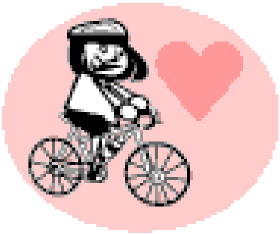
FYSISK TRÄNING
SENASTE NYTT OCH MÖJLIGHETER VID HJÄRTSVIKT



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Göteborgs universitet

Fysioterapeutledd fysisk träning inom hjärtrehabilitering

Konditionsträning intervall eller distans, 3-5 gånger/ vecka, 20-60 minuter per tillfälle på en nivå av 60-85% av VO_{2peak}

Muskulär motståndsträning 2-3 tillfällen per vecka, 1-3 set med 10-15 repetition maximum i 8-10 muskelgrupper i övre och nedre kroppshalvan

Vid mycket låg kapacitet – starta med perifer muskelträning

Balady, Williams et al. 2007, Mc Kelwiie 2008

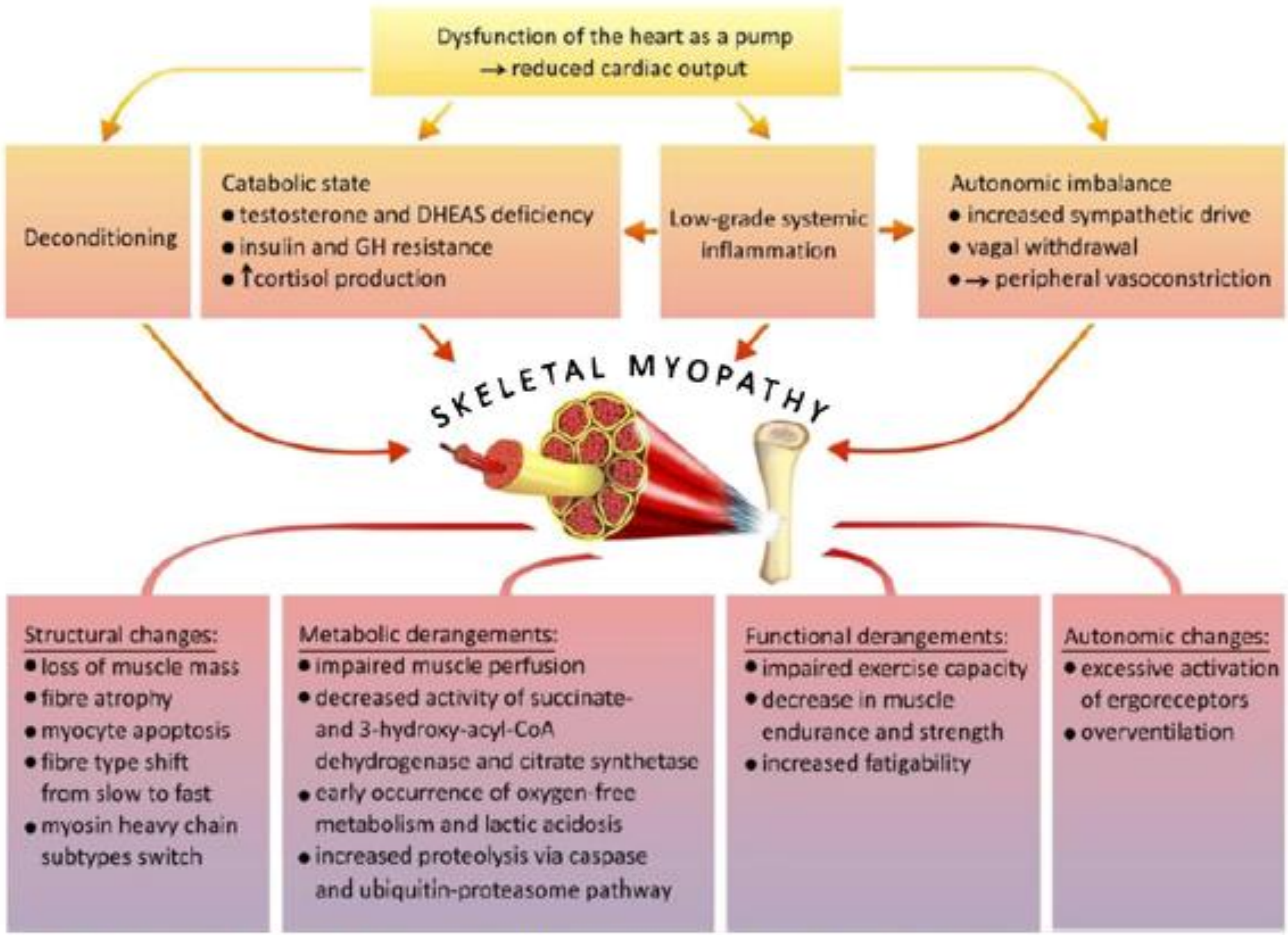


Fig. 1 The muscle hypothesis in heart failure: pathogenesis of skeletal myopathy—modified from [10]

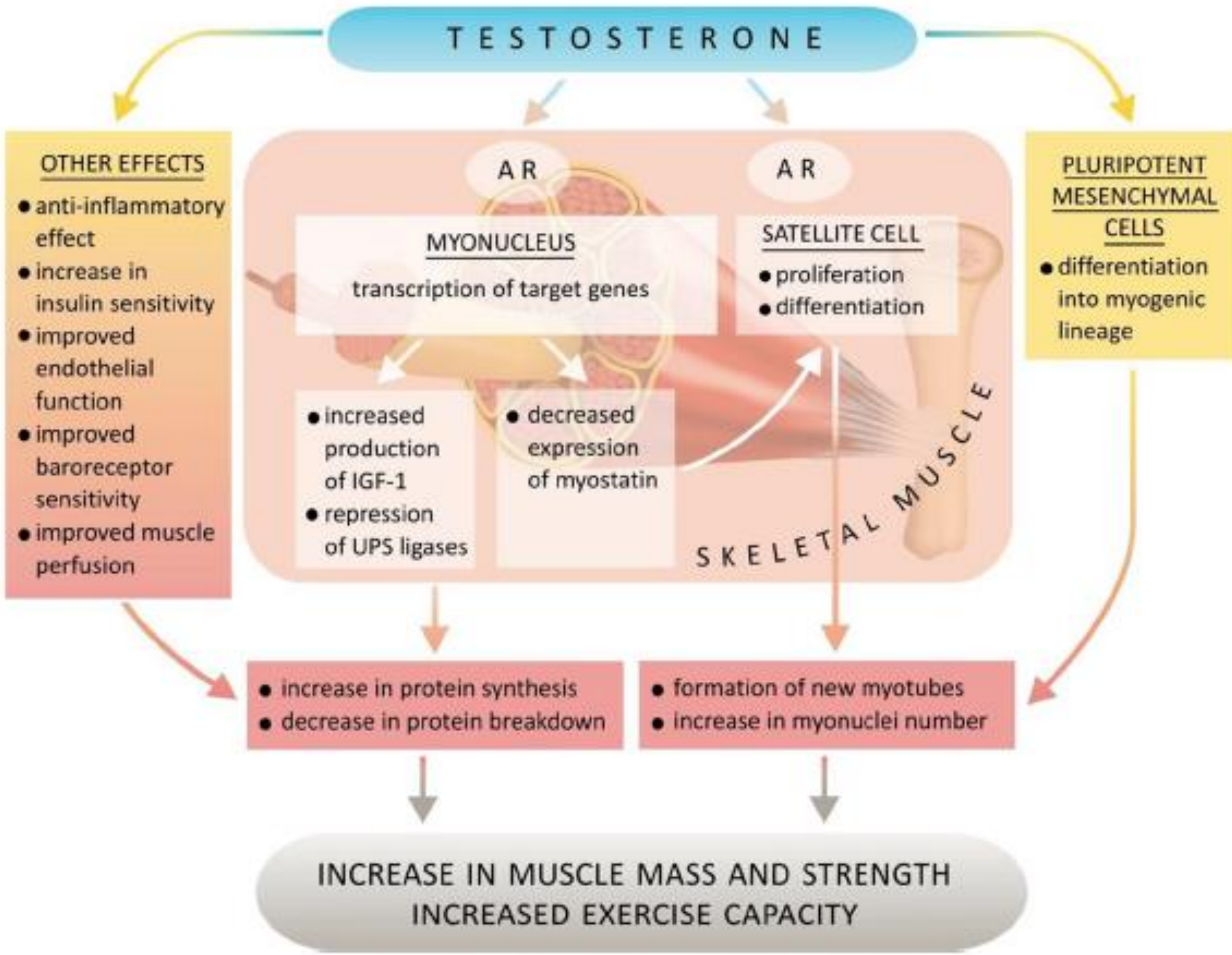


Fig. 2 Mechanisms of action of anabolic hormones on skeletal muscles. *AR* androgen receptor, *UPS* ubiquitin-proteasome system)

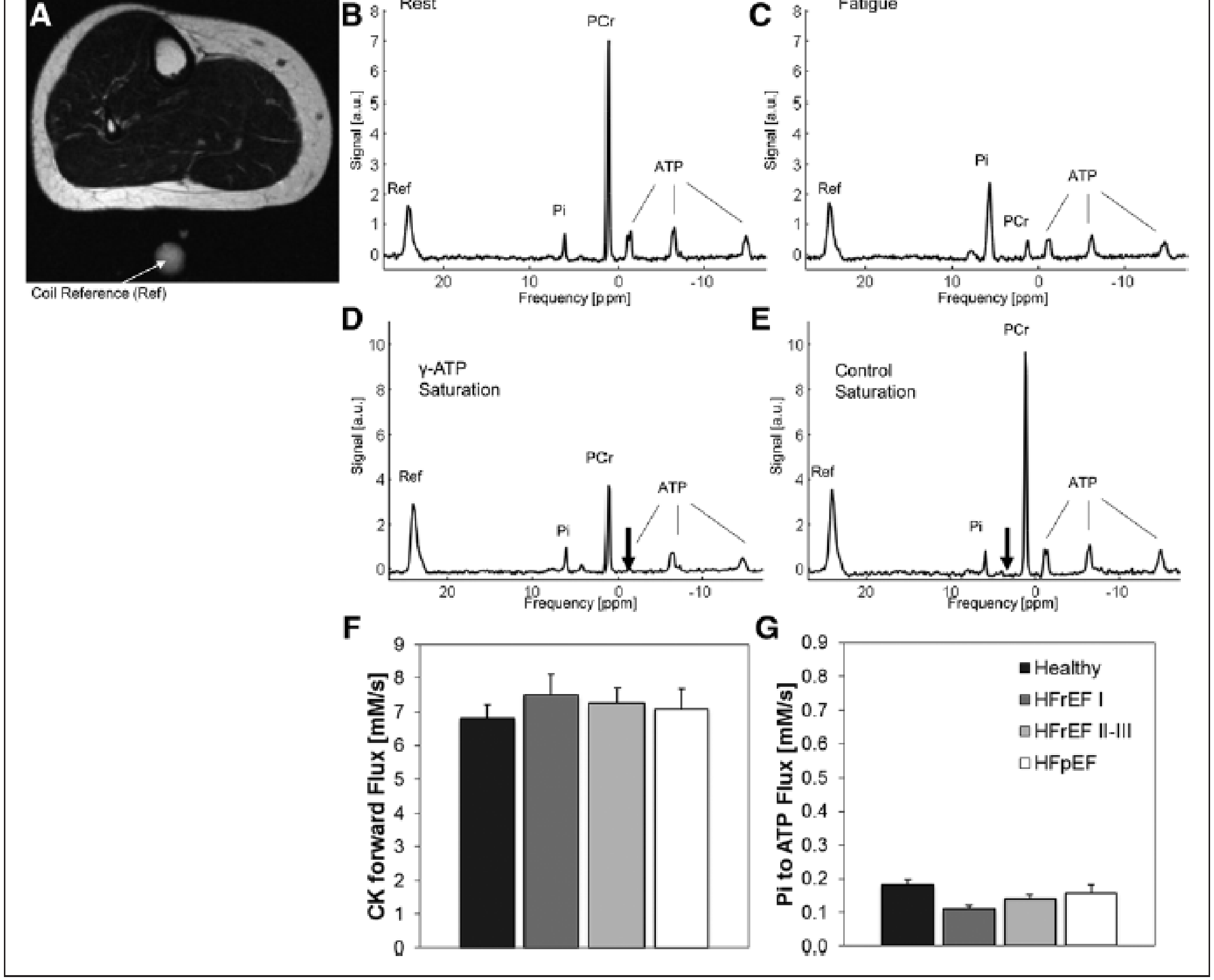
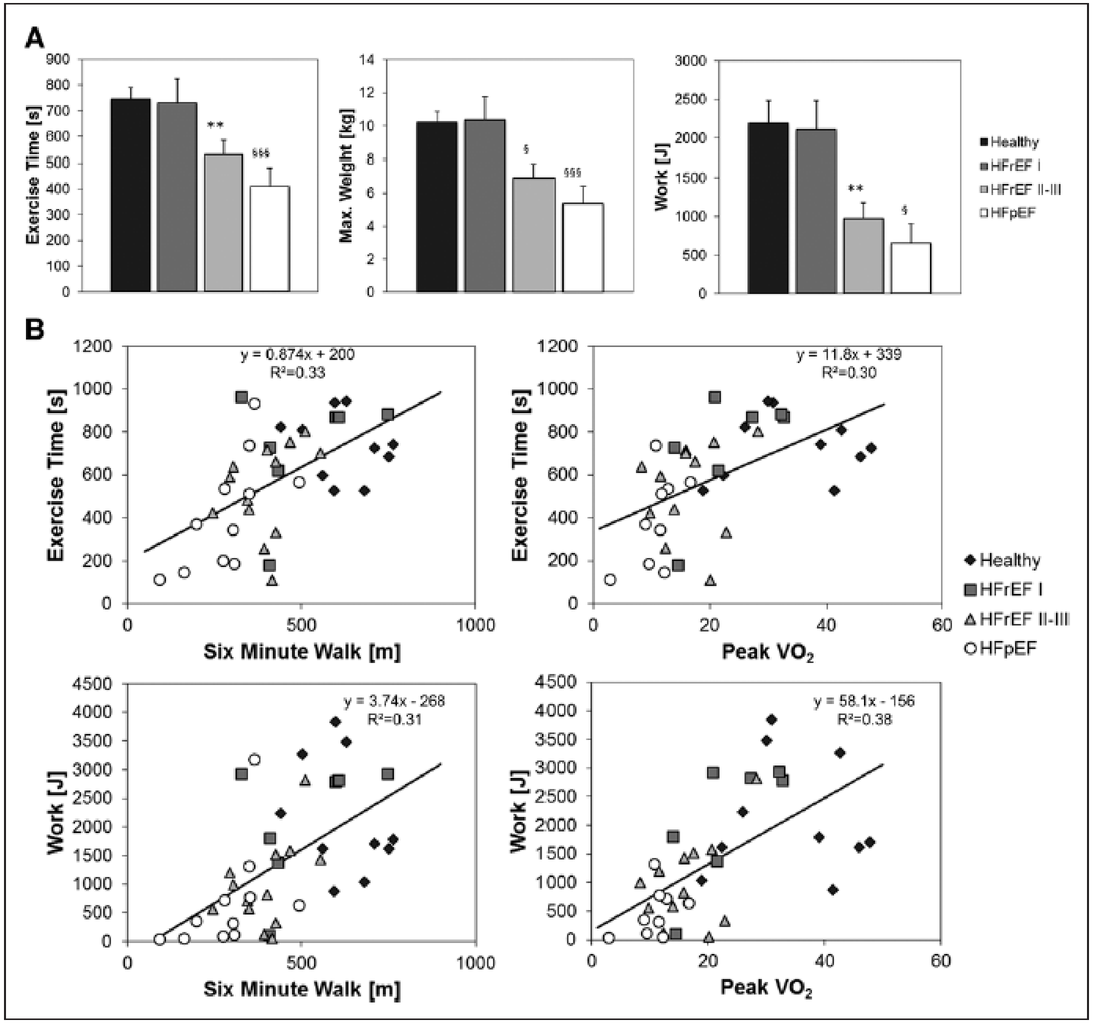


Figure 2. **A**, **Representative magnetic resonance imaging of the calf with coil reference (indicated by white arrow).** Phosphorous (^{31}P) spectrum from the calf of the same subject at rest (**B**) at the time point of fatigue (**C**). Note the depletion of creatine phosphate (PCr) and accumulation of Pi at fatigue. ^{31}P magnetic resonance spectroscopy (MRS) spectra at rest wherein the reduction in the PCr peak during ATP saturation (**D**, saturation indicated by black arrow), compared with PCr peak during control saturation (**E**, saturation indicated by black arrow), is proportional to the ATP synthesis rate through creatine kinase (CK). **F**, Summary ATP synthesis rates from PCr through CK. **G**, Summary ATP synthesis rates from Pi. There are no significant differences among the 4 groups at baseline resting conditions.

Circ Heart Fail. 2017;10:e004129. DOI: 10.1161/CIRCHEARTFAILURE.117.004129



igure 1. A, Mean plantar flexion exercise (PFE) time, maximum PFE exercise weight, and total PFE work of healthy ıbjects, heart failure with reduced ejection fraction (HFrEF) New York Heart Association (NYHA) class I (HFrEF I), FrEF NYHA class II–III (HFrEF II–III), and heart failure with preserved ejection fraction (HFpEF) patients.
ll 3 indices are reduced in HFpEF and HFrEF NYHA class II–III patients compared with healthy subjects and HFrEF patients with YHA class I symptoms. **B**, Correlations between indices of PFE performance (exercise time, maximum exercise weight, and ɔtal work) and more established, functional indices of 6-min walk and peak VO_2. Comparisons vs healthy subjects: ***P*<0.02, *P*<0.005, §§§*P*<0.001.

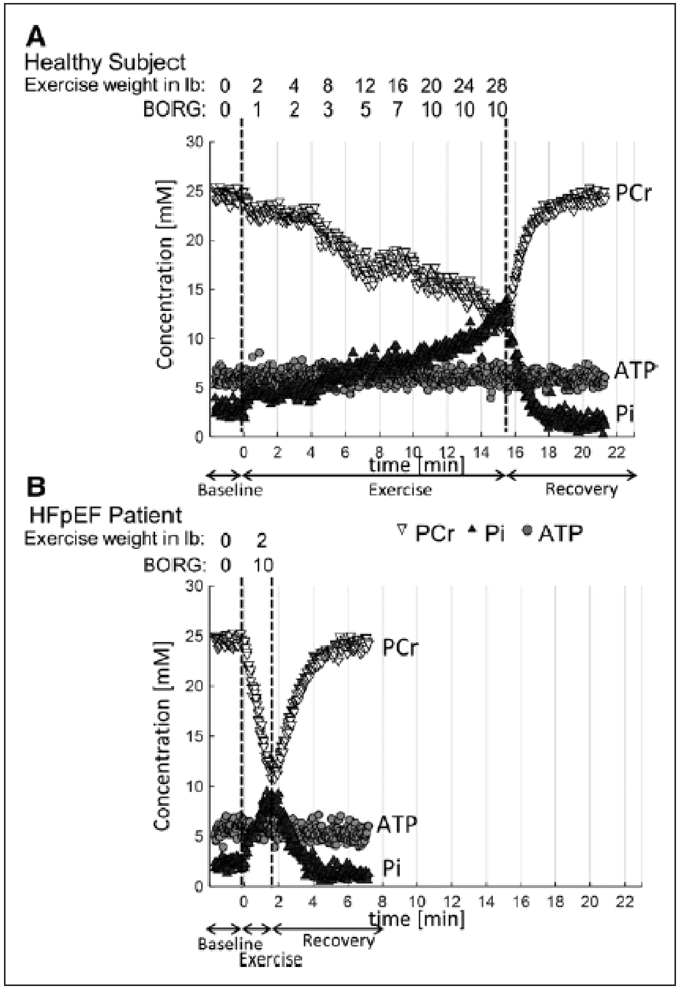


Figure 3. Time course of energetic changes and fatigue symptoms for a healthy subject with low fatigability (A) and for a heart failure (HF) patient with high fatigability (B).

In both cases, PCr is progressively depleted and Pi accumulates during staged-exercise while ATP is preserved. The rates of creatine phosphate (PCr) decrease and inorganic phosphate (Pi) increase are more rapid in the subject with high fatigability. Both subjects reached a similar subjective level of fatigue (Borg scale) and PCr depletion but at different workloads and exercise durations.

Circ Heart Fail. 2017;10:e004129. DOI: 10.1161/CIRCHEARTFAILURE.117.004129

Table. Skeletal Muscle Abnormalities in HFpEF

Reduced % lean muscle mass
Fiber atrophy
Increased intermuscular adipose
Increased ratio of thigh intermusclar adipose/muscle areas
Reduced capillary density (capillary/fiber ratio)
Downward shifted relationship between %leg lean mass/peak VO_2 (impaired oxygen utilization)
Reduced % type 1 (oxidative) muscle fibers
Shift in type 1/type 2 fiber ratio
Reduced citrate synthase activity
Reduced mitochondrial density
Impaired mitochondrial fusion
Reduced mitochondrial respiratory reserve capacity (maximal respiratory control ratio)
Accelerated high-energy phosphate depletion during exercise
Delayed high-energy phosphate repletion after exercise
Increased fatigability
Increased oxidative stress

Most of these abnormalities have been correlated with reduced exercise capacity. HFpEF indicates heart failure with preserved ejection fraction.

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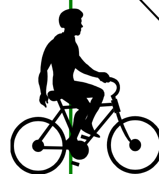
VÄSTRA GÖTALANDSREGIONEN

Fysisk träning vid kronisk hjärtsvikt



Elstimulering

Tai Chi

Respirations-
muskelträning

Muskulär
motståndsträning

Centralcirkulatorisk
träning

Kombinerad centralcirkulatorisk och muskulär motståndsträning

Land Vatten

Taylor et al 2014,
Smart et al 2013
Dieberg 2015
Adett 2015
Saeger 2015

Test av fysisk kapacitet
-en förutsättning
för att kunna förskriva optimal individanpassad träning

Arbets - EKG/konditonstest

Muskulär uthållighet

Definition of
Physical activity and Exercise

- **Physical activity**

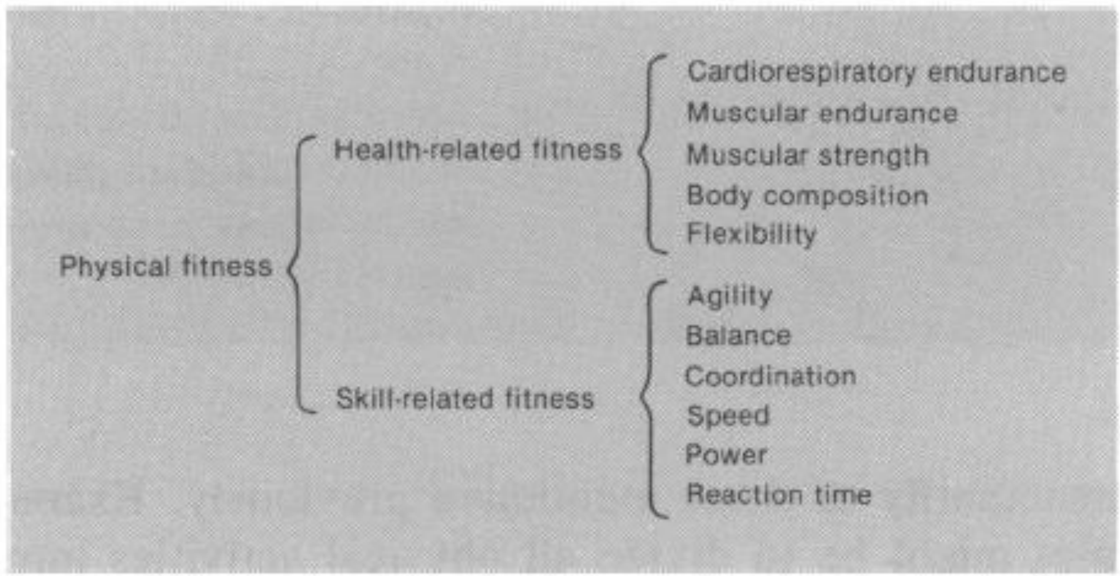
  Any bodily movement produced by skeletal muscles that results in energy expenditure.

- **Exercise**

  A subset of physical activity that is planned, structured, repetitive, and purposeful in the sense that improvement or maintenance of physical fitness is the objective.

Casparsen C, Powell K, Christenson G. Pub health Rep. 1985; 100:126-46.

Figure 2. Components of physical fitness



Anpassad efter Caspersen, 1985

Rådgivning av generell ökning av fysisk aktivitet jämfört med individanpassad fysisk träning

- Fysisk aktivet Primärprevention
- Fysisk träning Sekundär prevention

Table 3 Summary of changes in peak exercise central and peripheral determinants of peak exercise oxygen uptake (VO_{2peak}) following exercise training in heart failure patients with reduced or preserved ejection fraction.

Variable	HFrEF	HFpEF
Central Adaptations		
Peak exercise		
VO_2	↑ [15,26–31,34–37,48,51,57,66]	↑ [30,40–46]
Cardiac output	↑ [27,30,31,35–37,68] ↔ [15]	↔ [30,46,47]
Stroke volume	↑ [30,31,35–37,68] ↔ [27]	↔ [30,46,47]
Heart rate	↔ [15,26–28,34,35,37,51] ↑ [30,31,36]	↔ [30,40–42,45,47] ↑ [43,44,46]
LV end-systolic volume	↔ [37]	↔ [45,46]
LV end-diastolic volume	↔ [37]	↔ [45,46]
LV ejection fraction	↔ [37]	↔ [45]
PCWP	↔ [27,37]	Not studied
Peripheral Adaptations		
Peak exercise		
Systemic vascular resistance	↓ [31,35] ↔ [27,30]	↔ [30,46]
Arteriovenous O_2 difference	↑ [15,27,36,37] ↔ [30]	↑ [30,46]
Leg O_2 uptake	↑ [15,36,37]	Not studied
Leg blood flow	↑ [15,36,37]	Not studied
Leg O_2 delivery	↑ [15,36,37]	Not studied
Leg O_2 diffusive conductance	↑ [15]	Not studied
Leg vascular resistance	↓ [15,36,37]	Not studied
Leg arteriovenous O_2 difference	↑ [15,36,37]	Not studied

↑ = increase; ↓ decrease; ↔ stays the same.

Abbreviations: HFpEF = heart failure with preserved ejection fraction; HFrEF = heart failure with reduced ejection fraction; LV = left ventricle; PCWP = pulmonary capillary wedge pressure; VO_2 = oxygen uptake.

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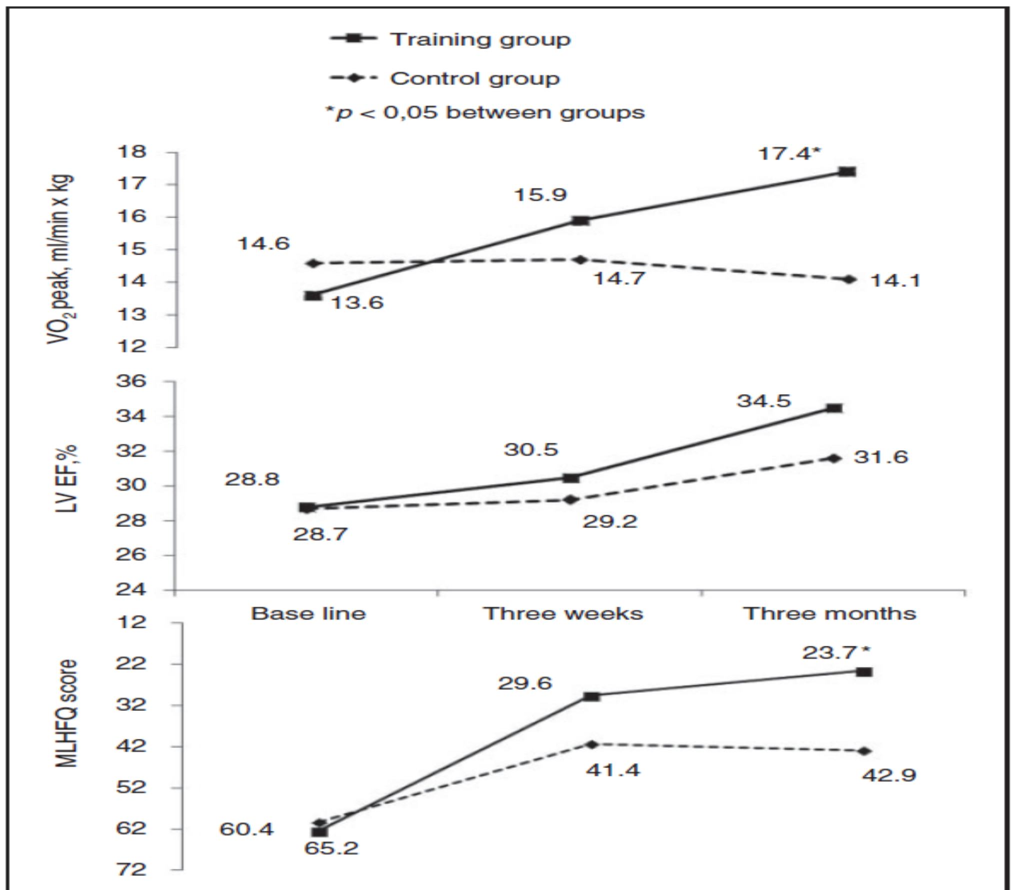
VÄSTRA GÖTALANDSREGIONEN

European Journal of Preventive Cardiology

Full research paper

Interval training early after heart failure decompensation is safe and improves exercise tolerance and quality of life in selected patients

Artem Doletsky[1], Denis Andreev[1], Ilya Giverts[1], Alexey Svet[1], Anna Brand[1], Maria Kuklina[1], Vsevolod Sedov[1], Oxana Dikur[1], Abram Syrkin[1] and Hugo Saner[1,2]



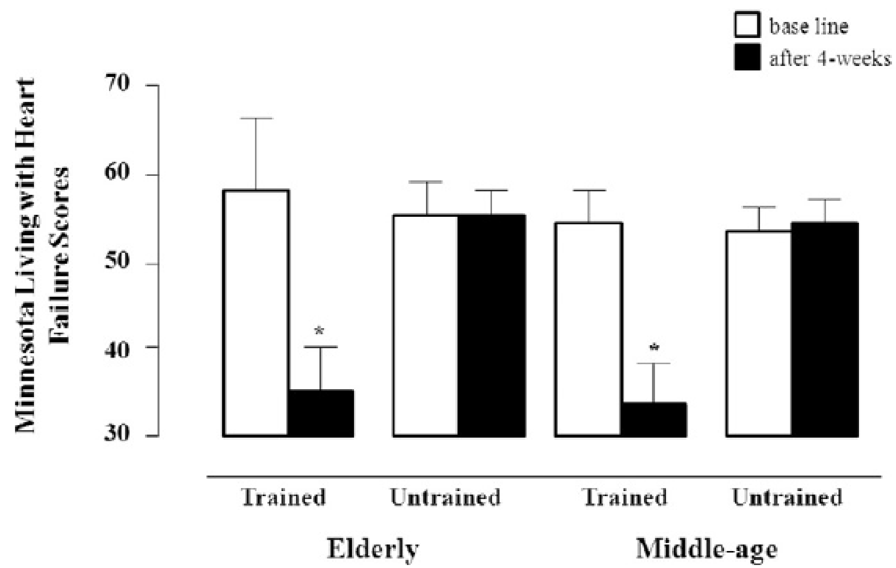
Doletsky, Andreev et al. 2018

Exercise training effects on elderly and middle-age patients with chronic heart failure after acute decompensation: A randomized, controlled trial

CrossMark

Domenico Acanfora [a,1], Pietro Scicchitano [b,1], Gerardo Casucci [c,1], Bernardo Lanzillo [a,1], Nicola Capuano [d,1], Giuseppe Furgi [a,1], Chiara Acanfora [a,1], Marialaura Longobardi [a,1], Raffaele Antonelli Incalzi [e,1], Giuseppe Piscosquito [a,1], Marco Matteo Ciccone [b,*,1]

[a] *Salvatore Maugeri Foundation, Institute of Care and Scientific Research, Rehabilitation Institute of Telese Terme, Benevento, Italy*
[b] *Section of Cardiovascular Diseases, Department of Emergency and Organ Transplantation, University of Bari, School of Medicine, Bari, Italy*
[c] *San Francesco Hospital-Telese Terme (BN), Italy*
[d] *Cardiovascular department Umberto I Hospital- Nocera inferiore ASL Salerno, Italy*



Acanfora, Scicchitano et al. 2016

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VÄSTRA GÖTALANDSREGIONEN

Check for updates

European Journal of Preventive Cardiology

ESC European Society of Cardiology

Invited editorial

A flying start? Early interval training in heart failure rehabilitation

Øyvind Ellingsen[1,2]

European Journal of Preventive Cardiology
2018, Vol. 25(1) 7–8
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DOI: 10.1177/2047487317733564
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Advances in Heart Failure

Exercise Training as Therapy for Heart Failure

Current Status and Future Directions

Jerome L. Fleg, MD; Lawton S. Cooper, MD, MPH; Barry A. Borlaug, MD;
Mark J. Haykowsky, PhD; William E. Kraus, MD; Benjamin D. Levine, MD;
Marc A. Pfeffer, MD, PhD; Ileana L. Piña, MD, MPH; David C. Poole, PhD, DSc;
Gordon R. Reeves, MD, MPT; David J. Whellan, MD, MHS; Dalane W. Kitzman, MD;
Results from a National Heart, Lung, and Blood Institute Working Group

Ellingsen 2018, Fleg, Cooper et al. 2015

Inspirationsmuskelträning

Registrera maximalt inspriationstryck

Archives of Physical Medicine and Rehabilitation 2014;95:1398-407

Vid nedsättning träna styrkan i inandningsmuskulaturen

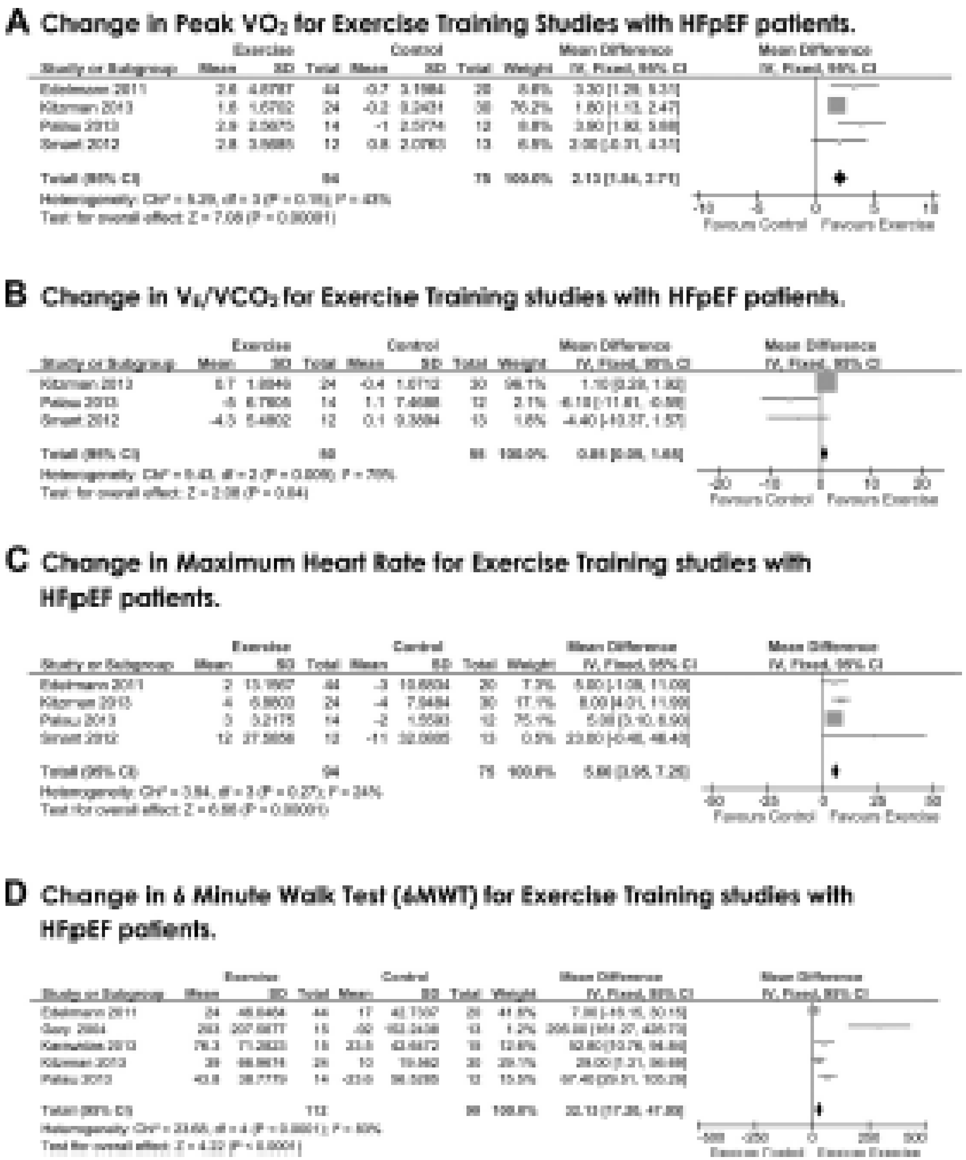

Fig. 2. Cardiorespiratory variables. *A*: change in peak $\dot{V}O_2$ for exercise training studies with heart failure patients with preserved ejection fraction (HFpEF) patients. *B*: change in $\dot{V}E/\dot{V}CO_2$ for exercise training studies with HFpEF patients. *C*: change in maximum heart rate for exercise training studies with HFpEF patients. *D*: change in Six-Minute Walk Test (6MWT) for exercise training studies with HFpEF patients.

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journal homepage: www.elsevier.com/locate/ijcard

High intensity interval training versus moderate intensity continuous training on exercise capacity and quality of life in patients with heart failure with reduced ejection fraction: A systematic review and meta-analysis

Mansueto Gomes Neto [a,b,c,d,*], André Rodrigues Durães [b], Lino Sergio Rocha Conceição [d,e], Micheli Bernardone Saquetto [a,b,c], Øyvind Ellingsen [f,g], Vitor Oliveira Carvalho [c,d,e]

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ABSTRACT

Objective: The aim of this study was to investigate the effects of high intensity interval training (HIIT) versus moderate intensity continuous training (MICT) in heart failure patients with reduced ejection fraction (HFrEF).
Background: Despite the well-known positive effects of exercise in heart failure patients, the best mode of exercise is still under discussion.
Methods: We searched Pubmed/MEDLINE, Cochrane Central Register of Controlled Trials, PEDro data base, and SciELO (from the earliest date available to October 2017) for randomized controlled trials that evaluated the effects of HIIT versus MICT in HFrEF patients. Weighted mean differences (WMD) with 95% confidence interval (CI) were calculated, and heterogeneity was assessed using the I^2 test.
Results: 13 studies met the study criteria, including 411 patients. Compared to MICT, HIIT resulted in improvement in Peak VO_2 WMD (1.35 $mL \cdot kg^{-1} \cdot min^{-1}$ 95% CI: 0.03 to 2.64 $N = 411$). HIIT resulted in no difference in VE/VCO_2 slope WMD (-1.21 95% CI: -3.0 to 0.58 $N = 135$), and quality of life measured by Minnesota Living with Heart Failure questionnaire WMD (1.19 95% CI: -5.81 to 8.19 $N = 79$). Sub-group analyses comparing studies with and without isocaloric exercise training protocol also showed a nonsignificant difference in peak VO_2 for participants in the HIIT group compared with MICT group.
Conclusions: HIIT improves peak VO_2 and should be considered as a component of care of HFrEF patients. However, its superiority versus MICT disappears when isocaloric protocols are compared. An important caveat is uncertainty and variation of actual training intensities compared to program targets.

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Impact of exercise-based cardiac rehabilitation in patients with heart failure (ExTraMATCH II) on mortality and hospitalisation: an individual patient data meta-analysis of randomised trials

Aims To undertake an individual patient data (IPD) meta-analysis to assess the impact of exercise-based cardiac rehabilitation (ExCR) in patients with heart failure (HF) on mortality and hospitalisation, and differential effects of ExCR according to patient characteristics: age, sex, ethnicity, New York Heart Association functional class, ischaemic aetiology, ejection fraction, and exercise capacity.

Methods and results Randomised trials of exercise training for at least 3 weeks compared with no exercise control with 6-month follow-up or longer, providing IPD time to event on mortality or hospitalisation (all-cause or HF-specific). IPD were combined into a single dataset. We used Cox proportional hazards models to investigate the effect of ExCR and the interactions between ExCR and participant characteristics. We used both two-stage random effects and one-stage fixed effect models. IPD were obtained from 18 trials including 3912 patients with HF with reduced ejection fraction. Compared to control, there was no statistically significant difference in pooled time to event estimates in favour of ExCR although confidence intervals (CIs) were wide [all-cause mortality: hazard ratio (HR) 0.83, 95% CI 0.67–1.04; HF-specific mortality: HR 0.84, 95% CI 0.49–1.46; all-cause hospitalisation: HR 0.90, 95% CI 0.76–1.06; and HF-specific hospitalisation: HR 0.98, 95% CI 0.72–1.35]. No strong evidence was found of differential intervention effects across patient characteristics.

Conclusion Exercise-based cardiac rehabilitation did not have a significant effect on the risk of mortality and hospitalisation in HF with reduced ejection fraction. However, uncertainty around effect estimates precludes drawing definitive conclusions.

Keywords Cardiac rehabilitation • Exercise training • Meta-analysis • Systematic review

European Journal of Heart Failure (2018)
doi:10.1002/ejhf.1311

Balansträning ?

Sammanfattning

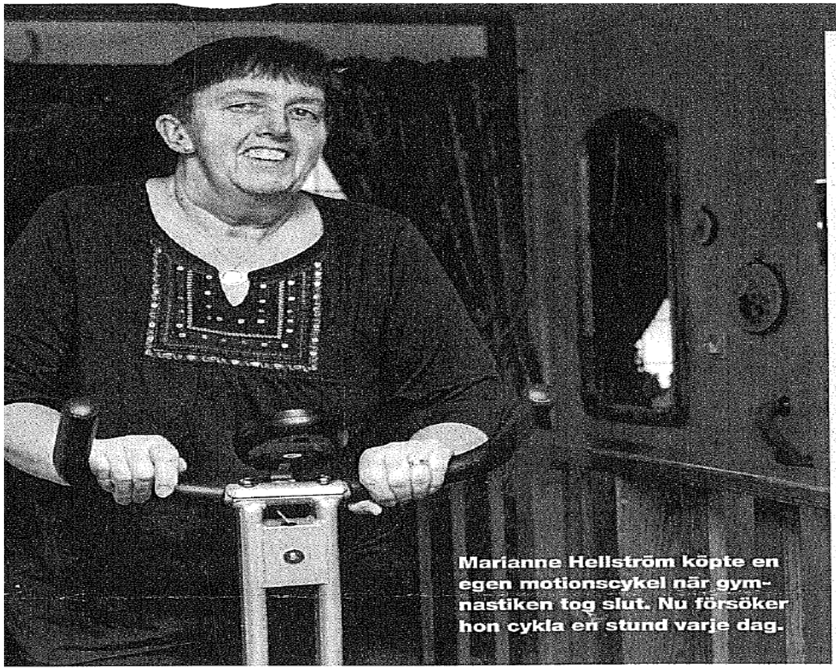
HFreF och HFpeF skall erbjudas fysisk träning inom hjärtrehab

Start av fysisk träning tidigt- även om patienten inte är fullt stabilicerad

Skelettmuskulaturen – en nyckelfaktor till att öka fysisk kapacitet

Andningsmuskulatur – mät om den är nedsatt – erbjud fysisk träning

*Metaanalys med individdata – ett observandu*m



Marianne Hellström köpte en egen motionscykel när gymnastiken tog slut. Nu försöker hon cykla en stund varje dag.

TRÄNING VID SVIKT

Forskning visar att fysisk träning klart förbättrar tillståndet hos patienter med hjärtsvikt och även har effekt på överlevnaden. Men det är viktigt att få ett personligt anpassat träningsprogram.

Gå till en sjukgymnast och testa din andnings- och muskelfunktion. Med utgångspunkt från resultatet läggs ett träningsprogram upp, med både konditions- och muskelträning.

Tidningen Status utgiven av

Riksförbundet hjärt-lung.

Tack för uppmärksamheten

Muskulär motståndsträning

Balansträning