myocardial infarction
- Physical examination: BP 160/90, no JVD, clear lungs, 4th heart sound, no edema
- LV ejection fraction - 30%
- On “optimal” medical therapy and CRT-D

Is the patient ready for exercise training?

1. Yes
2. No

Answer: No

- Hypertension is inadequately controlled
- No assessment of functional (exercise) capacity yet done
- ACE-I and beta-blocker doses increased with good fall in BP
- Metabolic exercise test shows RER of 1.18, VO2 of 11.2, and VE/VCO2 of 41

Is the patient ready for exercise training, now?

1. Yes
2. No

Answer: No

- Metabolic exercise test demonstrates good exercise effort but poor VO2 and VE/VCO2
- In adequately treated patients, these numbers prompt transplant evaluation
- Patient listed for and successfully transplanted
- Exercise training begun 6 weeks post-transplant