CARDIAC REHABILITATION PHASE IV

John's heart

Chris's heart

1

CARDIAC REHABILITATION PHASE IV

- "Endurance can be defined as the capacity to sustain a given velocity or power output for the longest possible time"

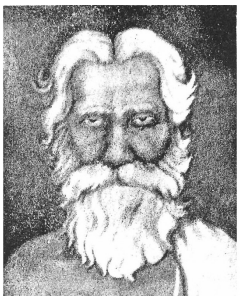
(Jones and Carter, 2000)

2

CARDIAC REHABILITATION PHASE IV

A Brief History of CR & Exercise

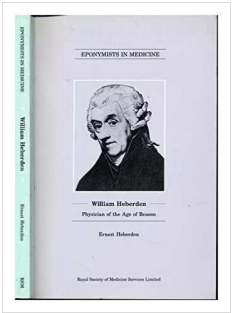
- First recorded prescriptions of ET was by Sushruta of India in 600 BC
- *"made the body stout, strong, firm, compact, and light, enhanced the growth of limbs and muscles, improved digestion and complexion, prevented inactivity, and reduced senility, [and absolutely] conducive to a better preservation of health."*



3

CARDIAC REHABILITATION PHASE IV

- In 1772, four years after his magnificent description of angina pectoris, Heberden reported a case of a patient who improved by working in the woods half an hour per day



4

CARDIAC REHABILITATION PHASE IV

A Brief History of CR & Exercise

- By the 1930s, patients with acute CHD events were still prescribed 6 weeks of bedrest
- In the 1940's, however, the paradigm began to shift as complications from prolonged recumbence became evident.

5

CARDIAC REHABILITATION PHASE IV

"Chair therapy"

- In 1912, James Herrick recommended that patients who survived an AMI be placed at strict bed rest.
- Lown asserts that "the chair" did more than any other intervention in the 1950s to help reduce mortality from acute myocardial infarction (AMI)

6

CARDIAC REHABILITATION PHASE IV

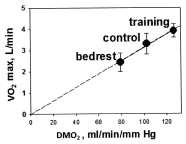
Early Ambulation after Myocardial Infarction

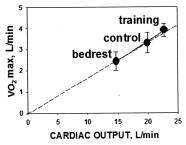
- By the 1960s few were recommending bed rest for any longer than 2 weeks, there was still no consistent standard for bed rest in the literature or in practice through 1970.
- Unfortunately, the early studies on the use of chair treatment and improvement in mortality were small, scanty and, by today's standards, fairly unsystematic.
- Dr. Wenger -*"Grady Memorial Hospital had the first early ambulation program [beginning in 1962] in the world."*

7

CARDIAC REHABILITATION PHASE IV

Saltin *et al*., (1966) Dallas Bed Rest and Exercise Study





Variable	1966		
	Baseline	After Bed Rest	After Training
Maximum oxygen uptake (L/min)	3.3	2.4	3.9
Cardiac output (L/min)	20.0	14.8	22.8
Heart rate (bpm)	193	197	190
Stroke volume (mL/beat)	104	75	120
Arteriovenous oxygen difference (mL O_2/100 mL)	16.2	16.5	17.1
Systolic blood pressure (mm Hg)	204	153	201
Diastolic blood pressure (mm Hg)	81	63	74

All values are group means.

8

CARDIAC REHABILITATION PHASE IV

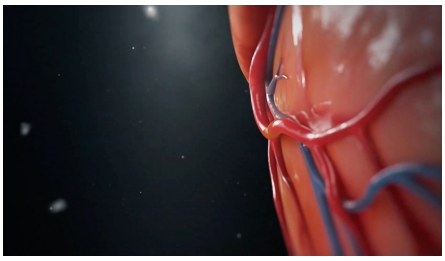
Training for Adaptational Changes to the Myocardium?

WHY WHY WHY ……???

9

CARDIAC REHABILITATION PHASE IV

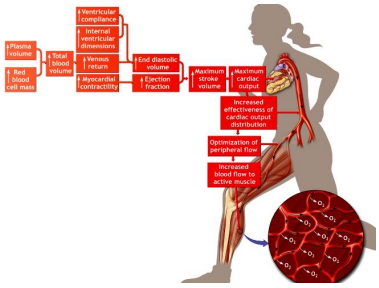
Training '*Dose*" for Adaptational Changes to the Myocardium?



10

CARDIAC REHABILITATION PHASE IV

Training for Adaptational Changes to the CV System?



11

CARDIAC REHABILITATION PHASE IV

Theoretical Background of [Aerobic] Endurance [?] Exercises in the Context of Cardiac Rehab

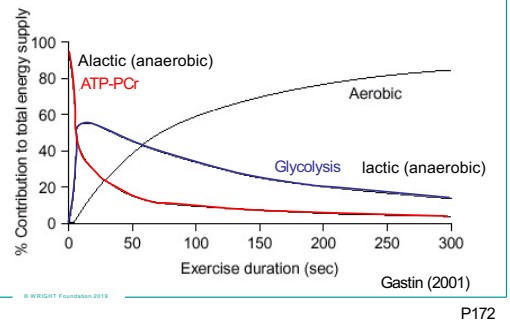
Page 166

Do you train systems [energy pathways]? Does the body know the difference between various exercise treatments [exercises]?

12

CARDIAC REHABILITATION PHASE IV

Exercise duration and energy metabolism



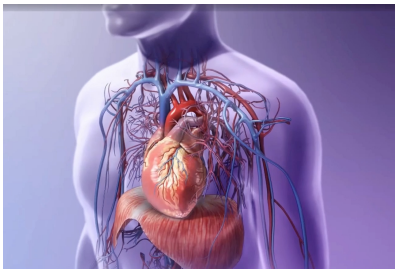
Gastin (2001)

P172

13

CARDIAC REHABILITATION PHASE IV

Effect of Training on the Heart

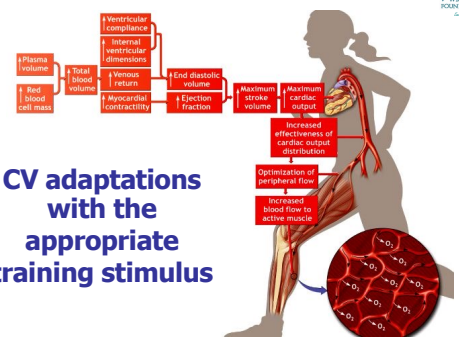


14

CARDIAC REHABILITATION PHASE IV

15

CARDIAC REHABILITATION PHASE IV

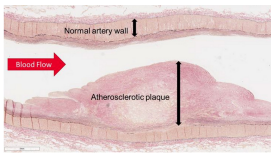


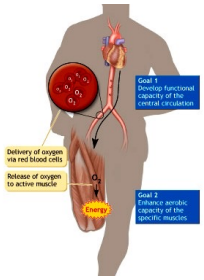
CV adaptations with the appropriate training stimulus

16

CARDIAC REHABILITATION PHASE IV

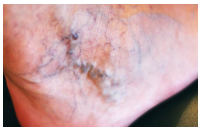
Training & Exercise [Considerations]





17

CARDIAC REHABILITATION PHASE IV



18

CARDIAC REHABILITATION PHASE IV

The functional basis for all ischaemic cardiovascular disease is the imbalance between available oxygen and the oxygen demanded by a working tissue area. Aerobic or endurance training can counteract this imbalance by encouraging certain biochemical and biophysical adaptations??

19

CARDIAC REHABILITATION PHASE IV

Exercise After Myocardial Infarction: a Controlled Trial

P. CARSON, BM, FRCP, FACC, *Consultant Cardiologist and Senior Research Fellow*, ROSALIND PHILLIPS, MB, M. LLOYD, MB, HELEN TUCKER, MB *and* M. NEOPHYTOU, DM, *Research Fellows*, N. J. BUCH, MD, MRCP(UK) *and* A. GELSON, MB, MRCP(UK), *Hon. Senior Registrars and Research Fellows*, A. LAWTON, BA, FRSS, *Statistician and Systems Analyst, Cardiology and Computer Departments, North Staffordshire Hospital Centre, Stoke-on-Trent, and Department of Postgraduate Medicine, Keele University, Staffordshire, and* T. SIMPSON, DIC, Dip Ed, *Lecturer in Physical Education, Cauldon College of Further Education, Stoke-on-Trent*

Article

August 19, 1988

Cardiac Rehabilitation After Myocardial Infarction

Combined Experience of Randomized Clinical Trials

Neil B. Oldridge, PhD; Gordon H. Guyatt, MD; Mary E. Fischer, MS; et al

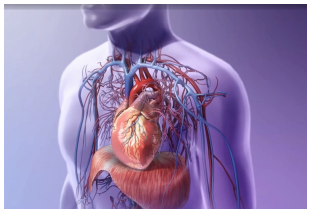
> Author Affiliations

JAMA. 1988;260(7):945-950. doi:10.1001/jama.1988.03410070073031

20

CARDIAC REHABILITATION PHASE IV

Cardiac

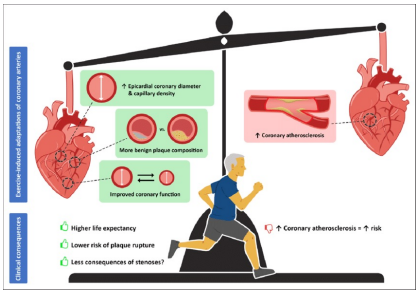


- Reduced resting HR
- Prolongation of diastole or ventricular relaxation
- Reduced sympathetic tone and thus catecholamine stimulation of the heart at rest.
- Enhanced electrical stability.

21

CARDIAC REHABILITATION PHASE IV

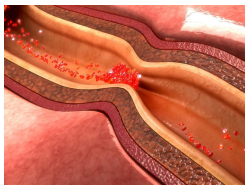
Changes in Blood Properties, Circulation and Lipid Profile



22

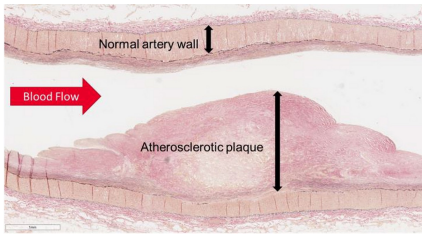
CARDIAC REHABILITATION PHASE IV

- More efficient capillary bed perfusion, most likely due to increased elasticity of red blood cells.
- Levels of high-density lipoprotein (HDL) are increased.
- Levels of low-density lipoprotein (LDL) and Triglyceride fractions are reduced



23

CARDIAC REHABILITATION PHASE IV



24

CARDIAC REHABILITATION PHASE IV

25

CARDIAC REHABILITATION PHASE IV

General Effects of [Aerobic] Endurance Training

	Cardio-vascular System	•Volume increase of the heart muscle (dilatation) •Hypertrophy of the heart muscle •Increase of stroke volume •Higher cardiac output •Optimised oxygen uptake •Decrease of the resting pulse •Stabilised blood pressure
	Muscle - Metabolism	•Increase of mitochondria (especially in ST-fibres) • Increased level of enzymes in the mitochondria •Greater glycogen stores [especially type 2] •Increased capillarization

P169

26

CARDIAC REHABILITATION PHASE IV

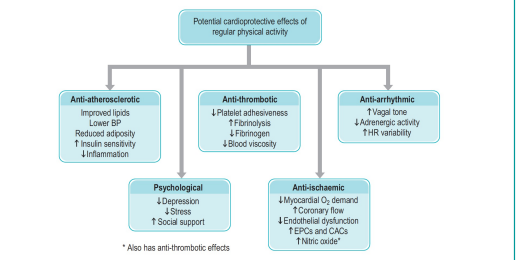
General Effects of [Aerobic] Endurance Training

	Blood	•Increase of red cells (erythrocytes) •Increase of haemoglobin •Increase of blood plasma •Greater buffering capacity during acidosis
	Respiratory system	•Deeper breathing •Increase of the respiratory minute volume •Higher vital capacity
	Nervous system	•Increase in parasympathic activity

27

CARDIAC REHABILITATION PHASE IV

Aerobic endurance exercise for patients with CHD

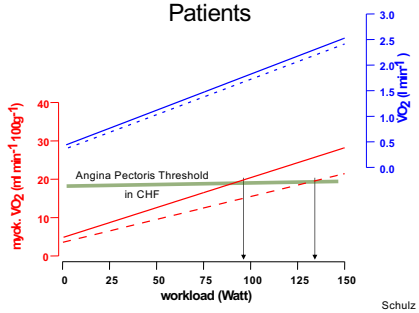


Multiple mechanisms by which moderate-to-vigorous exercise training may reduce the risk of non-fatal and fatal cardiovascular events. BP, blood pressure; EPCs, endothelial progenitor cells; CACs, cultured/circulating angiogenic cells; *, increased; #, decreased; O2, oxygen.

28

CARDIAC REHABILITATION PHASE IV

Effects of an Endurance Training on the O_2-Consumption of the Myocardium in Cardiac Patients



Schulz 2005

29

CARDIAC REHABILITATION PHASE IV

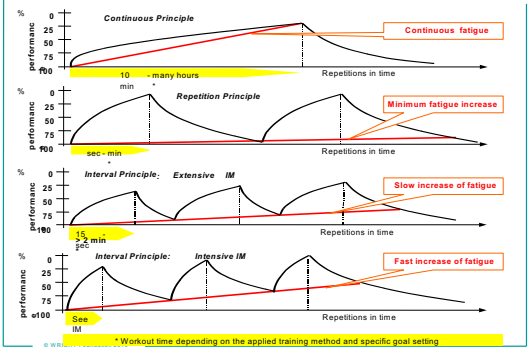
At what level do the training adaptations begin?

- Training adaptations [stimulus] have been measured and seem to occur from aerobic exercise occurring at around 50% of the individual's maximum predicted heart rate over about 20 minutes repeated every other day.
- There is no merit in training above 80% of HR_{max} if aerobic fitness is the dominant goal???

30

CARDIAC REHABILITATION PHASE IV

Training principles and methods???



Adapted from: Steinhöfer D, 2003

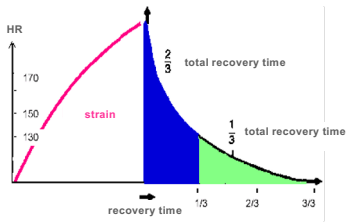
P173

31

CARDIAC REHABILITATION PHASE IV

Interval training and specific recovery times

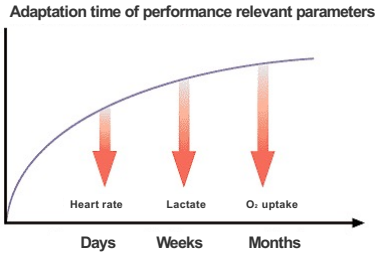
Whether a training method can be identified as an intensive or as an extensive IM not only depends on the intensity and duration of each [dose] rep, but also on the specific recovery time according to the method used.



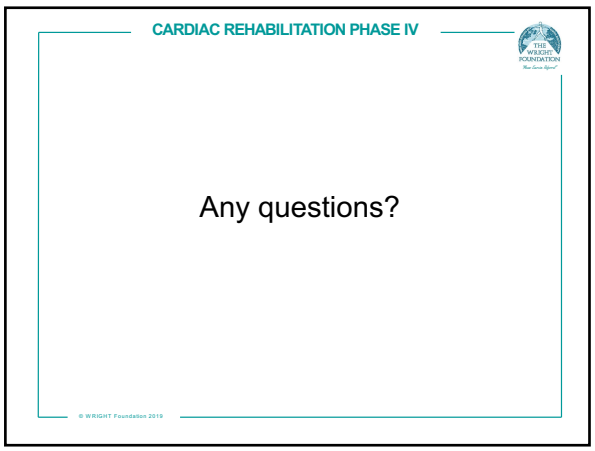
32

CARDIAC REHABILITATION PHASE IV

Adaptations of different parameters



33


CARDIAC REHABILITATION PHASE IV
Any questions?
© WRIGHT Foundation 2019

34