Sports Cardiology News

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No interest of disclosure concerning this lecture
Sport’s cardiology news

Benefits and risks, the « double-edged sword » pattern of sport

Athlete’s heart specific patterns

Sports cardiovascular prescreening
Is too much sport may be harmful?

Clinical update

Marathon run: cardiovascular adaptation and cardiovascular risk

Hans-Georg Predel*

Myocardial adaptation to intensive endurance exercise in middle-aged athletes - physiological vs. pathological

Cardiovascular events

None  Moderate  High  Very high

Dose of endurance sports

RV  LV
Endurance benefits of endurance training

- Delays Alzheimer and Parkinson's disease
- Lessens risk and severity of strokes
- Improves muscle strength
- Increases energy levels and endurance
- Limits obesity
- Counters diabetes
- Prevents hypertension
- Slows muscle atrophy and prevents sarcopenia
- Maintains bone density and decreases osteoporosis risk
- Maintains joint mobility
- Prevents falls in elderly
- Delays aging
- Improves circulation
- Improves mood and cognition
- Improves sleep
- Decreases stress
- Protects against atherosclerosis
- Improves function in heart failure
- Improves digestion
- Lowers incidence breast and colon cancer
- Improves fertility
- Improves lipid profiles
- Strengthens immune system
- Best current therapy for Peripheral Artery Disease
- Improves health of offspring
- Improves self-esteem

Skeletal muscle acts as an endocrine system

- White fat
- Brown fat
- Brain
- Blood vessels
- Liver
- Gut
- Pancreas
- Heart

- IL-6
- IL-15
- FGF21
- NRG LIF
- BDNF
- Myostatin
- VEGFA
- PDGFB
- IL-8
- Fstl1
- Fstl1
- Ins
- GLP-1
Health benefits of running

Lee D-C et al. J Am Coll Cardiol 2014;64:472-81

55,137 individuals
26 % women
Mean 40-45 y.o.
Non runners
Runners → 5 quintiles

Regular moderate walking-running are beneficial for health, but the « no pain no gain » theory is not necessary
Physical training and aging harm CV effects

Aging → decrease diastolic function and twisting / untwisting mechanisms

Analysis of torsional mechanisms with growing age in trained people

106 endurance-trained and 75 controls with 3 age groups 18-30, 31-45, > 45 years

Endurance training limits the deleterious effects of aging on diastolic function

Maufrais C et al
J Am Soc Echocardiograph 2014
Prolonged endurance exercise and right ventricle

Meta-analysis, 15 studies, 354 athletes, exercise duration 130-1472 min

Right ventricle in recreational endurance athlete

Normotensive healthy men
Active controls (n=33), marathon runners (n=38), ultra-endurance runners (n=26)
Mean age 42 ± 8 years
Questionnaire, physical examination, ETT, BP ambulatory recording, Holter ECG
No exercise test

Controversial relationship between physical activity and atrial fibrillation

Discarding results concerning endurance and atrial fibrillation
The real risk? < 50y.o. or any age
Exercise intensity and AF relationship
U shape?
Atria of athletes are physiologically normal
Is too much sport may be harmful?

1- Health effects of exercise depends of type, intensity, frequency,

2- Large variety of interindividual responses to exercise

3- The regular exercise dose necessary to achieve the best cardiovascular protection differs from that requested to obtain the best physical condition to perform

4- Adapted preparticipation screening to detect subjects at risk with high level of training

Give every individual the right amount of exercise, not too little and not too much. Hippocrates


adapted from Rowe GC Circulation. 2014;129:798-810
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Athlete’s heart specific patterns

Sports cardiovascular prescreening
Prognosis of early repolarization in athletes

Early repolarization (RP) more common in athletes

Contributing factors?

Prognosis?

Retrospective study

n= 332 professional football players

Clinical, ECG, and EE VO2 and ETT (n=235)

RP J≥1mm elevation in ≥2 contiguous leads

Followed 13.3 years

36% RP

The T-wave morphology of athletes

Professional athletes (n=80)
  - Cyclists (n=40)
  - Football players (n=40)

Controls (n=40)

Morphology combination score MCS

Hong L et al J Electrocardiol 2015;48: 35 - 42
Pathological T-wave inversions in athletes

Athletes presenting with PTWI (n=155)

Clinical examination, ECG, echocardiography, exercise testing, 24h Holter ECG, cardiac MRI

Negative T waves in athletes was associated with cardiac pathology in 45% of athletes with HCM (81%)
No disease noted in 55 %.
If normal echo MRI is warranted
In case of « normal » heart competitive sport clearance can be provided with an annual cardiac evaluation.

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Athlete’s heart specific patterns

Sports cardiovascular prescreening
Incidence of sudden death in athletes

MS related or not to exercise in athletes

Varaibility and limits of collection (media, insurance, ...)
Cardiac arrest often unrecognized
Impact of age
True determination of the denominator

Studies
14-18 years (n = 7 US, 1 prospective)
17-24 years (n = 3 US)
8-40 years (n = 10, 7US prospective Italy, Israel, Denmark)

Compared with non-athletes
RR 2.5-4.5 for prospective studies

Harmon KG, et al. Heart
2014;100:1227-1234

Lawless et al. JACC 2014

Classical incidence of SD is underestimated, at least 1/50 000
RR vs non-athletes between 2.5-4.5
« At risk » populations: men, African-Americans, basketball
Cardiac Screening before Participation in Sports — Polling Results

James A. Colbert, M.D.

NEJM web site 1266 votes from 86 countries

- **USA**
  - VNCI=0: 20%
  - H + EP: 35%
  - H+EP +ECG: 45%

- **Europe**
  - VNCI=0: 66%
  - H + EP: 13%
  - H+EP +ECG: 21%

- **Italie**
  - VNCI=0: 74%
  - H + EP: 15%
  - H+EP +ECG: 12%
Athlete's ECG interpretation criteria

2011
ESC criteria
Corrado D et al.

2013
Seattle criteria
Drezner JA, et al

2014
Refined criteria
Sheikh N et al.
Circulation. 2014;129:1637-49

Training related normal findings
- Sinus bradycardia
- First degree AV block
- Incomplete RBBB
- Early repolarisation
- Isolated QRS voltage criteria for LVH

Borderline (minor abnormal) findings
- Left Atrial enlargement
- Right atrial enlargement
- Left axis deviation
- Right axis deviation
- Right ventricular hypertrophy
- T-wave inversion in leads V1-V4 in Black athletes

Training unrelated abnormal findings
- ST segment depression
- Pathological Q waves
- T-wave inversions beyond V1 in Caucasian athletes; beyond V4 in Black athletes
- Complete LBBB or RBBB
- QTc ≥470ms
- Brugada like pattern
- Atrial or ventricular arrythmias
- ≥2 PVCs per 10 sec

If found in isolation considered normal
If 2 or more patterns present considered abnormal

CV evaluation?
NO
Adapted
YES

AV: atrioventricular; RBBB, right bundle branch block; LVH, left ventricular hypertrophy; LBBB, left bundle branch block; ms, milliseconds
Normal in Black athletes, no CV evaluation
Always abnormal
"Screening" after 40 y.o. with questionnaire AAPQ

North American adults n=6787 (49% men)

AAPQ: 32 questions in 3 sections.
1- medical history, symptoms, limitations to exercise if one yes → medical advice
2- CV risk factors if ≥ 2 → medical advice
3- No yes to 1 and 2 → no restriction for sport

With AAPQ questionnaire ≥ 90 % North Americans ≥ 40 y.o. who wish to begin sport will have medical evaluation !!!
Research directions in sports and exercise cardiology

1. Epidemiology of cardiac events in athletes
   a. Detect the true prevalence and clinical relevance of heart diseases in athletes.
   b. Identify individuals at highest risk.
   c. Develop standardized outcomes metrics for fatal and non-fatal events.
   d. Determine the true rates of SCD and SCA in well-defined athletic populations.

2. Evaluation
   a. Determine the predictive value of symptoms.
   b. Define normative data and reference values for ECG, echocardiography, and cardiac MRI in multi-racial and multi-ethnic American athletes at different levels (high school through Masters).
   c. Characterize chamber remodeling in all ages and levels of athletes.
   d. Correlate symptoms with underlying structure.
   e. Correlate surface ECG with underlying structure.
   f. Elucidate why some athletes remodel and others do not, even among homogeneous athletic populations.
   g. Prospectively validate cardiac testing in athletes.
   h. Define which cardiac tests (e.g., ambulatory monitoring, stress protocols) produce the greatest and most cost-effective diagnostic yield.
   i. Conduct randomized trials of PPE alone versus PPE plus ECG in varying demographic groups.

3. Management
   a. Determine the efficacy of defibrillation (AEDs and ICDs).
   b. Create a data-driven approach to differentiating pathology from athletic adaptation with regard to:
      i. Cardiomyopathies;
      ii. Aortic dimension, pulmonary pressure, and valvular regurgitation; and
      iii. Long QT, Brugada, and early repolarization.
   c. Specify the best treatments for asymptomatic WPW and atrial fibrillation.
   d. Identify the best way to diagnose and treat anomalous coronary artery and determine which variants require treatment.
   e. Correlate changes seen in endurance athletes with long-term outcomes.
   f. Determine risk and/or safe levels of exercise in individuals with heart disease to allow for revision of participation guidelines.

Lawless et al.
Protecting the Heart of the American Athlete.
JACC 2014

AED indicates automated external defibrillator; ECG, electrocardiogram; ICD, implantable cardioverter defibrillator; MRI, magnetic resonance imaging; PPE, pre-participation examination; CPR, cardiopulmonary resuscitation; WPW, Wolf-Parkinson-White (Reprinted with permission).