



IDOSO FRÁGIL – FIM DE LINHA DE TRATAMENTO OU CANDIDATO A REABILITAÇÃO CARDIOVASCULAR?

REABILITAÇÃO CARDIOVASCULAR: NOVAS FRONTEIRAS

Helena Santa-Clara, PhD, FESC



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***Candidato a
reabilitação cardíaca...***

THE CONTRIBUTION OF INDIVIDUAL EXERCISE TRAINING COMPONENTS TO CLINICAL OUTCOMES IN RANDOMISED CONTROLLED TRIALS OF CARDIAC REHABILITATION: A SYSTEMATIC REVIEW AND META-REGRESSION

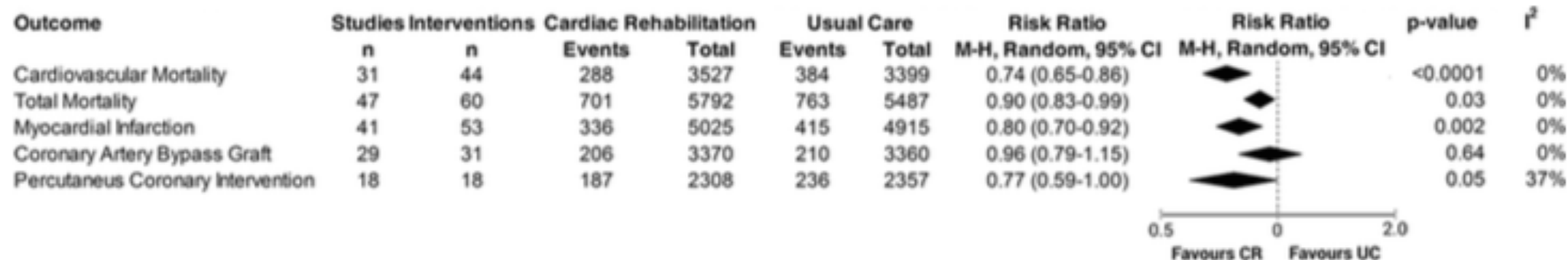


Fig. 4 The effect of exercise-based cardiac rehabilitation versus usual care on coronary heart disease outcomes. Diamonds represent the pooled summary estimate of random effects Mantel-Haenszel meta-analysis for each outcome. CR cardiac rehabilitation, UC usual care

10% reduction in over all mortality risk with exercise-based cardiac rehabilitation compared to usual care over a follow-up period of 10 years and, a 20% reduction in myocardial infarction events compared to usual care

Physical Activity, Cardiorespiratory Fitness, and Exercise Training in Primary and Secondary Coronary Prevention

Damon L. Swift, PhD; Carl J. Lavie, MD; Neil M. Johannsen, PhD; Ross Arena, PhD; Conrad P. Earnest, PhD; James H. O’Keefe, MD; Richard V. Milani, MD; Steven N. Blair, PED; Timothy S. Church, MD, PhD

Table 1. Benefits of Formal Cardiac Rehabilitation and Exercise Training Programs

Improvement in exercise capacity

1. Estimated METS +35%
2. Peak $\dot{V}O_2$ +15%
3. Peak anaerobic threshold +11%

Improvement in lipid profiles

1. Total cholesterol –5%
2. Triglycerides –15%
3. HDL-C +6% (higher in patients with low baseline)
4. LDL-C –2%
5. LDL-C/HDL-C –5% (higher in certain subgroups)

Reduction in inflammation

hs-CRP –40%

Reduction in indices of obesity

1. BMI –1.5%
2. % fat –5%
3. Metabolic syndrome –37%

Improvements in behavioral characteristics

1. Depression
2. Anxiety
3. Hostility
4. Somatization
5. Overall psychological distress

Improvements in quality of life and components

Improvement in autonomic tone

1. Increased heart rate recovery
2. Increased heart rate variability
3. Reduced resting pulse

Improvements in blood rheology

Reduction in hospitalization costs

Reduction in major morbidity and mortality

BMI, body mass index; hs-CRP, high-sensitivity C-reactive protein; HDL-C, high-density lipoprotein-cholesterol; LDL-C, low-density lipoprotein-cholesterol.

Circ J 2013;77: 281 – 292

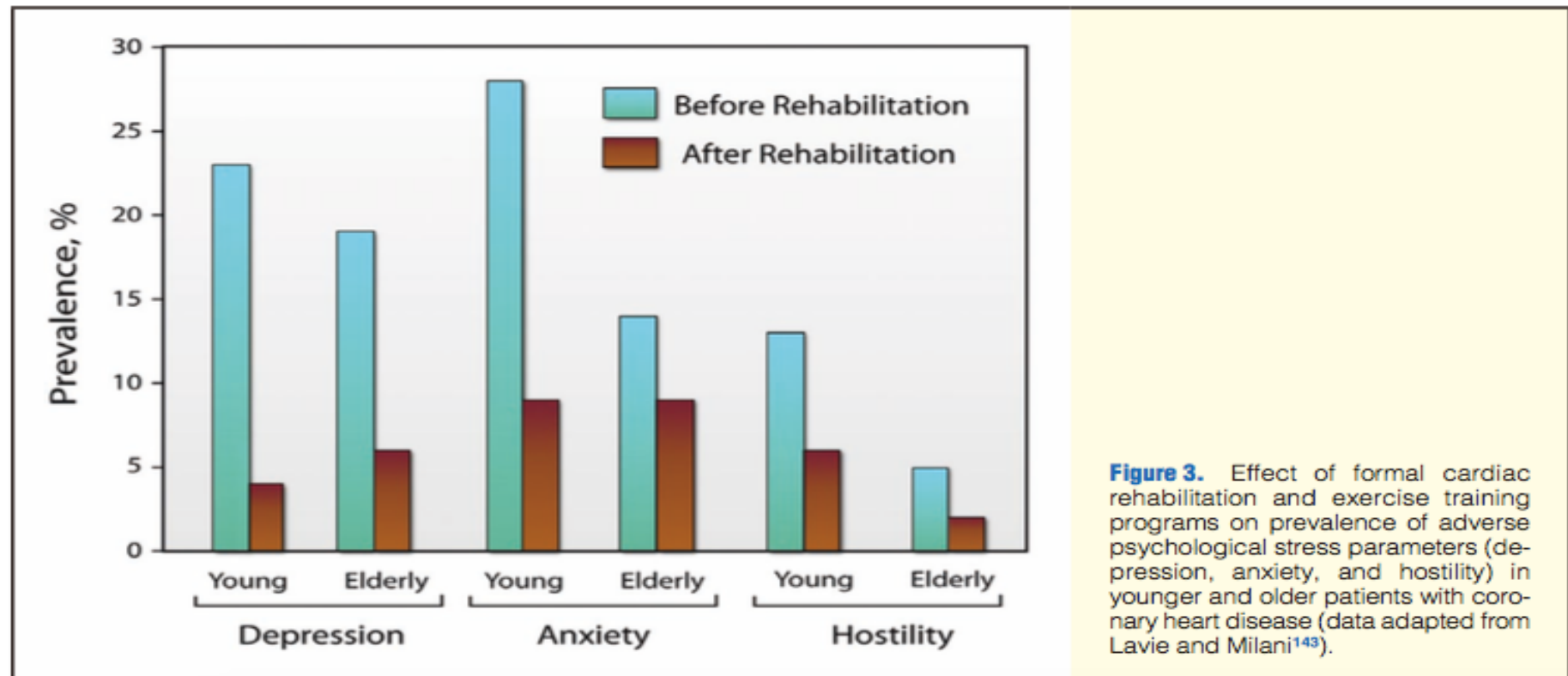


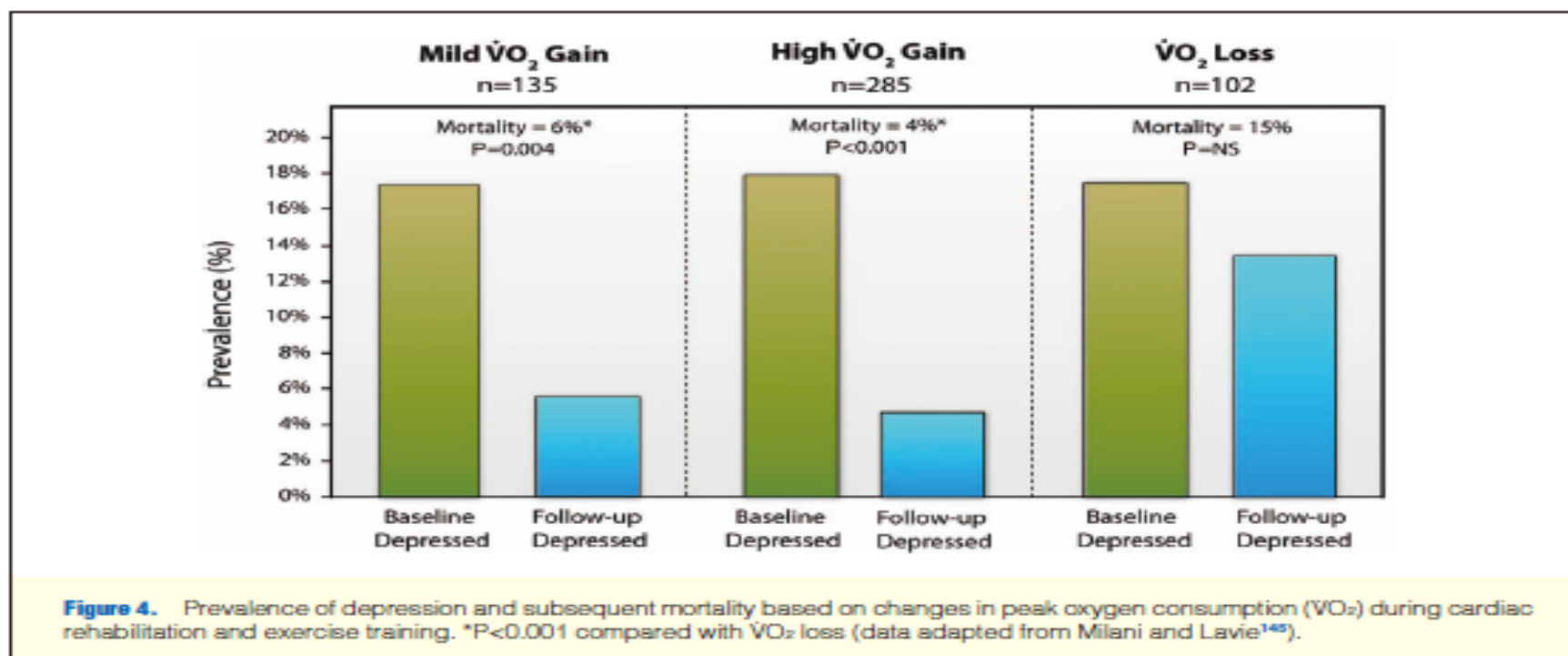
Figure 3. Effect of formal cardiac rehabilitation and exercise training programs on prevalence of adverse psychological stress parameters (depression, anxiety, and hostility) in younger and older patients with coronary heart disease (data adapted from Lavie and Milani¹⁴³).

Cardiorespiratory fitness (CRF)

Measures of CRF are a major predictor of mortality in CHD patients

↑ 3,5 mL/kg/min measured ≈ ↓ 10% major CV mortality (15,000 ♂ ♀) [Kavanagh T et al. Circulation 2002; 106: 666 – 671](#)

total mortality fell by 2% for every 1% increase in peak VO₂ with CRET [Kavanagh T et al. J Am Coll Cardiol 2003; 42: 2139 –2143.](#)



CARDIAC REHABILITATION IN VERY OLD ADULTS

EFFECT OF BASELINE FUNCTIONAL CAPACITY ON TREATMENT EFFECTIVENESS



Resistance and Balance Training Improves Functional Capacity in Very Old Participants Attending Cardiac Rehabilitation After Coronary Bypass Surgery

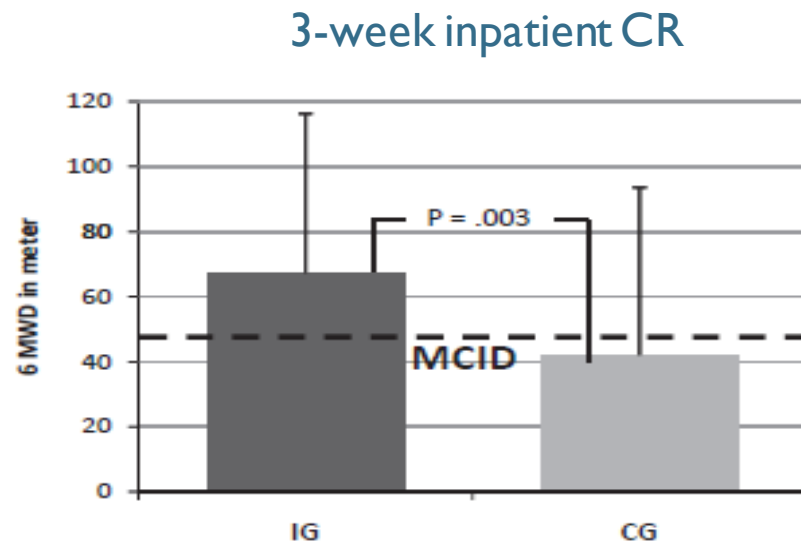
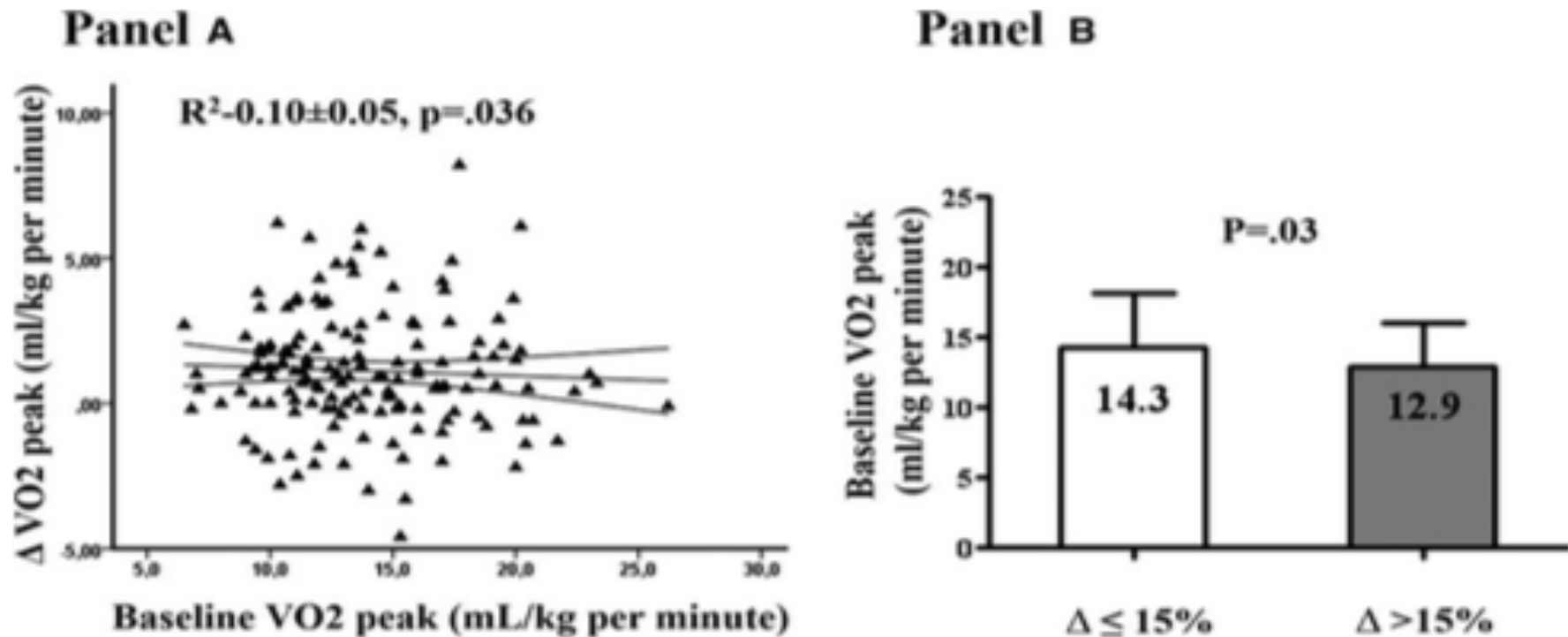


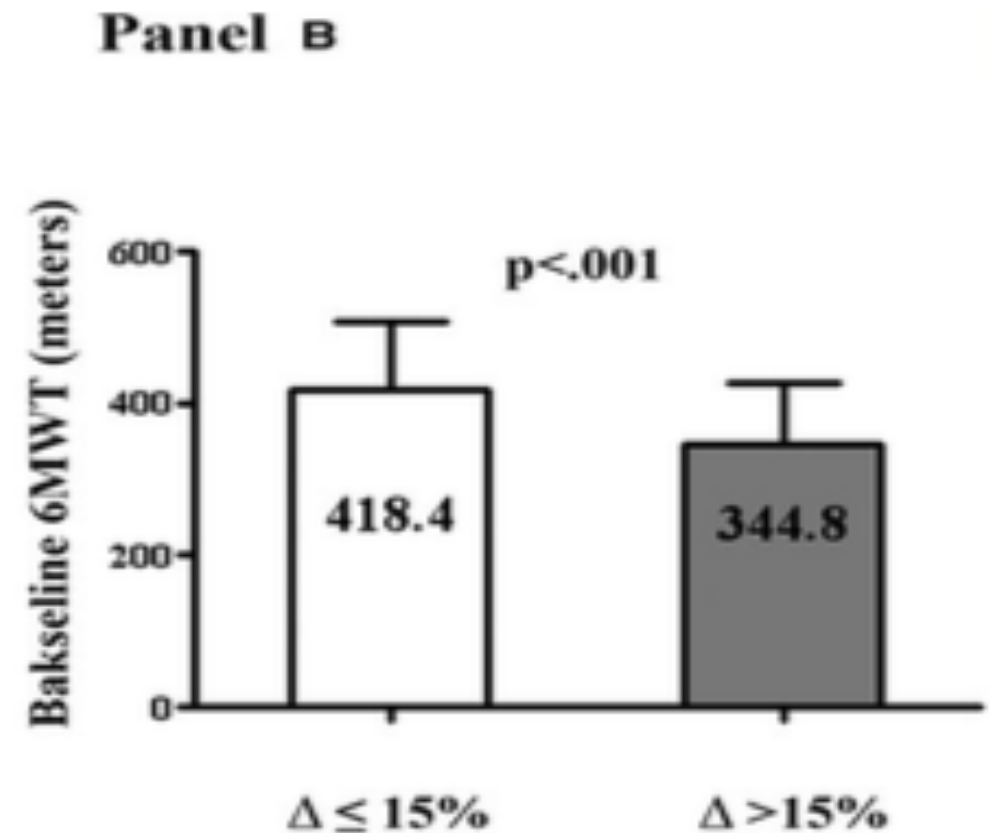
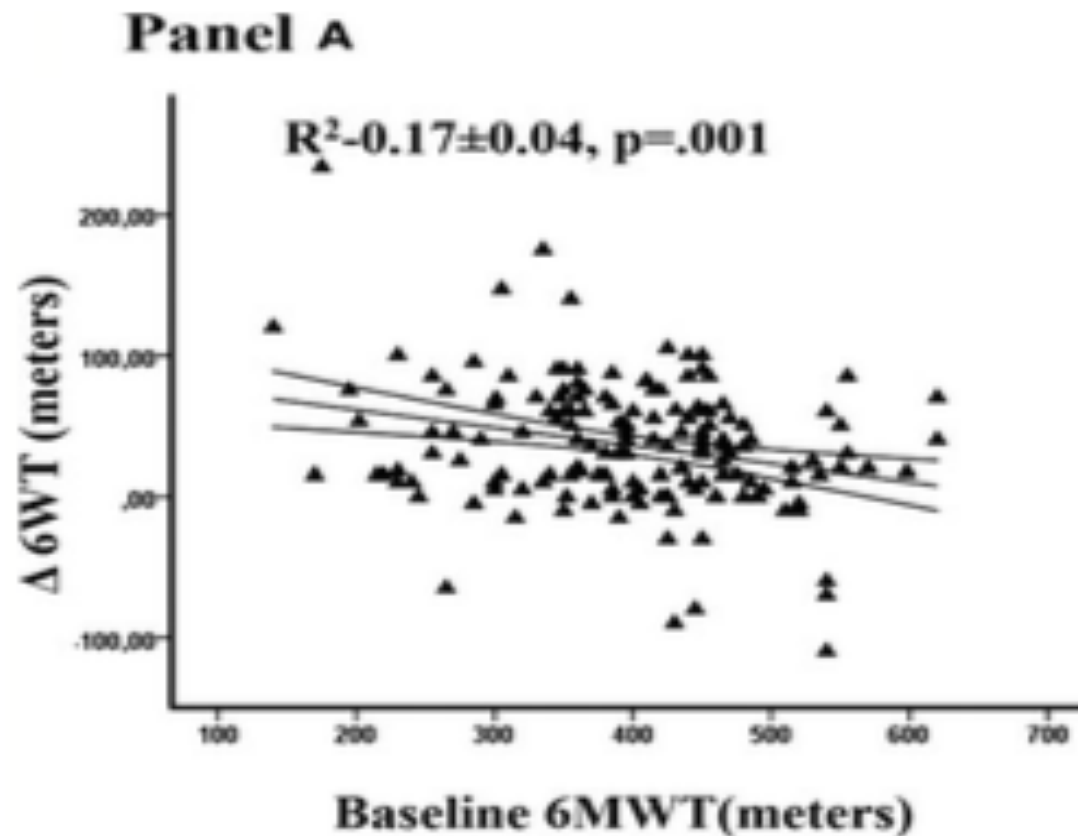
Figure 2. Delta 6-minute walk distance (6MWD). MCID = minimal clinically important difference 54 m; IG = intervention group, CG = control group.

- **CG** (n = 89) participated in the usual CREP: walks (30', 3xwk), calisthenics (30', 2xwk), and exercise training on cycle ergometer (30', 3xwk)
- **IG** (n = 84) usual CREP + daily resistance (1 set, 8-12 rep @60% 1RM for 4 exercises session) and balance (30')

Cardiac Rehabilitation in Very Old Adults: Effect of Baseline Functional Capacity on Treatment Effectiveness



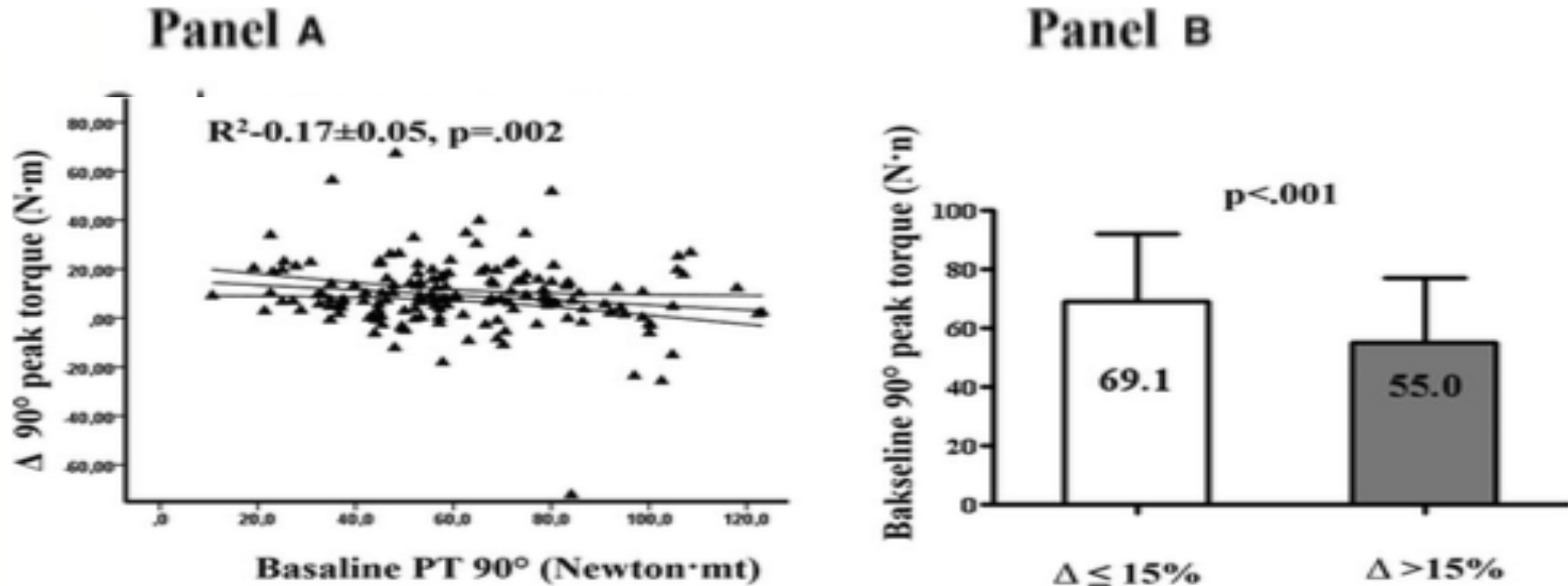
- (A) Scatter plots and linear correlation (adjusted for age and sex) between baseline values and final changes
(B) comparisons of mean baseline values of participants stratified according to predefined cutoff changes ($\leq 15\%$ vs $> 15\%$) observed at the end of cardiac rehabilitation



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Isokinetic muscle strength

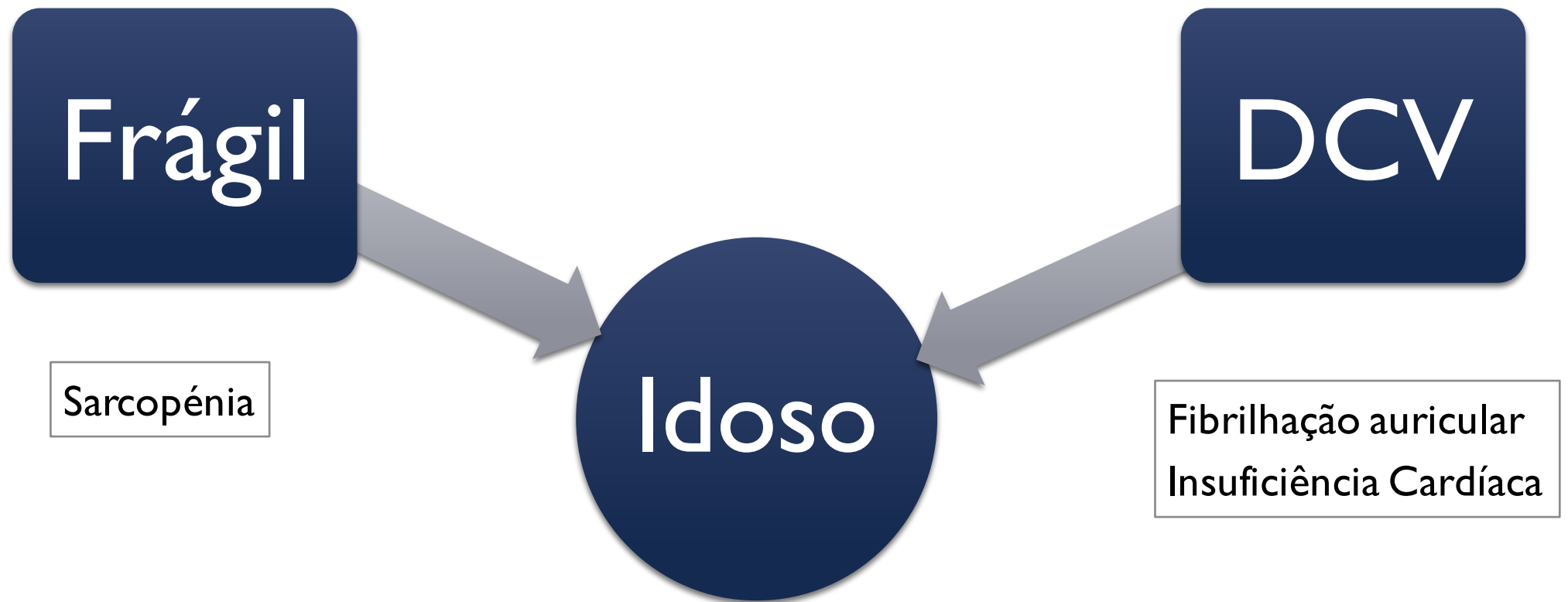
Isokinetic muscle strength, assessed using an isokinetic dynamometer at three angular speeds (5 repetitions at 90°/s; 8 repetitions at 120°/s; 10 repetitions at 180°/s), evaluating quadriceps and hamstring muscle strength in flexion and extension of the legs. Ninety-degree peak torque (Nm) was the outcome measure.



- (A) Scatter plots and linear correlation (adjusted for age and sex) between baseline values and final changes
- (B) comparisons of mean baseline values of participants stratified according to predefined cutoff changes ($\leq 15\%$ vs $> 15\%$) observed at the end of cardiac rehabilitation

Baldasseroni et al., J Am Geriatr Soc 64:1640–1645, 2016.

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IDOSO COM INSUFICIÊNCIA CARDÍACA

SKELETAL MUSCLE ABNORMALITIES AND EXERCISE INTOLERANCE IN OLDER PATIENTS WITH HEART FAILURE AND PRESERVED EJECTION FRACTION



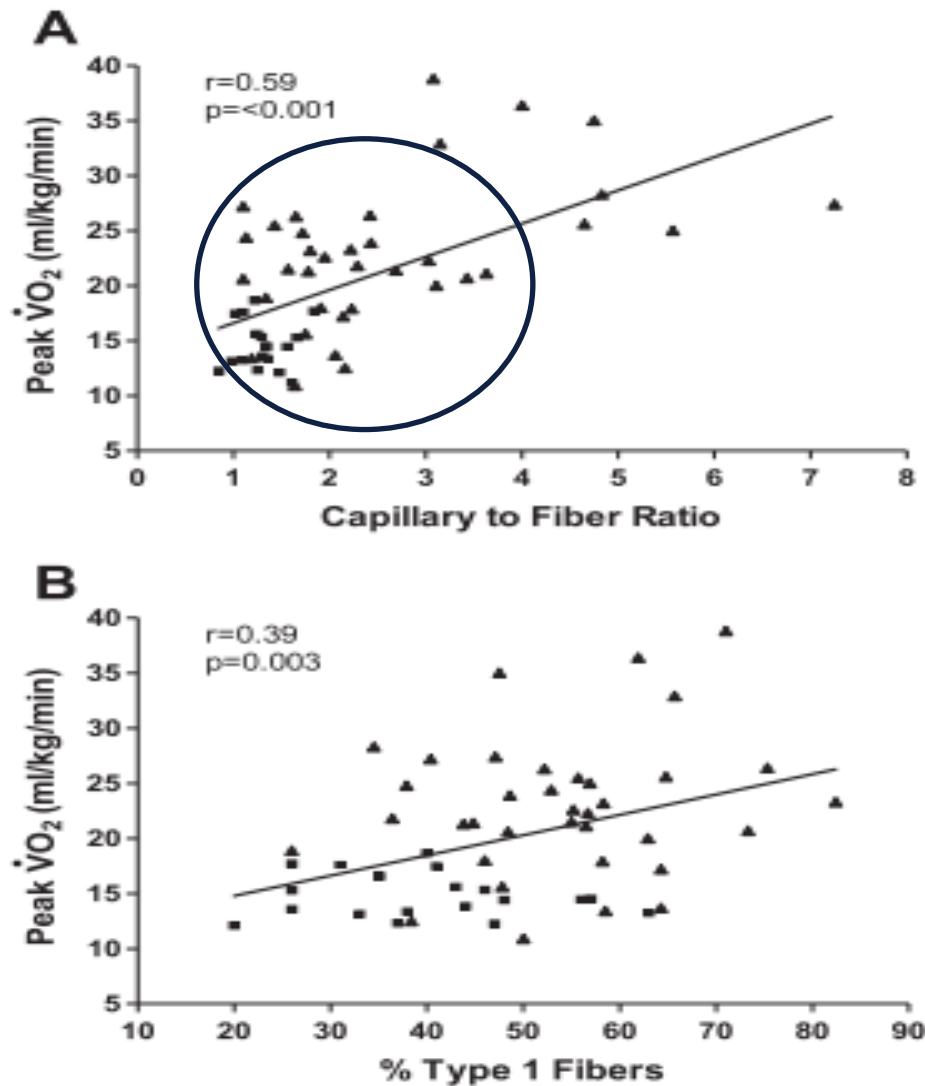


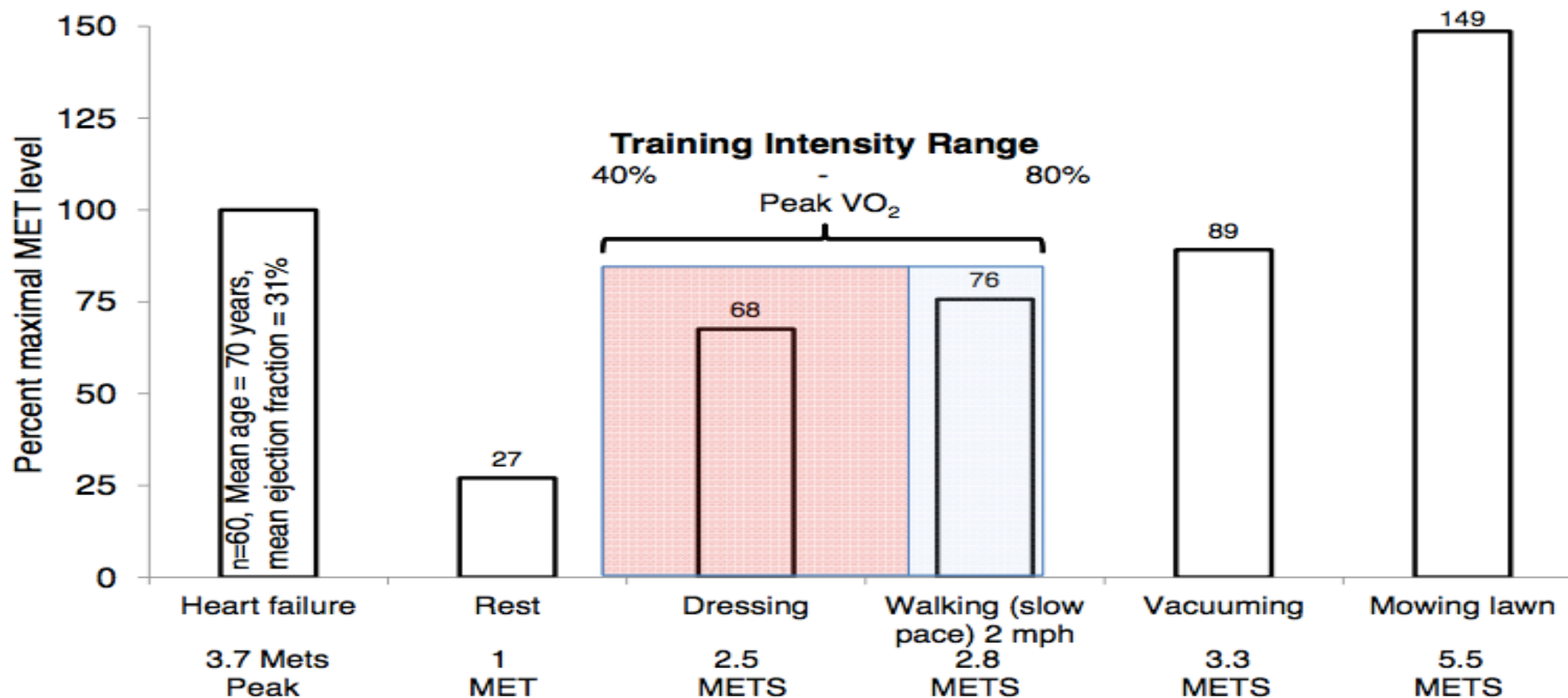
Fig. 1. Relationship of capillary-to-fiber ratio (A) and percentage of type I muscle fibers (B) with peak O_2 uptake ($\dot{V}O_2$) in older patients with heart failure with preserved ejection fraction (■) and age-matched healthy control subjects (▲).

Doentes mais idosos com HFPEF têm uma % significativamente inferior de:

- Fibra tipo I de contração lenta
- Ratio de fibra tipo I y II
- Proporção de área de fibras capilares

Esta alterações associam-se com o reduzido VO_2 pico.

Heart Failure Exercise Based Cardiac Rehabilitation: Who, When and How Intense?



13 ml/kg/min

Haykowsky MJ, et al Canadian Journal of Cardiology (2016), doi: 10.1016/j.cjca.2016.06.001.

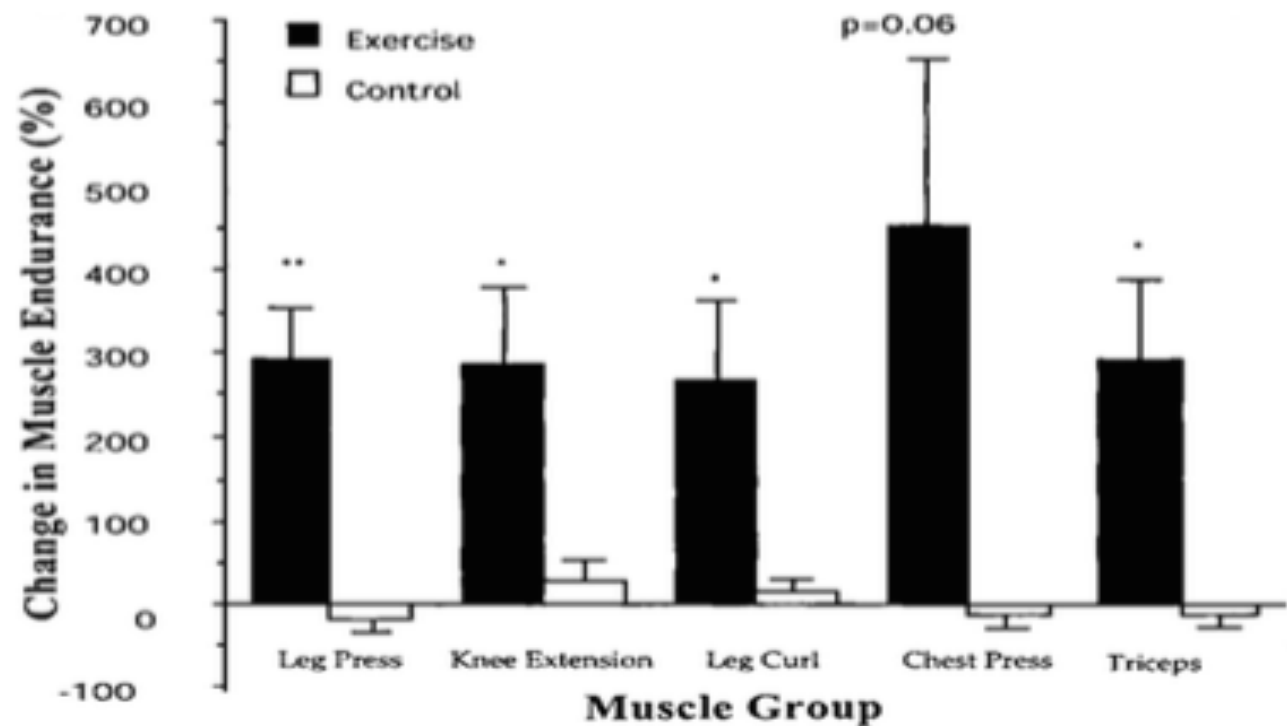
A 10-WK OF STUDY

EXERCISE: HIGH-INTENSITY PRT

CONTROL: STRETCHING

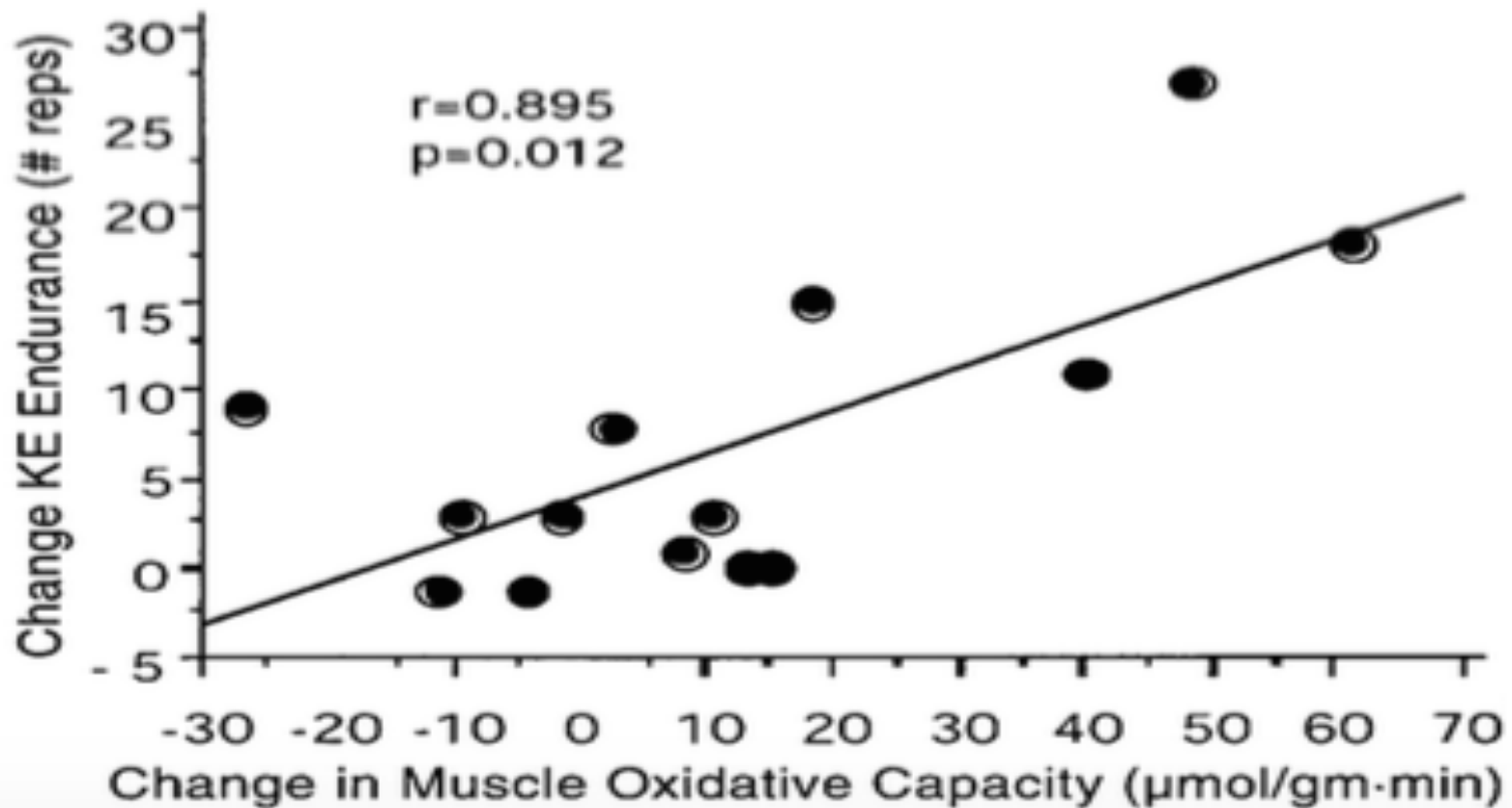
PROGRAM..

- Exercise protocol:
- 3xwk, 60' session, 80% 1RM
- 3 set of 8 rep each machine before moving on to the next
- Each rep lasted 6-9" with 2-3" rest between rep
- And 60-90" between sets
- As needed, rest period 1-3' between machines

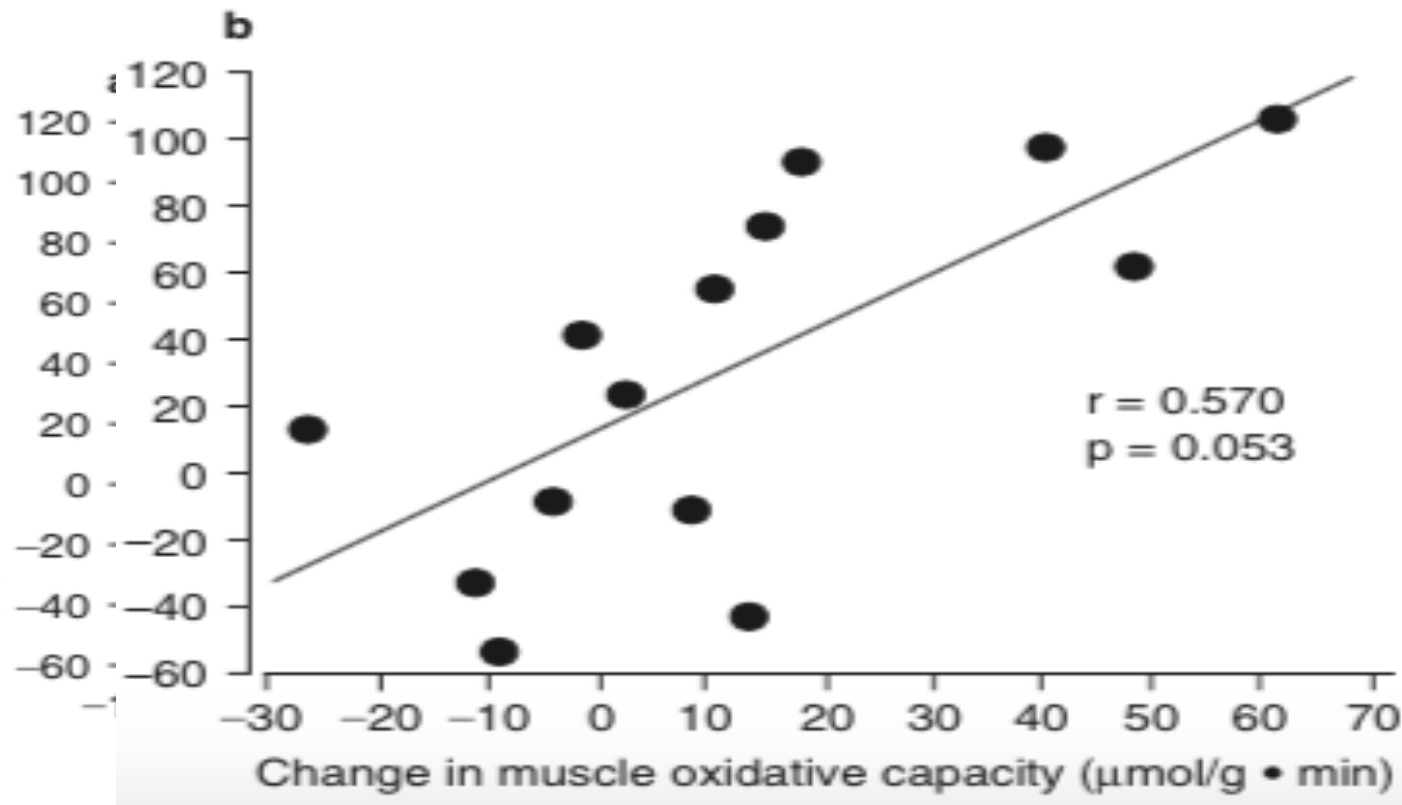


Pu C et al. Randomized trial of progressive resistance training to counteract the myopathy of chronic heart failure
J appl physiol 90: 2341–2350, 2001 90: 2341

RELATIONSHIP BETWEEN CHANGES IN MUSCULOSKELETAL PERFORMANCE AND SKELETAL MUSCLE ADAPTATIONS FOLLOWING 10 WK OF PRT.



PREDICTORS OF CHANGE IN 6-MIN WALK PERFORMANCE



Correlations between the improvement in functional capacity and (a) the changes in type I muscle fibre area and (b) the changes in muscle oxidative capacity after resistance training in patients with chronic heart failure

Pu C et al., J Appl Physiol 90: 2341–2350, 2001

BENEFÍCIOS DO TREINO NA INSUFICIÊNCIA CARDÍACA

■ Influência do tipo de treino

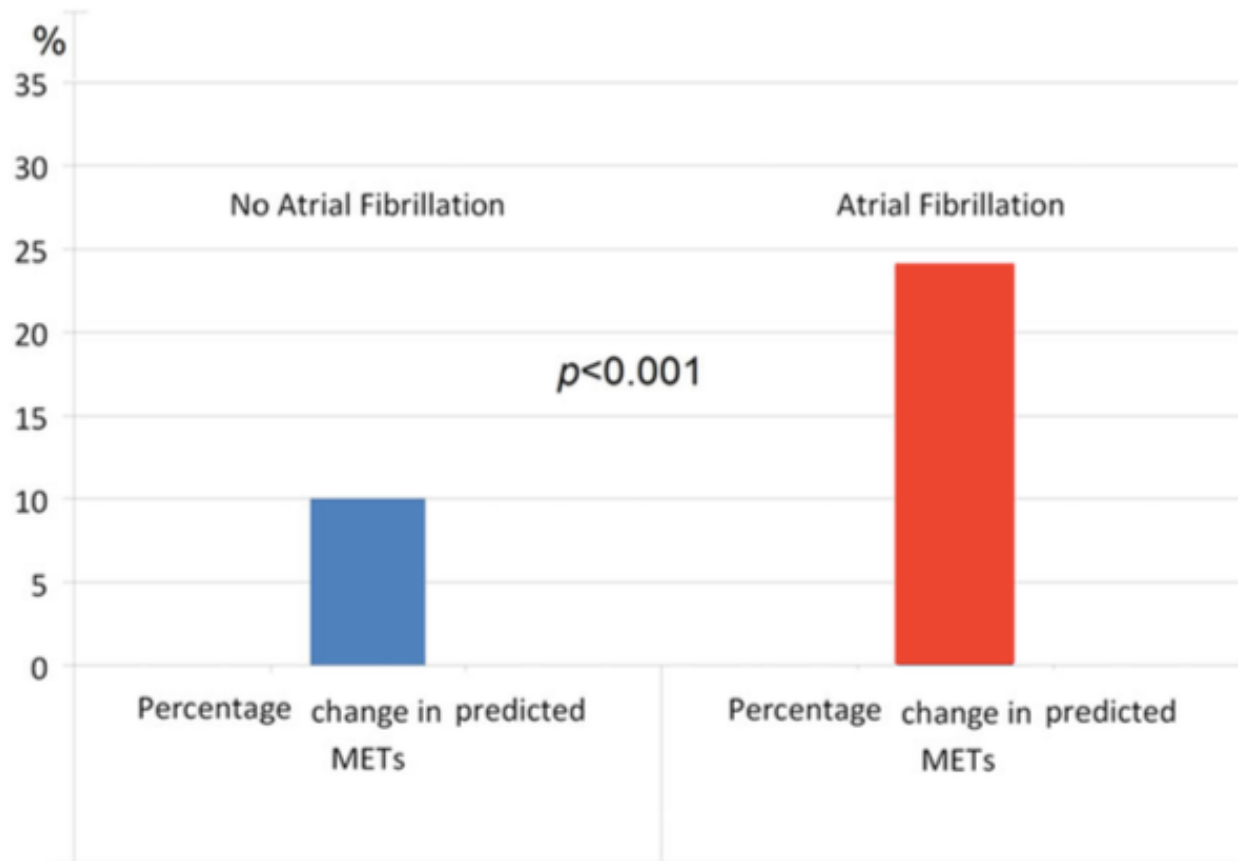
	AT	RT	AT+RT
Exercise capacity			
Peak VO ₂	↑↑	↑↔	↑↑
Cardiac function			
Peak cardiac output	↑↔	↔	
Peak stroke volume	↑	↔	
Ejection fraction	↑↔	↔	↑↔
End-systolic volume	↑	↔	↔
End-diastolic volume	↑	↔	↔
Vascular function			
Endothelial function	↑↑	↑	↑
Arterial remodeling	↑	↑↑	?
Skeletal muscle function			
Muscle strength	↔↑	↑↑↑	↑
Muscle endurance	↑	↑↑	↑
Oxidative enzymes	↑	↑	↑

↑—slight improvement; ↑↑—moderate improvement; ↑↑↑—large improvement; ↔—no effect; ?—Unknown; AT—acrobic training; RT—resistance training; AT+RT—combined aerobic and resistance training; CHF—chronic heart failure; peak VO₂—maximal oxygen consumption

THE ROLE AND OUTCOME OF CARDIAC REHABILITATION PROGRAM IN PATIENTS WITH ATRIAL FIBRILLATION

EVALUATE THE ROLE OF THE FITNESS LEVEL AT BASELINE AS WELL AS THE DEGREE OF IMPROVEMENT AMONG AF PATIENTS UNDERGOING CR AND ITS EFFECT ON CARDIAC RELATED MORBIDITY AND TOTAL MORTALITY.

(B) Delta* for the change of the predicted METs among the two cohorts.

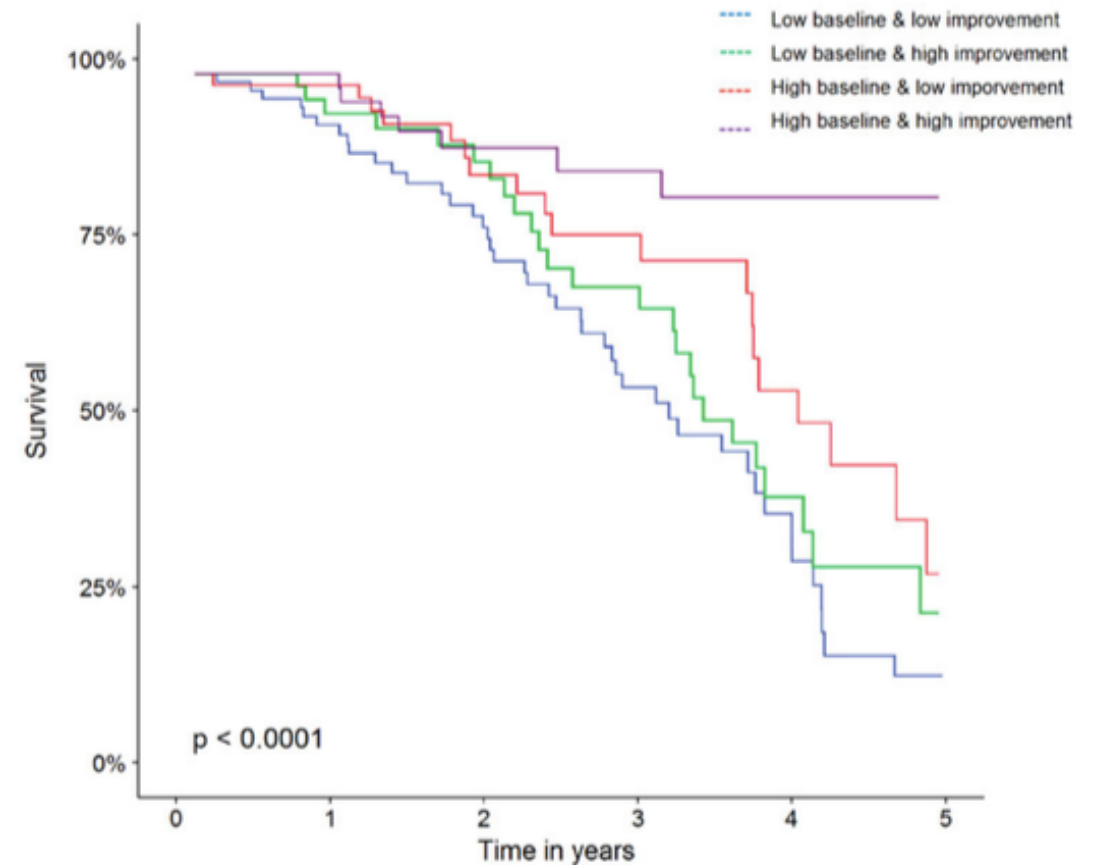


- The delta for improvement in fitness relative to age and gender predicted value was significantly more prominent in patients with AF (24% vs 10%, $P < 0.001$)

* $\frac{((\text{Follow up predicted METs} - \text{Baseline predicted METs}) / \text{Baseline predicted METs})}{100}$

- Kaplan-Meier survival analysis showing the risk for MACE and/or all-cause mortality among patients with AF based on their baseline fitness level and their percentage of improvement

Younis A. et al Clinical Cardiology.
2018;41:1170–1176.



	Number at risk					
	0	1	2	3	4	5
Low baseline & low improvement	94	75	53	32	14	6
Low baseline & high improvement	68	52	40	25	11	4
High baseline & low improvement	67	60	37	23	14	5
High baseline & high improvement	63	53	36	26	20	12

FRAGILIDADE

Classificação

- frágeis, se 3 ou mais itens do fenótipo estiverem presentes;
- pré-frágeis, se estiverem presentes 1 ou 2 itens; e
- não frágeis, quando não manifestarem a presença de nenhum item.

Fénotipo

- perda de peso não intencional,
- perda da força de preensão palmar,
- exaustão, diminuição da marcha e baixo nível de atividades físicas

EXERCISE TRAINING “AGAINST” SARCOPENIA

Resistance exercise

- ↑ muscle protein synthesis
- ↑ satellite cells activation and proliferation
- ↑ anabolic hormone production and ↓ in catabolic cytokine activity
- ↑ both Type I and II fibers cross-sectional areas
- Increase muscle mass (hypertrophy)

Aerobic exercise

- ↑ $\text{VO}_{2\text{peak}}$, SV, ↓ HR and BP at rest
- Induces an ↑ in skeletal muscle mitochondria
- Cumulative effect of these acute pulses in gene transcription resulting in the synthesis and incorporation of new mitochondrial proteins

Visvanathan & Chapman, Maturitas 66:383-388, 2010

G. Iolascon et al. Clinical Cases in Mineral and Bone Metabolism 11:215-221, 2014

EXERCISE TRAINING “AGAINST” SARCOPENIA

Resistance exercise

- Muscle protein synthesis is depressed during an exercise session but is elevated during recovery from resistance exercise for up to 48 h
- Neuronal adaptation
- Increase muscle strength and power
- And overall quality of life

Aerobic exercise

- ↑ muscle mitochondrial content and/or improved mitochondrial function lead to improved metabolic control, resulting in ↓ oxidative stress and optimized exercise capacity
- ↑ Insulin sensitivity
- ↓ body fat mass

Visvanathan & Chapman, Maturitas 66:383-388, 2010
G. Iolascon et al. Clinical Cases in Mineral and Bone Metabolism 11:215-221, 2014

NUTRITION

- Avoid unnecessary weight loss (propensity to loss lean mass)
- Protein intake
- Vitamin D deficiency
- Calcium



(...) Todas as pessoas com doenças cardiovasculares.

RECONHECIMENTO DE UM PROGRAMA DE REABILITAÇÃO CARDÍACA

HOME MESSAGES - OLD ADULTS

- Enhancement of exercise capacity and muscular strength was observed at the end of the CR program;
- Baseline VO₂ peak, 6MWT difference, and 90° peak torque were the strongest predictors of final improvement
- These findings would be clinically valuable in a geriatric population, because enhanced global functional capacity is known to reduce incident disability, improve health-related quality of life, and foster social reintegration and independence



OBRIGADA PELA VOSSA ATENÇÃO...

santaclara@fmh.ulisboa.pt





EAPC
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of Preventive Cardiology

2019 **EuroPrevent**

European Congress on Preventive Cardiology



11-13 April 2019
Lisbon, Portugal

www.escardio.org/europrevent
[#europrevent](https://twitter.com/europrevent)



ESC
European Society
of Cardiology

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- Frailty in elderly patients with acute coronary syndrome or percutaneous transluminal coronary angioplasty
 - Many studies have evaluated frailty in elderly patients after an acute coronary syndrome (ACS) or percutaneous transluminal coronary angioplasty (PTCA) by using several instruments, such as the phenotypic model (PFI), the CSHA clinical frailty scale, or the EFS. In this setting frailty ranged from 10% to 48%, and higher levels of frailty were associated with worse outcomes

- 
- 
- Frailty in elderly patients undergoing cardiac surgery
 - In the current era, the elderly represent the fastest growing group of patients referred for cardiac surgery, with the proportion of patients aged 75 years or older rising from 16% in 1990 to 25% in most recent estimates. These complex and often frail patients are at increased risk of falls, prolonged hospitalisation and mortality after surgery. For this reason, many groups have evaluated preoperative frailty to increase prognostic capability.

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- 
- Transvalvular aortic valve replacement
 - Transvalvular aortic valve replacement (TAVR) is a successful intervention in elderly patients with aortic stenosis, and patients after TAVR benefit from CR despite their older age and clinical complexity and frailty. Several studies have recently described the added prognostic value of frailty evaluation over standard criteria in elderly patients undergoing TAVR.