Physical Exercise

B.Soma Raju
Care Hospital & Care Foundation

“The superior practitioner treats
What is not yet sick,
The mediocre practitioner treats only
What is already sick,”

Pien chu’ UEH *c i r e a* 500 B.C

Ischemic heart disease risk factors

Nonmodifiable

- Age
- Sex
- Family History(Heredity)

Modifiable

- Hypertension
- Hyperlipidimia
- Cigarette Smoking
- Glucose Intolerance (Hyperglycemia)
- Obesity
- Sedentary Lifestyle
- Psychological Stress
- Environment
- Treating MLC cases

Care Hospital Outpatient

The dignity of a physician requires that he should look healthy, and as plump as nature intended him to be; for the common crowd consider those who are not of this excellent bodily condition Not able to take care of themselves.

-*Hippocrates (c.400 B.C)*


© Art Wolfe

Is Exercise Cardio-Protective ?

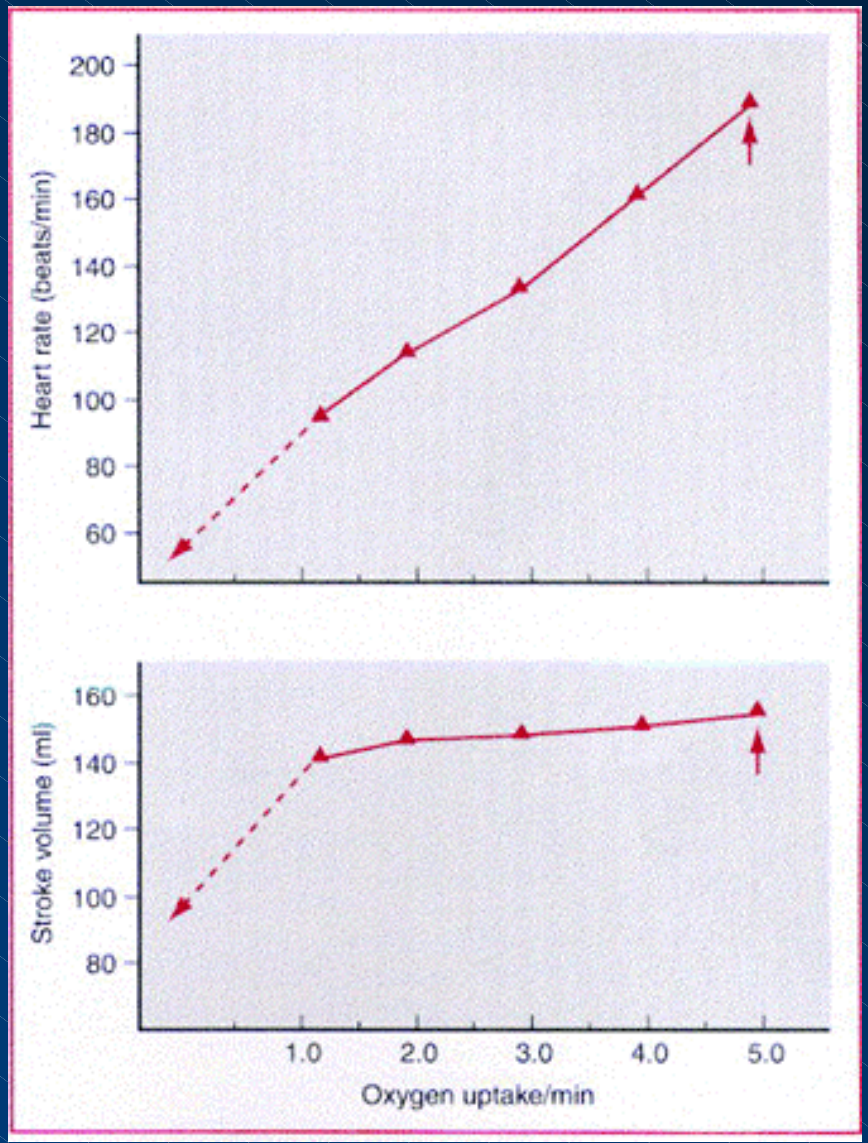
Yes

Types of Exercise

	Isotonic	Isometric	Resistance
Alternative	Dynamic	Static	Resistive
Example	Running	Handgrip	Wt lifting
O2 uptake	Greatest	Least	Interm
CO	Greatest	Least	Interm
<PVR	Greatest	Least	Interm
BP	Decreases	Increases	Increases

Clinical Effects of Exercise Training

- > O2 consumption
- > Stroke Volume
- > Maximal Exercise CO
- > Resting Parasympathetic tone
- < Resting sympathetic tone
- < Resting heart rate


Heart rate (beats/min)
200
180
160
140
120
100
80
60
Stroke volume (ml)
160
140
120
100
80
1.0
2.0
3.0
4.0
5.0
Oxygen uptake/min

Prevention of heart attack

Obesity

- Higher BP
- More prone for diabetes
- More prone for heart attack
- More cholesterol
- Cannot walk because of arthritis
- Reduction of even modest weight helpful

Type of studies clarify the relationship of aerobic exercise training to CAD

- Population or clinical CAD.
- Animal studies of the effects of chronic exercise on atherosclerosis and the heart.
- Studies evaluating the effects of exercise on factors that could effect the progression of myocardial ischemia.

PHYSIOLOGIC ADAPTIONS IN RESPONSE TO REGULAR EXERCISE

- ↑ LV volume and ↑ stroke volume
- More efficient exercise induced vasodilation in muscles
- ↑ action of oxidative enzymes in exercising muscles
- More efficient O2 delivery to and extraction by muscles
- At any level of submax exertion HR,BP,& SNS ↑ less in fit people
- ↓ In exercise-induced platelet action

“Trained staff”

Reflections the physiologic and biochmical adaptations of the body to chronic exercise, characterized by

- Increase in physical work capacity
- Increase in maximal oxygen Consumption (VO_2)
- Decrease in hemodynamic stress (HR and BP response) at submaximal Levels of exertion.

Physical activity and risk of coronary heart disease and death

The Framingham study

"There is a clear trend of improved overall, Cardiovascular,and coronary mortality with increased level of physical activity at all ages, including the elderly."

(Kannel WB, Amer.Heart J.112:820, 1986)

Physical activity and risk of coronary heart disease and death

The multiple risk factor Intervention trial:

"Men at high risk for CHD who self-selected moderate amounts of predominantly light and moderate non-work physical activity had lower rates of CHD mortality,sudden death and overall mortality than more sedentary men."

(Lean AS,JAMA 258:2388,1987)

Physical activity and risk of coronary heart disease and death

Lipid Research Clinics Study:

Lower level of physical fitness is associated with a higher risk of death from coronary heart disease and cardiovascular disease in clinically healthy men, independent of conventional coronary risk factors.”

(Elkelund LG,N.Engl.J.Med. 319:1379,1998)

Physical activity and risk of coronary heart disease and death

The US Rail road Study:

"Physical activity, specifically that done in leisure time,protects against death from coronary heart disease and all-cause mortality."

(Slattery ML,Circ.79:304,1989)

Centers for disease control: morbidity and mortality weekly report 36:426,1987

Conclusion: A casual inverse relationship exists between physical activity and coronary heart disease (CHD).

Which Three risk factors have the most serious influence ?

- Cigarette smoking
- High blood pressure
- Lack of regular exercise
- Stress
- High cholesterol levels in the blood

CDC:MMWR 36:426,1987

"The prevalence of people at risk of CHD because of high serum Cholesterol, high blood pressure or cigarette smoking is actually small compared with that of persons who do not perform regular physical activity. This is because the 3 prevalence levels are comparatively low."

CDC: MMWR 36:426,1987

Therefore, “ since these four CHD risk factors are similar in strength, physical activity appears to be a far more important risk factor.”

Physical activity and risk of coronary heart disease and death

The Harvard College Alumni study:

"Beginning moderately vigorous sports activity, quitting cigarette smoking, maintaining normal blood pressure and avoiding obesity were separately associated with lower rates of death from all causes and from coronary heart disease among middle aged and older men."

(paffenbarger RS, N.Engl.J Med.328:538,1993)

Physical activity and risk of coronary heart disease and death

The Cooper Institute for aerobics research study:

"Men who maintained or improved adequate physical fitness were less likely to die from all causes and from cardiovascular disease during follow up than persistently unfit men. Physicians should encourage unfit men to improve their fitness by starting a physical activity program."

(Blair SN,JAMA 273:1093,1995)

Clinical trials of physical exercise

Trial	%Red. Mort.	Stat. Sig.
• Wilhelmsen, et al	21	No
• Kentala	22	No
• Palatsi	29	No
• Kallio, et al	27	No
• Natl, exer.heart Dis.Prof	37	No
• Southern Ontario exer.trial	-29	No
• Carson,et al	43	No

Cumulative/pooled estimate =20% Reduction in mortality

The conclusions of epidemiologic studies are supported by experimental studies showing exercise improves

- CAD Risk factors
- Blood Lipid profile
- Resting BP in Hypertensives
- Glucose tolerance and insulin sensitivity
- Body composition
- Bone density
- Immune function
- Psychologic function

Editorial Comment

Effects of Exercise on Coronary Atherosclerotic Lesions

Mary J Malloy, MD
San Francisco,California

JACC Vol.22,No.2 August 1993:478-9

Exercise and sudden death:

"Although the risk of primary cardiac arrest is transiently increased during vigorous exercise, habitual vigorous exercise is associated with an overall decreased risk of primary cardiac arrest."

(Siscovick DS,NEJM 311:874,1984)

Reduction of CAD risk by exercise Physiologic and Metabolic mechanisms

- ? HDL cholesterol
- ? Triglyceride levels
- ? BP
- ? Fibrinolysis & ? Platelet aggregation
  (? Risk of acute thrombosis)
- ? Glucose tolerance & insulin sensitivity
- ? Myocardial sensitivity to catecholamines
  (? ? ventricular arrhythmias)

Cardiovascular effects of exercise and the endothelium

- Exercise increases intracoronary blood flow,resulting in vasodilation of coronary arteries.
- Exercise-induced increases in blood flow and shear stress have been observed to enhance vascular function, reactivity (vasodilation),and structure(remodeling)
- By increasing release of NO and prostacyclin, increased flow and shear stress augment endothelium dependent vasodilation and inhibit multiple processes involved in atherosclerosis and restenosis.

Suggested mechanism of cardioprotection by exercise training : sudden cardiac death

- Animal Studies: exercise training may confer protection from provoked ventricular fibrillation during acute myocardial ischemia by a change in autonomic balance,with increased vagal activity.
- Clinical Studies: exercise training increases parasympathetic activity and augments heart rate variability.
- Consider: exercise training may improve sympathovagal balance,enhance electrical stability, and prevent lethal arrhythmias during ischemia.

Special summary:
AHA Position statement

INACTIVE
LIFESTYLE IS
FOURTH MAJOR
CAD RISK FACTOR

Physical Activity and Public Health

A recommendation from the centers for disease control and prevention and the American college of Sports Medicine

Statement on Exercise: Benefits and Recommendations for Physical Activity programs for all Americans

A statement for Health Professionals by the committee on Exercise and Cardiac Rehabilitation of the council on clinical cardiology, American Heart Association

circulation. 1996:94:857-862

NIH Consensus Conference

Physical activity and cardiovascular Health

NIH consensus Development Panel on Physical Activity and Cardiovascular Health

JAMA 1996;276:241-246

Physical Activity and Health

A report of the Surgeon General Executive Summary.

402 JAMA February 1, 1995-Vol 273,No.5

Special Communication

Physical Activity and Public Health

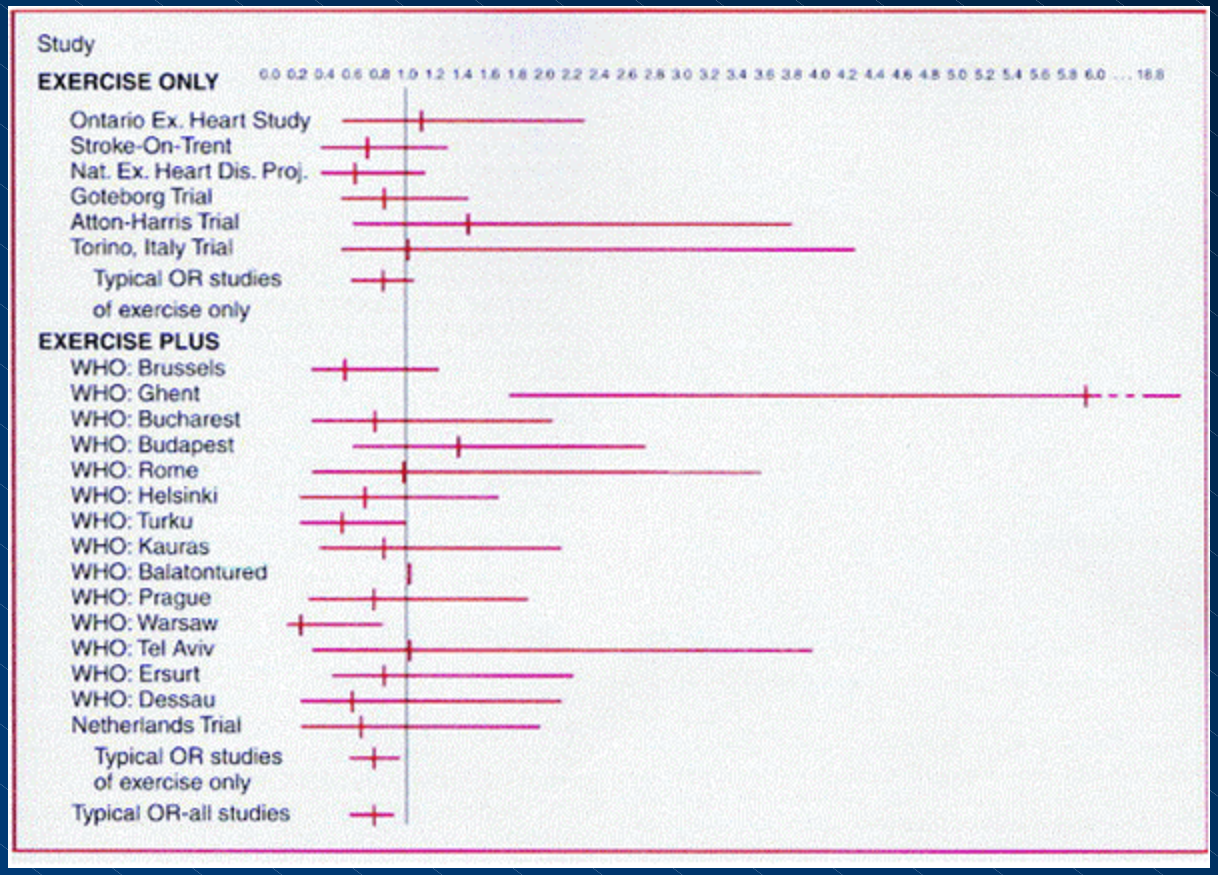
A Recommendation From the Centers Disease Control and Prevention and the American College of Sports Medicine

Exercise as a coronary protective factor Current Status 1994:

The available studies provide convincing evidence that exercise protects against coronary artery disease, coronary events, and mortality, both cardiovascular and all-cause.

The virtual unanimity of findings of a cardioprotective effect of exercise presents a persuasive argument to include regular exercise in a healthy life-style directed at reducing the risk of coronary artery disease.

Cardiovascular Rehabilitation- Randomized Clinical Trials



Basic exercise prescription to achieve and maintain training effect.

- Type of Exercise:

  Dynamic (Isotonic) Exercise involving repetitive movements of large muscle groups – both arm and leg.

(2) Frequency:

  At least 3 times weekly. Preferably on non-consecutive days.

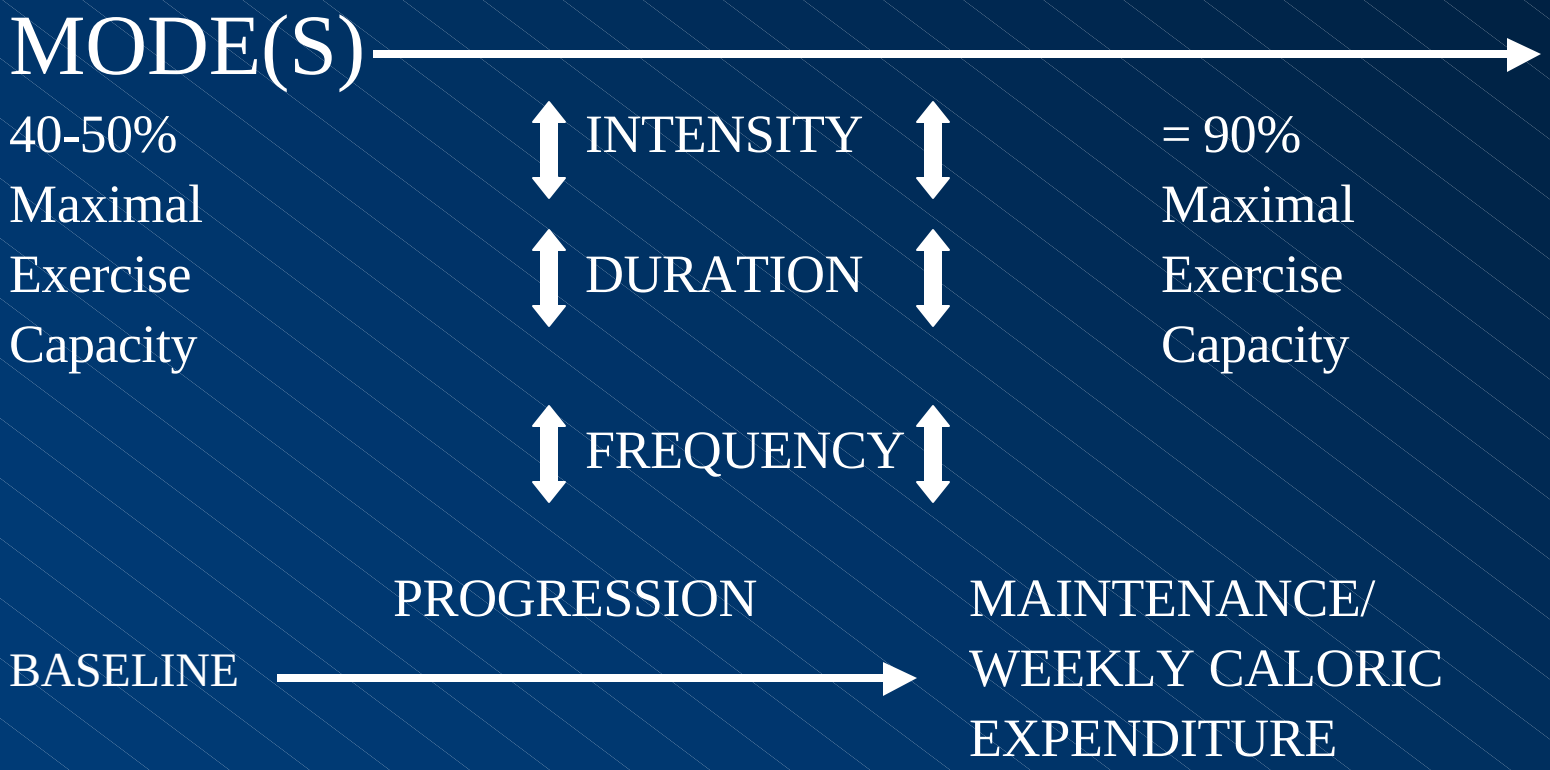
(3) Duration:

  15-30 minutes per session.

(4) Intensity:

  To attain 70-85% of Maximal heart rate safely achieved at prior maximal exercise test

EXERCISE TRAINING PROTOCOL



Cardiovascular Disorders Associated with Sudden Death (During exercise)

- Coronary artery disease
- Coronary arterial anomalies
- Myocardial bridging
- Idiopathic LVH
- Dilated Cardiomyopathy
- Hypertrophic Cardiomyopathy
- MVP
- AS
- Marfan’s syndrome
- Coarctation of aorta
- Long- QT syndrome
- W-P-W Syndrome
- Idiopathic VT
- Arrhythmogenic RV dysplasia
- Sarcoidosis
- Kawasaki’s disease
- Drug induced morphologic changes
- Myocarditis

Screening Tests Prior to Exercise Training

- History, Physical Examination
- Electrocardiogram
- Echocardiogram
- Pulmonary function test
- Exercise testing

Exercise
State of the Art summary: 1996

- Total time of physical activity and caloric expenditure are associated with ? CV disease incidence and mortality.
- There is a dose-response relationship for this association.
- Regular moderate exercise provides substantial health benefits.
- Intermittent bouts of physical activity(8-10 mins) totaling 30 min or more on most days provide beneficial health and fitness effects.

1989-90: Active areas of CV research on exercise

- Diabetes and atherosclerosis

  ? Prevention of Type II

2. Cardiac “fatigue” and LV dysfunction after strenuous exercise(athletes and normals)
3. High intensity exercise training in CAD patients

   ? Central and peripheral adaptations

   ? Improvement in LV function
4. Beneficial effects of exercise training in patients with severe LV dysfunction and compensated CHF
5. The changing role of exercise testing: from a diagnostic to prognostic test for CAD

Exercise is the Key stone

To change in lifestyle and reduction of risk factors

Heberden (CA. 1800)

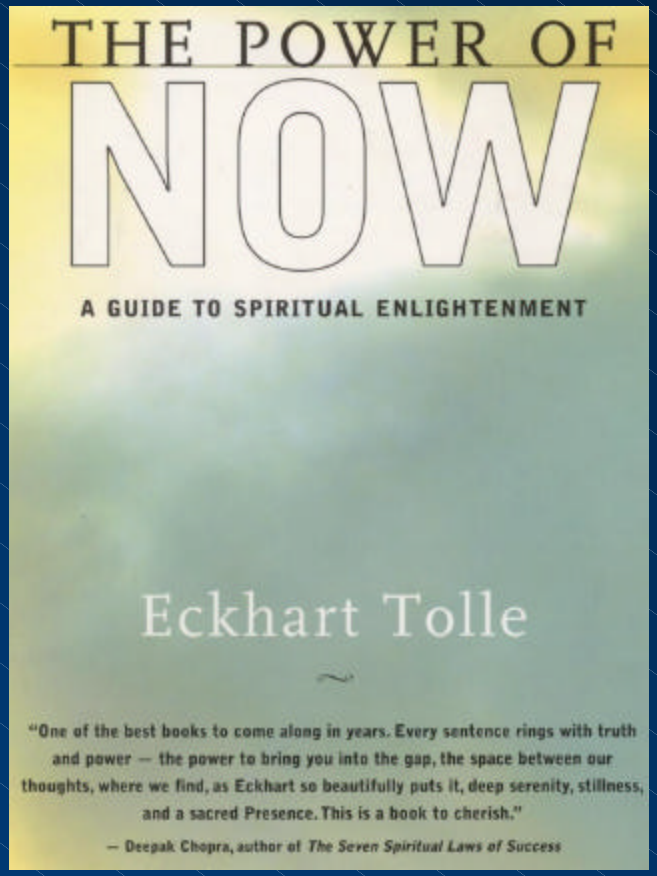
"I know one who set himself a task of sawing wood for half an hour every day and was nearly cured."

Is Exercise Cardio-Protective ?

YES

HORN (1985):

“ Until we can totally prevent it, let’s outrun coronary disease.”


THE POWER OF
NOW
A GUIDE TO SPIRITUAL ENLIGHTENMENT
Eckhart Tolle
"One of the best books to come along in years. Every sentence rings with truth and power — the power to bring you into the gap, the space between our thoughts, where we find, as Eckhart so beautifully puts it, deep serenity, stillness, and a sacred Presence. This is a book to cherish."
— Deepak Chopra, author of The Seven Spiritual Laws of Success

The Tragedy of Life

The first half of it consists of the capacity to enjoy without the chance; the last half consists of the chance without the capacity.

-Mark Twain