Herzkrank, Anticoagulation und Sport: Get started

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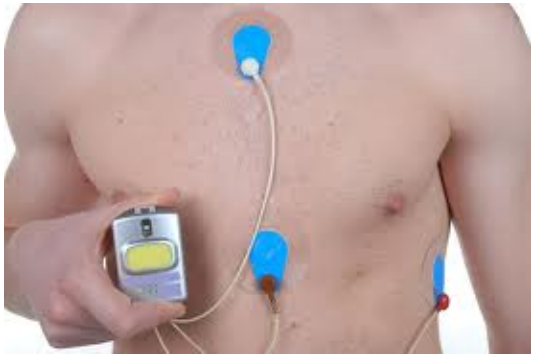
Fallbeispiel 1

- 67 jährige, lebenslange Langstreckenläuferin
- 5-7 Stunden Laufsport pro Woche
- Seit 4 Monaten immer wieder anfallsweises Herzrasen mit unregelmässigem Puls. Tritt in Ruhe und bei Trainingsbeginn auf
- Beim Hausarzt im EKG immer alles gut – allerdings in der Situation keine Beschwerden

Abklärung beim Kardiologen

- 7-Tage-Langzeit-EKG auch während Training
- Nachweis von Vorhofflimmern
- 14 Episoden, Dauer max. 11 Minuten, HFmax 174/min
- Therapie mit Xarelto 20 mg und Antiarrhythmikum -> keine Beschwerden



Alle sagen...

- „Kein Wunder, Du bist halt nicht mehr zwanzig, musst endlich aufhören mit der ewigen Rennerei...“
- „In Deinem Alter, und jetzt mit den Herzrhythmusstörungen und den gefährlichen Blutverdünnungsmitteln (**Xarelto**) darfst Du wirklich nicht mehr rennen, das ist viel zu gefährlich !“

Herr Doktor: darf ich wieder Rennen gehen?


B4 D1
C D2
D3
TourDeCoeur.ch
SUBARU
BMC

Fallbeispiel 2

- 74 jähriger, lebenslanger Radsportler, Ex-Profi
- 5-7 Stunden Training pro Woche bis OP
- Künstliche Herzklappe plus Bypass-OP vor 3 Monaten **-> Marcumar INR 2.5**
- Trainingsverbot vom Reha-Arzt
- Ist stark verunsichert, möchte gerne wieder trainieren
- Velofahren = Lebensqualität

Herr Doktor: darf ich wieder aufs Velo ?

Sport?

...or No Sport?

Get started: Agenda

- Was definiert die körperliche Leistungsfähigkeit bei jedem Menschen?
- Was sind Wirkungen von Training auf das Herz, die Skelettmuskulatur und das Gefässystem?
- Warum Training gerade bei Herzkranken sinnvoll ist
- Welche Sportart?
- Ist Sport sicher bei Herzkranken?
- Was braucht es vor Aufnahme eines Trainingprogrammes und im Verlauf um die Patientensicherheit zu gewährleisten?

Anticoagulation: Indikationen

- **Häufig: Herzkreislauferkrankungen**

  Vorhofflimmern

  künstliche Herzklappe

  Lungenembolie

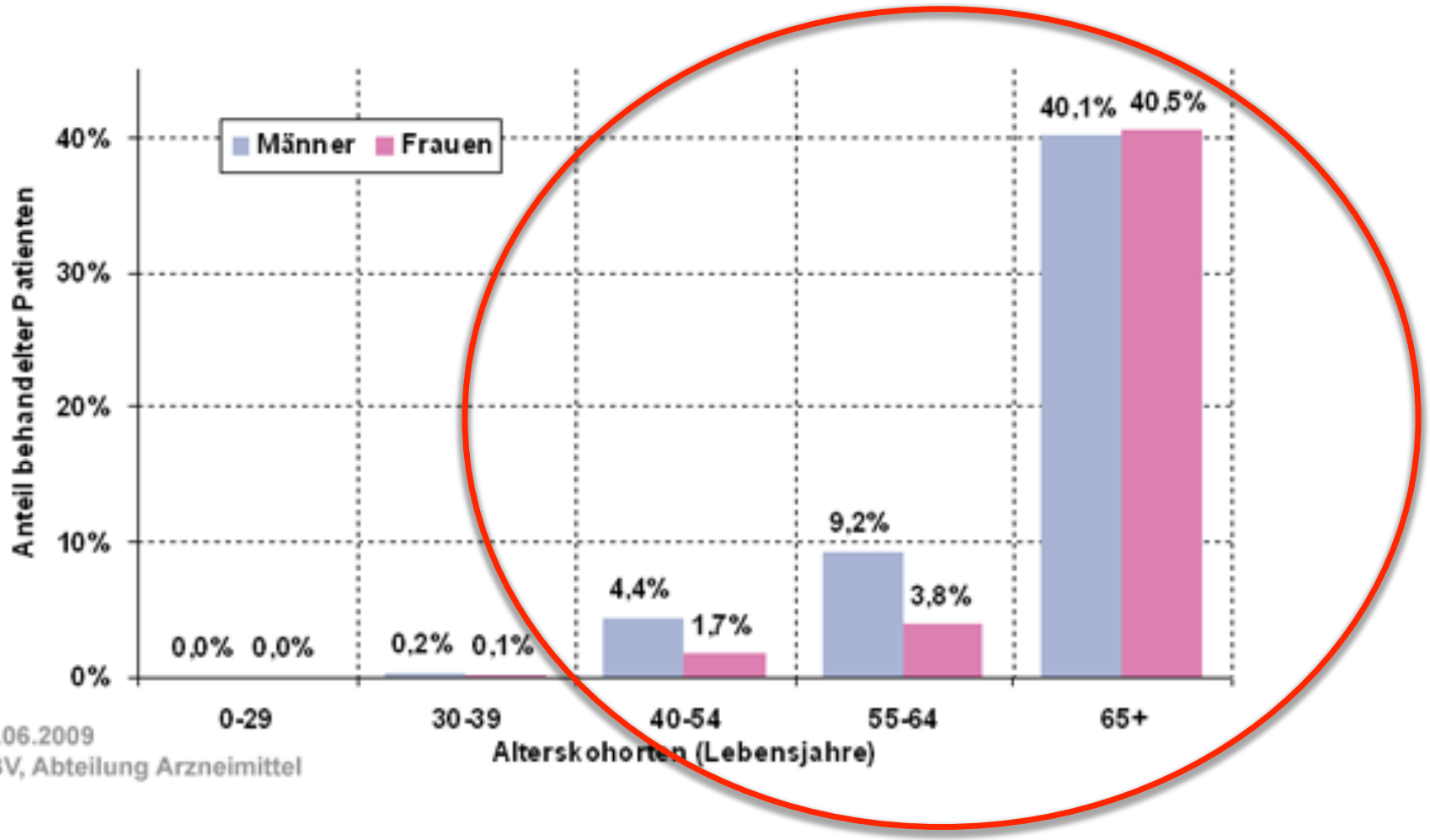
  Venenthrombose

- **OP mit passagerer Immobilisation**
- **Selten: Krankheiten des Gerinnungssystem**

  Faktor V Leiden-Mutation

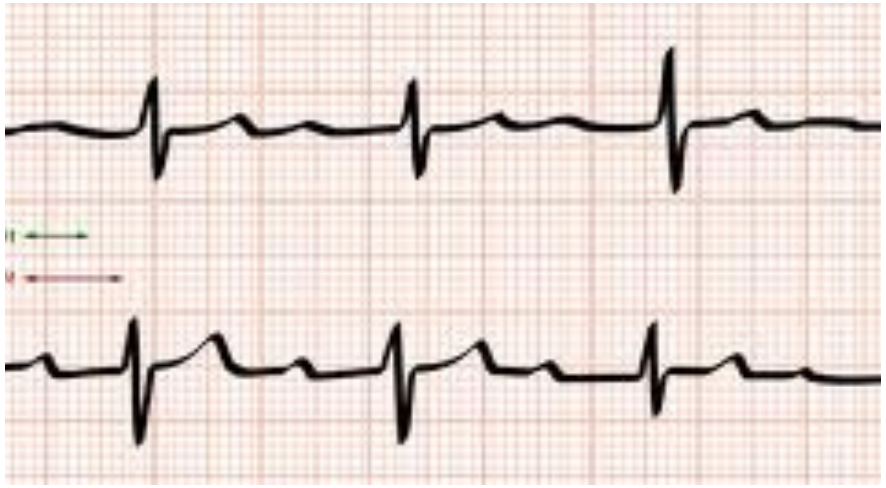
  Phospholipid-AK-Syndrom

Incidenz von Herzkrankheiten in Abhängigkeit vom Lebensalter

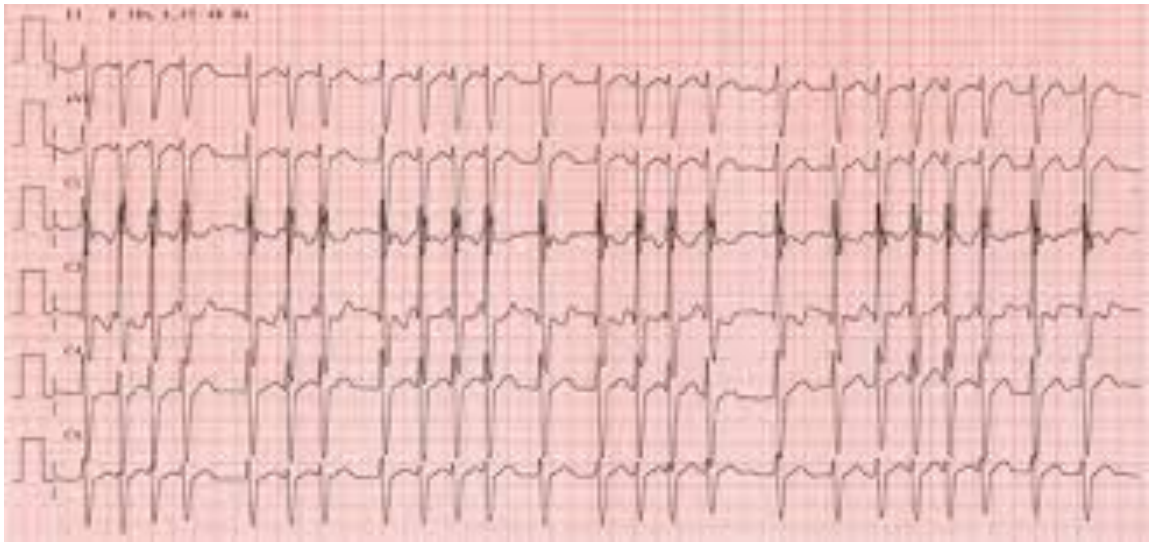


Anticoagulation bei Vorhofflimmern

Normales EKG
Sinusrhythmus
AV-Block I
Langsam
regelmässig



Vorhofflimmern
Schnell
Unregelmässig



Vorhofflimmern und Anticoagulation CHADS2-VASC-Score

- **C**ongestive heart failure (1 Punkt)
- **H**ypertension (1 Punkt)
- **A**ge (> 75 = **2** Punkte)
- **D**iabetes mellitus (1 Punkt)
- **S**troke/TIA (**2** Punkte)
- **V**ascular disease (1 Punkt) pAVK, Zn. Herzinfarkt, Verkalkung der Aorta
- **A**ge: 65-74 (1 Punkt)
- **Geschlecht:** Frauen, wenn > 65 Jahre (1 Punkt)

Jährliches Schlaganfallrisiko und CHADS2-VASC-Score

$CHADS_2$ Score	Schlaganfallrisiko %	95% Konfidenzintervall
0	1.9	1.2 – 3.0
1	2.8	2.0 – 3.8
2	4.0	3.1 – 5.1
3	5.9	4.6 – 7.3
4	8.5	6.3 – 11.1
5	12.5	8.2 – 17.5
6	18.2	10.5 – 27.4

Orale Anticoagulation indiziert bei > 1 Punkt

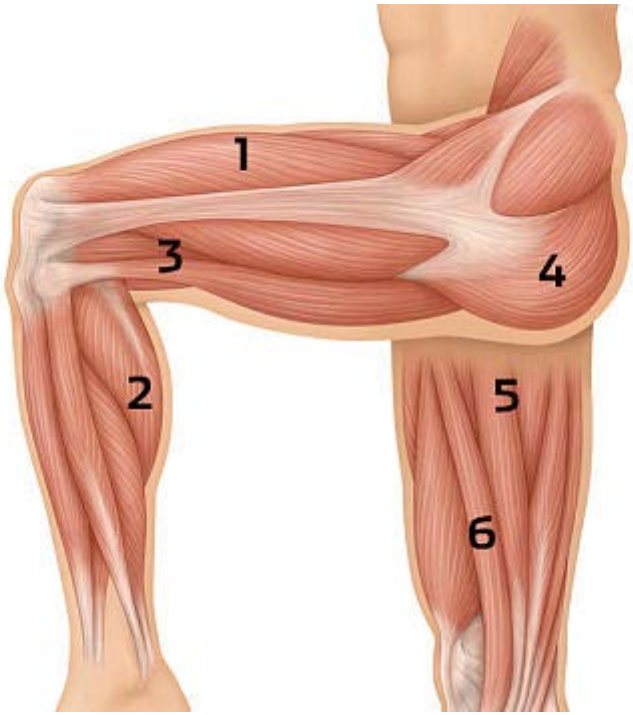
Was definiert die körperliche Leistungsfähigkeit bei jedem Menschen, gesund oder herzkrank?

Regulation der Herzfrequenz
Durchblutung
Kraftentwicklung

* In case of normal pulmonary function

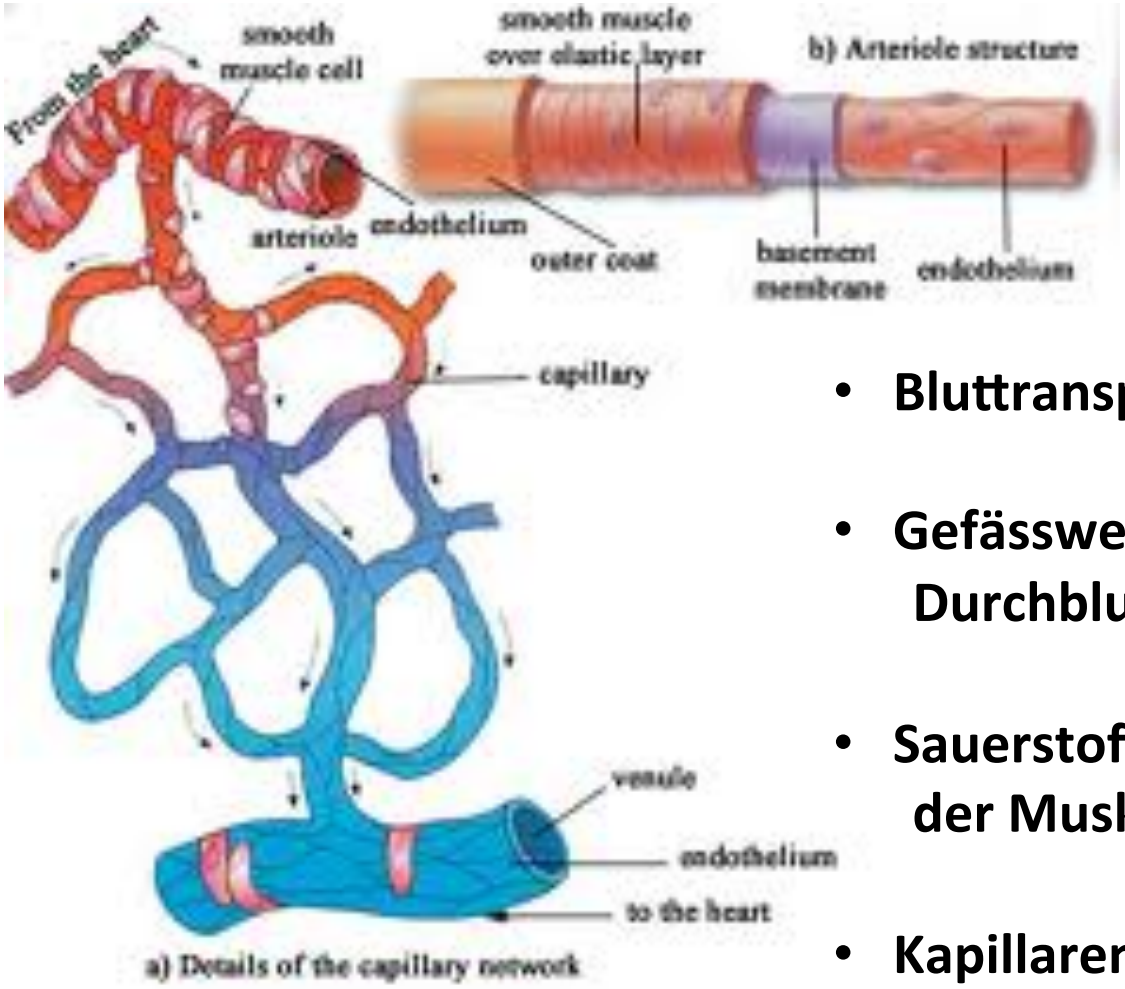
+

Trainingszustand der Körperperipherie



Vasodilatory function/structure peripheral vasculature
Function/ultrastructure of skeletal muscle
Power to weight ratio

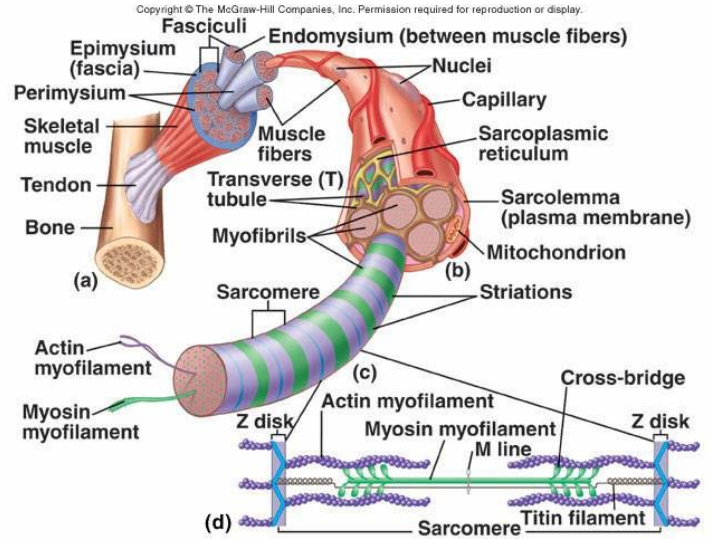
Fähigkeit der Arterien zur Weitstellung
Struktur der peripheren Gefässe

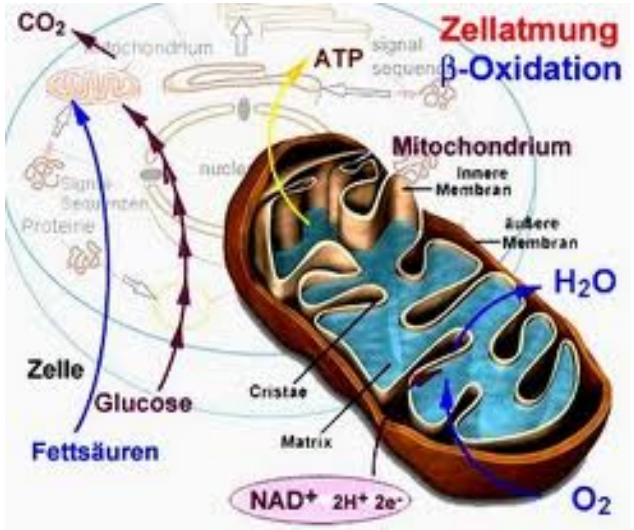


- **Bluttransport zum Skelettmuskel**
- **Gefässweitstellung/Zunahme der Durchblutung bei Training**
- **Sauerstoffaufnahme und Versorgung der Muskelzellen mit Sauerstoff**
- **Kapillaren/Muskelquerschnittsfläche**

Funktion/Ultrastruktur der Skelettmuskulatur

Aerober (=Sauerstoff-nutzender-)Energiestoffwechsel als „Schlüssel“ zur Verbesserung der Leistungsfähigkeit





- **Enges Netzwerk zwischen Kapillaren und Skelettmuskelzellen, d.h. O2-Versorgung und O2-Verbrauch**
- **Muskel: Kraftentwicklung durch aerobe/an-aerobe Energiegewinnung (ATP-PC; anaerobic glycolysis; *aerobic metabolism*)**
- **Muskelfasern pro Querschnittsfläche -> Kraftentwicklung**
- **Mitochondrien als Kraftwerke der Muskeln**
- **Mitochondrien/Muskelquerschnittsfläche**
- **Ox. Enzyme/Mitochondria -> Energie/Leistung**

Leistungsgewicht

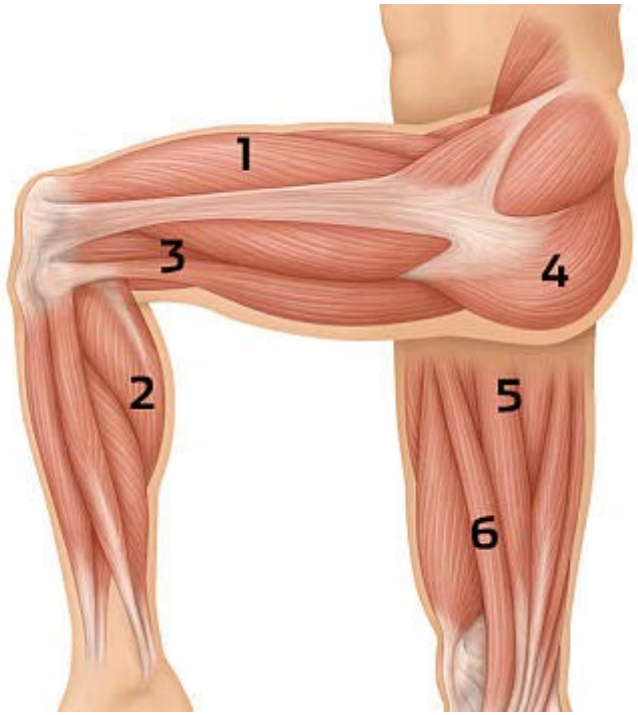
Power 400 Watt
Gewicht 60 kg
Ratio: 6.6 Watt/kg

Power 120 Watt
Weight 120 kg
Ratio: 1 Watt/kg

Training: attraktives Konzept *insbesonders* bei Herzkranken

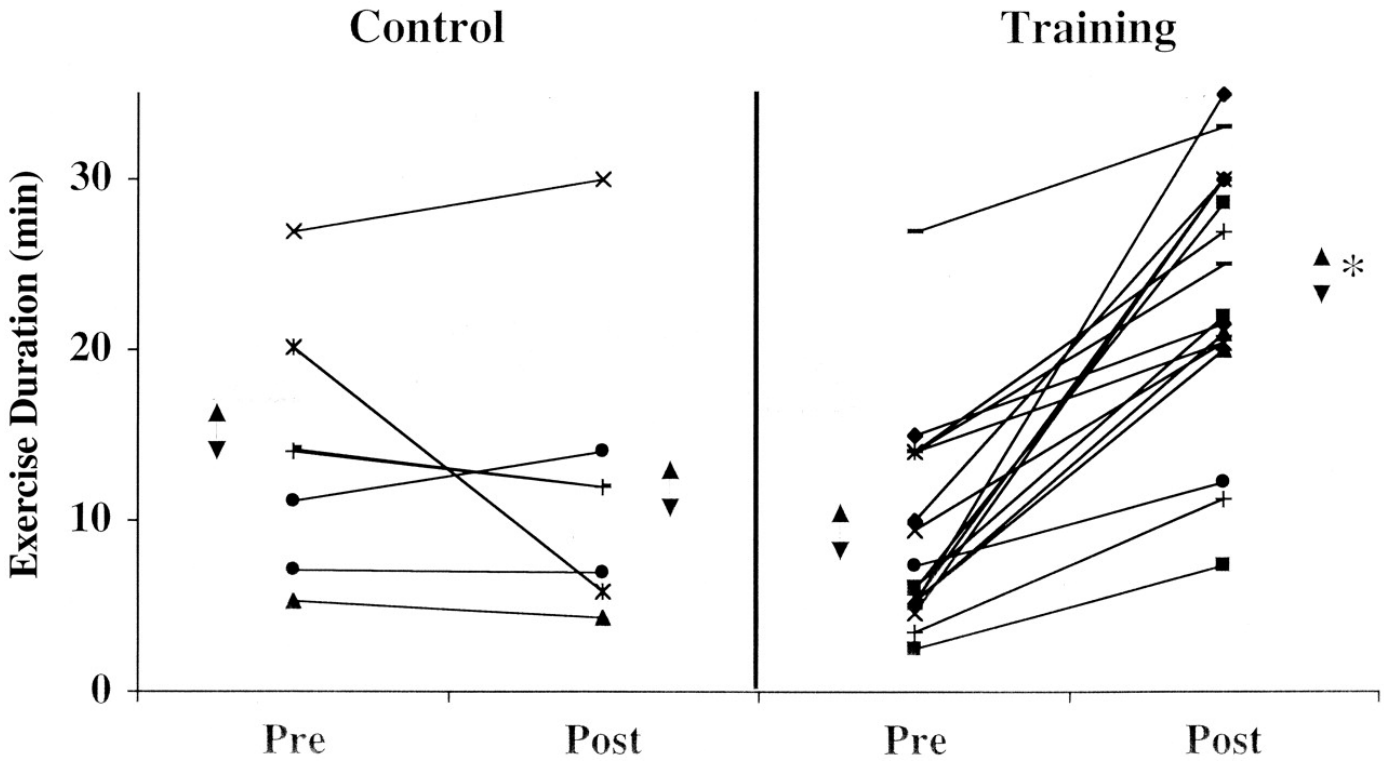
Überwiegende Wirkung auf den funktionellen Zustand der Körper*peripherie* (Skelettmuskel, peripheres Gefässystem, Leistungsgewicht)

+



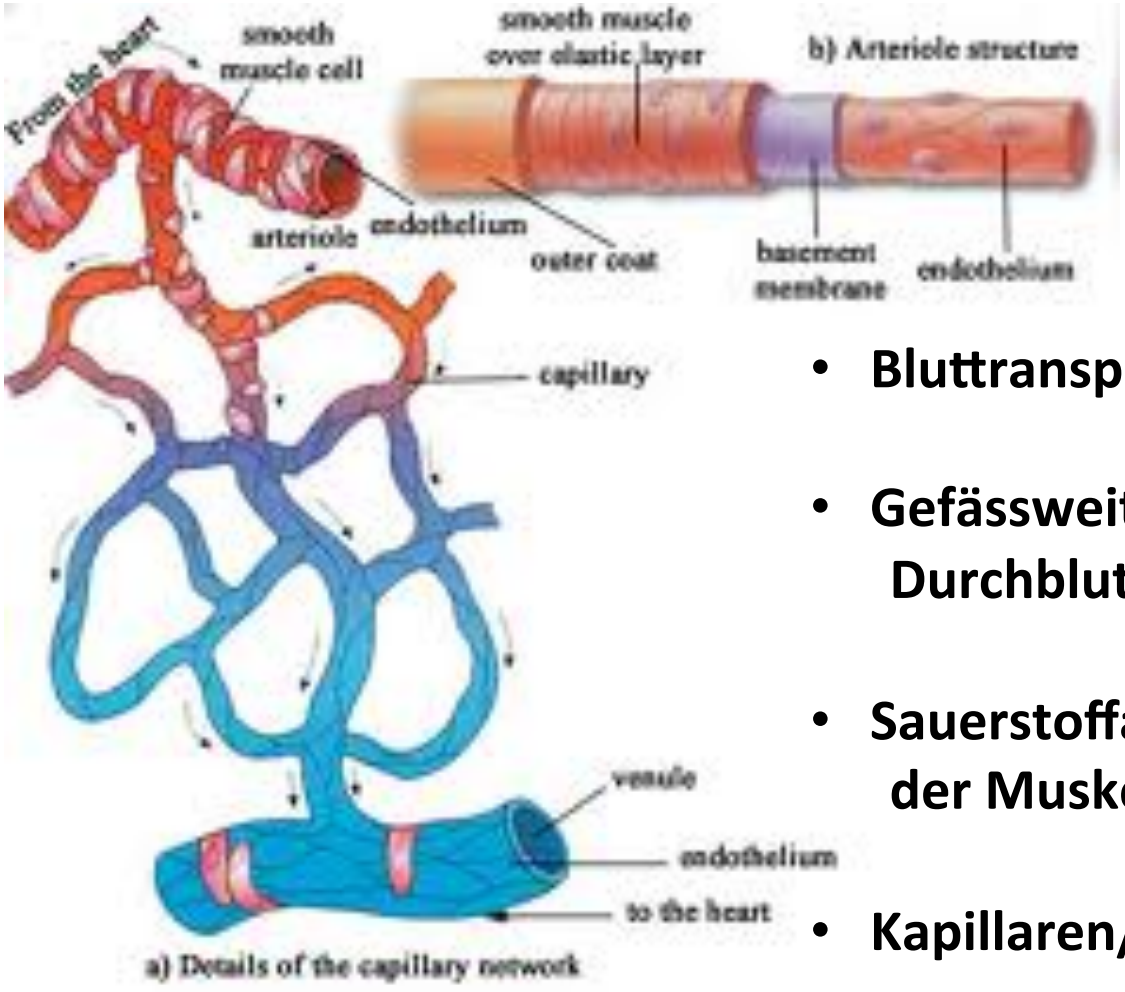
Training verbessert die Belastungsdauer bei Patienten mit chronischer Herzschwäche

Single-load exercise duration in the control and training groups before and after the intervention



Beniaminovitz, A. et al. J Am Coll Cardiol 2002;40:1602-1608

Fähigkeit der Arterien zur Weitstellung
Struktur der peripheren Gefässe
Wirkungen von Training



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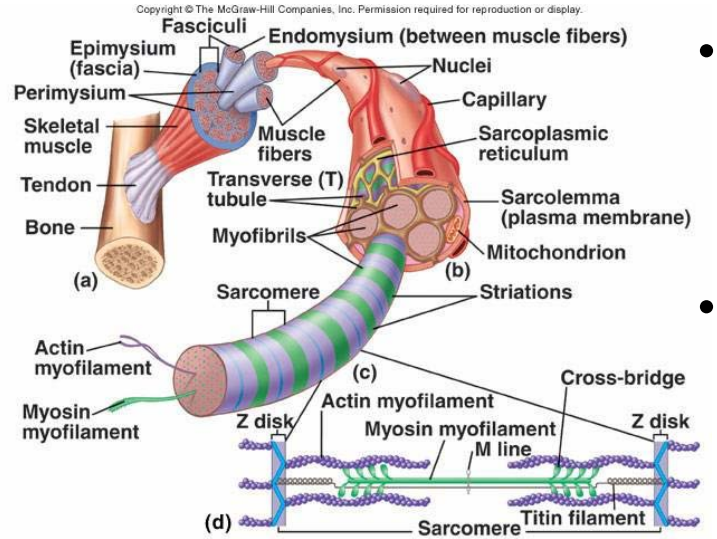
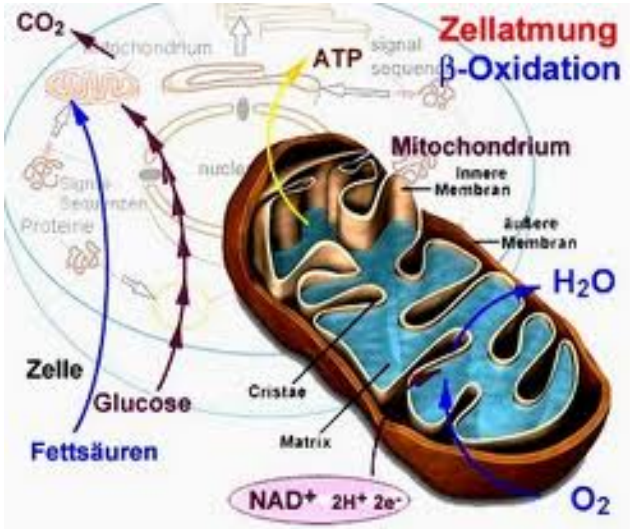
Funktion/Ultrastruktur der Skelettmuskulatur

Wirkungen von Training





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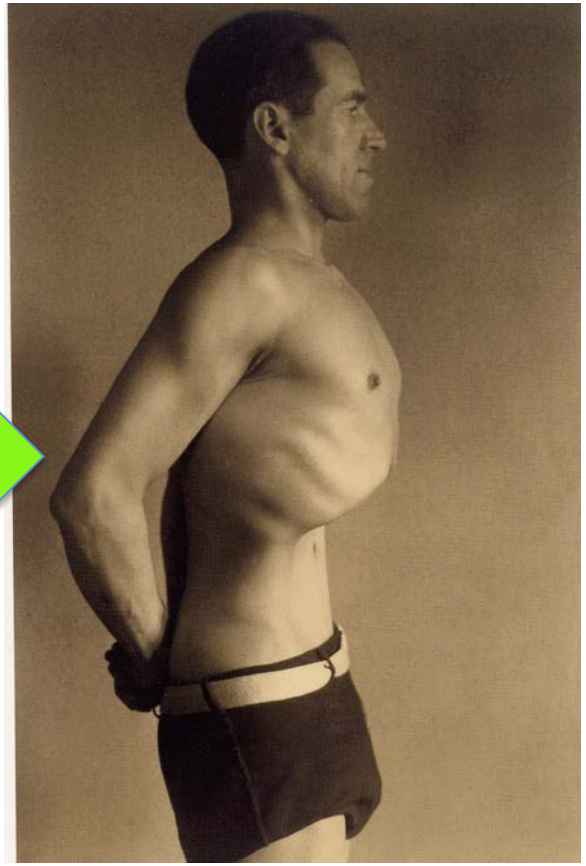
- Ox. Enzyme/Mitochondria -> Energie/Leistung

Leistungsgewicht: Wirkungen von Training

Zunahme der Leistung, Abnahme des Gewichts



- Warum hat Training diese Wirkungen bei Herzkranken?
- Wie funktioniert das?

Chronische Herzschwäche nach Herzinfarkt

a) Herz: Pumpfunktion ***irreversibel*** reduziert

b) Skelettmuskel: ***reversible*** Veränderungen

- Reduktion der Mitochondriengrösse
- Reduktion der Mitochondrienzahl pro Muskelquerschnittsfläche
- Reduktion der Muskelfasern pro Muskelquerschnittsfläche
- Reduktion der oxidativen Enzyme in den Mitochondrien

- **Diese Veränderungen korrelieren mit der Leistungsfähigkeit**

Drexler H et al: Circulation 1992; 85: 1751 - 1759

Training bei chronisch Herzkranken: Wirkung auf die Fitness und Skelettmuskelabnormalitäten in der Beinmuskulatur

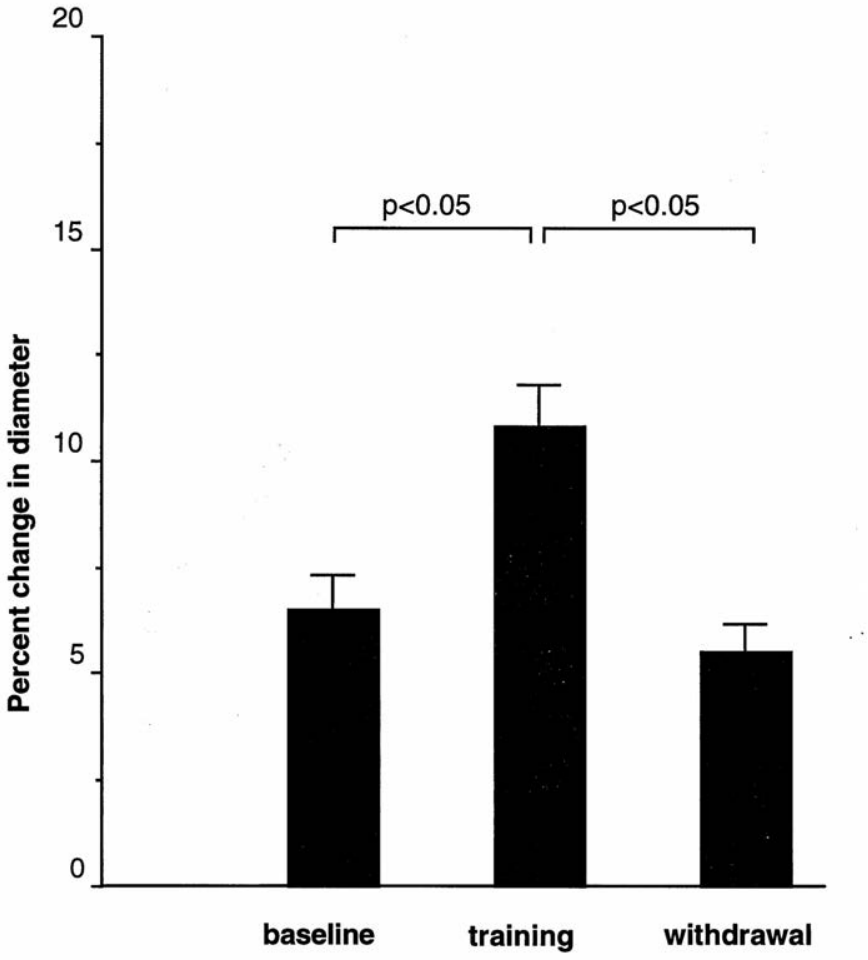
Regelmässiges Training hat *keinen Effekt auf die Herzpumpleistung pro Minute*, *steigert aber die Maximalleistung bei Patienten mit chronischer Herzschwäche* ... Durch Zunahme der oxidativen Kapazität der Skelettmuskulatur

Nach 6 Monaten Training (5xpro Woche 30 Min. Ergometer)

- **Zunahme der Mitochondriengrösse**
- **Zunahme der Mitochondrien pro Muskelquerschnittsfläche**
- **Zunahme der Muskelfasern pro Muskelquerschnittsfläch**
- **Zunahme der Sauerstoff zur Energiegewinnung nutzenden Enzyme in den Mitochondrien**

Hambrecht R et al.: J am Coll Cardiol 1995, 1239–1249

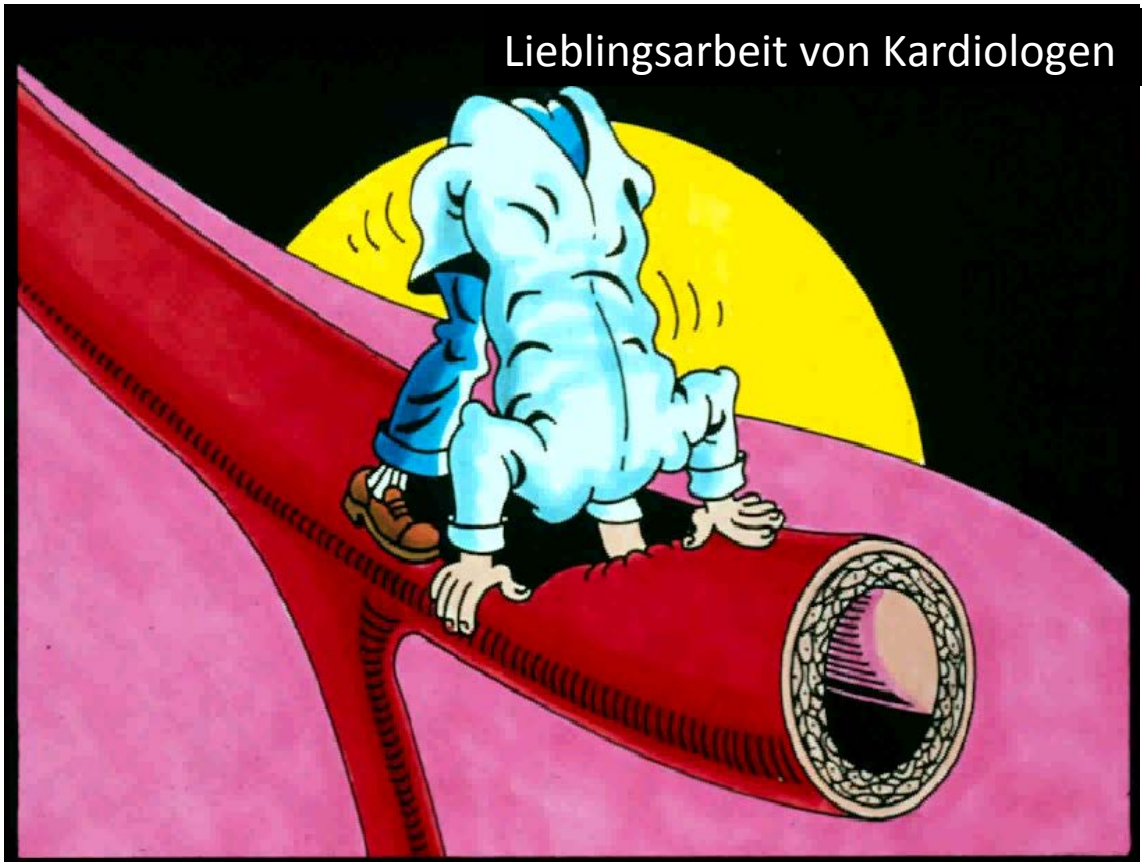
Training verbessert in peripheren Arterien von chronisch Herzkranken die Fähigkeit zur Gefässweitstellung …aber nur so lange regelmässig trainiert wird!

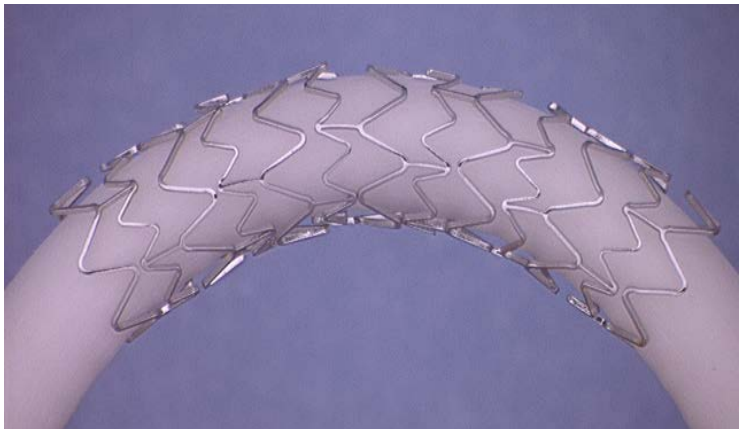


Burkhard Hornig, et al.
Circulation Volume 93(2):210-214
January 15, 1996

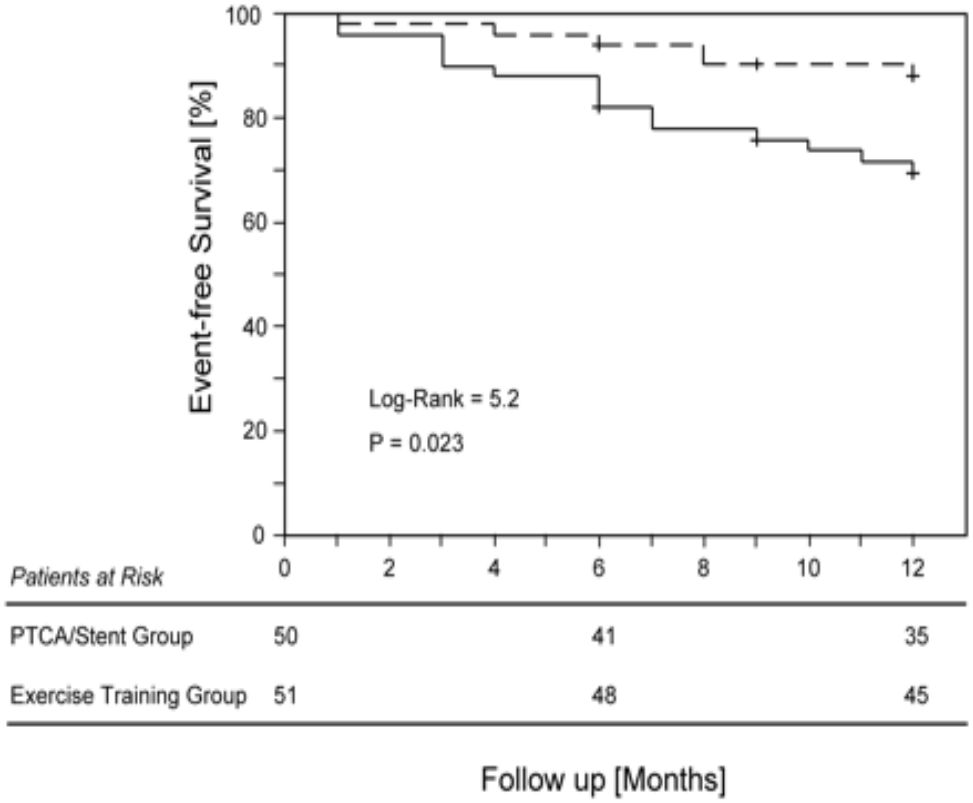
American Heart Association
Learn and Live

Ist Training vielleicht sogar eine Alternative zur Behandlung von verengten Adern am Herzen an Stelle der Reparatur mit Ballon und Stent?





Ballondilatation im Vergleich zu Training als Therapie von Patienten mit stabiler Angina pectoris und verengten Herzkranzarterien. Eine randomisierte Studie



Training

PCI

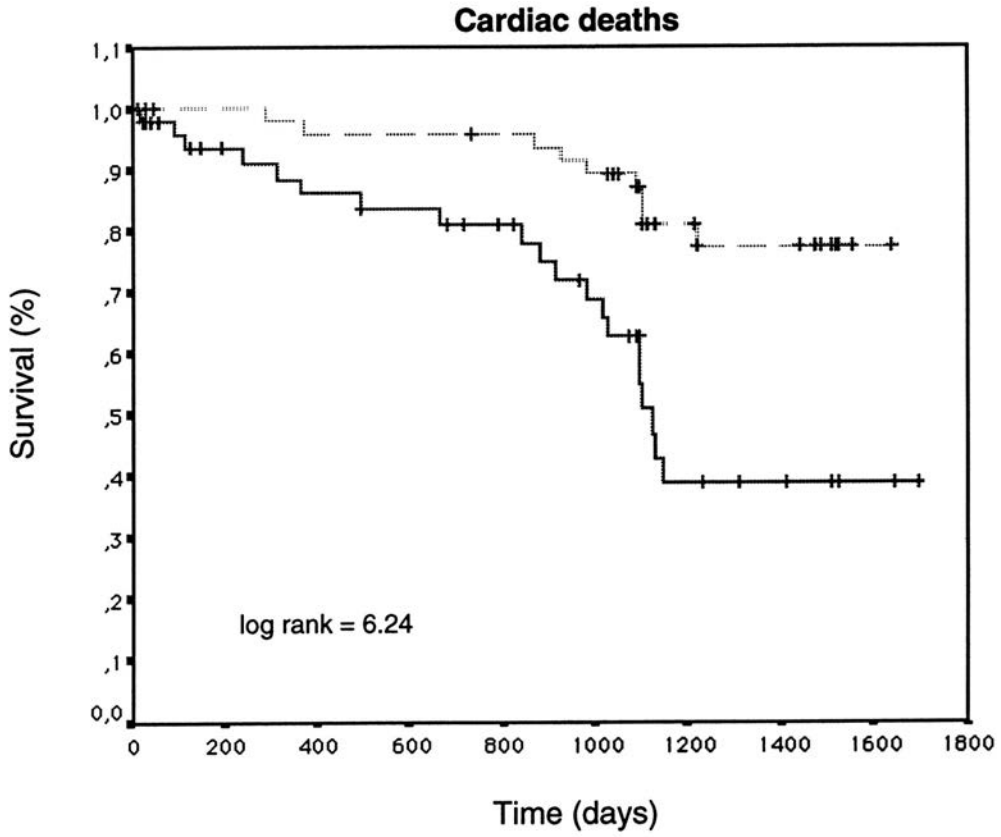
***Schlussfolgerung*— Im Vergleich zur PCI führt ein 12-monatiges Trainingsprogramm zu einem besseren Ereignis-freien Überleben und einer verbesserten Leistungsfähigkeit und kostet erst noch weniger, und zwar weil in der Trainingsgruppe seltener erneute Hospitalisierungen und erneute Behandlungen an den Herkranzgefässen erforderlich waren**

***Hambrecht R: Circulation.* 2004;109:1371-1378**

Is „Sport“ = Training sicher bei herzkranken Patienten?

Physical training reduces mortality in patients with chronic heart failure

Kaplan-Meier survival curves of cardiac death in trained group (broken line) and untrained control group (solid line) during follow-up



Training

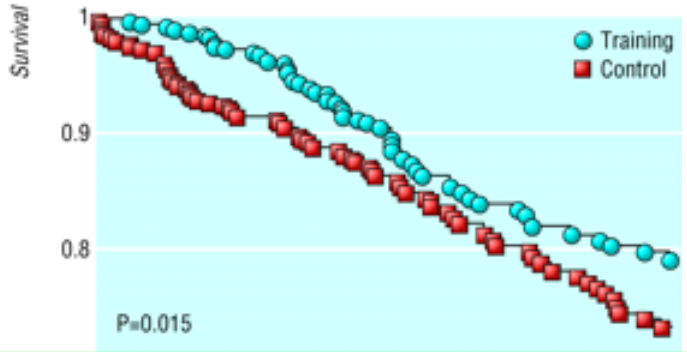
controls

No. OF PATIENTS AT RISK

Untrained	49	46	43	42	41	37	29	29	29	29
Trained	50	50	48	48	48	45	42	41	41	41

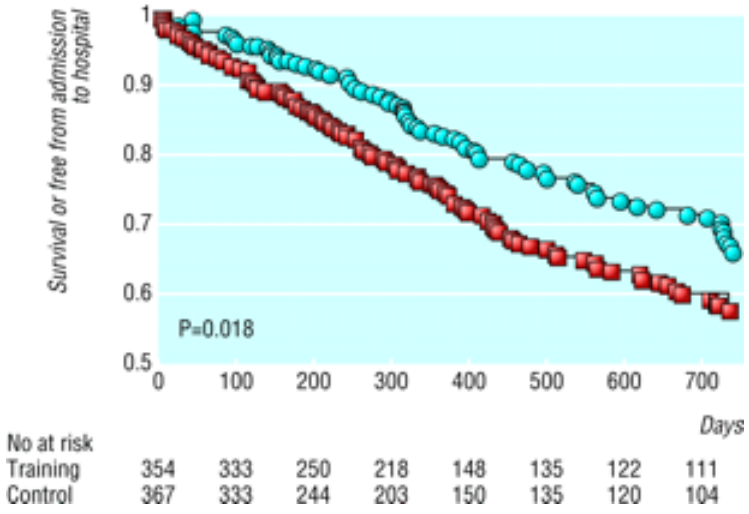
Belardinelli, R. et al. Circulation 1999;99:1173-1182

Metaanalysis of published data
Physical training reduces mortality and hospitalisations



Physical training is safe in patients with heart disease

Even reduces mortality and costs due to reduction of Re-Hospitalisations



Piepoli MF: Br Med J 2004;328:189

Ist Sport für *jeden* Herzkranken sicher ?

Cave: not for every patient, not in every situation!!!

Was braucht es, um Sport bei Herzkranken *sicher* durchführen zu können?

Requiring a medical evaluation and a stress test before undertaking ***walking*** (or equivalent) exercise in broad, healthy populations of adults ***has not been proven to be useful*** and could serve as a barrier to undertaking healthful exercise.

Individuals who are planning ***more vigorous physical activity than walking*** (or equivalent) should consider a ***medical screening***, particularly if they are in an age and cardiac risk factor classification that would indicate a higher risk of exercise-related adverse events.

Circulation. 2013;128:873-934

Faustregel

Nordic walking darf jeder

Alles, was intensiver ist, benötigt Freigabe durch Arzt nach vorheriger Untersuchung

Es gibt aktuelle Leitlinien zum Thema Sport bei Herzkranken

Exercise Standards for Testing and Training: A Scientific Statement From the American Heart Association

Circulation. 2013;128:873-934

Definition of four risk categories from

Class A) apparent healthy humans
Class B) Those at low to moderate Risk for Cardiac Complications During Exercise
Class C) Those at Moderate to High Risk for Cardiac Complications During Exercise
Class D) known severe/unstable heart disease

Wer braucht ein Belastungs-EKG und sollte vom Kardiologen gesehen werden *bevor* er/sie mit Sport beginnt?

AHA Scientific Statement
Exercise Standards for Testing and Training

Class A: *Apparently Healthy Individuals*

1. A-1: Children, adolescents, men <45 years of age, and premenopausal women who have no symptoms or known presence of heart disease or major coronary risk factors
2. **A-2**: Men ≥45 years of age and postmenopausal women who have no symptoms or known presence of heart disease and with <2 major cardiovascular risk factors

3. **A-3:** Men ≥45 years of age and postmenopausal women who have no symptoms or known presence of heart disease and with ≥2 major cardiovascular risk factors

***It is suggested that persons classified as Class A-2 and particularly Class A-3 undergo a medical examination and possibly a medically supervised exercise test before engaging in vigorous exercise**

Diese Patienten brauchen ein Belastungs-EKG und sollten vom Kardiologen vor Beginn eines Sportprogrammes und im Verlauf ca. alle 6 Monate getestet werden

Definition of four risk categories from

Class A) apparent healthy humans
Class B) Those at low to moderate Risk for Cardiac Complications During Exercise
Class C) Those at Moderate to High Risk for Cardiac Complications During Exercise
Class D) known severe/unstable heart disease

Für diese Patienten Sport/Training nicht empfohlen!

Class B:

1. CAD (MI, coronary artery bypass graft, percutaneous transluminal coronary angioplasty, angina pectoris, abnormal exercise test, and abnormal coronary angiograms); includes patients whose condition is stable and who have the clinical characteristics outlined below
2. Valvular heart disease, excluding severe valvular stenosis or regurgitation, with the clinical characteristics as outlined below
3. Congenital heart disease; risk stratification for patients with congenital heart disease should be guided by the 27th Bethesda Conference recommendations[145]
4. Cardiomyopathy: ejection fraction ≤30%; includes stable patients with heart failure with clinical characteristics as outlined below but not HCM or recent myocarditis
5. Exercise test abnormalities that do not meet any of the high-risk criteria outlined in Class C (Table 5)

Class C: Those at Moderate to High Risk for Cardiac Complications During Exercise or Unable to Self-Regulate Activity or to Understand Recommended Activity Level

1. CAD with the clinical characteristics outlined below
2. Valvular heart disease, excluding severe valvular stenosis or regurgitation with the clinical characteristics as outlined below
3. Congenital heart disease; risk stratification for patients with congenital heart disease should be guided by the 27th Bethesda Conference recommendations[145]
4. Cardiomyopathy: ejection fraction ≤30%; includes stable patients with heart failure with clinical characteristics as outlined below but not HCM or recent myocarditis
5. Complex ventricular arrhythmias not well controlled

Clinical characteristics (any of the following)1. New York Heart Association class III or IV

2. Exercise test results
3. Exercise capacity <6 METs
4. Angina or ischemic ST depression at a

Clinical characteristics (must include all of the following):1. New York Heart Association class I or II2. Exercise capacity >6 METs
3. No evidence of heart failure
4. No evidence of myocardial ischemia or angina at rest or on the exercise test at or below 6 METs
5. Appropriate rise in systolic blood pressure during exercise
6. Absence of sustained or nonsustained VT at rest or with exercise
7. **Ability to satisfactorily self-monitor intensity of activity**

Activity guidelines: Activity should be individualized, with exercise prescription provided by qualified individuals and approved by primary healthcare provider

Supervision required: Medical supervision during initial prescription session is beneficial.

Supervision by appropriate trained nonmedical personnel for other exercise sessions should occur until the individual understands how to monitor his or her activity. Medical personnel should be trained and certified in Advanced

Training/Sport ist nicht empfohlen für Class D Patienten

Class D: Unstable Disease With Activity Restriction*

1. Unstable ischemia
2. Severe and symptomatic valvular stenosis or regurgitation
3. Congenital heart disease; criteria for risk that would prohibit exercise conditioning in patients with congenital heart disease should be guided by the 27th Bethesda Conference recommendations[609]
4. Heart failure that is not compensated

5. Uncontrolled arrhythmias
6. Other medical conditions that could be aggravated by exercise

Survival of the fittest – welcher Sport?

General Guidelines for Endurance and Resistance Training

Endurance training
Frequency ≥5 d/wk
Intensity 55%–90% maximum predicted HR* or 40%–80% O_2max or HR reserve
RPE 12–16
Modality Walking, treadmill, cycling, etc
Duration 30–60 min

Resistance training
Frequency 2–3 d/wk
Intensity 50%–80% of 1-RM
or RPE 12–16
1–3 sets of 8–15 repetitions per exercise
Modality Lower extremity: leg extensions, leg curls, leg press. Upper extremity: bench press, lateral pulldowns, biceps curl, triceps extension
Duration 30–45 min

Circulation. 2013;128:873-934

Ist Sport möglich trotz Therapie mit Antikoagulantien?

Ist Sport möglich trotz Therapie mit Antikoagulantien?

- **Grundsätzlich Ja!**

Aber:

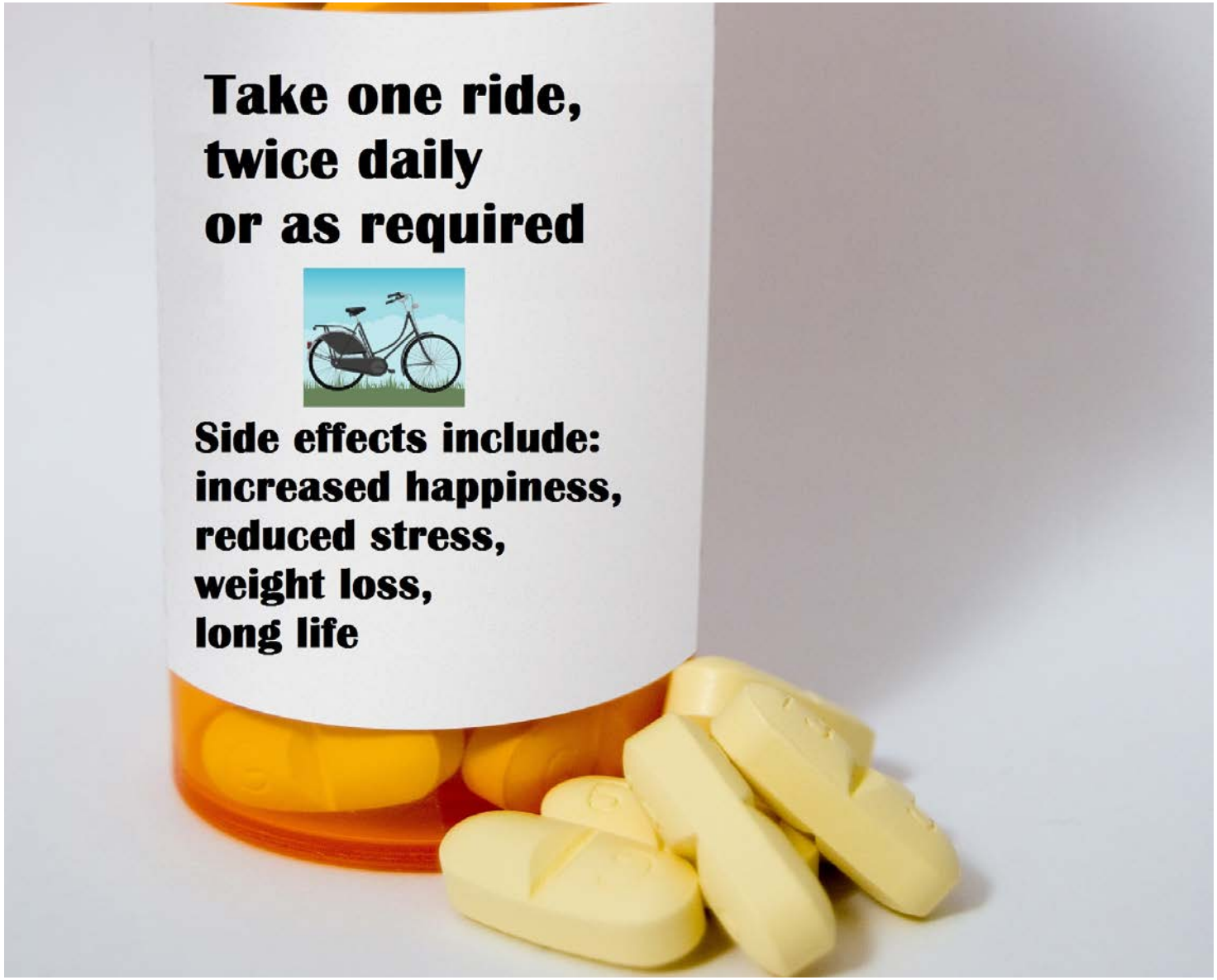
- Regelmässige INR-Kontrolle und Dosisanpassung bei Marcoumar obligat
- Kontaktsportarten **nicht** empfohlen

  Boxen/Karate/Ringen/Fussball
- Helm beim Ski-/Velofahren obligat

With two sticks

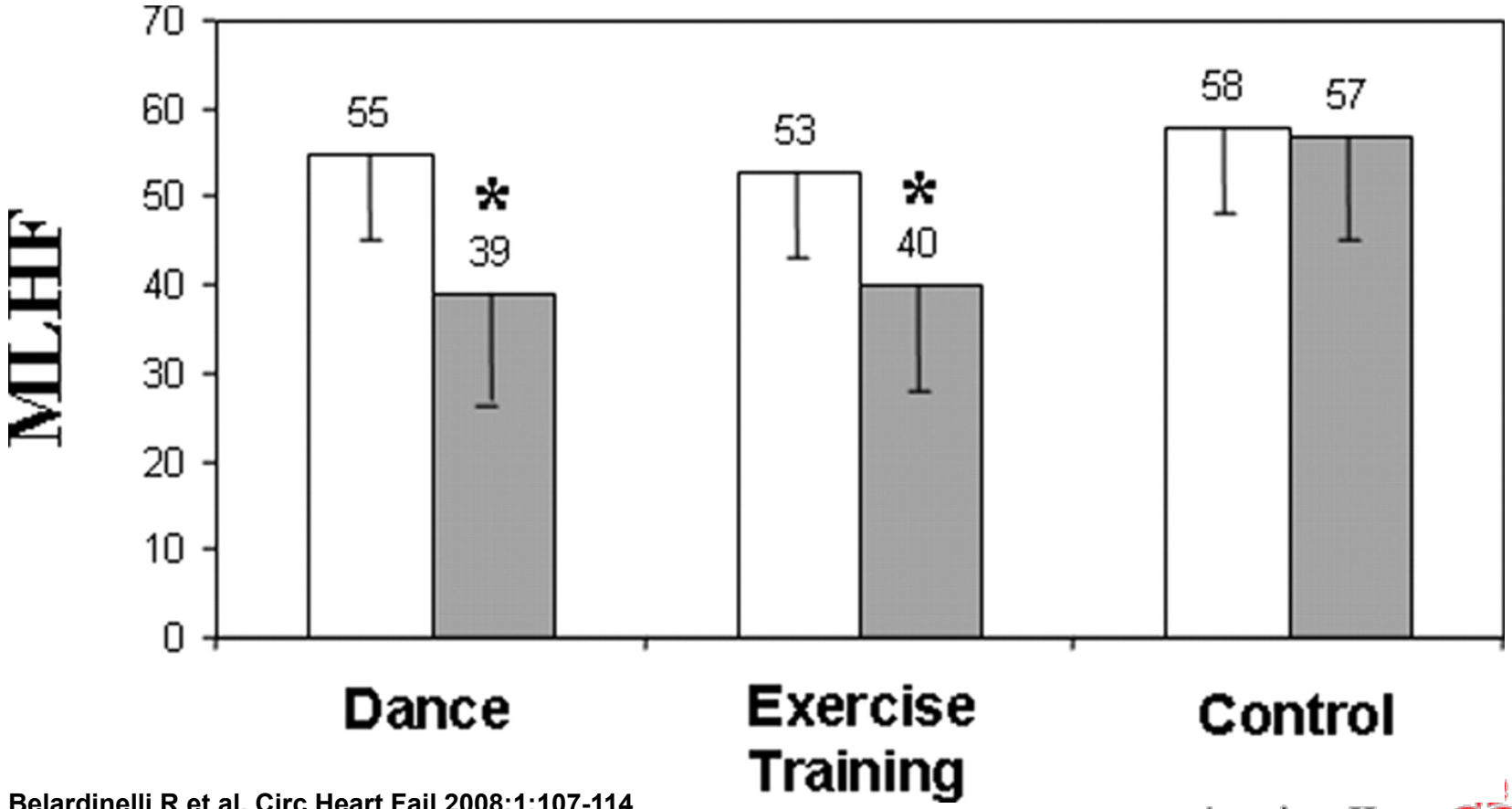
With two wheels

http://www.ecf.com/news/the-cycling-calculator-valuing-the-health-benefits-of-cycling/



Dancing in heart disease

Heaven... I'm in heaven,
And my heart beats so that I can hardly speak.
And I seem to find the happiness I seek,
When we're out together dancing cheek to cheek.
-- Irving Berlin



Belardinelli R et al. Circ Heart Fail 2008;1:107-114

American Heart Association
Learn and Live

Get started: Agenda

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- Was sind Wirkungen von Training auf das Herz, die Skelettmuskulatur und das Gefässystem?
- Warum Training gerade bei Herzkranken sinnvoll ist
- Welche Sportart?
- Ist Sport sicher bei Herzkranken?
- Was braucht es vor Aufnahme eines Trainingprogrammes und im Verlauf um die Patientensicherheit zu gewährleisten?

Merci beaucoup pour votre attention et bonne route!

Physical training improves functions of peripheral arteries in patients with heart disease

Reduction of Angiotensin-II mediated vasoconstriction by reduction of AT1-receptor-expression and NADPH-Oxidase-Expression

Adams V: Circulation 2005;111:555-562

Improvement of endothelium-dependent vasodilatation in peripheral conduit and resistance arteries

Hornig B et al, Circulation 1996;93:210-214

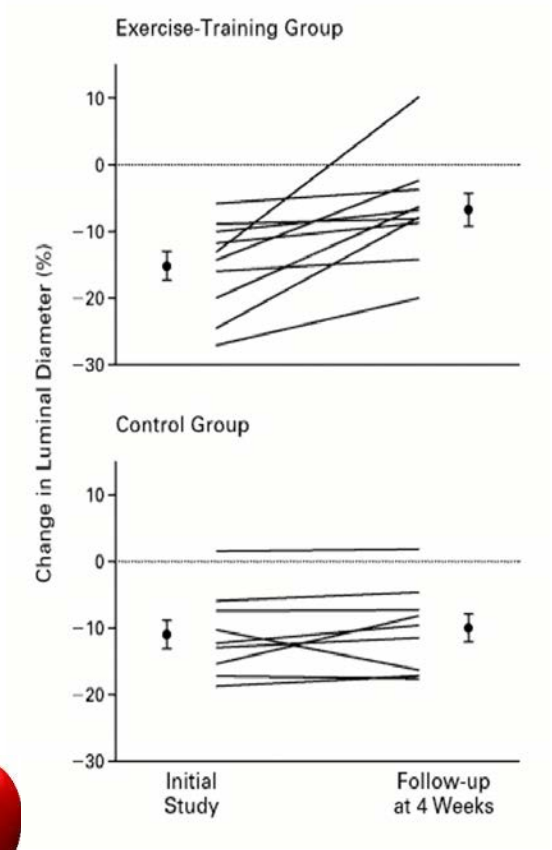
Increase of capillary density per skeletal muscle cross sectional area

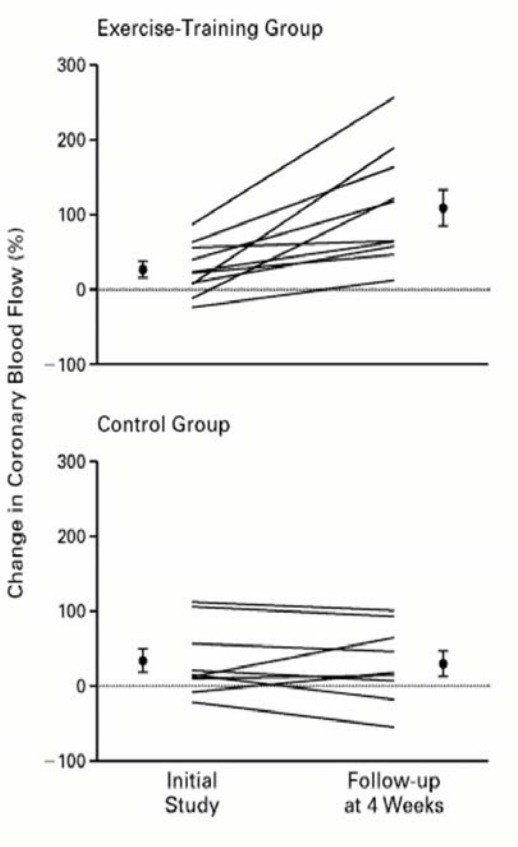
Drexler H et al: Circulation 1992; 85: 1751 - 1759

Effect of Exercise on Coronary Endothelial Function in Patients with Coronary Artery Disease

Epicardial conduit artery-
>
-> Plaque rupture

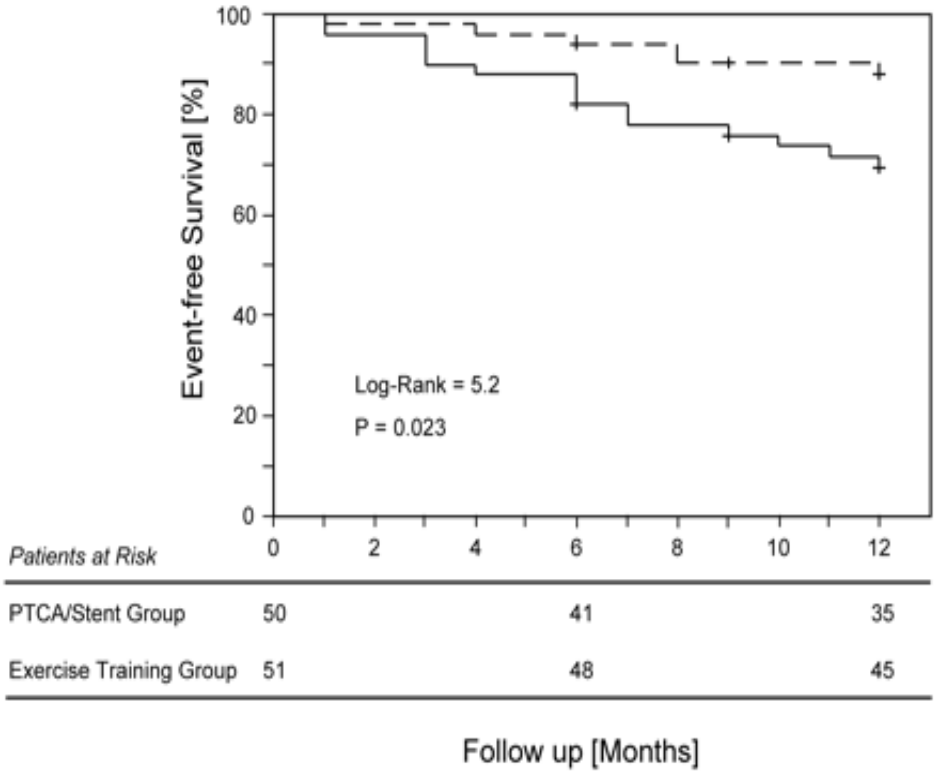
Coronary Microcirculation
-> Myocardial perfusion





Hambrecht R et al.: N Engl J Med 2000; 342:454-460

Percutaneous Coronary Angioplasty Compared With Exercise Training in Patients With *Stable Coronary Artery Disease*

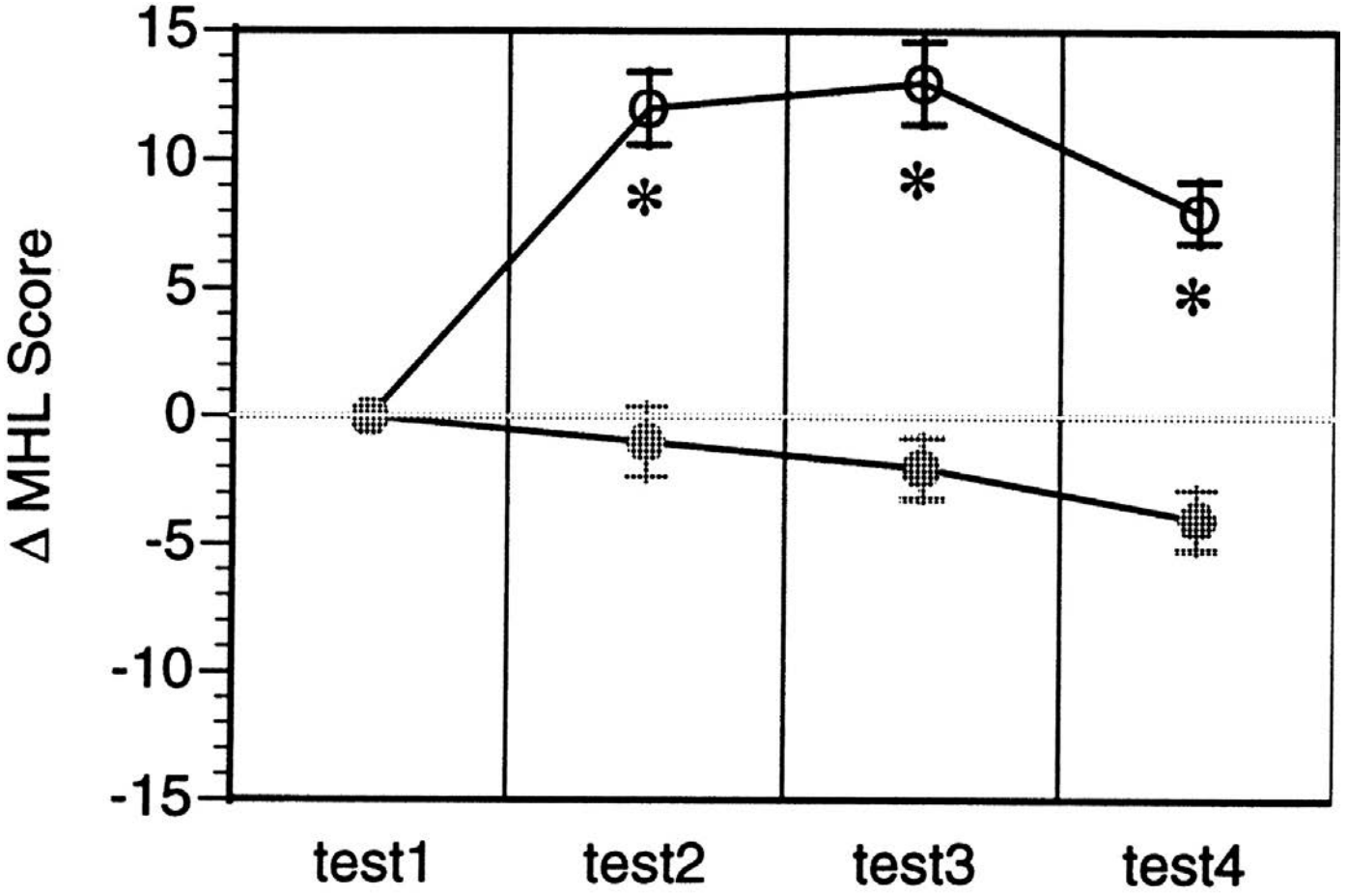


***Conclusions*— Compared with PCI, a 12-month program of regular physical exercise in selected patients with stable coronary artery disease resulted in superior event-free survival and exercise capacity at lower costs, notably owing to reduced rehospitalizations and repeat revascularizations**

***Hambrecht R: Circulation.* 2004;109:1371-1378**

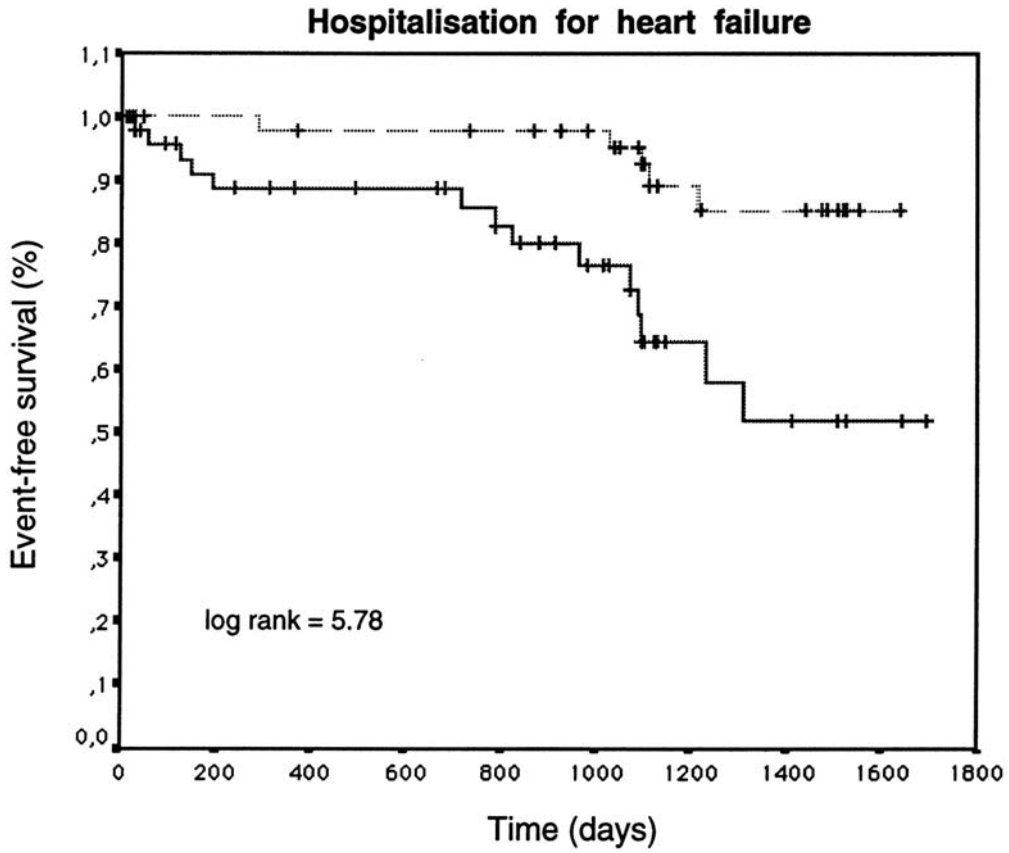
Physical training improves quality of life in patients with chronic heart failure

Changes in the Minnesota Living With Heart Failure (MHL) scores for trained (open circles) and untrained patients (closed circles) at baseline (test 1) and after 2, 14, and 26 months (tests 2, 3, and 4)



Physical training reduces hospitalisations in patients with chronic heart failure

Kaplan-Meier curves of survival without hospital readmission for heart failure in trained patients (broken line) and untrained patients (solid line) during follow-up



Training

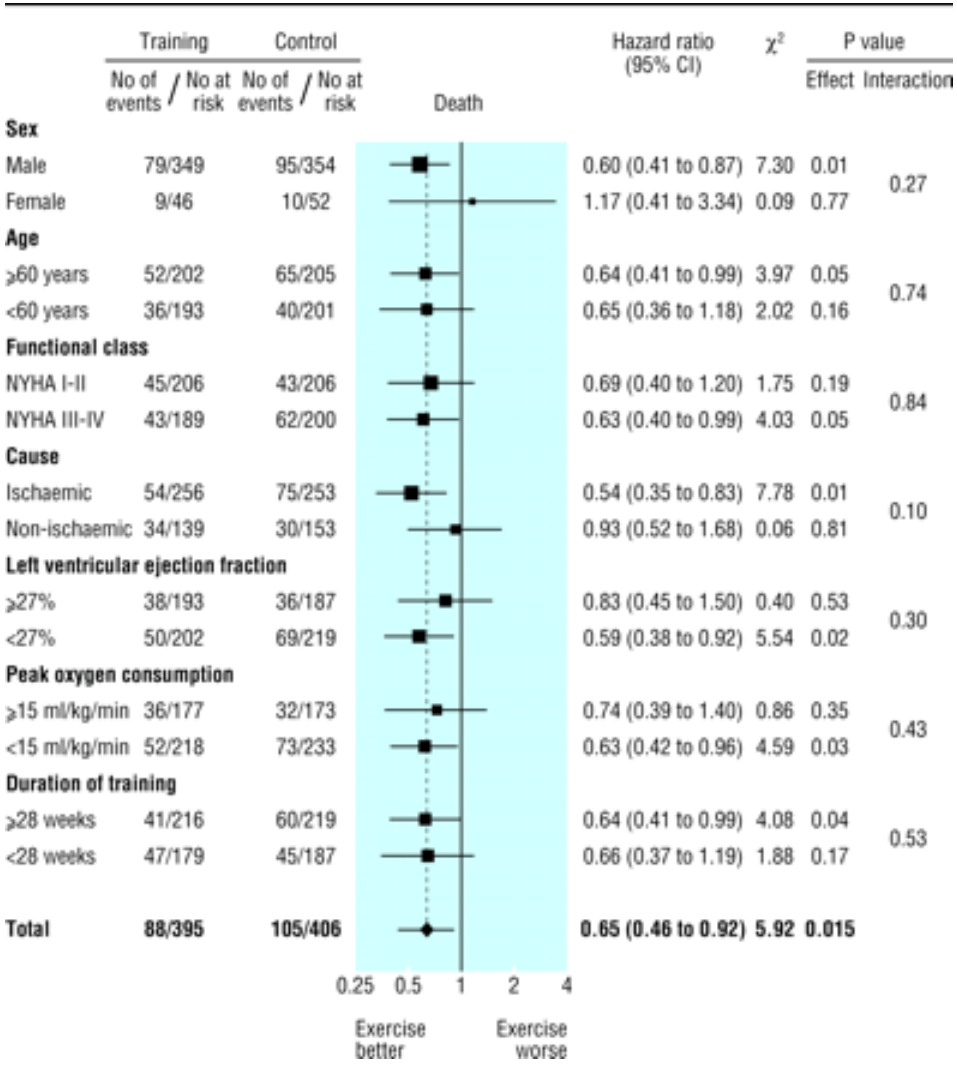
Controls

No. OF PATIENTS AT RISK

Untrained	49	44	44	44	42	41	38	36	36	36
Trained	50	50	49	49	49	49	45	45	45	45

Belardinelli, R. et al. Circulation 1999;99:1173-1182

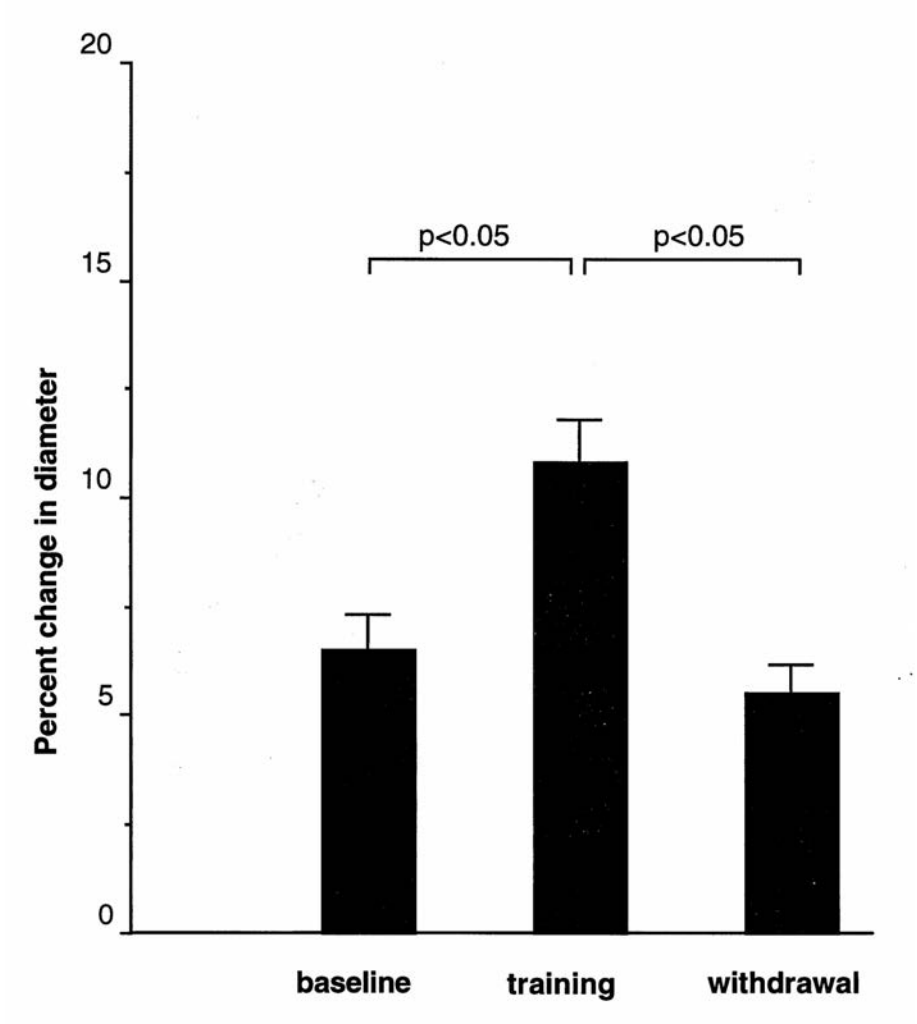
Metaanalyse aller publizierten Daten
Körperliches Training führt zu einer Abnahme der Mortalität
Subgruppen-Analysen



Piepoli MF: Br Med J 2004;328:189

Physical training improves endothelial function in heart failure patients

By increasing eNOS gene expression



Hornig B et al. Circulation 1996;93:210-214

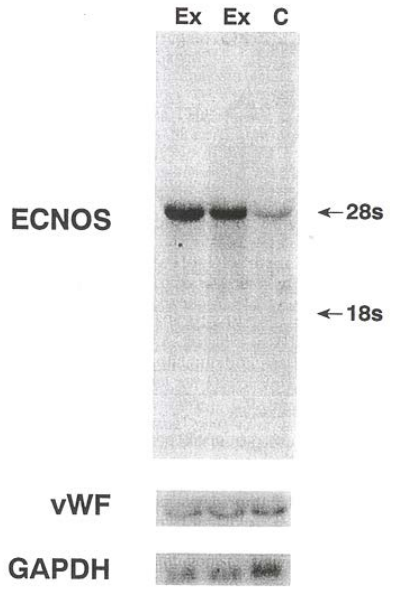


FIG 2. Northern blot showing that exercise induces endothelial cell nitric oxide synthase (ECNOS) gene expression in aortic extracts. Total RNA (10 μg) from two exercised (Ex) dogs and 1 control (C) dog was hybridized with full-length cDNAs for ECNOS, von Willebrand's factor (vWF), or glyceraldehyde-3-phosphate dehydrogenase (GAPDH) and washed under high-stringency conditions as described.

Sessa et al, Circ Res 1994;74:349-3530

Körperliches Ausdauer-Training (Ergometer) verbessert spezifisch die Funktionalität des *peripheren Gefäss-Systems bei Herzkranken*

Abnahme der Angiotensin-II vermittelten Vasokonstriktion durch Reduktion der AT1-Rezeptor-Expression und Reduktion der NADPH-Oxidase-Expression

Adams V: Circulation 2005;111:555-562

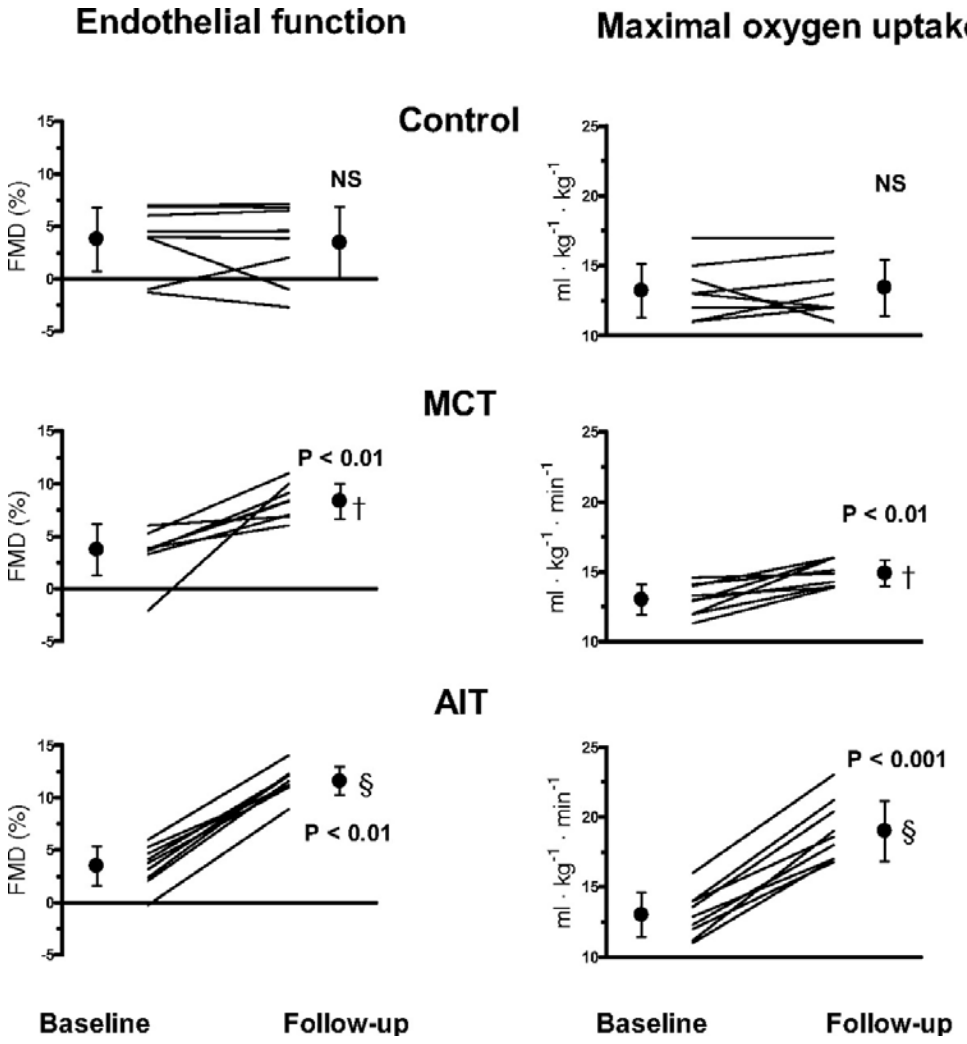
Verbesserung der endothelabhängigen Vasodilatation im Bereich der peripheren Leitungs- und Widerstandsgefässe

Hornig B et al, Circulation 1996;93:210-214

Zunahme der Kapillardichte pro Muskelfaserquerschnitt

Drexler H et al: Circulation 1992; 85: 1751 - 1759

Superior Cardiovascular Effect of Aerobic Interval Training Versus Moderate Continuous Training in Heart Failure Patients



Wisløff U et al. Circulation 2007;115:3086-3094

Why could „Sport“ be attractive for patients over 40?

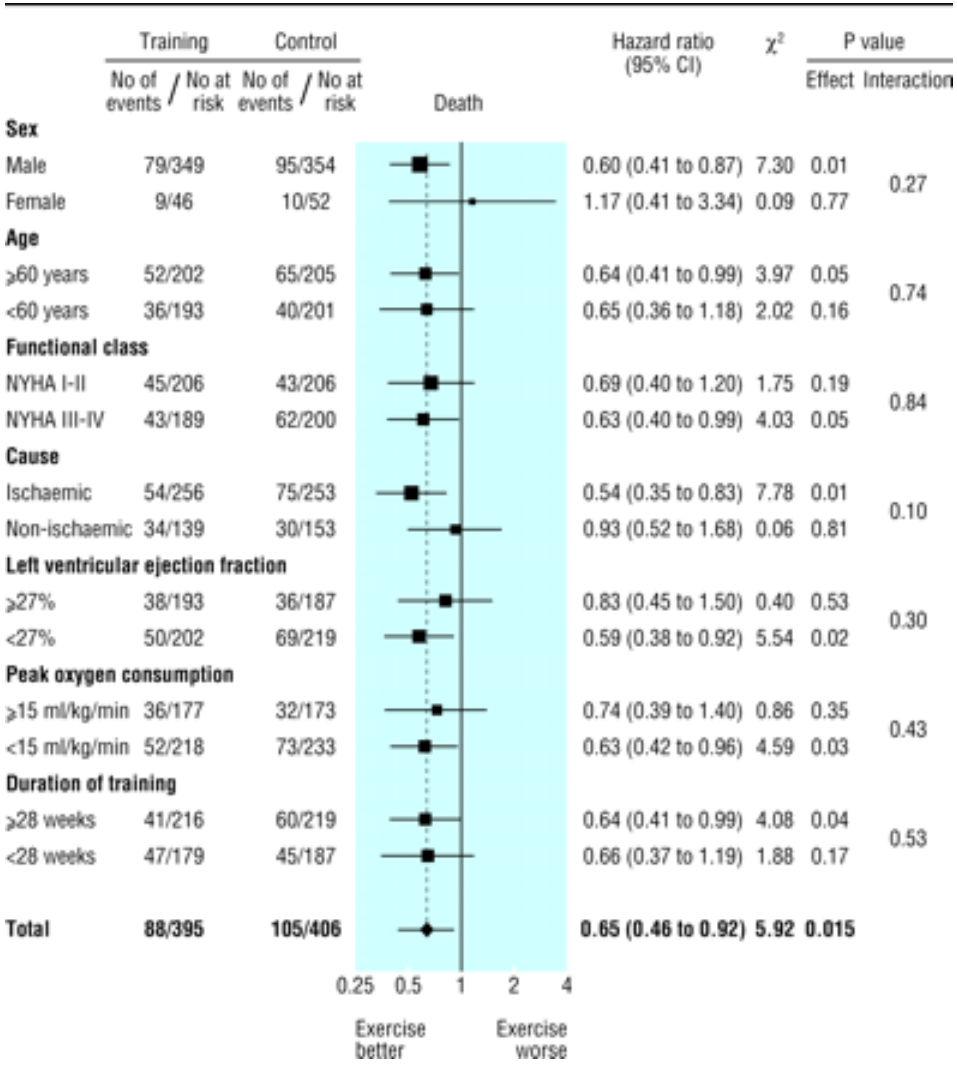
- Patients have been physically active until index event (heart attack, arrhythmia...)
- Sport as integral part of quality of life
- More and more persons > 40 start to discover sport as a goal after a succesful professional career beside job and family
- Physical fitness in the elderly may even be decisive for managing to live in the own apartment/house

Sport as a mass phenomenon

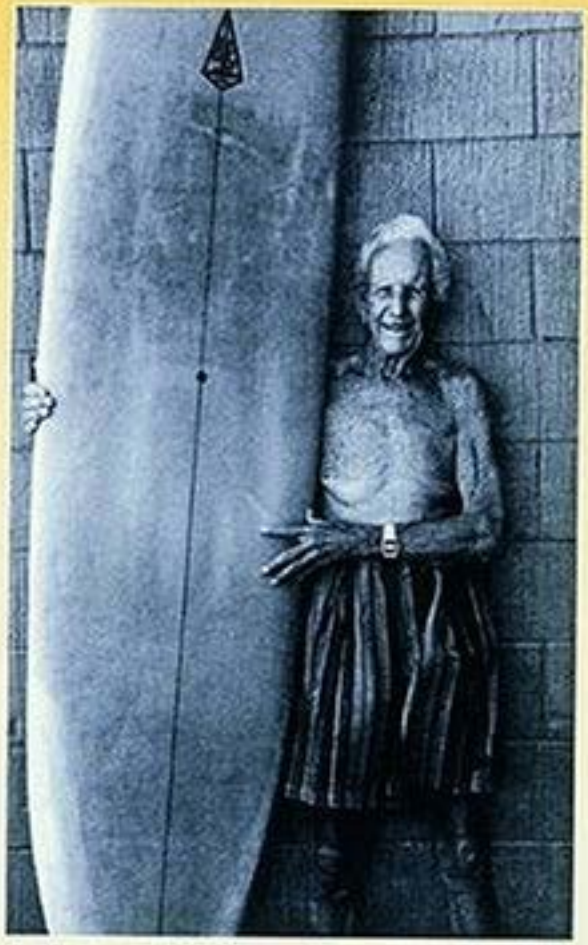
Why could „Sport“ be attractive for patients over 40?

Is „Sport“ = physical training safe in patients with heart disease ?

Metaanalysis of all published data:
Physical training reduces mortality in heart disease



Piepoli MF: Br Med J 2004;328:189



GROWING OLD IS NOT FOR SISSIES 2

Portraits of Senior Athletes

ETTA CLARK
WITH AN INTRODUCTION BY RICHARD SELZER

Radsport für Herzkranke, um die Leistungsfähigkeit zu erhalten?

Grundprinzip: Leistungsfähigkeit des Organismus bestimmt durch

a) Pumpfunktion des Herzens (Frequenz/Durchblutung/Kraft)
b) Trainingszustand der Körperperipherie
   = Funktion/Struktur des peripheren Gefäss-System
   = Funktion des Skelettmuskels
c) Leistungsgewicht

Why could „Sport“ be attractive for patients over 40?

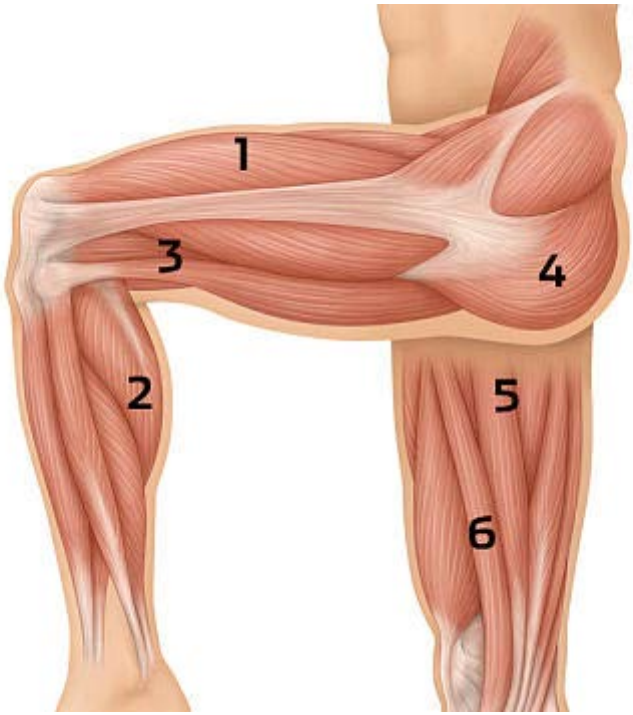
Physical capability defined by

a) Function of the heart
b) Condition of the skeletal muscle and peripheral vasculature

Background

Physical capability defined by functional state of:

+



Leistungs-Gewicht

Leistung 600 KWatt
Gewicht 600 kg
Leistungsgewicht 1 Kwatt/kg

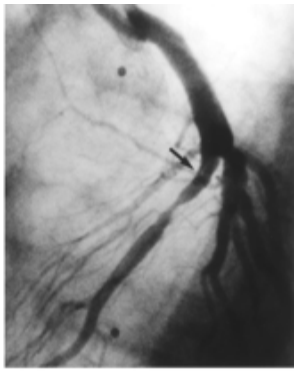
Leistung 300 KW
Gewicht 40 000 kg
Leistungsgewicht 0.0075 Kwatt/kg

Höhepunkt Saison 2011:

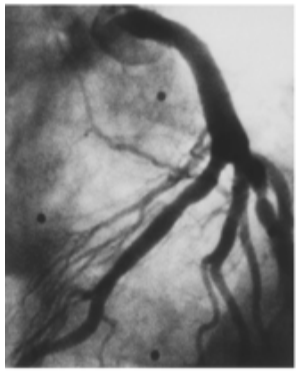
Tour de coeur: Bern-Paris in 6 Etappen

Endothelial Dysfunction of Coronary arteries
Independent predictor for cardiovascular events

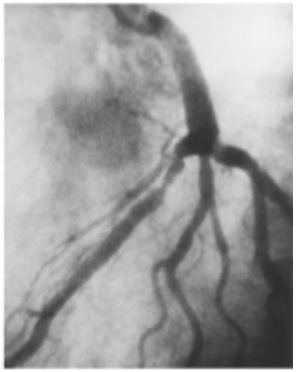
Baseline



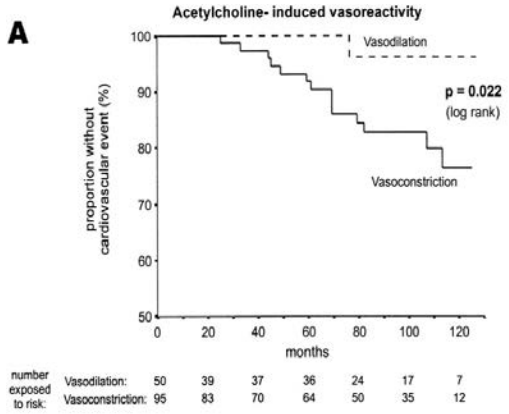
Acetylcholine

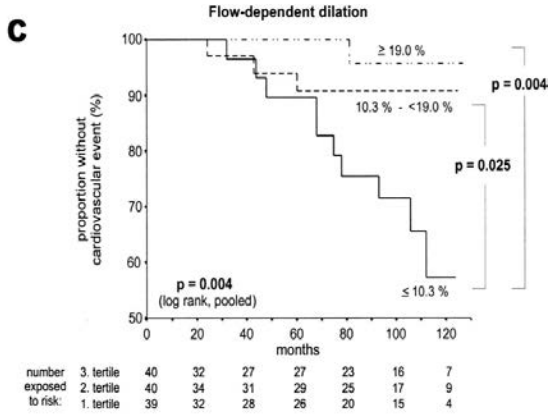


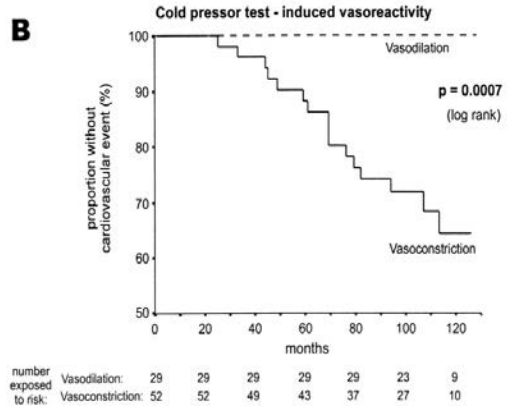
Nitroglycerin

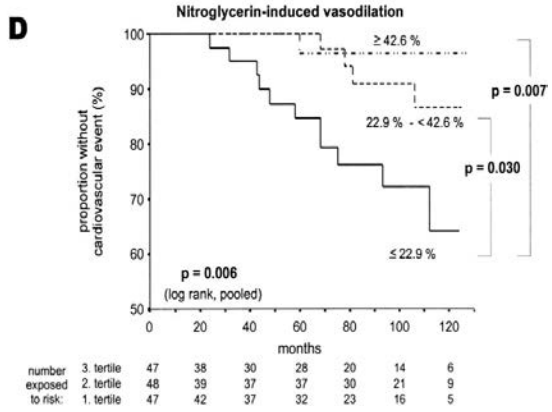


Follow up (3.7 years)









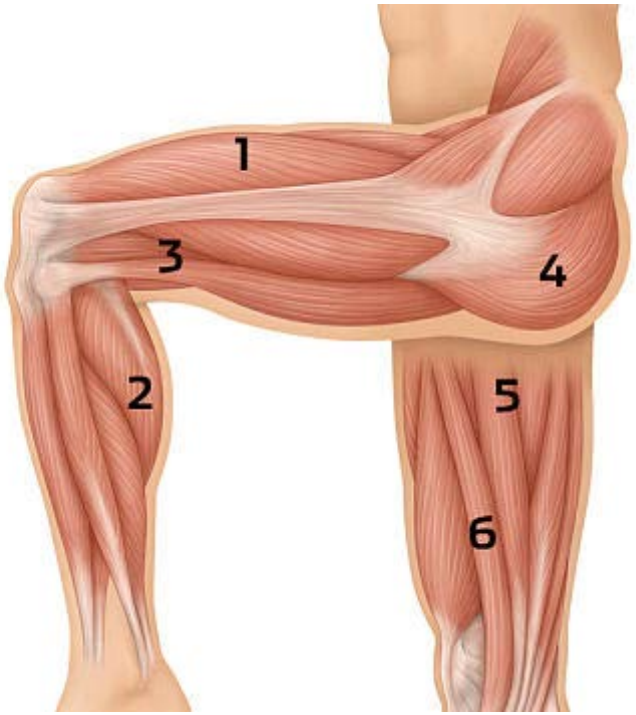
Schächinger V et al.; Circulation 2000;101:1899

Effects of physical training

Major effect on the functional state of body *periphery*

(skeletal muscle, peripheral vasculature and power/weight ratio)

<



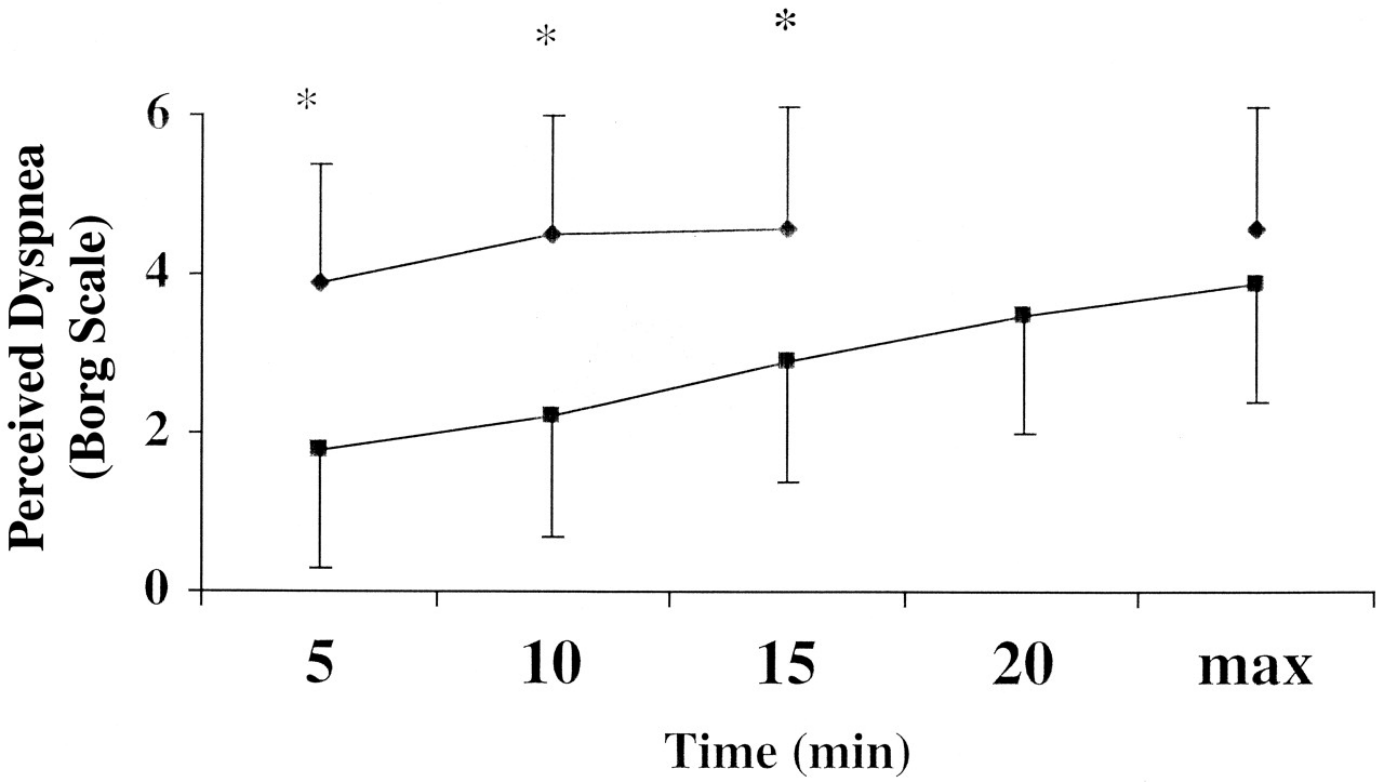
Regular Physical Activity and Risk of Atrial Fibrillation
A Systematic Review and Meta-analysis

Conclusions—Our data do not support a statistically significant association between regular physical activity and increased incidence of atrial fibrillation.

Circ Arrhythm Electrophysiol. 2013;6:252-256,

Physical training reduces dyspnoe and improves exercise duration in patients with chronic heart failure

Perceived dyspnea using the modified Borg scale during submaximal testing in the training group before and after training



Beniaminovitz, A. et al. J Am Coll Cardiol 2002;40:1602-1608

The medical history should include the following: a history of familial CAD or heart failure; presence of valvular heart disease, stable or unstable angina, congenital heart disease, stroke, sudden death, history of pulmonary disease (ie, chronic obstructive pulmonary disease or asthma); presence of symptoms including chest discomfort, dizziness, and shortness of breath (at rest or with activities of daily living) and leg discomfort (claudication) suggesting cardiovascular or pulmonary disease;

Among men <45 years and women <55 years of age who are asymptomatic without known or suspected CVD, cardiovascular work-up is generally not needed unless there are extenuating circumstances, such as a family history of sudden death at a young age, or poorly controlled cardiac risk factors.

Among men >45 years and women >55 years of age undertaking vigorous exercise who have diabetes mellitus or 2 other risk factors for CVD, a medical evaluation is advised. This should include a medical history, a physical examination, and a risk factor profile. For most, an electrocardiographic stress test is recommended.

Regular Physical Activity and Risk of Atrial Fibrillation
A Systematic Review and Meta-analysis

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