

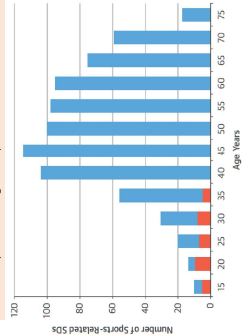


**Risk Factor: Age – Background Information**

Middle-aged and older athletes are at significantly higher risk for sudden cardiac death (SCD) compared with younger athletes and are more vulnerable to misconceptions regarding the cardiovascular effects of sports.

The overwhelming majority of sports-related sudden deaths occur among those older than 35 years of age. The approach to pre-participation screening for risk of sudden death in the older athlete is a complex issue and at present is largely focused on identifying inducible ischemia due to significant coronary disease.

Relationship Between Age and Sports-Related Sudden Deaths



From an epidemiological point of view, the probability of developing SCD increases with age. Males are at a greater risk compared to women, and they tend to develop it at younger ages, the overwhelming majority of sports-related SCDs have occurred in men, with a 9:1 ratio of men to women experiencing SCD during sports (reason: women tend to develop atherosclerosis about 10 years later than men).  
 => Middle aged and older athletes will benefit from risk stratification, fitness assessment and a balanced exercise prescription.

Distribution by age of sports-related sudden deaths (SDs) in the overall population (blue) and among young competitive athletes (red) in a nationwide, 5-year study in France, showing that the vast majority occurred in those 35 years of age and older.  
 From *Montjoye et al., 2011*

**Risk Factor: Age – Background Information**

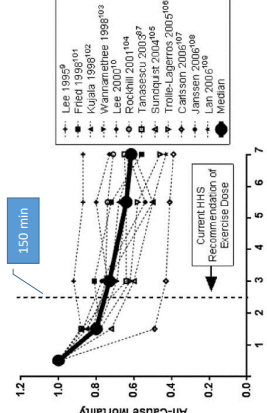
Retrospective studies of athletes who participate in marathons yield estimates of 0.8 to 2 SCDs per 100,000 marathon runners. Most of these events occurred in older male athletes, with only 6% of all cases of sports-related SCDs in young, competitive athletes. For recreational joggers, however, the annual incidence of SCD is significantly higher: 13 SCDs per 100,000 joggers per year. The popularity of endurance sports, especially running, is significantly on the rise => increased likelihood of SCDs. Although the majority of veteran endurance athletes (masters) do not have coronary artery calcification, there is a higher prevalence of coronary artery calcification and higher prevalence of atrial fibrillation in veteran endurance athletes compared to age- and risk factor-matched controls. Vigorous exercise can transiently increase the risk of an acute cardiac event, particularly in older athletes.



Between 1990 and 2013, the number of participating athletes who completed running races in the United States increased significantly to approx. 20 million per year; 54% were older than 65 years of age, and 57% were male.

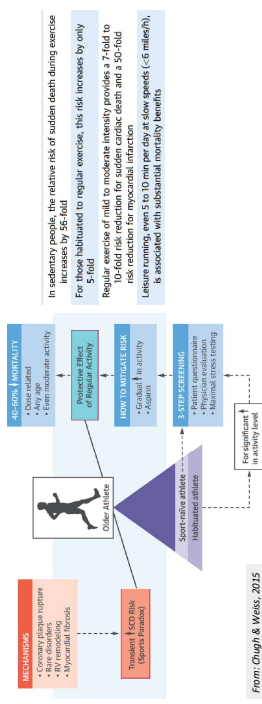
From *Chugh & Weiss, 2015*  
*Kishman & Rog, 2019*

**Mortality risk reduction based on hrs of moderate physical activity – background information**



Physical Activity Guidelines Advisory Committee Report to the Secretary of Health and Human Services, 2008

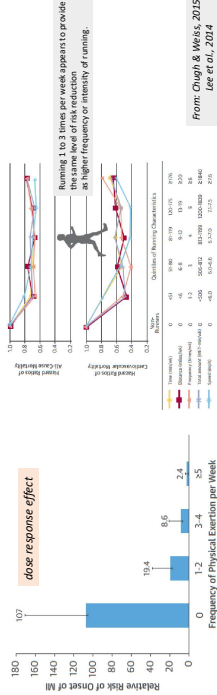
**Risk Factor: Sedentary Lifestyle – health promoting effects of exercise and the sports paradox – Background Information**



**Risk Factor: Sedentary Lifestyle – health promoting effects of exercise – Background Information**

The beneficial, health-promoting effects of habitual physical and sports activity are undeniable. Moderate exercise (30 min of moderate activity 5 times per week) reduces cardiovascular risk by 20%, and high levels of exercise (30 min of vigorous activity 5 times per week) reduce cardiovascular risk by 30% to 40%. These benefits are enhanced by the observed additional impact of regular exercise on the risk of cancer. Over an 8-year period, regular high levels of exercise in healthy people were associated with a 70% reduction in age-adjusted all-cause mortality in men and an 80% reduction in women.

However, these benefits are not habituated to exercise, experience sports activity-related cardiac arrests, usually associated with underlying heart disease. A clear dose-response effect exists => the greater the frequency of weekly exercise, the greater the reduction in relative risk. The magnitudes of the risk reduction attributed to frequent exercise are impressive, in the range of 7- to 10-fold lowered risk for exercise-associated SCD and 50-fold reduction for exercise-associated MI.



From *Chugh & Weiss, 2015*  
*Lee et al., 2014*

**Reduction in life expectancy between ages 40 and 85 years – Background Information**

Current habit or disease	Years-of-life-lost
Current smoking	4.8 years
Diabetes	3.9 years
Physical inactivity	2.4 years
Hypertension	1.6 years
Obesity	0.7 years
Alcohol intake	0.5 years

Participants with low socioeconomic status had greater mortality compared with those with high socioeconomic status (HR 1.42, 95% CI 1.38-1.45 for men; 1.34, 1.28-1.39 for women)

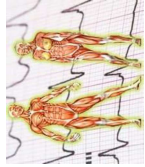
The population attributable fraction was highest for smoking, followed by physical inactivity then socioeconomic status.

Stringhini S, et al., Socioeconomic status and the 25 x 25 risk factors as determinants of premature mortality: a multicohort study and meta-analysis of 1.7 million men and women. *Lancet*. 2017 Mar 25;389(10075):1229-1237.

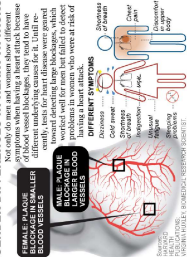
**Gender differences & gender as a risk factor — background information**

Male athletes have a three- to five-fold higher risk of sudden cardiac death compared to female athletes

Emery MS, Kovacs RJ. Sudden cardiac death in athletes. *JACC: Heart Fail* 2018;6:30-40.



**GENDER DIFFERENCES IN HEART ATTACKS**



ECGs of young athletes demonstrate gender-related differences in P-R intervals, which should be considered when using these characteristics in the screening of young athletes.

**A Graded Approach to Exercise Conditioning in the Older Athlete — Background Information**

