



L'ACTIVITÉ PHYSIQUE EST -ELLE
BÉNÉFIQUE POUR LE COEUR ?

CONTROVERSE



Réunion CLaRCS
11 juin 2015

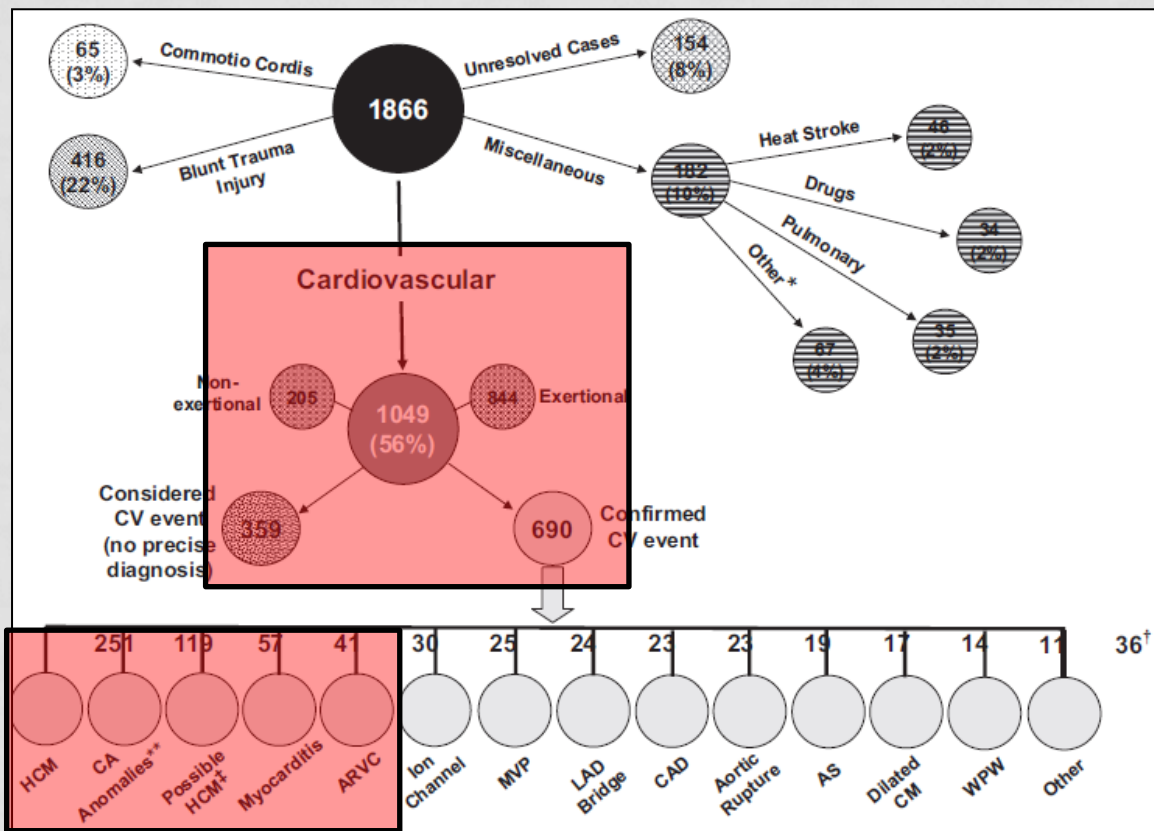


POURQUOI FAUT-IL ÉVITER DE FAIRE DU SPORT ?



**Quel que soit votre âge,
vous risquez la mort subite**

MORT SUBITE ET SPORT CHEZ LE JEUNE



Impact sur les praticiens et sur la communauté

1866 athlètes
 MS (décès/récupérés)
 19±6 ans
 US de 1980 à 2006
 38 sports ≠

89% d'hommes

n = 55, 23 ans

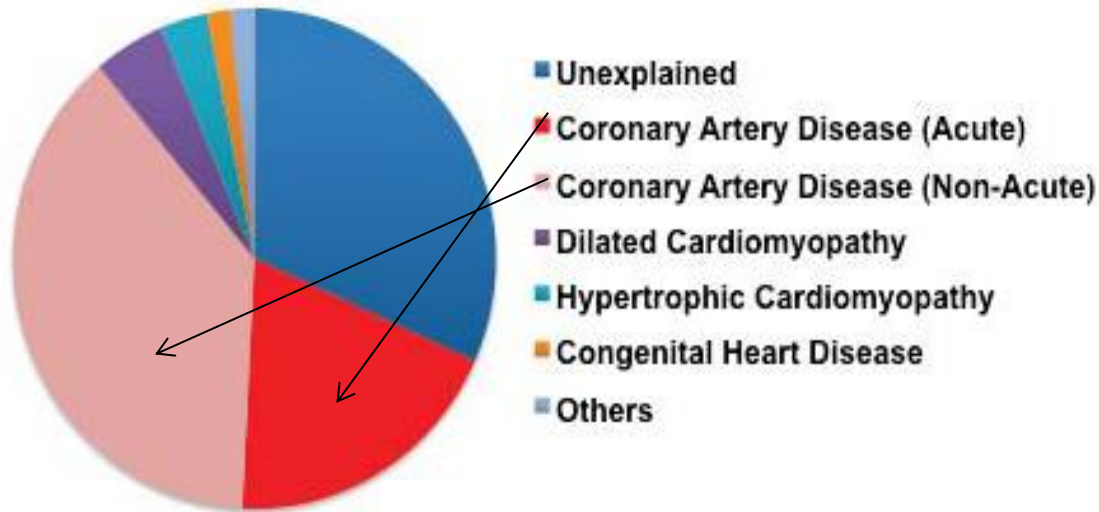
- CMH : 2%
- Coronaires: 32% (Malf° : 12%, Athér. : 20%)
- DVDA : 24%

CMH (36%) et ACAC (17%)

MORT SUBITE ET SPORT À L'ÂGE MOYEN

n = 1247 MS, 35-65 ans, US de 2002 à 2013

63 MS soit 5% pdt sport à 51 ± 8 ans



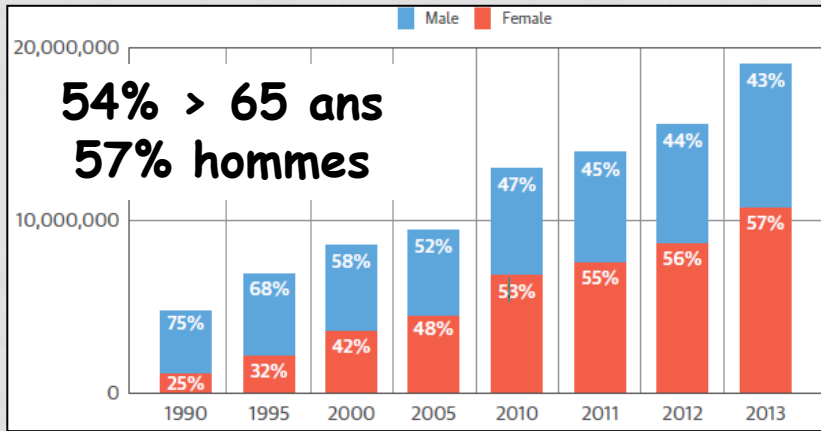
16% MS lié au sport
Cardiopathie connue

56% avec 1 FdR CV

36% symptômes CV
ds semaine précédent MS

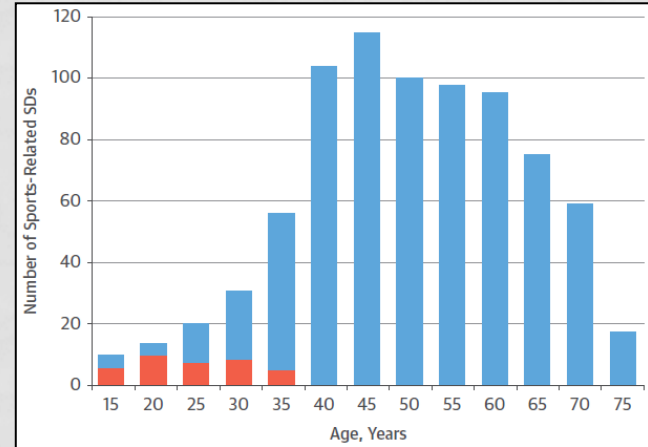
Homme RR x 18 lié au sport

MORT SUBITE ET SPORT CHEZ LE SÉNIOIR

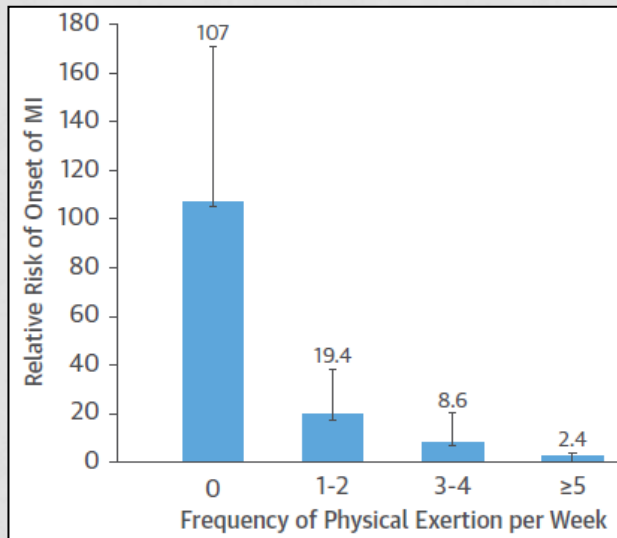


➔ Nb d'athlètes

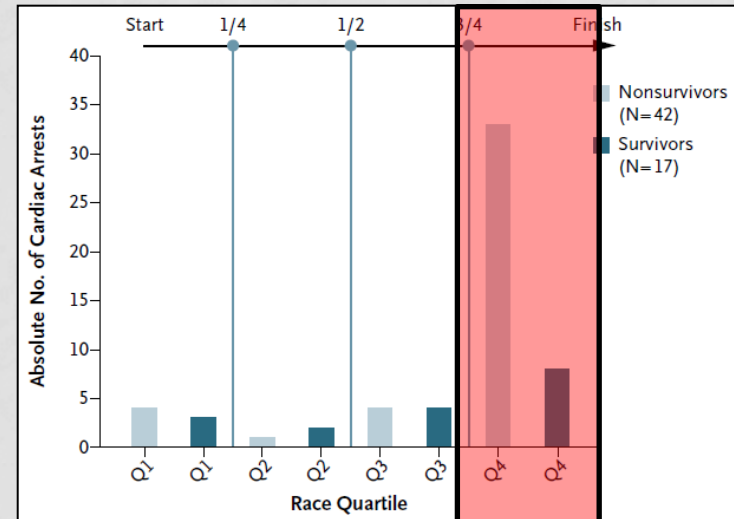
*State of the Sport US
Running USA 2014*



*Relation Age / MS lié au Sports
Marion Circulation 2011*

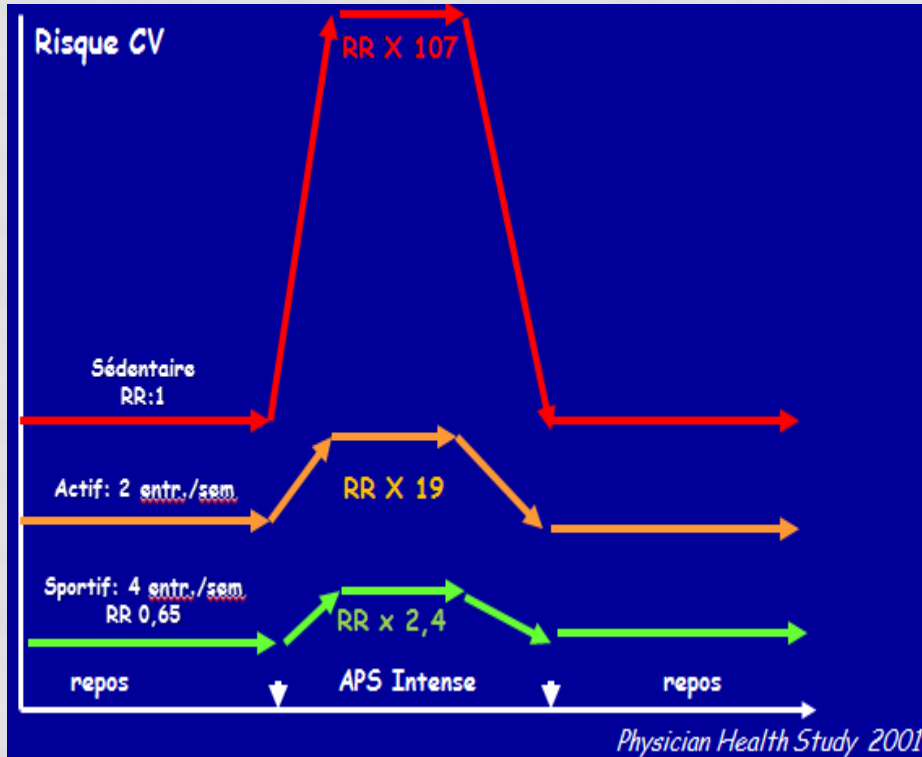


Mittleman et Al. NEJM



Kim et Al. NEJM 2012

MORT SUBITE ET SPORT



Exercice intense
= ↗ transitoire risque MS

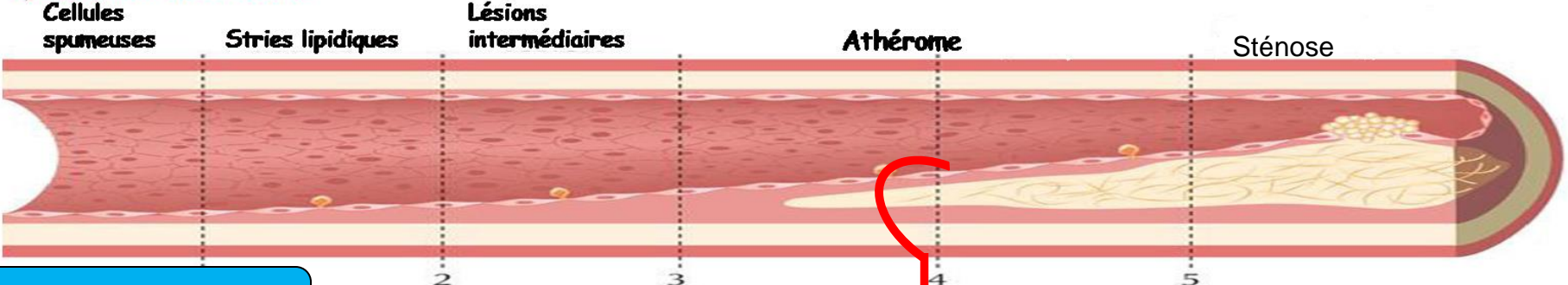
Entraînement adapté
↘ Risque mais non nul



Chugh et Weriss
JACC 2015;65:493-502.

Risques de l'exercice intense et prévention de l'entraînement

Dysfonction endothéliale



Entraînement physique au long cours

Entraînement physique au long cours

Thrombose

Effort physique +

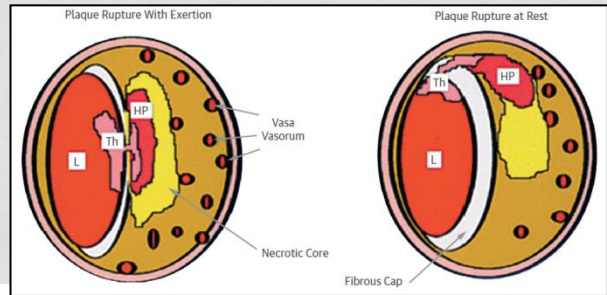
SCA

« Sang vulnérable »

« Plaque vulnérable »
 Chappe fibreuse fine (<math>< 65 \mu</math>)
 Noyau lipidique +,
 Peu de cellules musculaires lisses
 Substrat inflammatoire ++
 Dissolution collagène, *métalloprotéases*

Rupture de plaque
 Erosion de plaque

Effort physique +



Exerc

Repos

POURQUOI FAUT-IL ÉVITER DE FAIRE TROP DE SPORT ?

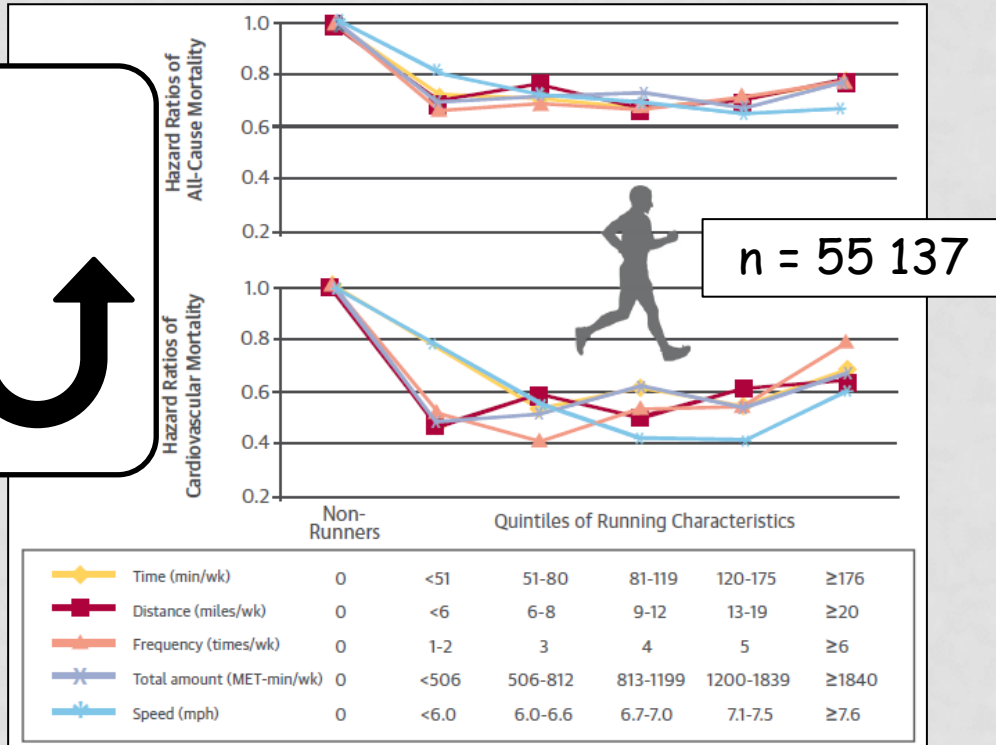
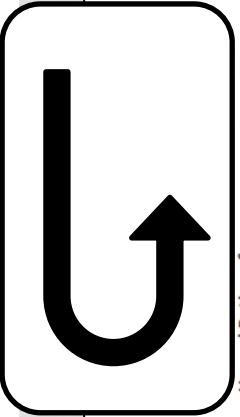


Quel que soit votre âge,
vous risquez la mort subite

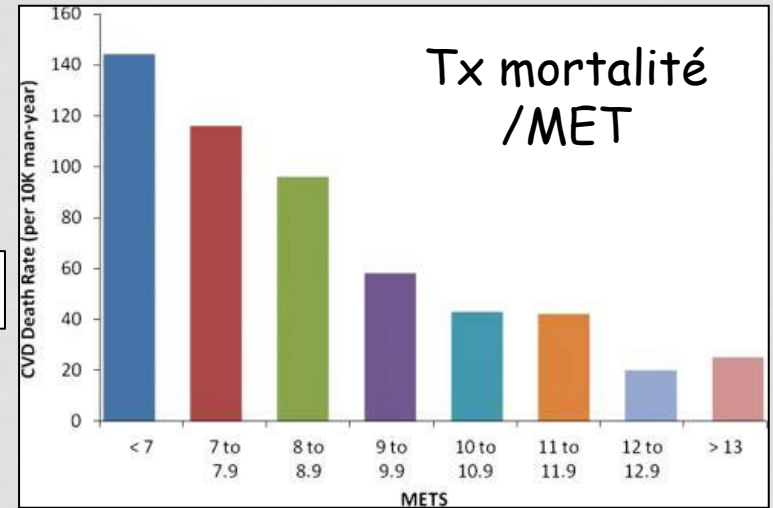
Sport, entraînement et
performance
la bonne dose ?



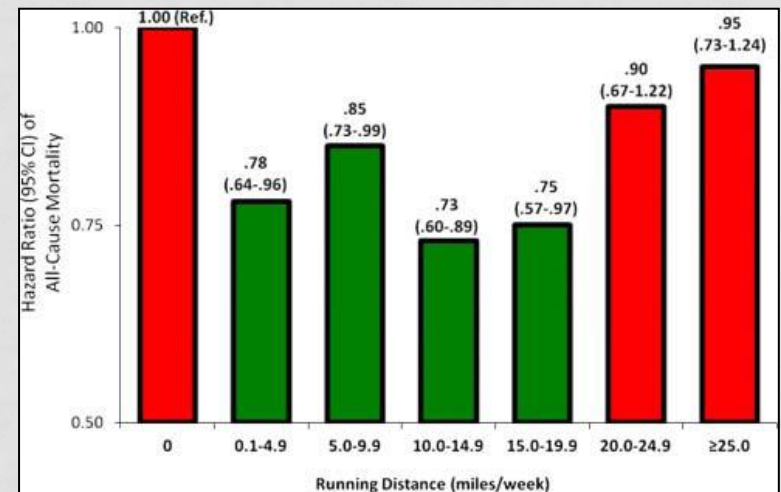
QUELLE DOSE D'ENTRAINEMENT ?



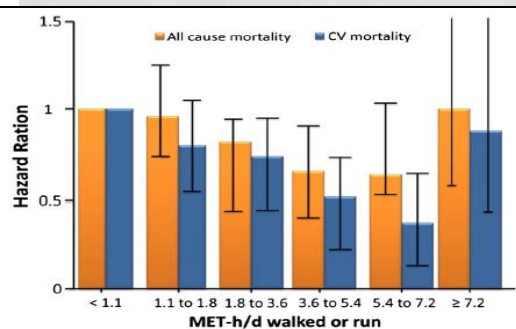
Lee et al. JACC 2014;64:472-81.



Church et Al. Arch Int Med 2005



Lee. Med Sc Sport Ex 2012

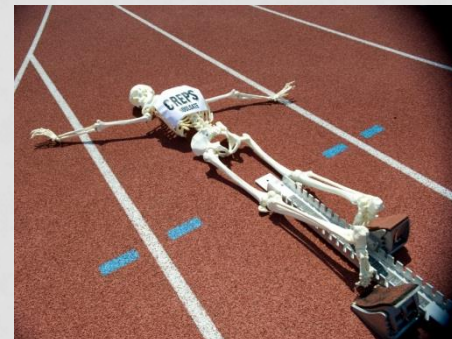
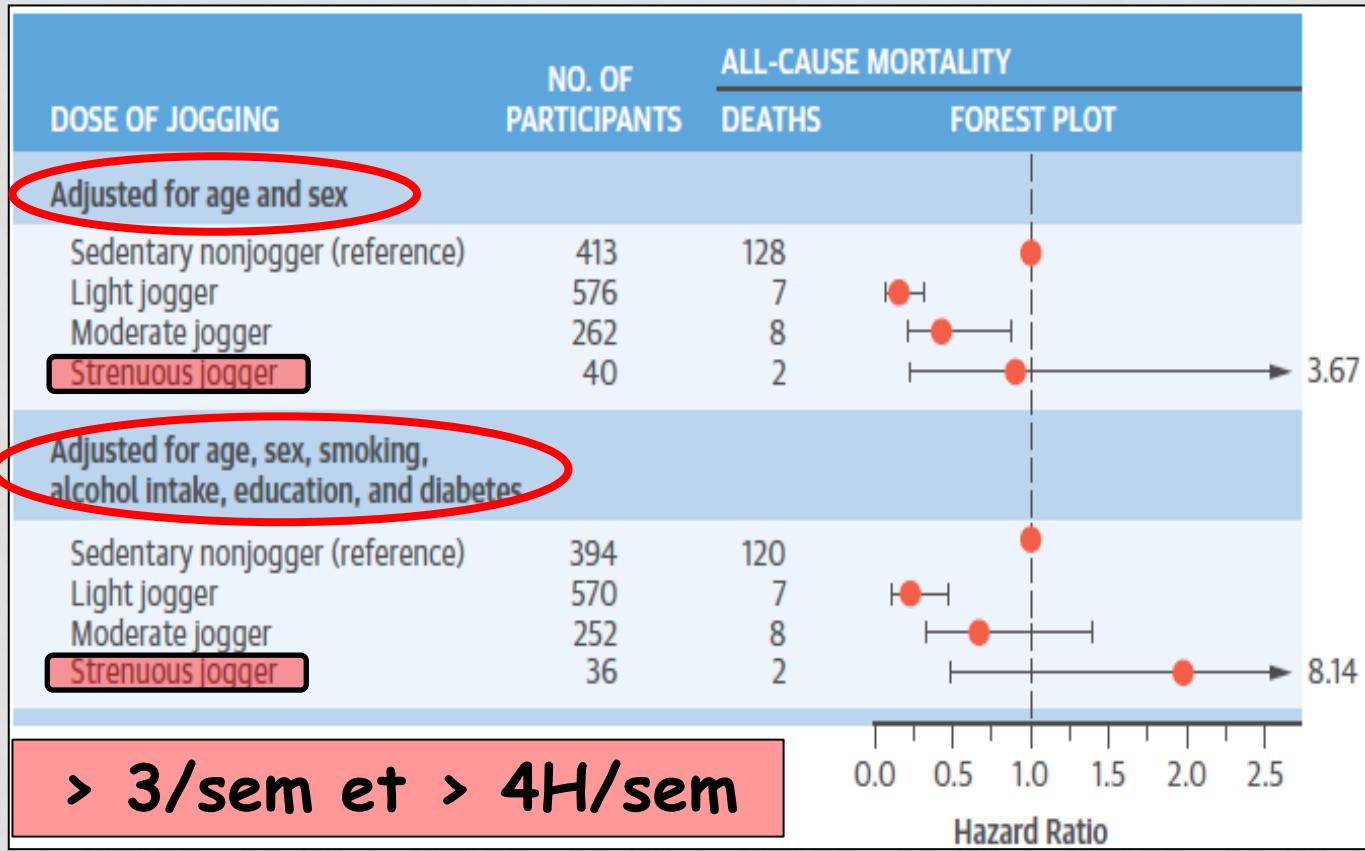


Williams et Al.
Mayo Clin Proc.
2014

QUELLE DOSE D'ENTRAINEMENT ?

Copenhagen City Heart Study

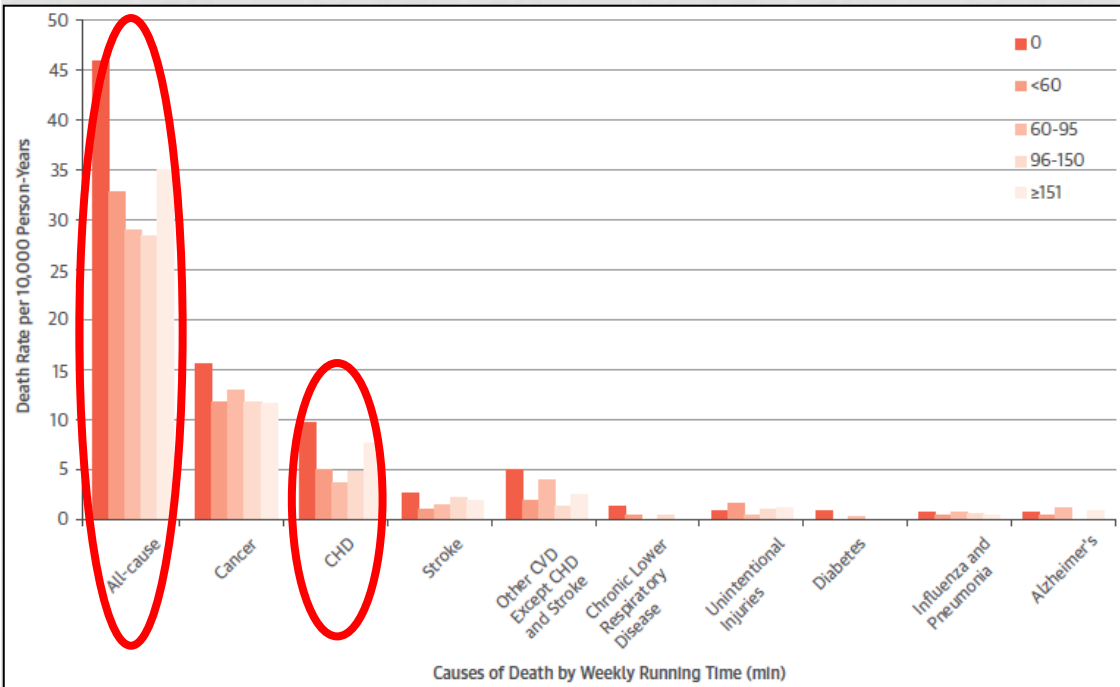
1098 joggers / 3950 non joggers



Durée, Intensité
et fréquence

Schnohr et al. JACC 2015; 65(5):411-9.

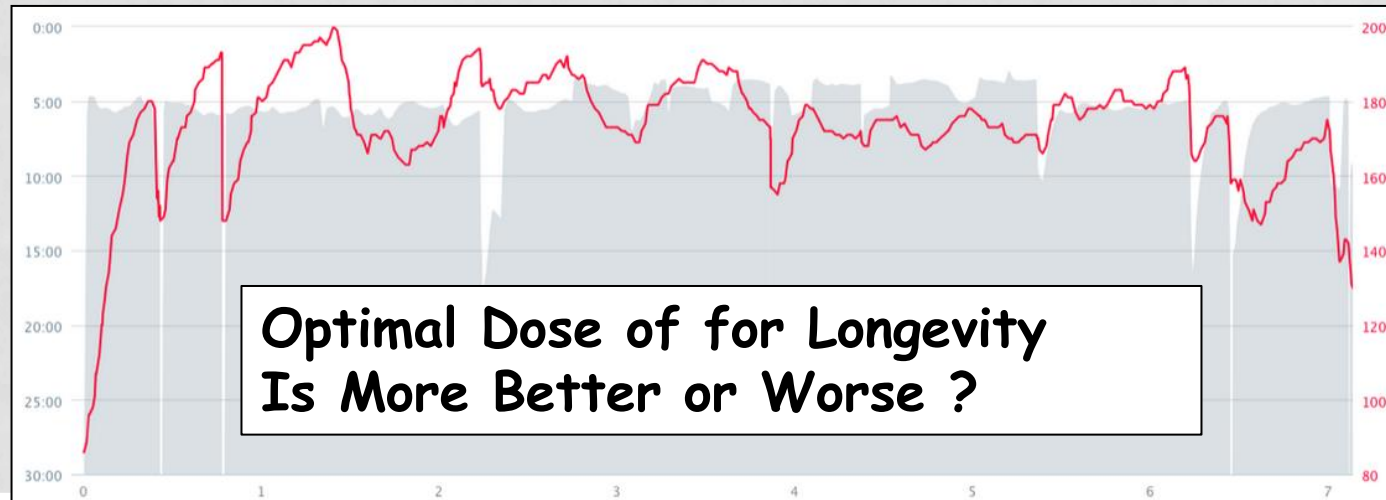
DOSE OPTIMALE D'ENTRAINEMENT ?



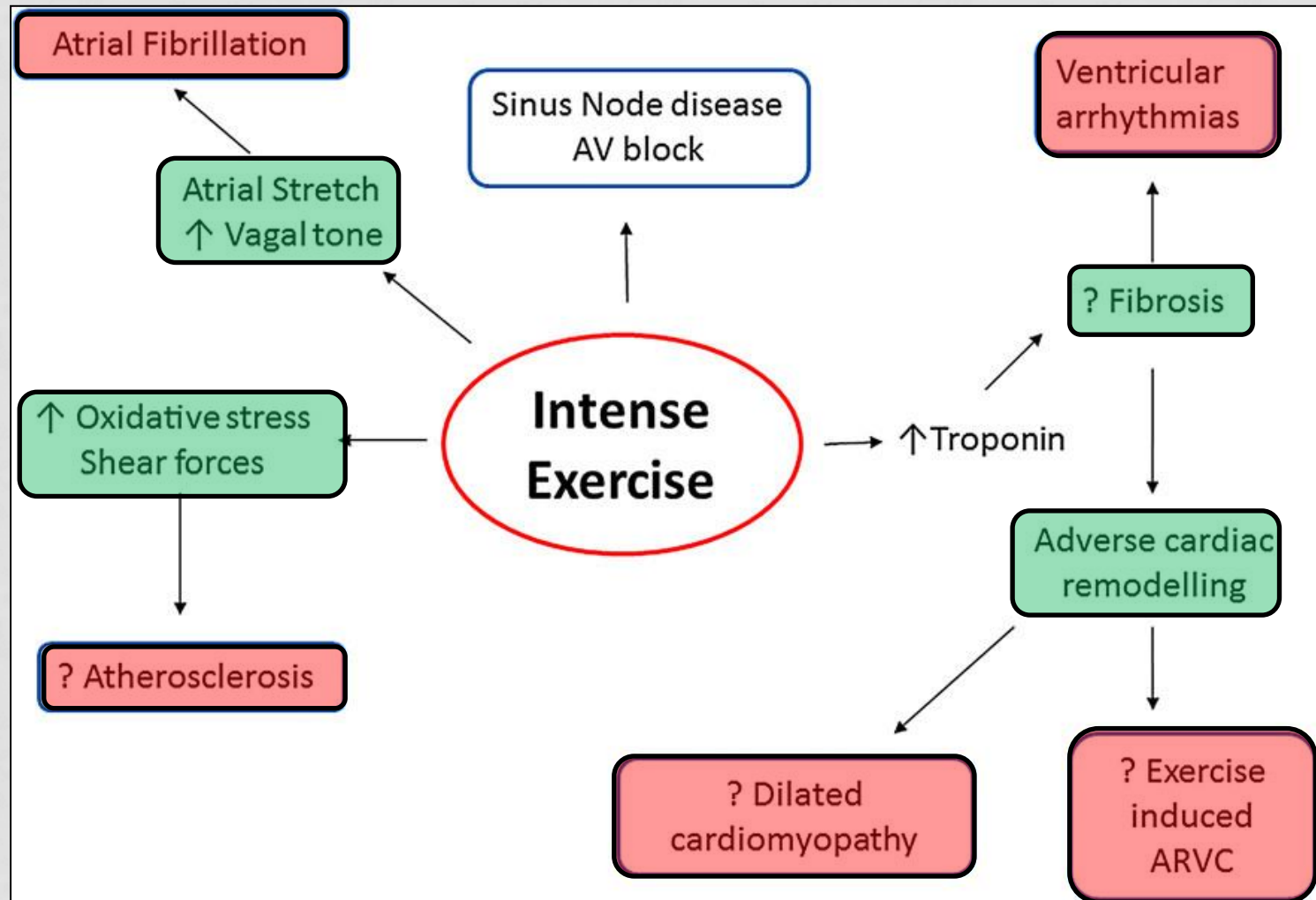
Taux de mortalité /
Tps de course/sem

Lee et Al. JACC Vol 65 2015

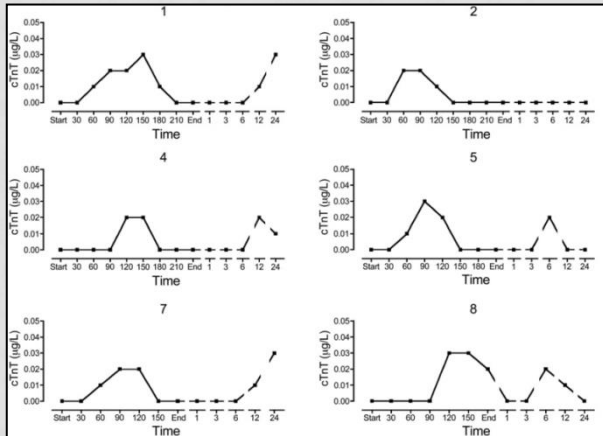
Marathon
Cyclisme
Trail
Ultra-trail



L'EXERCICE PEUT-IL ENDOMMAGER UN COEUR « SAIN » ?



EXERCICE ET TROPONINE ?

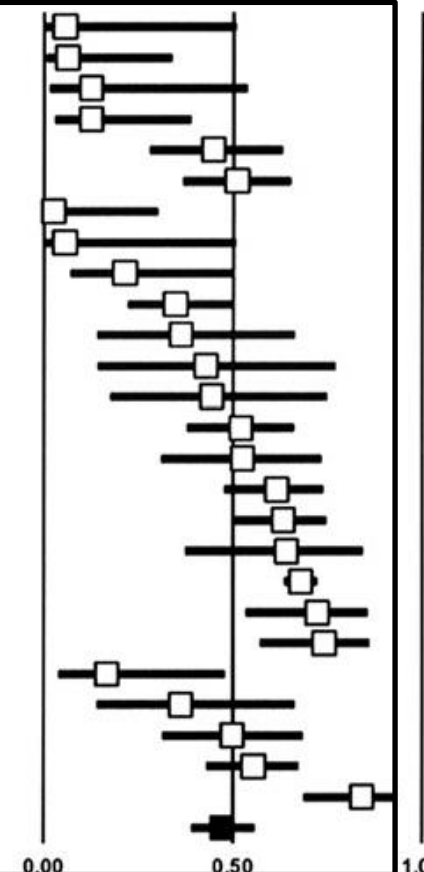


Shave et Al. MSSE 2007

**Incidence ↗ Tn
= 39 à 56 %**

Study name	Exercise mode	Gender (% males)	Mean duration (min)	Incidence rate and 95% CI
------------	---------------	------------------	---------------------	---------------------------

Shave et al.(45)	cycle	100	254
Neumayr et al.(36)	cycle	100	1342
Shave et al.(46)	cycle	100	126
Dawson et al.(10)	cycle	100	240
Neumayr et al.(35)	cycle	100	550
Scharhag et al.(42)	cycle	93	360
George et al.(16)	run	100	85
Shave et al.(47)	run	100	30
Scharhag et al.(42)	run	71	607
Shave et al.(unpub.)	run	86	613
Middleton et al.(33)	run	100	139
Shave et al.(48)	run	0	374
Shave et al.(49)	run	100	301
Scharhag et al. (42)	run	87	238
Apple et al.(1)	run	58	289
Whyte et al.(56)	run	17	245
Neilan et al.(34)	run	68	285
Middleton et al.(32)	run	93	212
Fortescu et al.(15)	run	67	*
George et al.(17)	run	79	256
George et al.(18)	run	89	256
Rifai et al.(39)	triathlon	0	715
Rifai et al. (39)	triathlon	100	586
Shave et al. (50)	triathlon	100	506
Cleave et al.(7)	triathlon	*	*
Tulloh et al.(55)	triathlon	95	686



Hétérogénéité +++

Shave et Al. JACC 2010

EXERCICE, IRM ET REHAUSSEMENT TARDIF ?

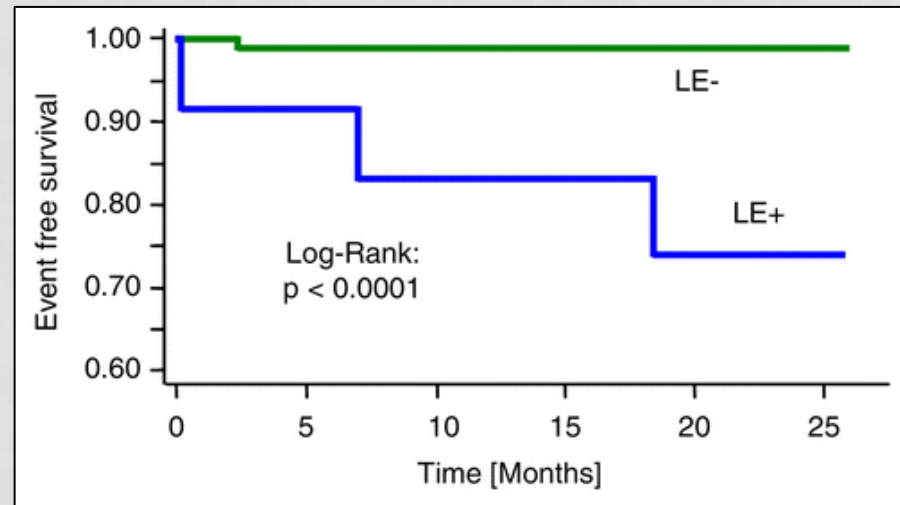


n = 102 Marathonien sains 50-72 ans
(5 marathons / 3 dernières années)
versus 102 témoins

Suivi 21 mois

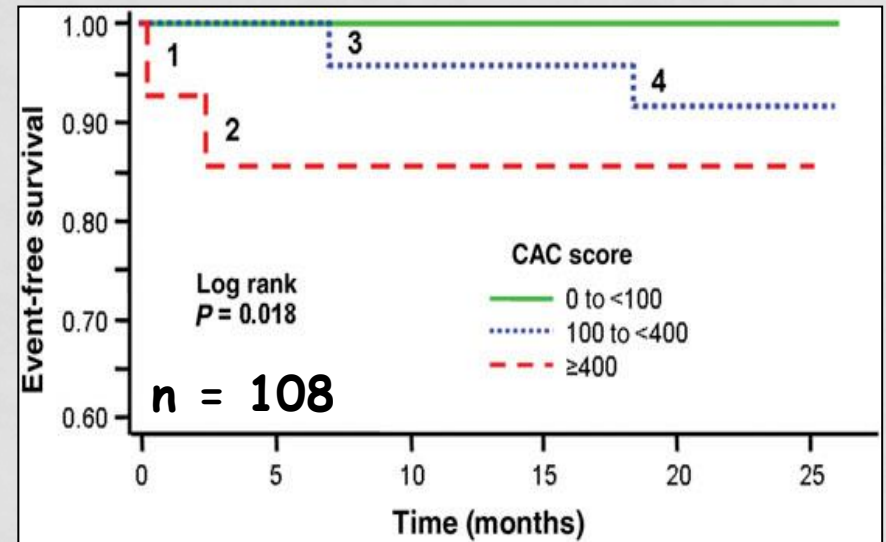
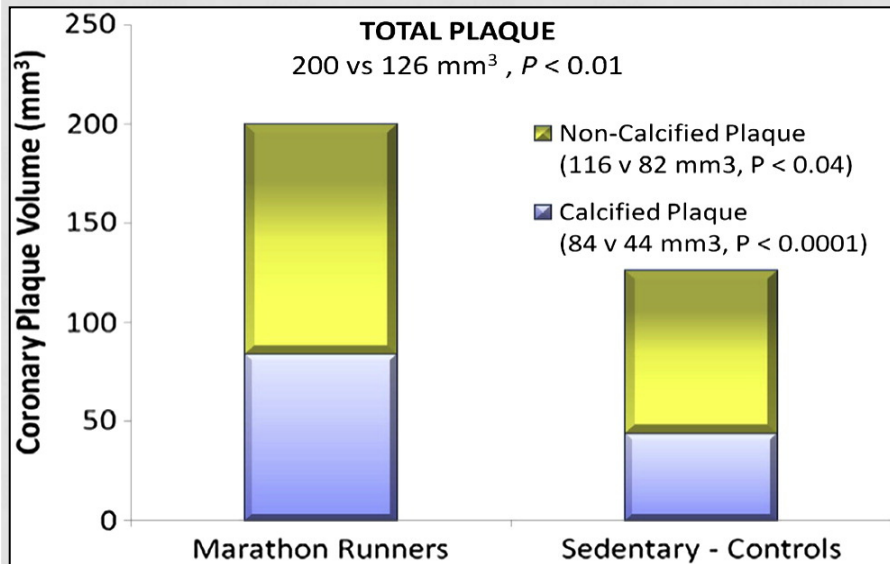
102 marathoniens
5 = RT ss-endoc (= CMI)
7 = RT myoc

RT Mar./Tém. = 12 / 4%



Breuckmann et Al. Radiology 2009

EXERCICE ET CALCIFICATIONS CORONAIRES ?



RT = % CAC et nb de marathons

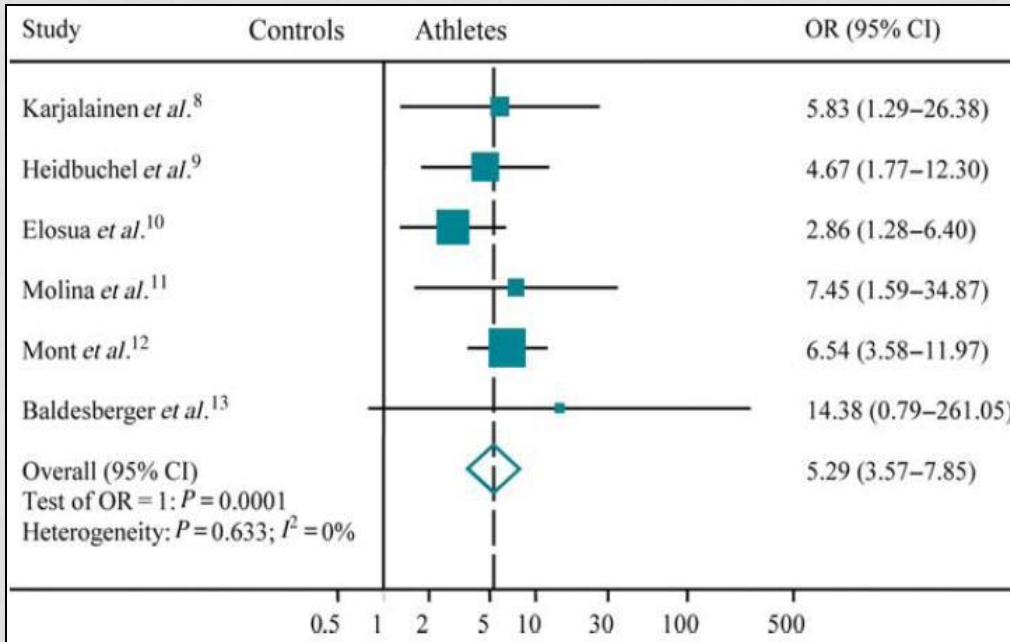
Sédentaires /
vétérans hommes endurants
(au - 1 Marathon/an/25 ans)

- Forces cisaillement à FC ↗
- ↗ ILK circulantes / inflam^o
- Production radicaux libres

Schwartz et Al. Missouri Med. 2014

Möhlenkamp et Al. Eur Heart J 2008

FIBRILLATION ATRIALE ET SPORT



655 athlètes et 895 témoins

51±9 ans et 93% hommes

RR = 5,29

Abdulla et Al *Europace* 2009

Modulators

Increased vagal tone:

- Bradycardia
- Shortening and dispersion of atrial refractory period

Gastroesophagic reflux

Triggers

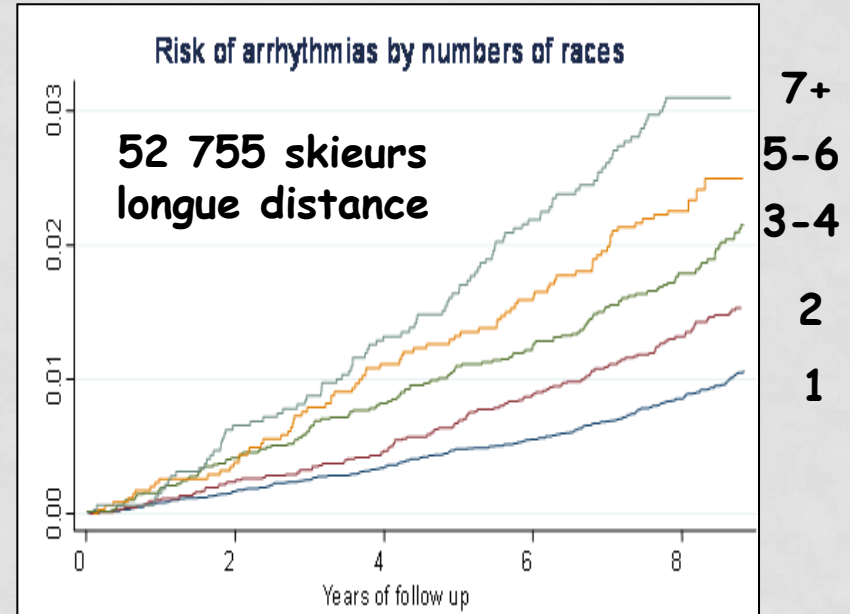
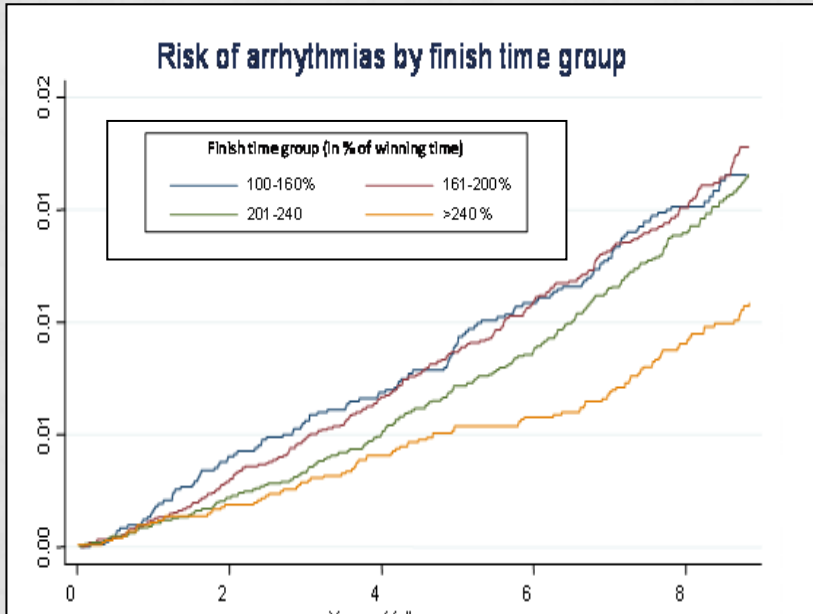
Increased pulmonary vein ectopy

Endurance sport practice

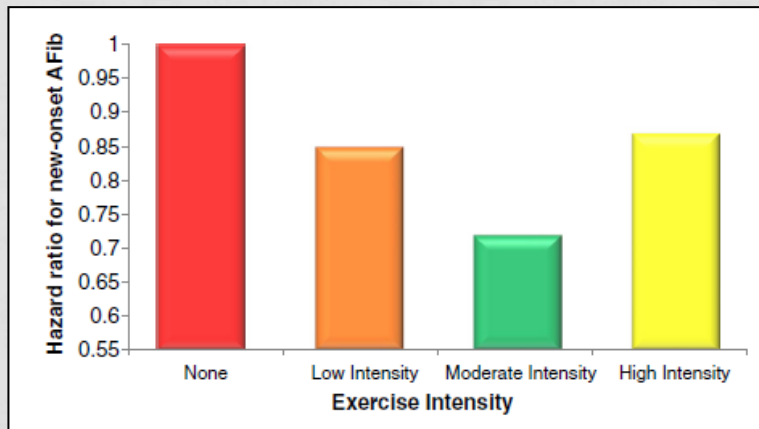
Substrate

- Pressure and volume overload
- Atrial stretch
- Myocyte hypertrophy
 - Atrial dilatation
 - Inflammatory response
 - Atrial fibrosis

ARYTHMIES (FIBRILLATION ATRIALE) ET SPORT



> 1500 H sport et >5 H ex. intensif/sem depuis l'âge de 30 ans

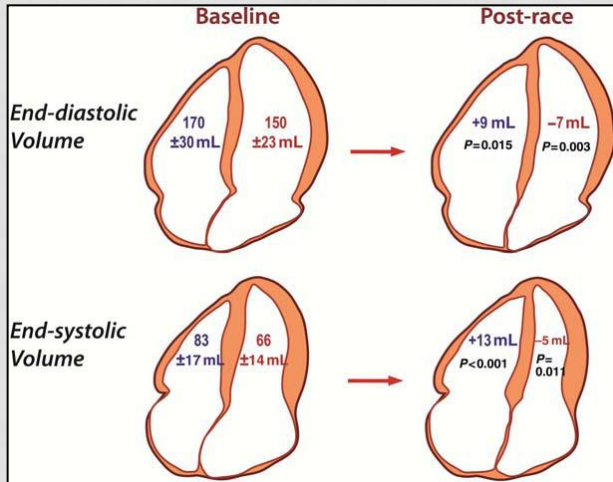


Andersen EHJ (2013) 34; 3624--31

5446 adultes (>65 ans)

O'Keefe et Al. Mayo Clin Proc. 2014

REMODELAGE CARDIAQUE, ARYTHMIES VENTRICULAIRE DROITE ET SPORT

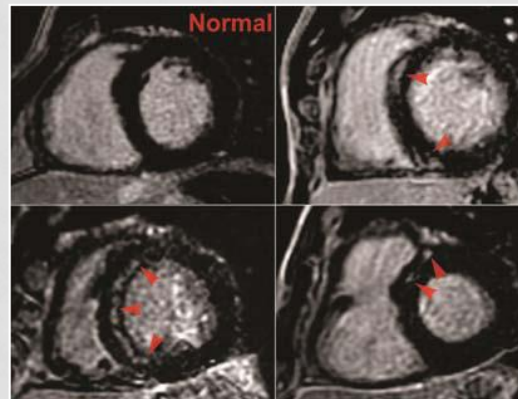


80% des arythmies ventriculaires = VD

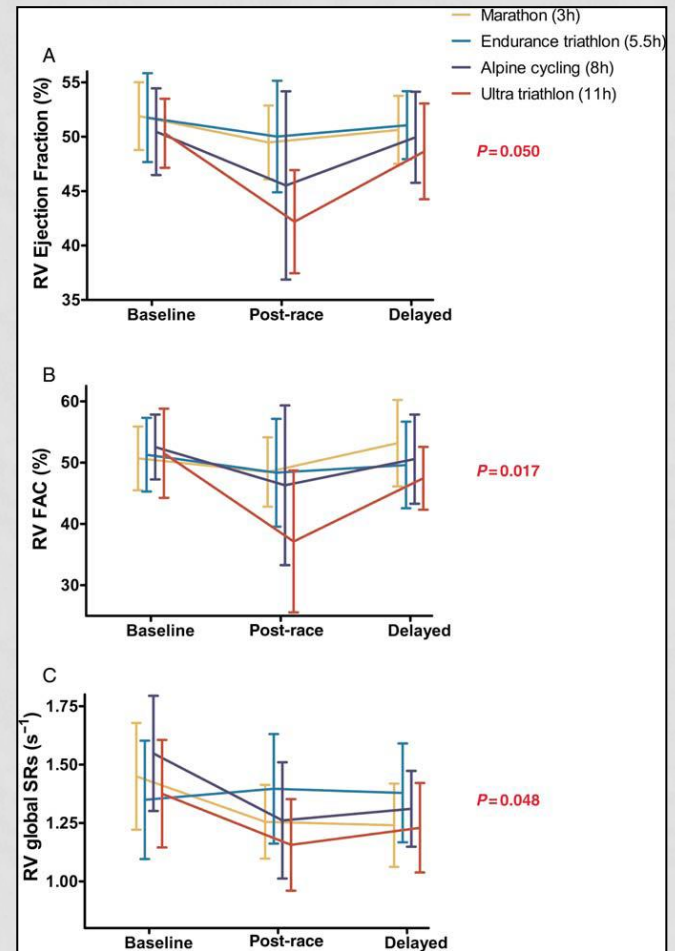
40 athlètes
 >20 h/week
 for >20 years

à l'effort:

- PAPs > 80 mmHg (post-charge VD)
- Tn et BNP

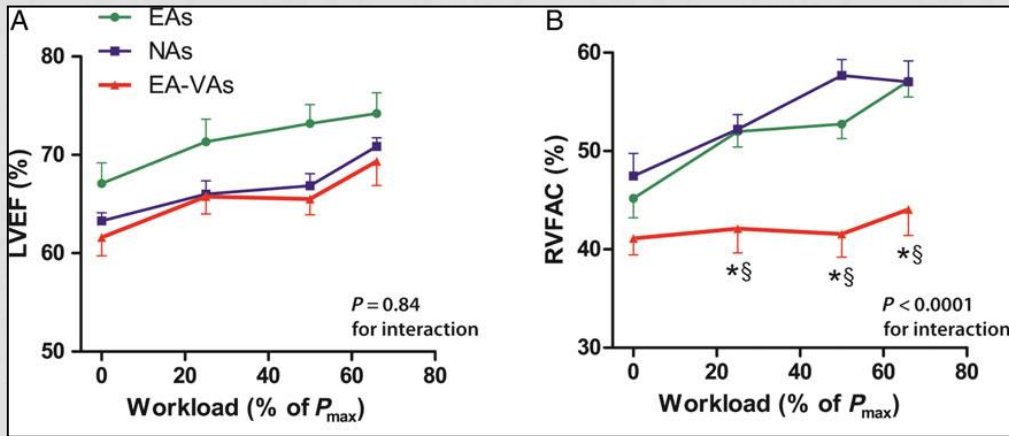


n = 5/39

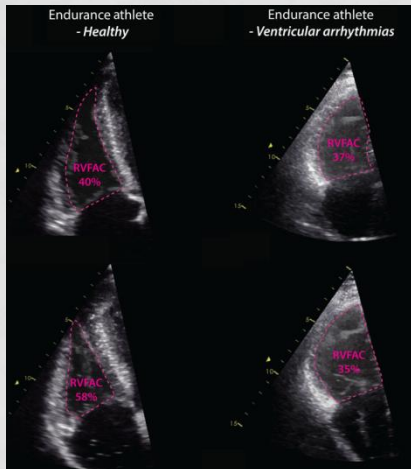


Exercise-induced right ventricular dysfunction and structural remodelling in endurance athletes

REMODELAGE CARDIAQUE, ARYTHMIES VENTRICULAIRE DROITE ET SPORT

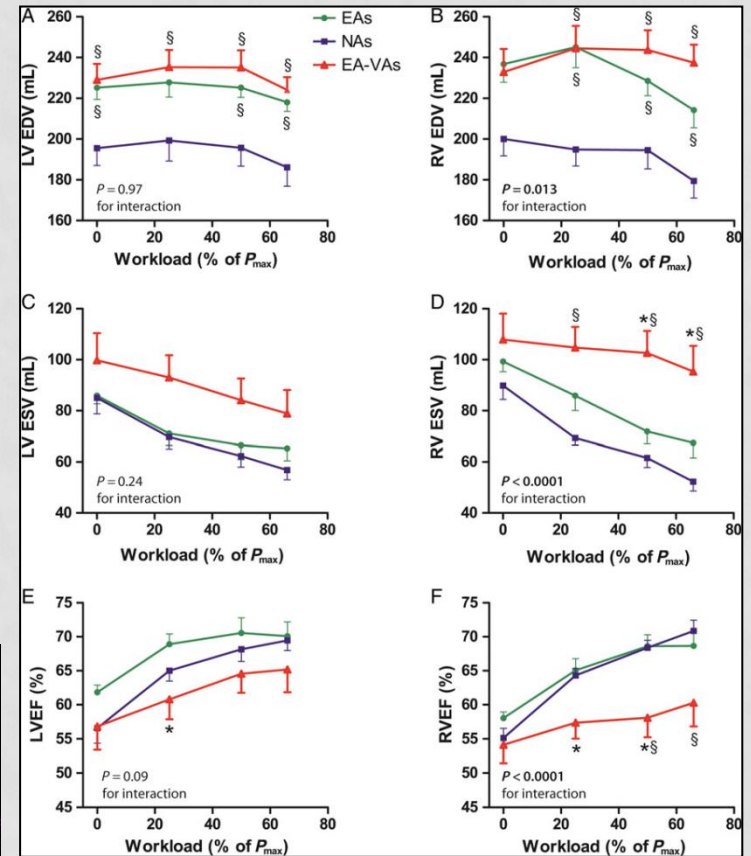
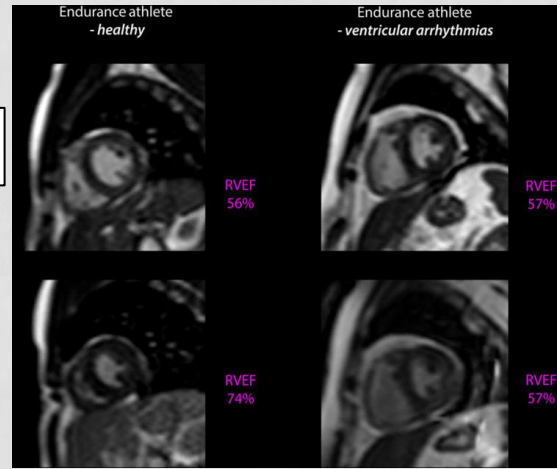


17 athlètes TV VD (8 DAI)
10 endurants N, 7 non-athlètes



Rep.

Ex.



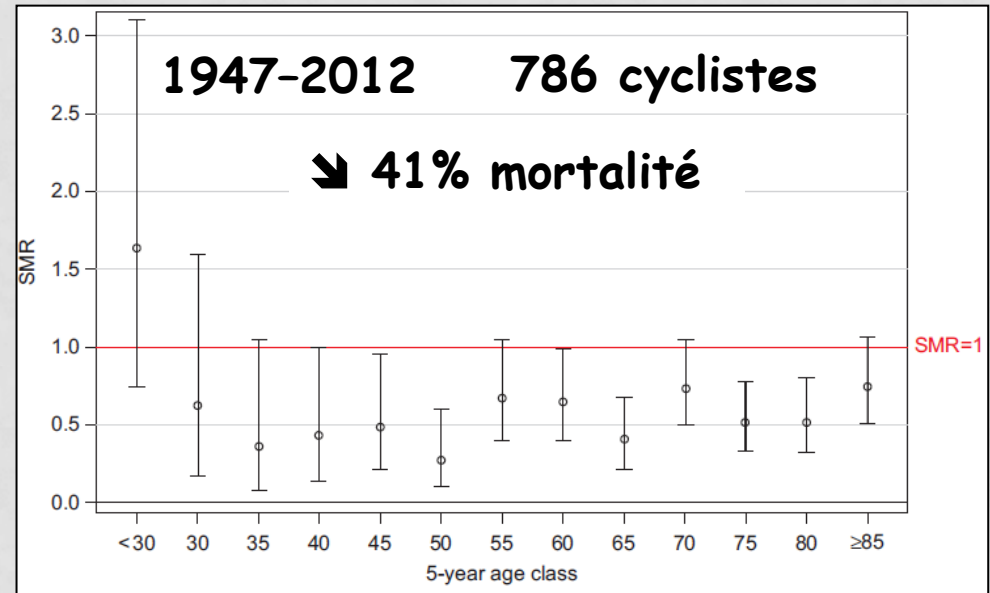
Remodelage irréversible VD?

REMODELAGE CARDIAQUE, ARYTHMIES VENTRICULAIRE GAUCHE ET SPORT

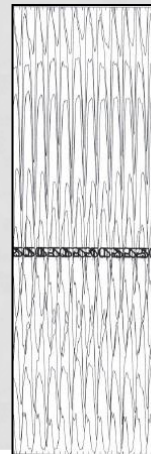
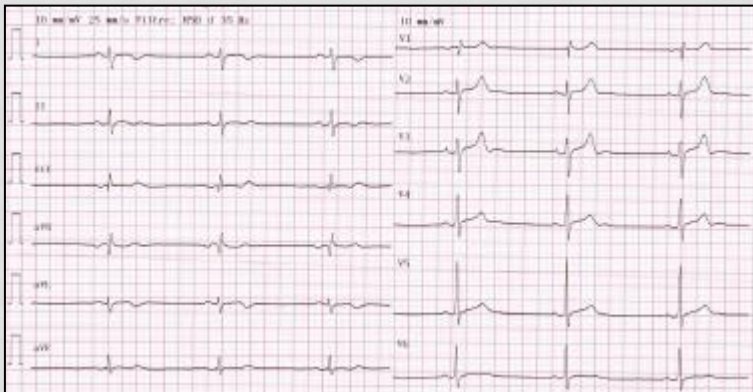
114 athlètes olympiques
Suivi 2 à 5 olympiades
50% canoë/kayak

	Total Athletes (n = 114)		
	Initial	Most Recent	p Value
EF (%)	62 ± 5 (50-78)	63 ± 5 (53-74)	0.09
FS (%)	35 ± 4 (27-47)	37 ± 4 (28-48)	0.02
Peak E (cm/s)	74.1 ± 14.7 (42-116)	76.5 ± 15.1 (43-145)	0.15
Peak A (cm/s)	32.3 ± 10.0 (15-56)	42.3 ± 9.4 (24-76)	0.001
E/A ratio	2.5 ± 0.7 (1.2-5.1)	1.8 ± 0.4 (1.1-3.7)	0.001

Pelliccia et Al. JACC 2010



Marijon et Al. EHJ 2013

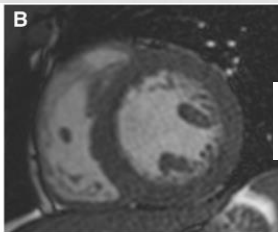
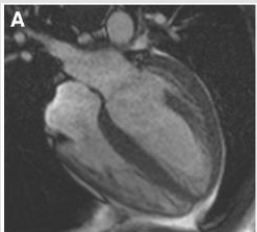


Anomalie du cœur G ?
dans situation extrême

COEUR ET DOPAGE = effets cardiaques des drogues améliorants la performance

Substance	HTN	Arrhythmias	LVH	CAD	MI	HF	SCD
Anabolic androgens	+	+	+	+	+	+	+
Human chorionic gonadotrophin		+	+			+	+
Erythropoietin	+					+	
B2 agonists		+			+	+	+
Diuretics		+					
Amphetamines	+	+			+	+	+
Cocaine	+	+		+	+	+	+
Ephedrine	+	+		+	+		+
Narcotics							+
Cannabinoids		+			+		+
Glucocorticoids	+			+			
Alcohol	+	+			+	+	+

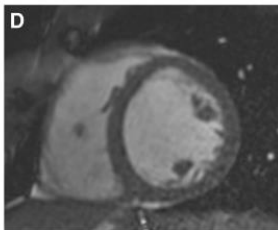
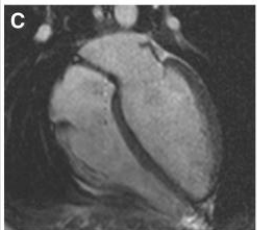
Deligiannis et Al. ESC study group of sports cardiology. EJCPR 2006;13:687-694.



AAS-using

LV/RV EF = 46/43%

strength athletes



non-AAS-using

LV/RV EF = 56/52%



Luijckx et Al. Int J Cardiol 2015;167:664-668

"paradoxe" Sport

Physiopathogénie ? CM athlètes endurants

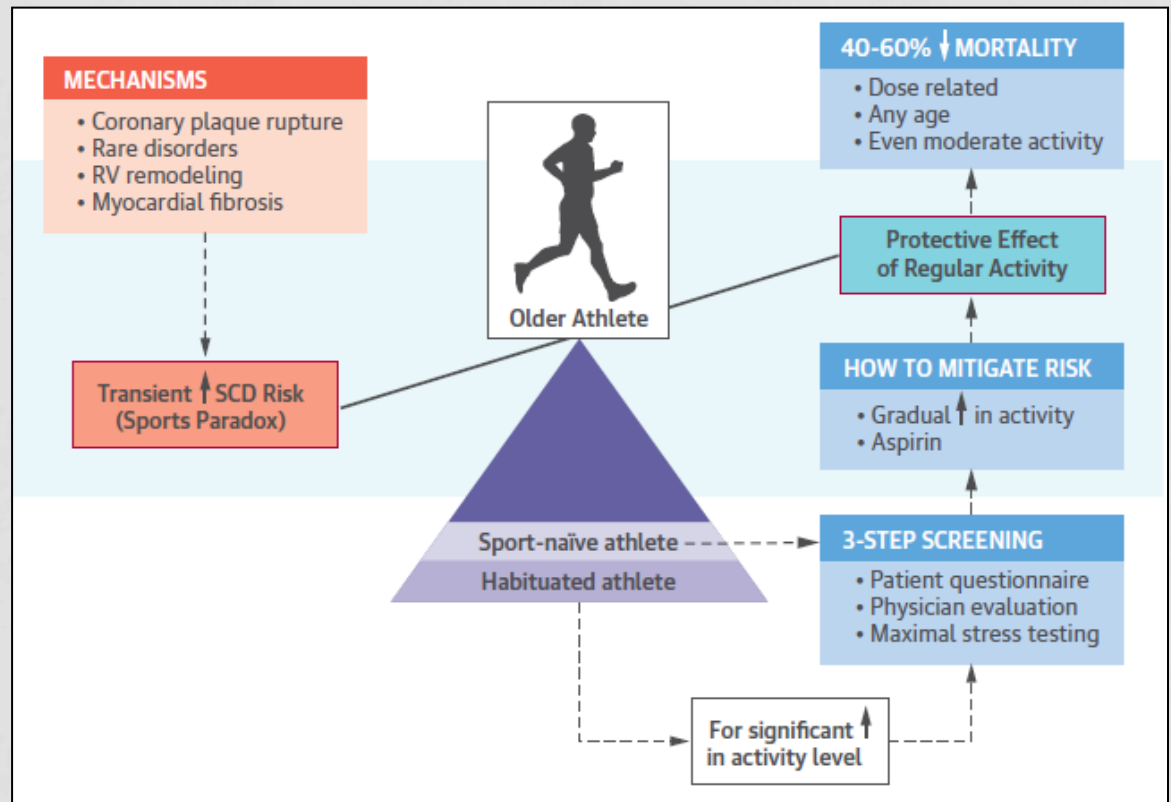
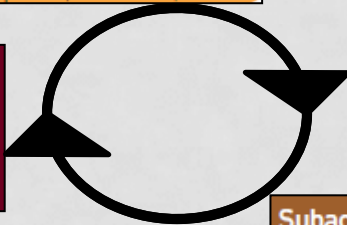
Extreme exercise efforts
(eg. marathon)
↓
↑Catecholamine
↑O₂ Demand
↑↑↑Preload and ↑afterload
↑Troponin, ↑CK-MB, ↑BNP

Immediate effects
↓
Right heart strain
R/RV dilatation
RV hypokinesia
Diastolic dysfunction

Subacute effects
↓
Cardiac fibrosis

Long-term effects
↑Cardiac chamber sizes
Patchy areas of fibrosis
↑ Atrial arrhythmias
↑ Ventricular arrhythmias
↑ Incidence of SCD

Chronic training
LV dilatation
LV hypertrophy
↑LV mass



Années d'exercice intensif
↗ longévité / mode de vie,
supériorité génétique, ..
mais n'élimine pas une ↗
risque cardiaque

THE GOOD AND THE BAD AND THE UGLY



Directed by
SERGIO CARRE

Exercise and the heart: the good, the bad, and the ugly

Sanjay Sharma^{1*}, Ahmed Merghani¹, and Lluís Mont²

Eur Heart J 2015 Apr 2

*The sport, yes !!!
but*

*"Everything in excess is
opposed to nature"*

Hippocrates