

# Cardiac Adaptation in Veteran Athletes



Stuart Hood  
Consultant Cardiologist  
Greater Glasgow & Clyde

Prof Jeremy Morris 06/05/1910 – 28/10/2009



1954 World Conference of Cardiology

# Exercise and the Heart

## Athlete's Heart

Structure

Rhythm / ECG

Function

# Exercise and the Heart

## Athlete's Heart

### Structure

- Dynamic Exercise:      Largely increase in volume load  
                                 Increase in LV internal dimension  
                                 Proportionate increase LV wall thickness  
                                 “Eccentric “ LVH
- Static Exercise:            Largely increase in pressure load  
                                 Increase in LV wall thickness  
                                 No change in LV internal dimension  
                                 “Concentric “ LVH

# Exercise and the Heart

## Athlete's Heart

### Structure

What about the Right Ventricle?

Increase in RV end diastolic volume

Increase in RV mass

# Exercise and the Heart

## Athlete's Heart

### Rhythm /ECG

Sinus bradycardia /arrest

Wandering pacemaker

Junctional bradycardia

First degree AV block

2<sup>nd</sup> Degree AV block (Wenckebach)

Repolarisation “abnormalities” (ST & T wave changes)

# Exercise and the Heart

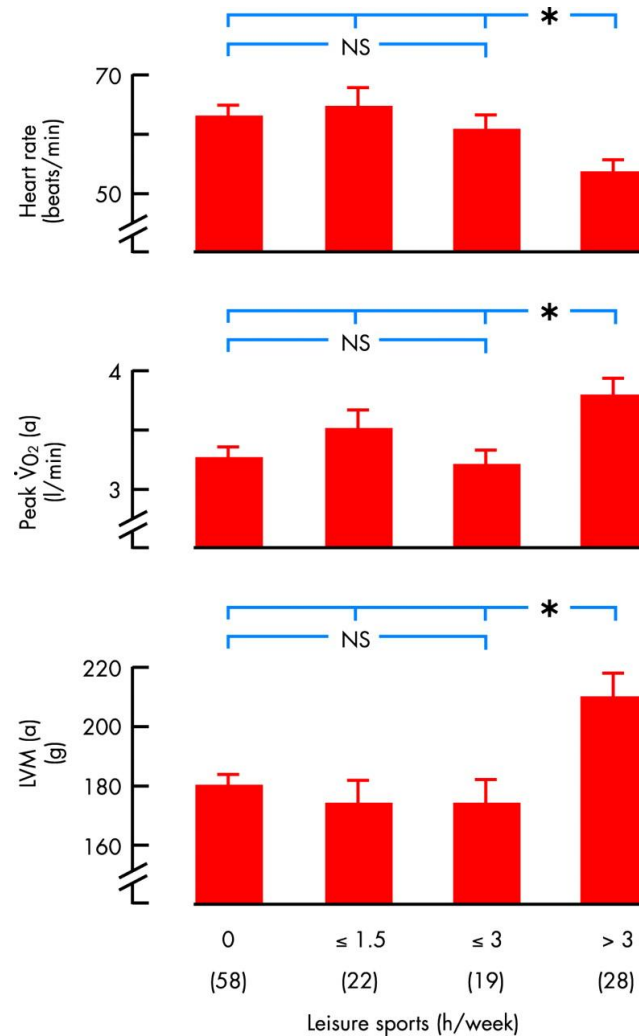
## Athlete's Heart

### Function

LV systolic function – Normal at rest and on exertion

LV diastolic function – Normal at rest  
Enhanced on exertion

# Heart rate, peak oxygen uptake ( $\dot{V}O_2$ ), and left ventricular mass (LVM) in 127, 18–34 year old men according to weekly hours of sports activity.



Fagard R Heart 2003;89:1455-1461



# What about veteran athletes?

Coronary artery disease

Conduction system disease

Hypertension



# Electrocardiographic findings in male veteran endurance athletes

20 male members of Scottish Veteran Harriers Club

20 age matched controls (golfers / bowlers)

Non smokers and no CVS disease

Resting, exercise & ambulatory ECG analysis

Echocardiography

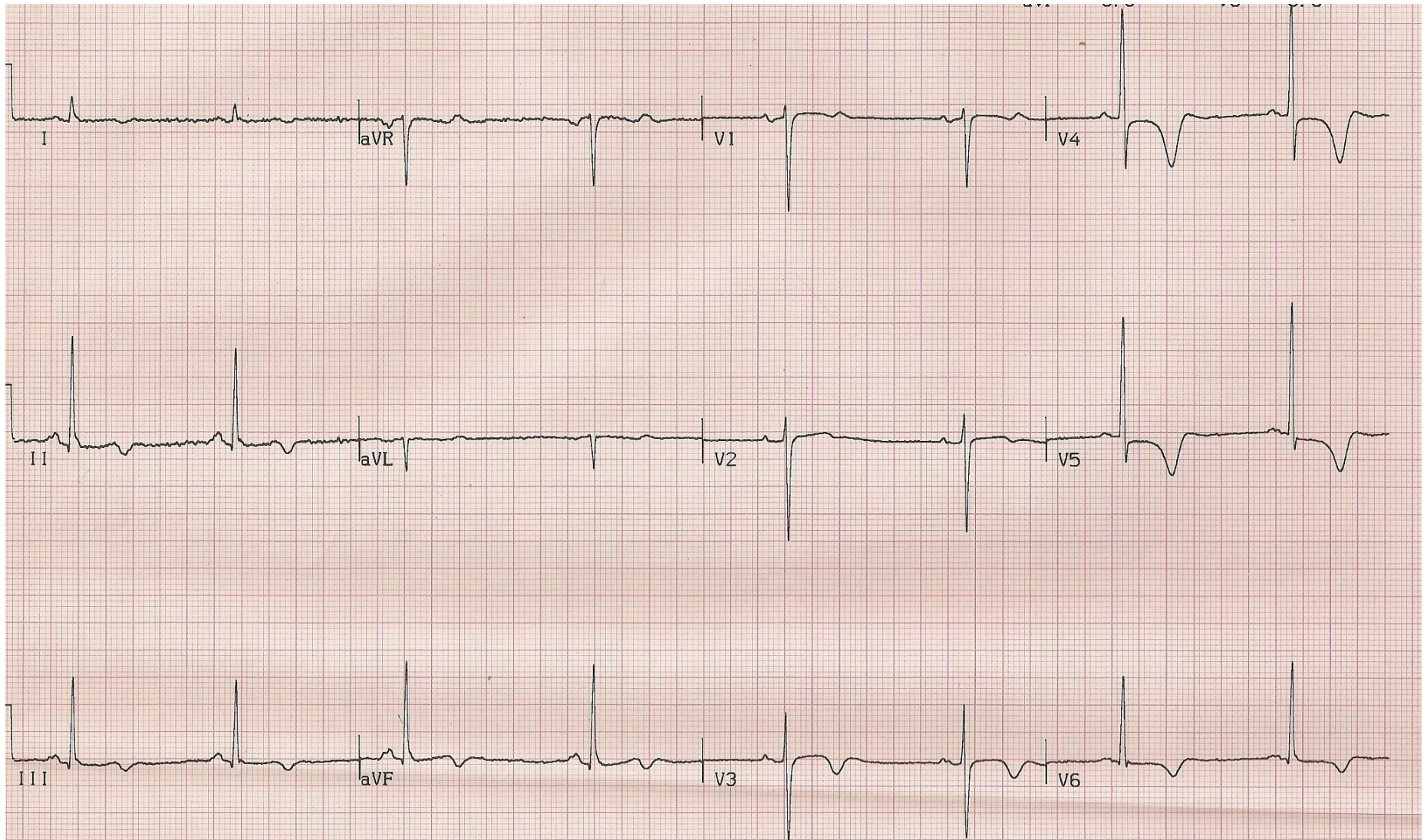
# Echocardiographic findings in male veteran endurance athletes

## STRUCTURE

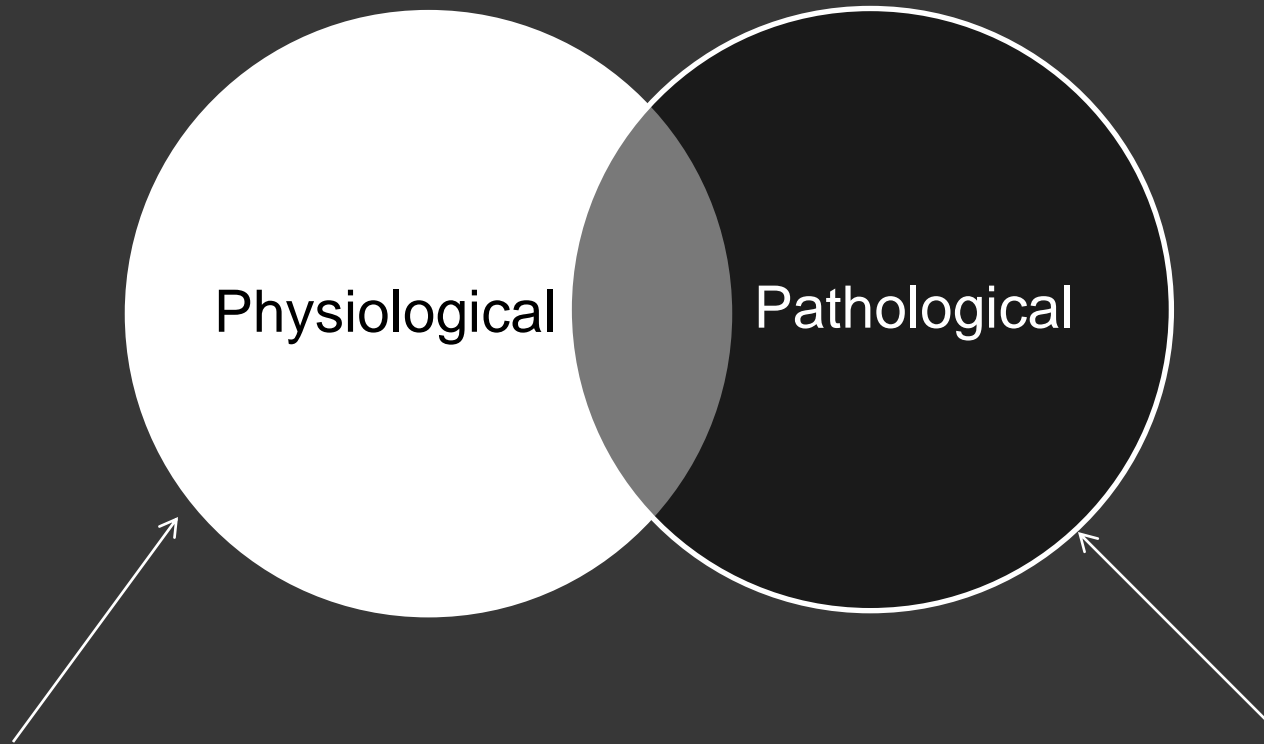
	Athletes	Controls	p value
LV mass (g)	265	221	<0.01
LV mass (g/m <sup>2</sup> )	151	118	<0.01
LVID diastole (mm)	47	47	ns
LVID systole (mm)	33	34	ns
LVEF (%)	57	58	ns

This group of veteran endurance athletes developed concentric rather than eccentric LVH

# Athlete's Heart or HCM or Myocardial Ischaemia



# Left Ventricular Hypertrophy HCM or Athlete's Heart



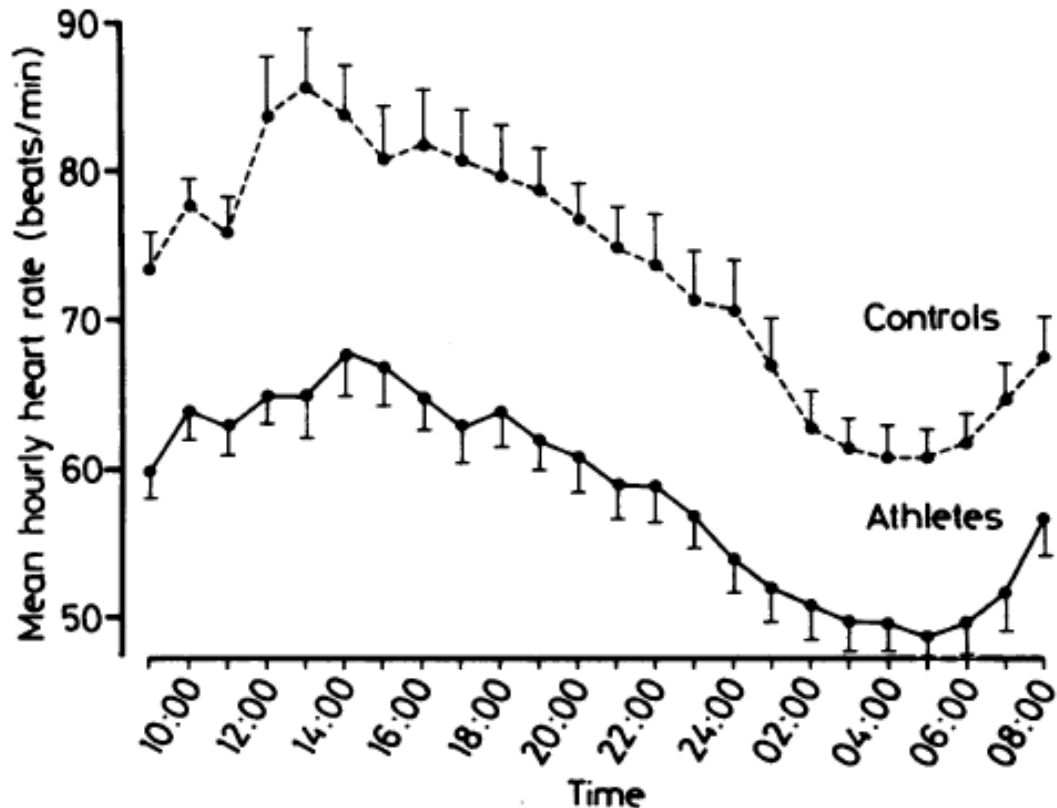
Physiological

Pathological

Septal thickness <13mm  
Normal atria  
Normal or dilated LV  
VO<sub>2</sub> max >50ml/kg/min  
Regress with detraining  
Normal LV filling

Septal Thickness >13mm  
Enlarged atria  
Reduced LVID  
VO<sub>2</sub> max <50ml/kg/min  
No regression  
Abnormal LV filling

# Electrocardiographic findings in male veteran endurance athletes



24 hour trend of heart rate in athletes and controls

# Bradycardia in Veteran Athletes

	Athletes	Controls
Mean 24hr heart rate (bpm)	59	74
Asystole >2s	7/20	2/20
2 <sup>nd</sup> Degree Heart Block	4/20	0/20
3 <sup>rd</sup> Degree Heart Block	3/20	0/20

# Heart Rate Response over 24hrs & frequency of asystole >2s in one veteran athlete



# Electrocardiographic findings in male veteran endurance athletes

## 12 Year Follow Up

19 male members of Scottish Veteran Harriers Club

20 age matched controls (golfers / bowlers)

Non smokers and no CVS disease

Resting, exercise & ambulatory ECG analysis

Echocardiography

# 12 Year Follow Up of Veteran Endurance Athletes

## Echocardiogram Findings

	<u>1985</u>	<u>1997</u>
Number with LV dilatation	1	2
Number with LVH	9	10

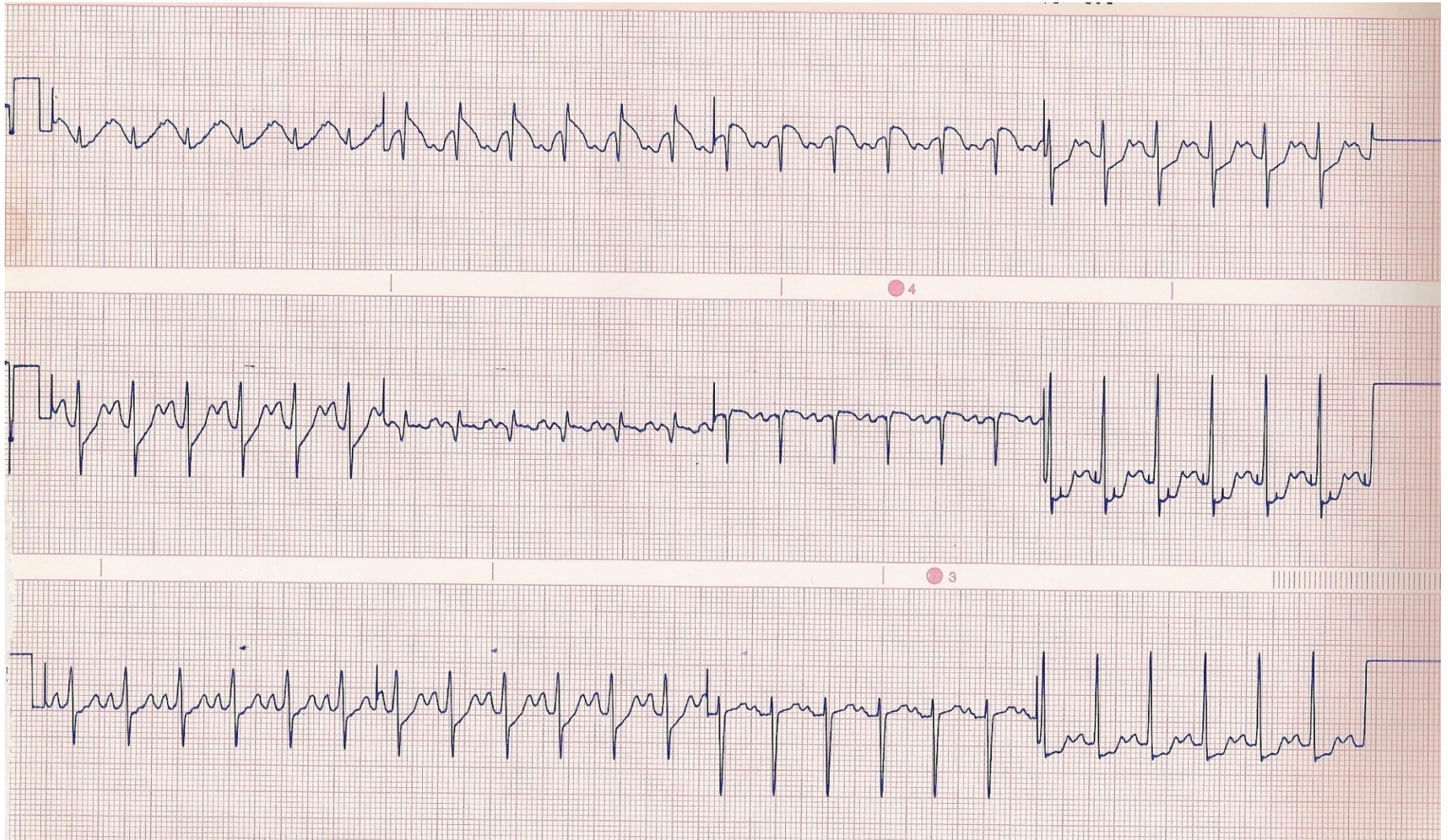
# 12 Year Follow Up of Veteran Endurance Athletes

## EXERCISE ECG FINDINGS

Mean exercise time (s.d.) - 14.8 (3.8) mins

3 Subjects (17%) had >2 mm ST depression

# Exercise Tolerance Test in a Veteran Athlete



# 12 Year Follow Up of Veteran Endurance Athletes

## EXERCISE ECG FINDINGS

Mean exercise time (s.d.) - 14.8 (3.8) mins

3 Subjects (17%) had >2 mm ST depression

- 1 - Normal thallium scan
- 1 - Fixed perfusion defect (Normal cor angio)
- 1 - Normal coronary angio 1991

# Bradycardia in Veteran Athletes

## 12 Year Follow Up

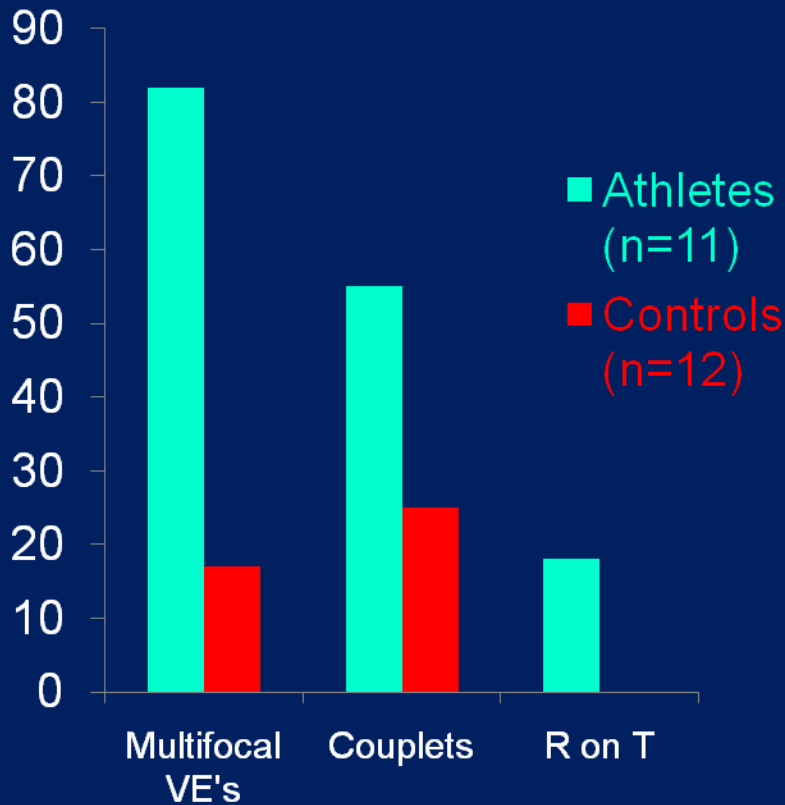
	1985	1997
Mean HR	59	55
Asystole >2s	7/20	2/20
2 <sup>nd</sup> Degree Heart Block	4/20	1/20
3 <sup>rd</sup> Degree Heart Block	3/20	3/20 (2 paced)

# Veteran Athletes and Atrial Fibrillation

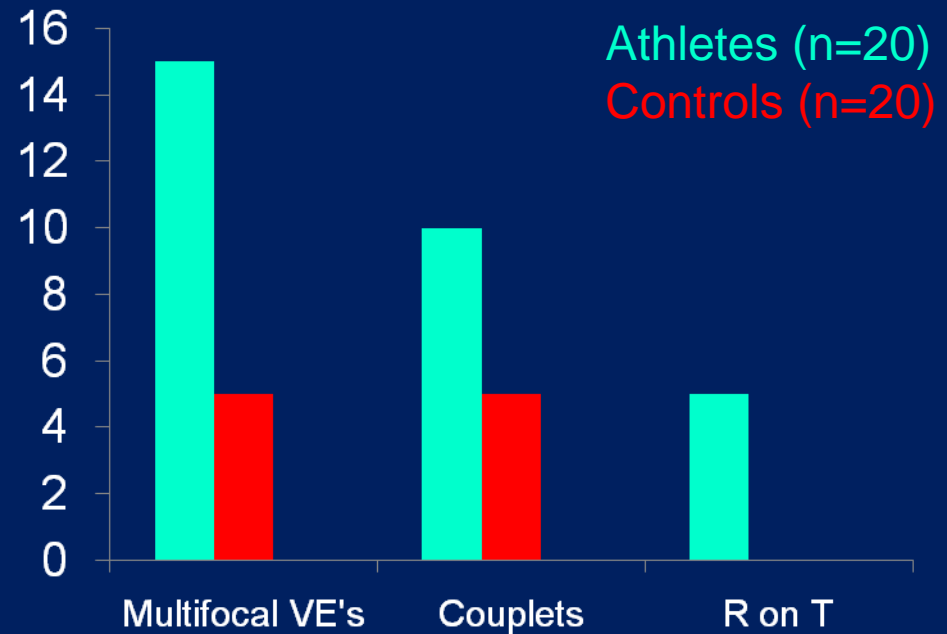
# Veteran Athletes and Atrial Fibrillation

Author	Type of study	% men	Age	Sport	Cases/controls	Odds Ratio (95%C.I)
Kjaarlienen	Longitudinal Case control	100	47 $\pm$ 5 runners 49 $\pm$ 5 controls	Orienteering	262/373	5.5 (1.3 to 24.4)
Mont	Retro v gen pop	100	44 $\pm$ 13 sports 49 $\pm$ 11 non-sports	Endurance Sports >3hrs/week	70 lone AF	61% of subjects with lone AF
Elusoa	Retrospective Case control	100	41 $\pm$ 13 AF patients 44 $\pm$ 11 controls	>1500 hrs cumulated practice	51/109	2.87 (1.39 to 7.05) adjusted for age and hypertension
Heidbuchel	C/C in ablation pts	83	53 $\pm$ 9 sports 60 $\pm$ 10 controls	Cycling running or swimming >3hrs /week	31/106	1.81 (1.10 to 2.98)
Molina	Longitudinal Case control	100	39 $\pm$ 9 runners 50 $\pm$ 13 controls	Marathon runners	252/305	8.80 (1.26 to 61.29) adjusted for age and blood pressure
Baldesberger	Longitudinal Case control	100	67 $\pm$ 7 cyclists 66 $\pm$ 6 golfers	Cycling	134/62	10% AF in cyclists 0% AF in controls
GIRAF (Mont)	Prospective Case control	69	48 $\pm$ 11	Endurance sports	107/107	7.31 (2.33 to 22.9)

# Ventricular Arrhythmias and Exercise



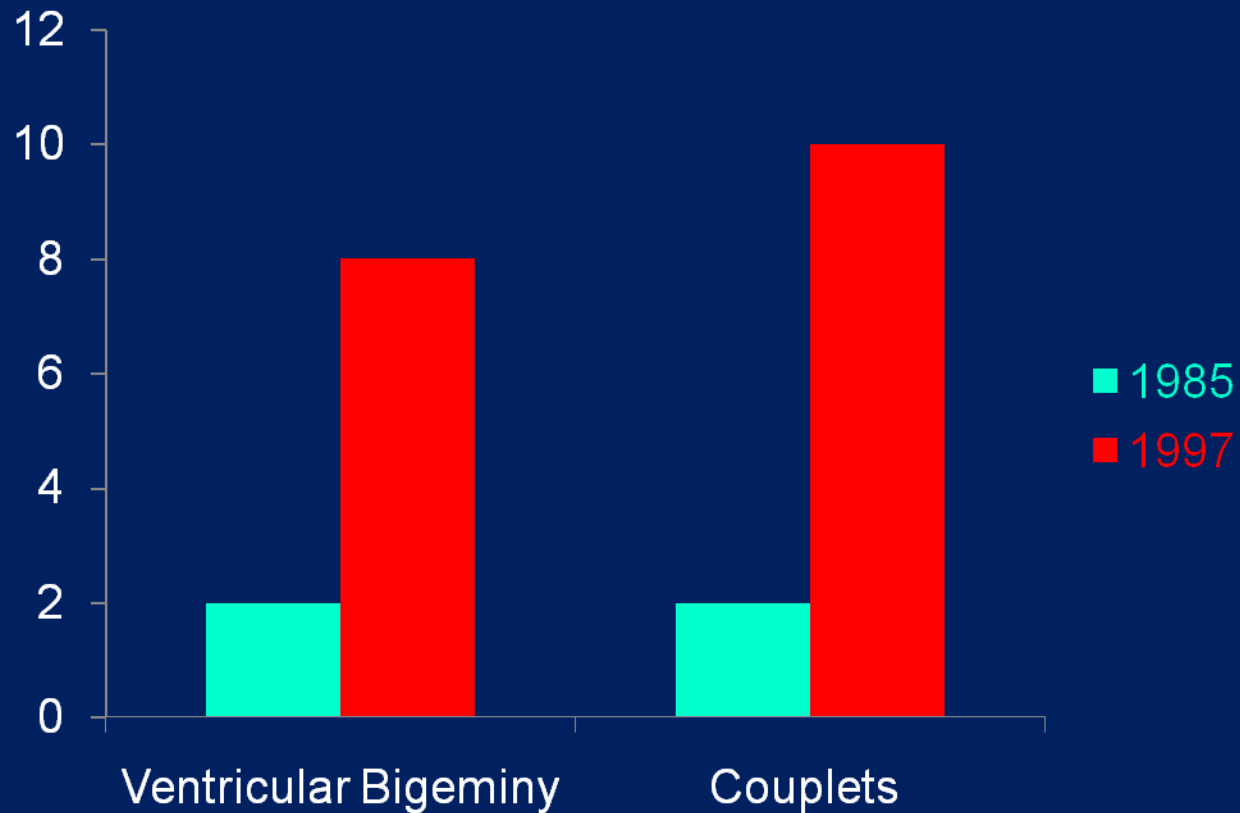
*Jensen-Urstad et al Heart 1998*



*Northcote et al Br Heart J 1989*

# Ventricular Arrhythmias and Exercise

## Number of patients with ventricular dysrhythmias



# Exercise and the Heart

## Veteran Athlete's Heart

Structure

Rhythm / ECG

Function

# Cardiac Adaptation in Veteran Athletes

## Summary

Exercise is beneficial

Athlete's Heart – Generally benign  
Usually reversible on detraining  
Occasionally harmful

Everything in moderation

# Indian Yoga

## Asanas with Props

*The ancient yogis used logs of wood, stones, and ropes to help them practice asanas effectively. Extending this principle, Yogacharya Iyengar invented props which allow asanas to be held easily and for a longer duration, without strain.*



### YOGACHARYA IYENGAR IN SETUBANDHA SARVANGASANA

*This version of the posture requires considerable strength in the neck, shoulders, and back, requiring years of practice to achieve. It should not be attempted without supervision*



# Indian Yoga (Glasgow Style)

