제1회
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Endurance Athlete with CAD

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Endurance Athlete with CAD

The benefits of exercise in cardiovascular risk

- ✓ **Positive impact on atherosclerotic risk factors**
  - ✓ Blood pressure, lipid profile, BMI, and insulin resistance.
- ✓ **Promotes nitric oxide production from the vascular endothelium**
  - ✓ Improving vasodilatory capacity, vascular homeostasis
  - ✓ Deactivation of scavenging oxidative species.
- ✓ **Stimulates angiogenesis**
  - ✓ Increases tissue oxygen transport
- ✓ **Mediate the inflammatory atherosclerotic process**
  - ✓ Inhibits cell adhesion molecules

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Dose of Jogging and Long-Term Mortality

The Copenhagen City Heart Study (1,098 healthy joggers and 3,950 healthy non-joggers)

	Jogging Pace								
	Slow			Average			Fast		
	<2.5 h/week	2.5-4 h/week	>4 h/week	<2.5 h/week	2.5-4 h/week	>4 h/week	<2.5 h/week	2.5-4 h/week	>4 h/week
Frequency of jogging									
≤3 times/week	Light	Moderate	Moderate	Light	Moderate	Moderate	Moderate	Moderate	Strenuous
>3 times/week	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Strenuous	Strenuous

DOSE OF JOGGING	NO. OF PARTICIPANTS	ALL-CAUSE MORTALITY DEATHS	FOREST PLOT
Adjusted for age and sex			
Sedentary nonjogger (reference)	413	128	
Light jogger (6 METs)	576	7	
Moderate jogger	262	8	
Strenuous jogger (≧ 12 METs)	40	2	3.67
Adjusted for age, sex, smoking, alcohol intake, education, and diabetes			
Sedentary nonjogger (reference)	394	120	
Light jogger	570	7	
Moderate jogger	252	8	
Strenuous jogger	36	2	8.14

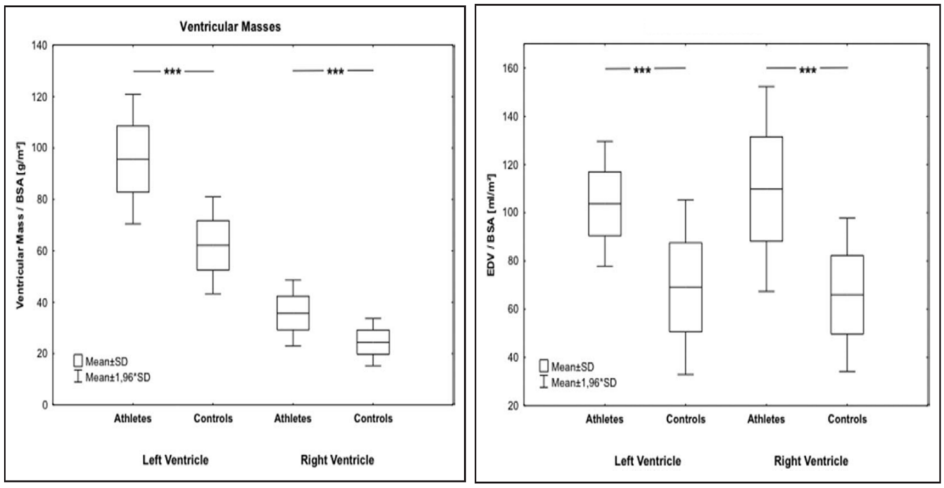
0.0 0.5 1.0 1.5 2.0 2.5
Hazard Ratio

J Am Coll Cardiol 2015;65:411–9

Cardiac adaptation in the master athlete

<Ventricular mass>

<End-diastolic volume>



Circulation. 2016;133:1927-1935.

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Cardiac adaptation in the master athlete

<Echocardiographic parameters>

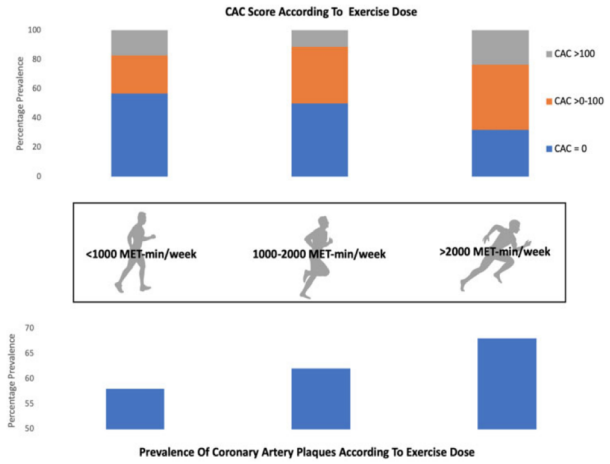
Echocardiography	Endurance Athletes	Control Subjects	*P* Value
Baseline parameters	n=33	n=33	
Heart volume, mL/kg	14.2±1.7	9.8±1.1	<0.001
LVEDD, mm	56.4±2.2	50.0±4.2	<0.001
RVEDD, mm	34.1±3.8	27.3±4.3	<0.001
IVST, mm	11.7±0.7	10.3±0.8	<0.001
PWT, mm	10.4±1.1	9.2±1.1	<0.001

Circulation. 2016;133:1927-1935.

Coronary artery disease in master athletes

Occult coronary artery disease in middle-aged sportsmen with a low cardiovascular risk score (MARC study)

✓ 318 middle-aged male endurance athletes (mean age 54.7 years)



Eur J Prev Cardiol 2016;23:1677–1684.

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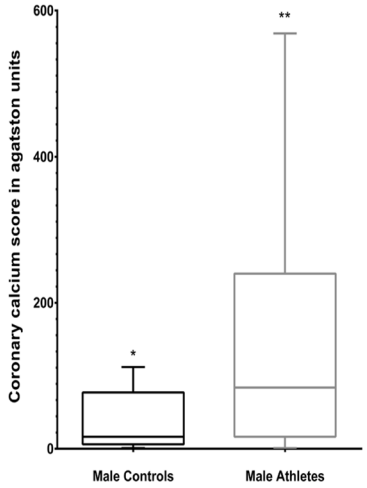
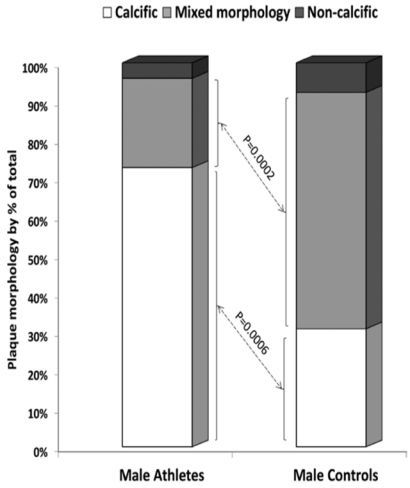
Coronary artery disease in master athletes

Prevalence of subclinical CAD in Masters Endurance Athletes with a Low Atherosclerotic Risk Profile





Circulation. 2017;136:126–137.

Myocardial fibrosis in athletes

Study	Study size	Training volume/ intensity	Age and sex	LGE vs controls	LGE pattern
Malek et al[22]	30 middle age athletes vs 10 controls	Active, median 6 y of ultramarathon running	40.9 ± 6.6, 100% male	27% vs 10%	Nonischemic (insertion point—one in control group, lateral wall)
Tahir et al[19]	83 athletes vs 36 controls	>3 y of competitions, >10 h/wk	43 ± 10 y, 65% male	17% male, 0% female vs 0% ns	Nonischemic (inferolateral, insertion points)
McDiarmid et al[16]	30 athletes vs 15 controls	Athletes committing on regional, national, or international level	31.7 ± 7.7 y, 100% male	3% vs 0%	Nonischemic (postmyocarditis pattern)
Mordi et al[18]	21 athletes with depressed LVEF vs 21 controls	>6/h per wk of intensive aerobic exercise at an amateur level	45.9 ± 10.7 y, 100% male	9.5% vs 0%	Nonischemic (insertion points)

Clin Cardiol. 2020;43:882-888.

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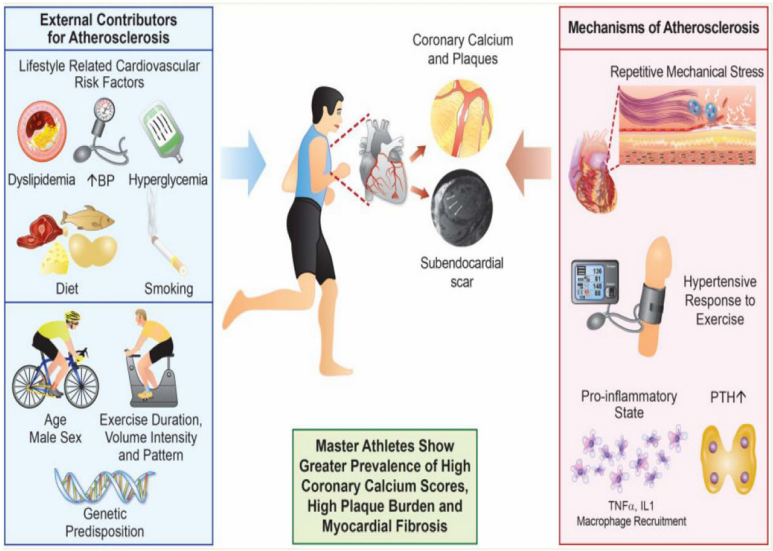
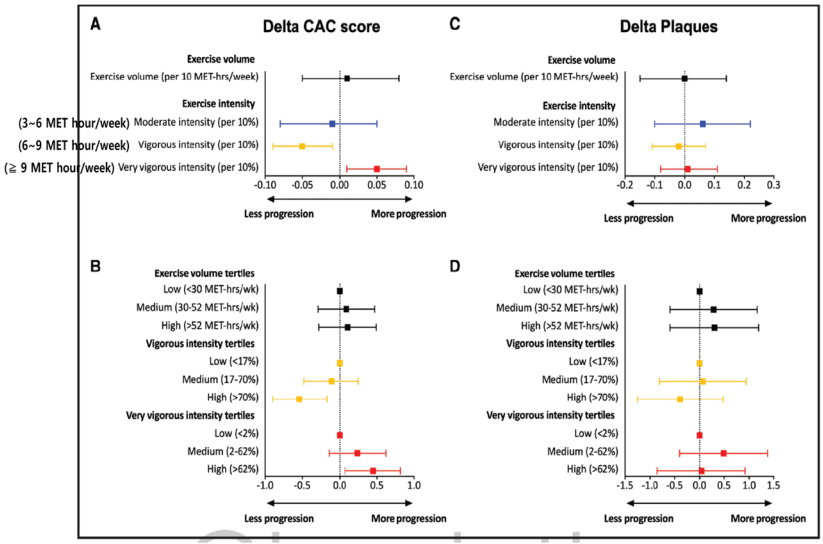
Possible mechanisms for coronary atherosclerosis and coronary artery calcium



EHJ. 2021;42:2737-2744.

MARC-2 Study

Exercise volume vs. intensity and the progression of coronary atherosclerosis in middle-aged and older athletes (MARC-2 study)



Circulation. 2023;147:Online ahead of print

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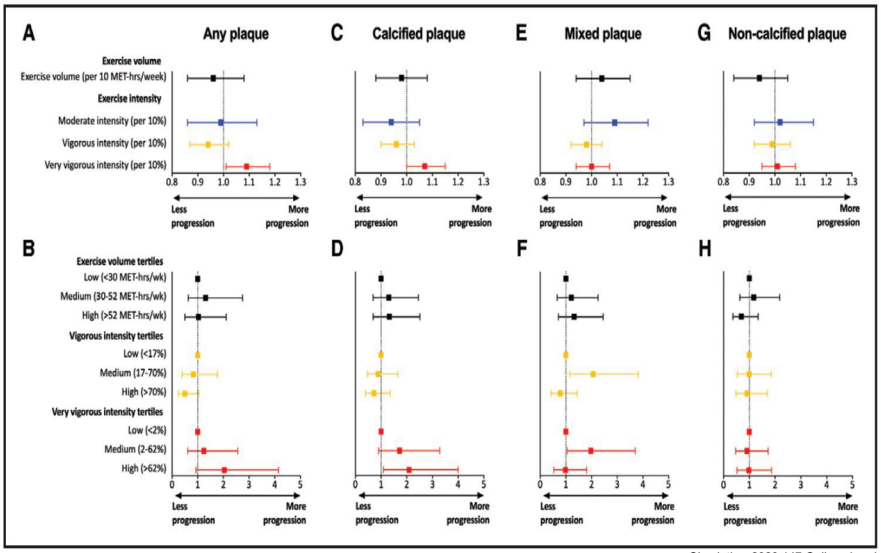
MARC-2 Study

Exercise volume vs. intensity and the progression of coronary atherosclerosis in middle-aged and older athletes



Circulation. 2023;147:Online ahead of print

Summary

- ✓ **Moderate intensity exercise is beneficial for cardiovascular disease**
- ✓ **Coronary artery calcification (CAC) scores are high in master athletes**
  - ✓ Calcific plaque is frequent
- ✓ **Possible mechanisms**
  - ✓ Prolonged and repetitive mechanical stress
  - ✓ Increased parathyroid hormone levels
  - ✓ The acute pro-inflammatory state
- ✓ **Exercise intensity but not volume was associated with progression of coronary atherosclerosis**

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Thank You For Attention
CHUNG-ANG UNIVERSITY
GWANG-MYEONG HOSPITAL

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