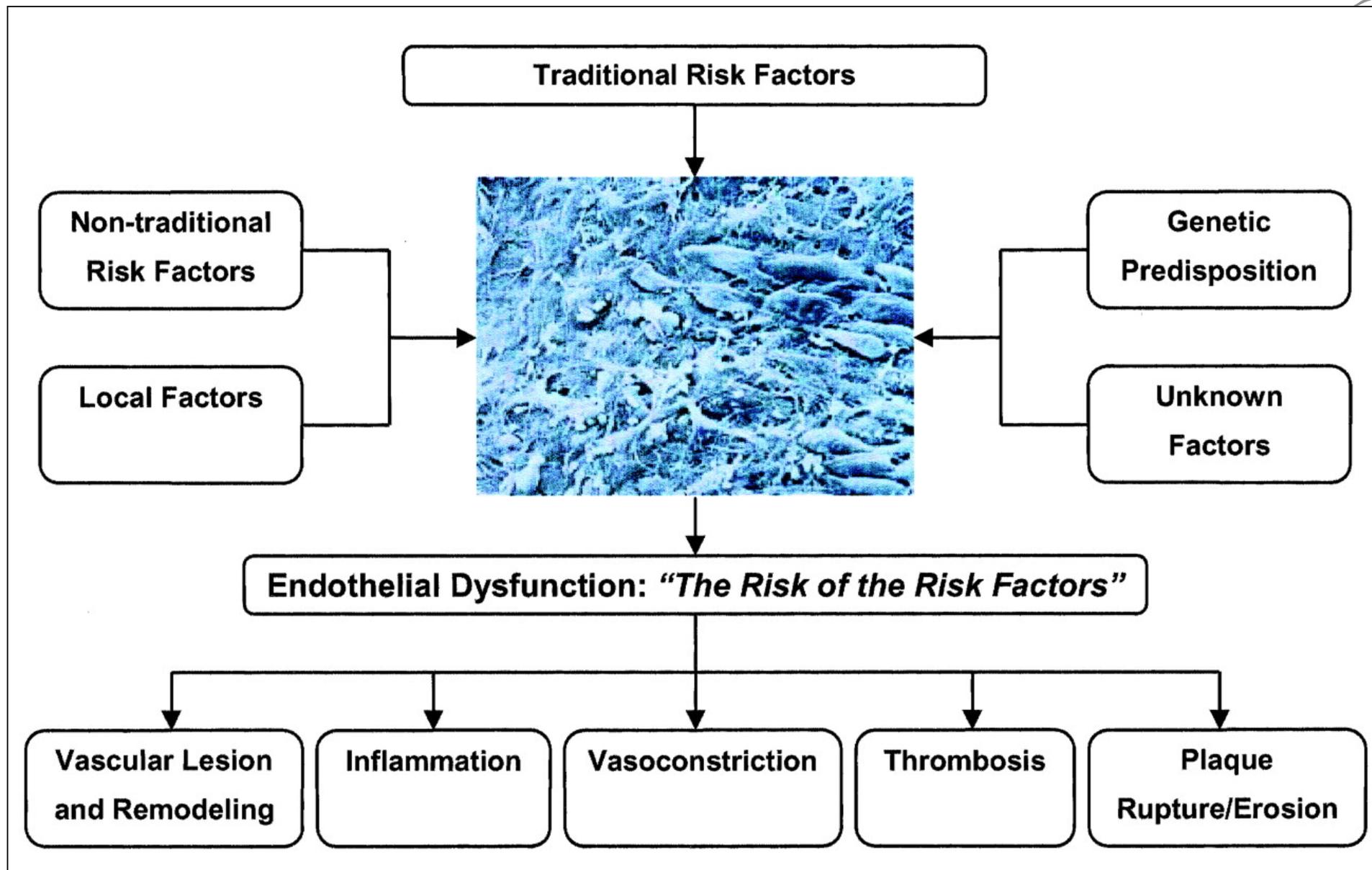


Effekte der Rehabilitation auf das kardiovaskuläre System und die Prognose

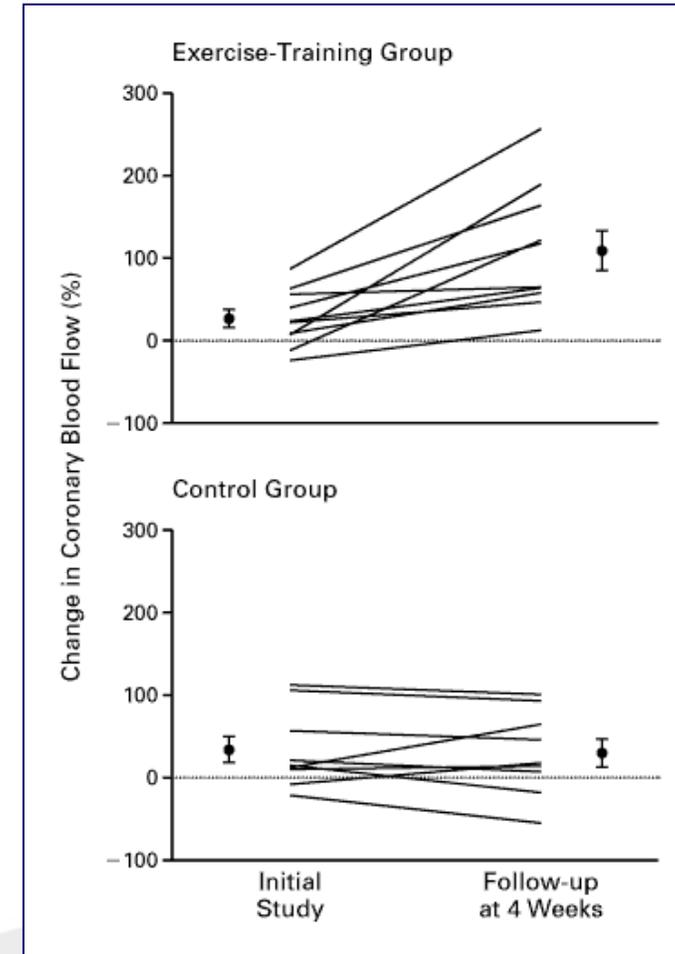
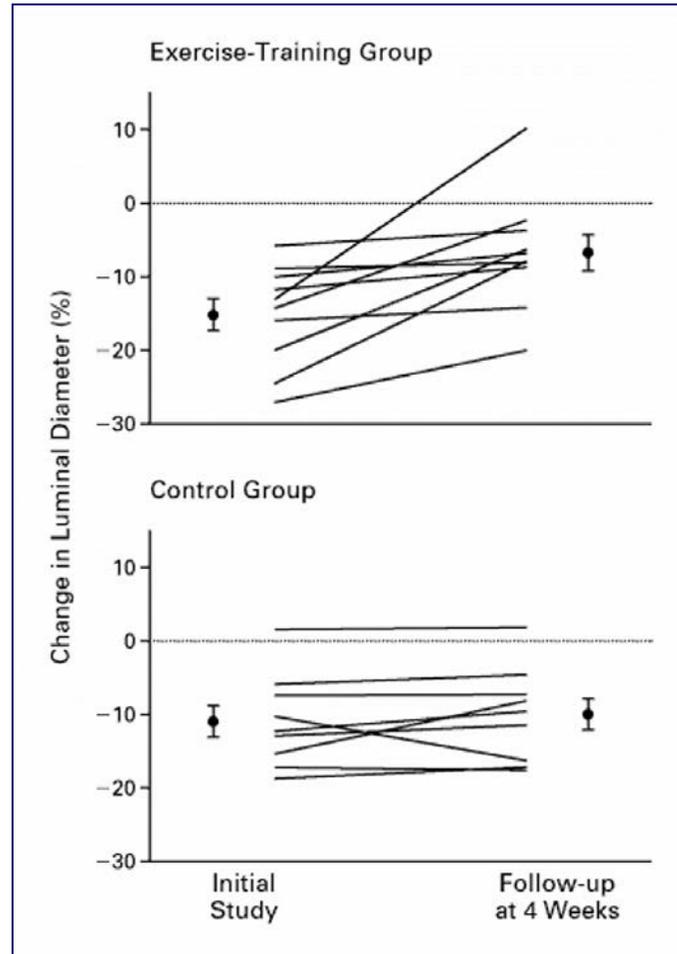


Prof. Jean-Paul Schmid

Chefarzt Kardiologie, Co-Leiter Departement Innere Medizin

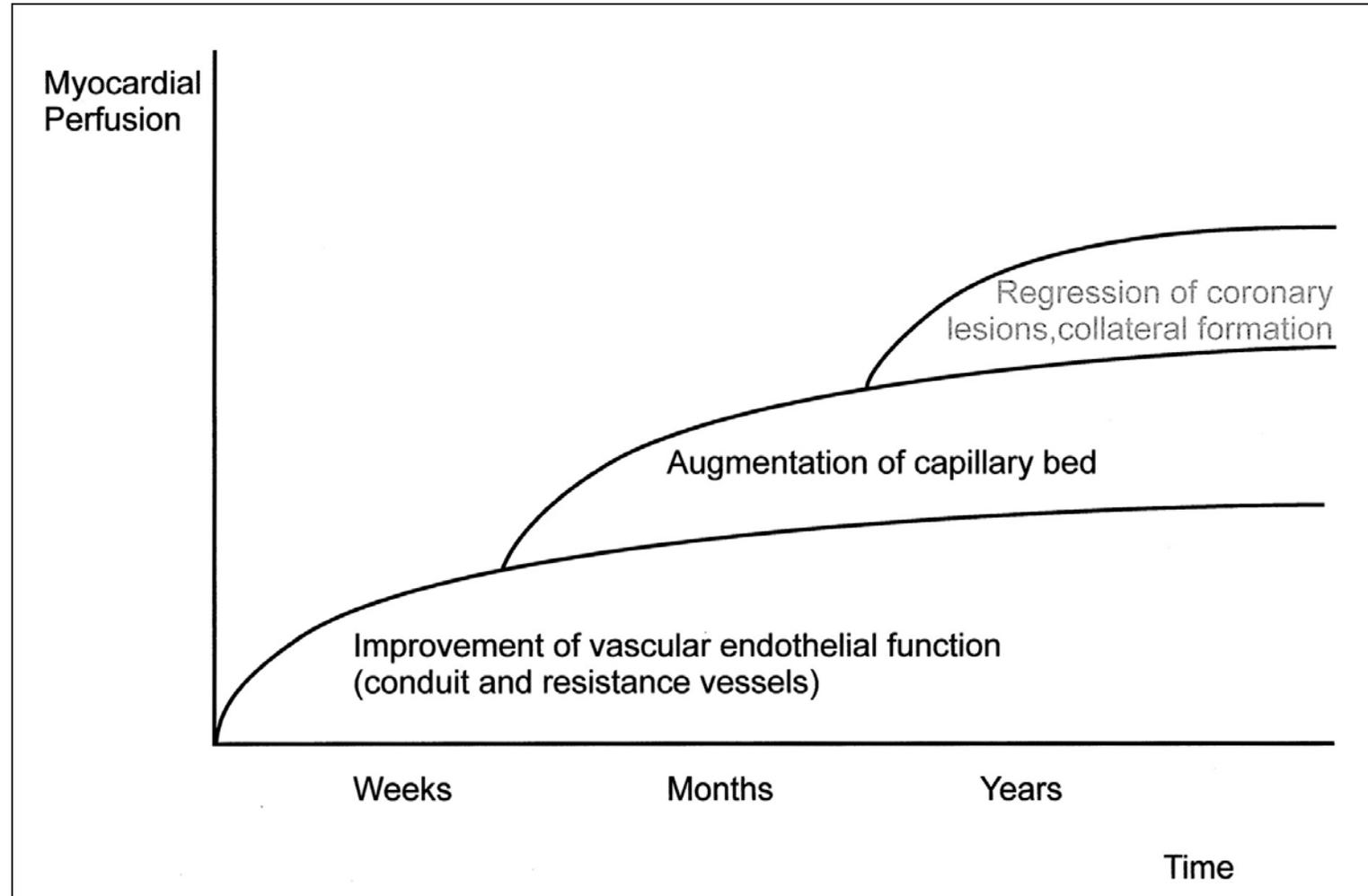


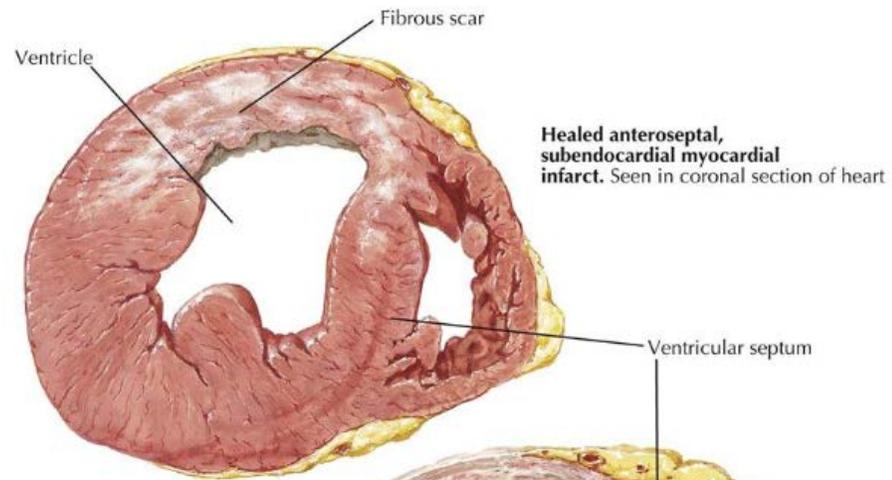
Effect of Exercise on Coronary Endothelial Function



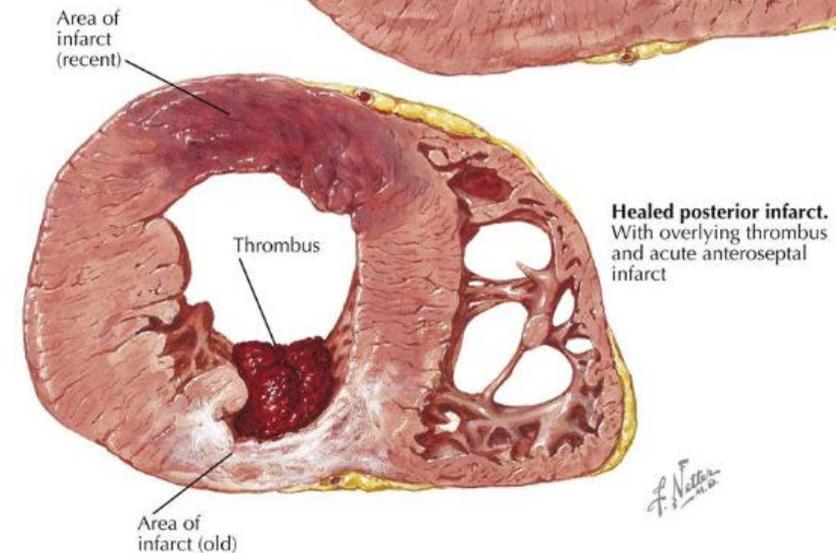
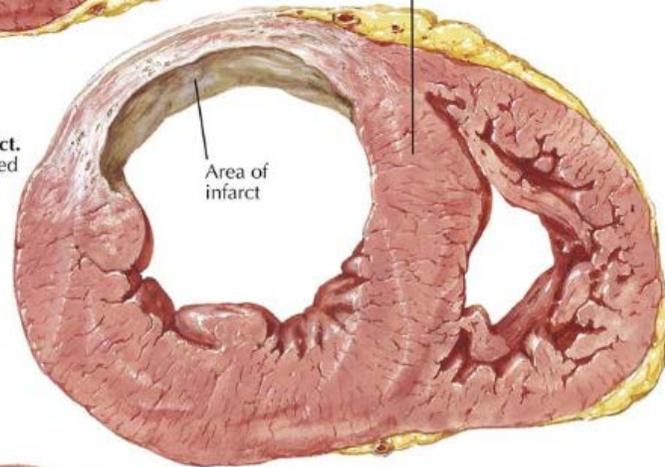
Individual Changes in Coronary-Vessel Luminal Diameter in Response to Acetylcholine at a Dose of 7.2 μg per Minute.

Effects of Endurance Training on Myocardial Perfusion



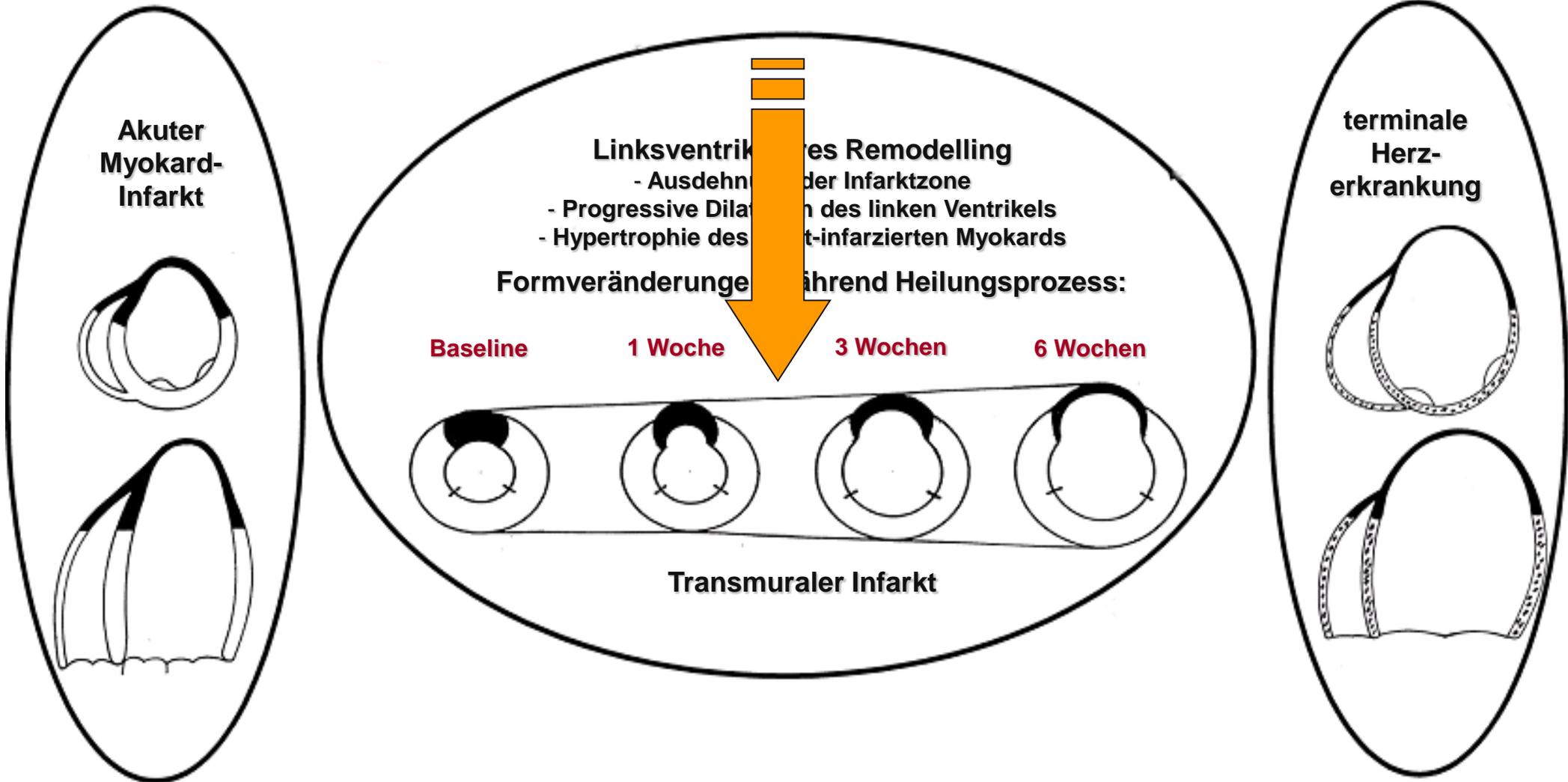


Healed anterolateral infarct.
In hypertrophied and dilated heart secondary to hypertension: Right ventricular hypertrophy indicative of heart failure



Myokardinfarkt

Ausdauertraining beeinflusst negatives Remodeling positiv



7 Main Target Areas

- Physical training
- Smoking Cessation
- Lipid- and Weight Management
- Hypertension and Diabetes
- Education and Information
- Psychosocial Support
- Vocational Rehabilitation

A Meta-Analysis of the Effect of Exercise Training on Left Ventricular Remodeling in Heart Failure Patients

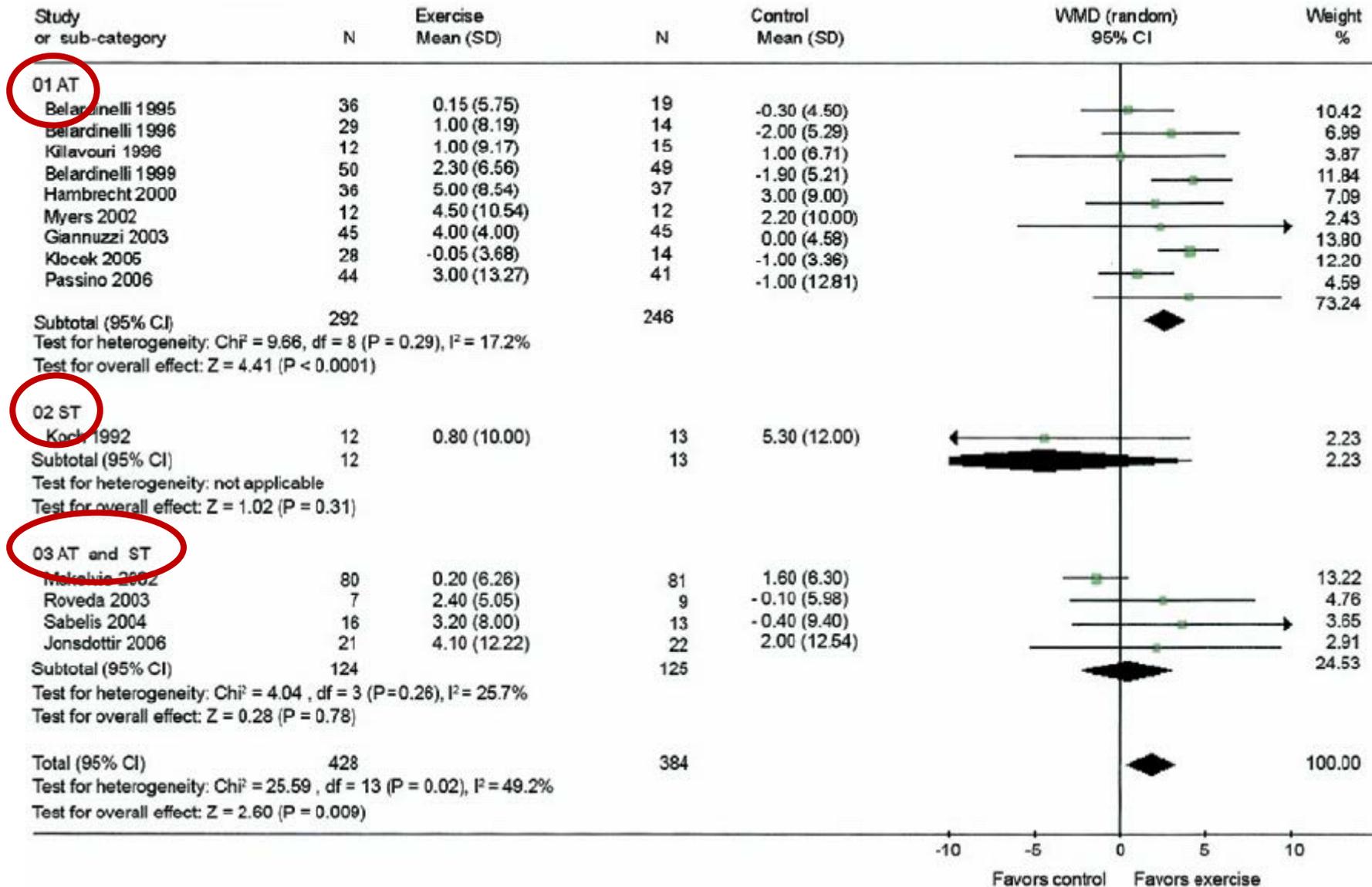
The Benefit Depends on the Type of Training Performed

Mark J. Haykowsky, PHD,* Yuanyuan Liang, PHD,† David Pechter, BA,* Lee W. Jones, PHD,§
Finlay A. McAlister, MD, MSC,|| Alexander M. Clark, PHD‡

Edmonton, Alberta, Canada; and Durham, North Carolina

Exercise Training & LV Remodeling

AT = aerobic training
ST = strength-training



A Meta-Analysis of the Effect of Exercise Training on Left Ventricular Remodeling in Heart Failure Patients

The Benefit Depends on the Type of Training Performed

Mark J. Haykowsky, PHD,* Yuanyuan Liang, PHD,† David Pechter, BA,* Lee W. Jones, PHD,§
Finlay A. McAlister, MD, MSc,|| Alexander M. Clark, PHD‡

Edmonton, Alberta, Canada; and Durham, North Carolina

Conclusions:

Aerobic training is an inexpensive and effective nondrug, nondevice, nonsurgical intervention that reverses ventricular remodeling and improves VO_2 peak in clinically stable individuals with HF and LV systolic dysfunction. These benefits were not confirmed with combined aerobic and strength training.

Heart, Lung and Circulation (2019) xx, 1–11
1443-9506/04/\$36.00
<https://doi.org/10.1016/j.hlc.2019.05.097>

Resistance Training Following Median Sternotomy: A Systematic Review and Meta-Analysis

Jacqueline Pengelly, MClinExPhys^{a*}, Michael Pengelly, MAppSpSci^b,
Kuan-Yin Lin, PhD^c, Colin Royse, MD^{d,e}, Alistair Royse, MD^{d,f},
Adam Bryant, PhD^g, Gavin Williams, PhD^g, Doa El-Ansary, PhD^{a,d}

^aDepartment of Health Professions, Swinburne University of Technology, Melbourne, Vic, Australia

^bIndependent Researcher, Melbourne, Vic, Australia

^cDepartment of Physiotherapy, School of Primary and Allied Health Care, Faculty of Medicine, Nursing and Health Science, Monash University, Melbourne, Vic, Australia

^dDepartment of Surgery, University of Melbourne, Melbourne, Vic, Australia

^eDepartment of Anaesthesia and Pain Management, Royal Melbourne Hospital, Melbourne, Vic, Australia

^fDepartment of Cardiothoracic Surgery, Royal Melbourne Hospital, Melbourne, Vic, Australia

^gDepartment of Physiotherapy, University of Melbourne, Melbourne, Vic, Australia

Conclusion

- The performance of resistance training appears to be safe and feasible, and resulted in similar improvements in both cardio-pulmonary capacity and anthropometry, when compared to aerobic training alone
- Definition and application of resistance training is frequently a lower intensity and volume than recommended
- Sternal precautions are not reflective of the kinematics and weights used when performing many activities of daily living
- Resistance training needs to be task-specific, reflecting functional tasks to promote recovery

Necessity of a multidisciplinary team



Recommendation	Class ^a	Level ^b
It is recommended to implement strategies for prevention in CVD patients, including lifestyle changes, risk factor management and pharmacological optimization, after an acute event before hospital discharge to lower risk of mortality and morbidity.	I	A

Evidence of exercise based CR programmes

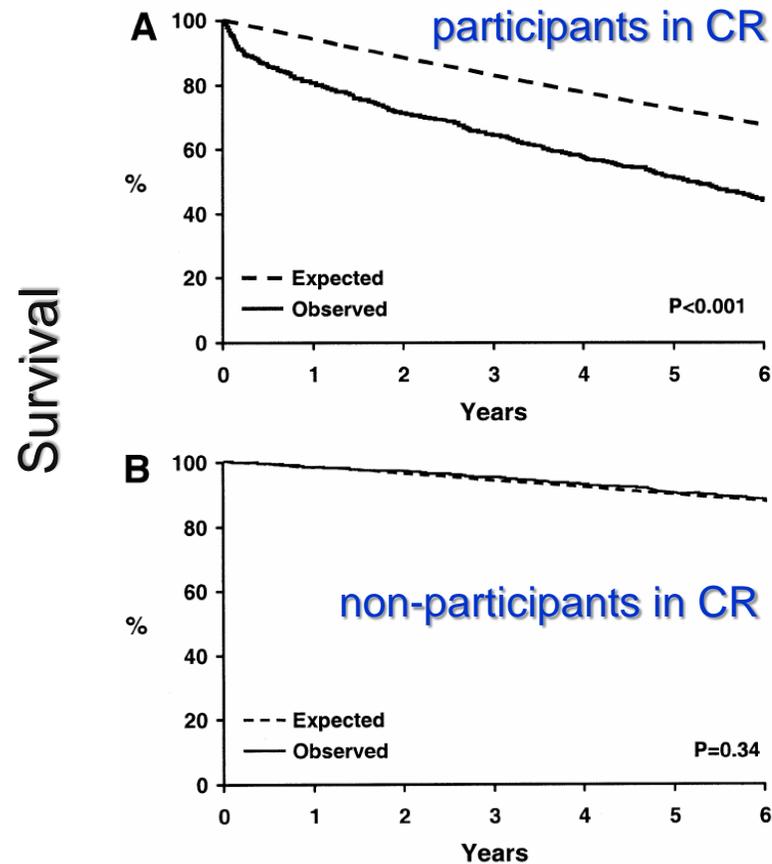
Recommendations	Class ^a	Level ^b
Participation in a CR programme for patients hospitalized for an acute coronary event or revascularization, and for patients with HF, is recommended to improve patient outcomes.	I	A
Preventive programmes for therapy optimisation, adherence and risk factor management are recommended for stable patients with CVD to reduce disease recurrence.	I	B



RRR exercise-based cardiac rehabilitation or usual care Cochrane Database 2011 Jul 6;(7).

Overall mortality	0.87
Cardiovascular mortality	0.74
Hospital admissions	0.69

Effect of exercise based cardiac rehabilitation programmes

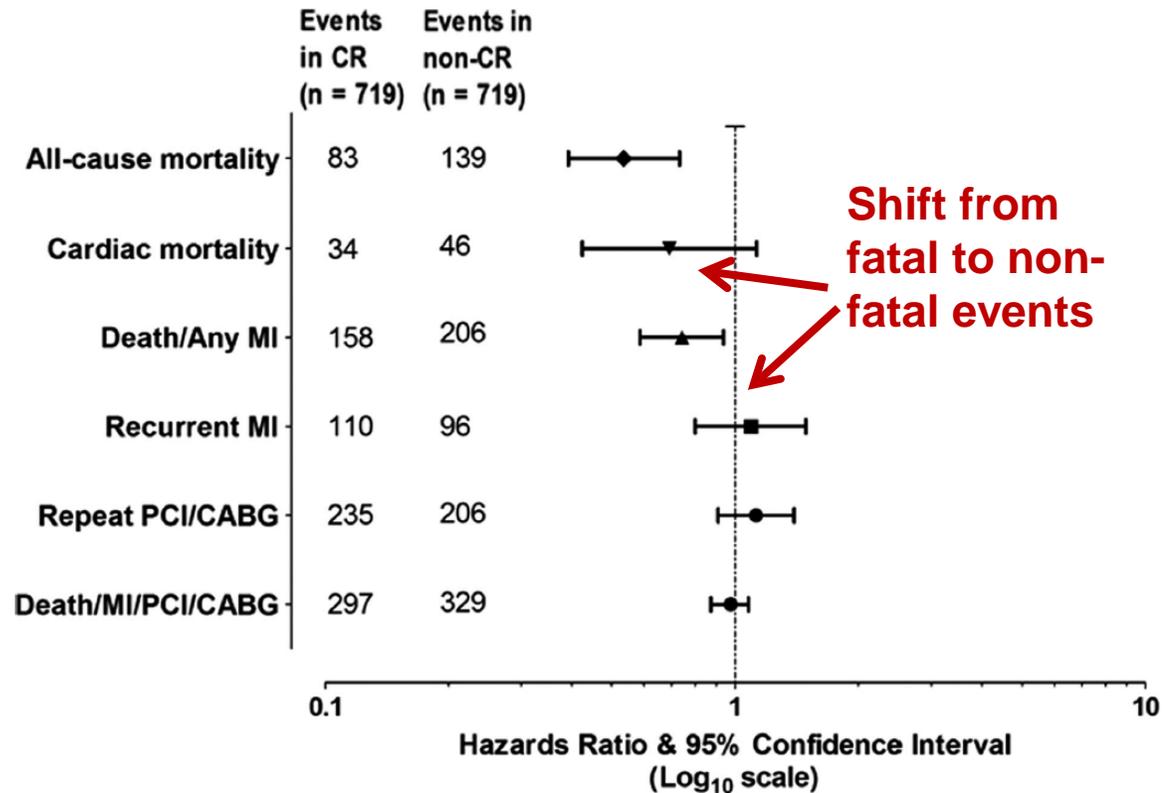
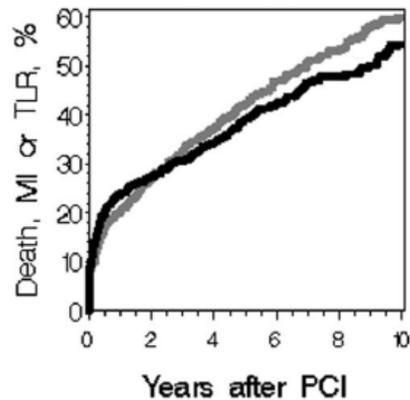
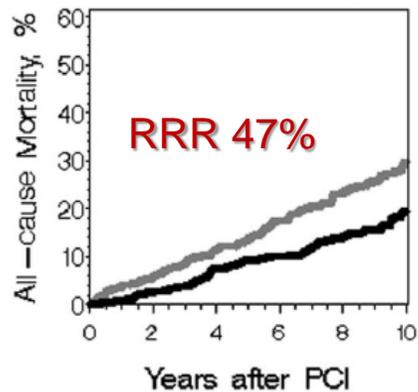


- 1,821 persons with incident MI
- Inclusion 1988 – 1998
- Protective effect stronger in more recent years



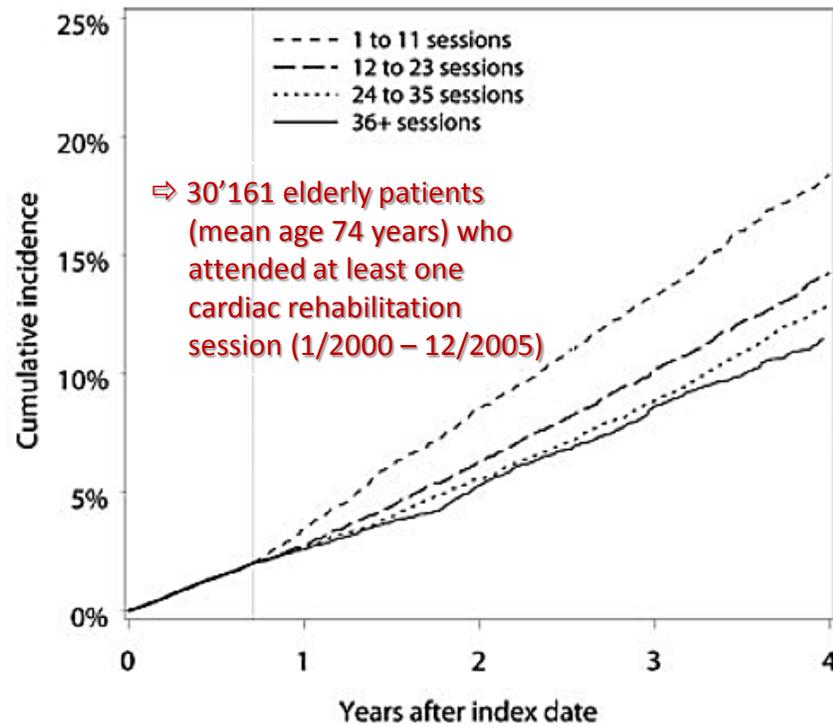
Impact of Cardiac Rehabilitation on Mortality and Cardiovascular Events After Percutaneous Coronary Intervention in the Community

Kashish Goel, Ryan J. Lemmon, R. Thomas Tilbury, Ray W. Squires and Randal J. Thomas

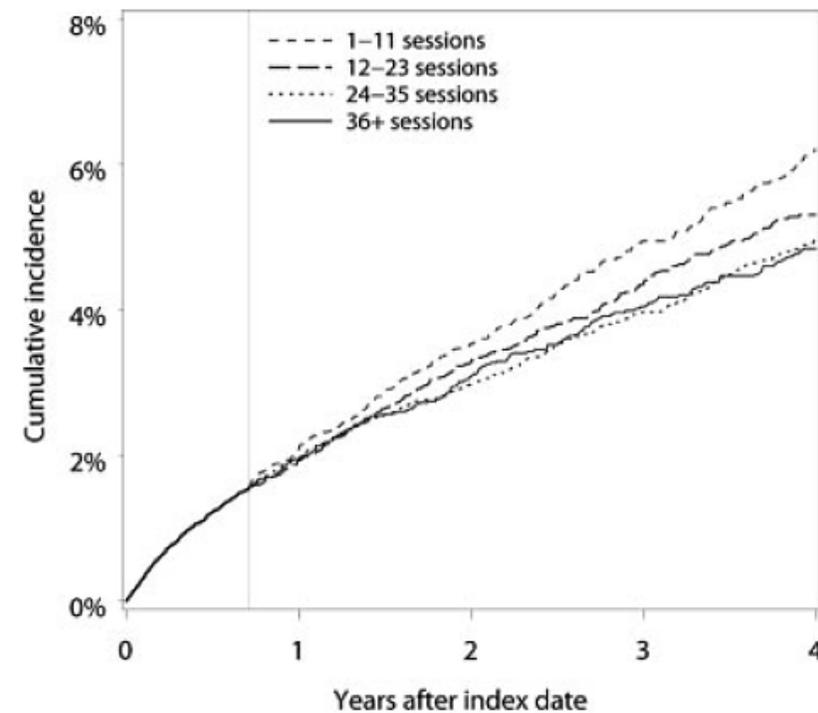


Number of sessions attended & risk of death and MI

Hammill B et al. *Circulation*. 2010;121:63-70



Mortality



Myocardial infarction

Importance of the quality of CR programs

Rehabilitation after myocardial infarction trial (RAMIT): multi-centre randomised controlled trial of comprehensive cardiac rehabilitation in patients following acute myocardial infarction

Robert R West,¹ Dee A Jones,² Andrew H Henderson³

Heart April 2012 Vol 98 No 8

“In this trial, comprehensive rehabilitation following MI had no important effect on mortality, cardiac or psychological morbidity, risk factors, health-related quality of life or activity.”

The RAMIT trial, a pragmatic RCT of cardiac rehabilitation versus usual care: what does it tell us?

Patrick Doherty,¹ Robert Lewin²
Heart April 2012 Vol 98 No 8

Huge variation in:

- staffing levels and multi-disciplinary involvement (eg, dietetics, physiotherapy, psychology, occupational therapy)
- duration and frequency (eg, 4 to 20 weeks, once or twice weekly)
- intensity of exercise prescribed
- methods used to change health behaviour (eg, lectures, cognitive behavioural methods, written materials)
- method of delivery (eg, individual, group based, group based with 'home exercise', outpatient, self-management at home, home-based and menu based).

Review

European Journal of
**Preventive
Cardiology**



The prognostic effect of cardiac rehabilitation in the era of acute revascularisation and statin therapy: A systematic review and meta-analysis of randomized and non-randomized studies – The Cardiac Rehabilitation Outcome Study (CROS)

Bernhard Rauch¹, Constantinos H Davos², Patrick Doherty³, Daniel Saure⁴, Maria-Inti Metzendorf⁵, Annett Salzwedel⁶, Heinz Völler⁶, Katrin Jensen⁴ and Jean-Paul Schmid⁷; on behalf

European Journal of Preventive
Cardiology

2016, Vol. 23(18) 1914–1939

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DOI: 10.1177/2047487316671181

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Outcomes; clinical course after the index event

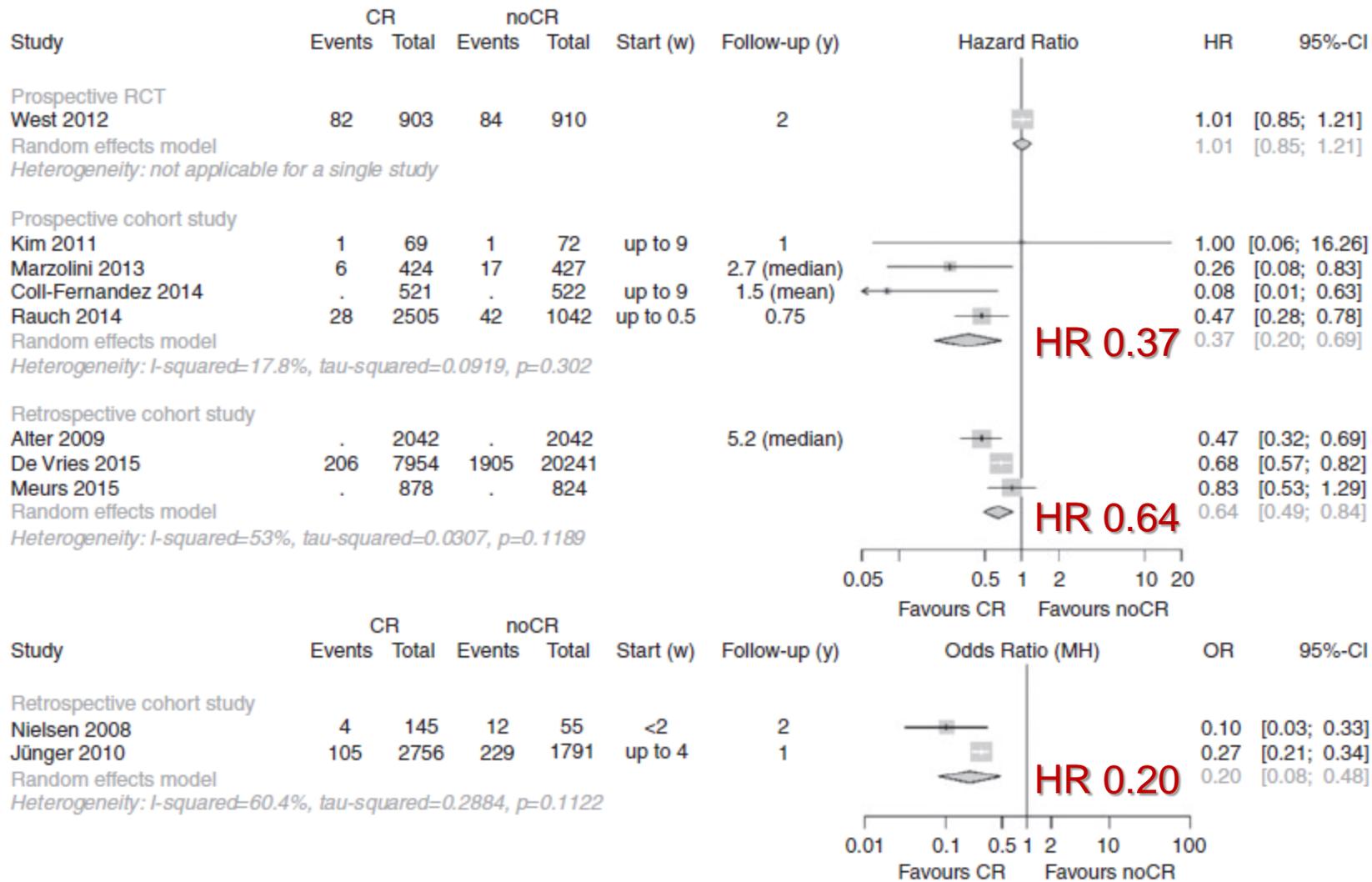
Primary outcome	(1) Total mortality
Secondary outcomes	(2) Cardiovascular mortality (3) Major cardiovascular and cerebrovascular events (MACCE = combined endpoint of death, non-fatal myocardial infarction and non-fatal stroke) (4) Non-fatal myocardial infarction (5) Non-fatal stroke (6) Hospital readmission for any reason (7) Unplanned hospital readmission for any cardiovascular event (8) Unplanned coronary revascularization (9) Cardiovascular mortality + admission for any cardiovascular event (10) All combined endpoints including fatal and non-fatal events not predefined (amendment by the CROS steering committee, 18 January 2015)
Observation period	6 months or more after hospital discharge

Intervention

Multi-component CR

Start	No later than 3 months after hospital discharge
Supervision	CR must be under supervision and responsibility of a rehabilitation centre (centre-based CR)
Definition of 'multi-component'	CR including supervised and structured physical exercise at least twice a week as basic requirement plus at least one, preferably more, of the following components: information, motivational techniques, education, psychological support and interventions, social and vocational support
CR setting	In-patient, out-patient or mixed. Tele-rehabilitation will be included as long as the major part of CR sessions is centre-based and all other predefined criteria are fulfilled

ACS



Summary

Effects of cardiac rehabilitation (CR) are not «for granted»

Delivery of CR at the «highest level» (or «according to the guidelines») is of utmost importance

Adherence to and long term maintenance of lifestyle changes and medications is crucial

Consequent referral to cardiac rehabilitation institutions is highly recommended (Guidelines: class A, level of evidence A) in high and low-risk patients, after an acute event/ or intervention, but also in stable clinical conditions with uncontrolled cardiovascular risk profile.