

Relationship between the heart rate and E/A ratio in athletic and non-athletic males in different ages

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Introduction:

One of the most important effects of regular physical training is the adaptation of the cardiovascular system. The basic importance of the "athlete's heart" is manifested in two fields, one is the public health, the second is the competitive sport. The aim of the present study is to clarify whether the higher E/A quotient of athletes is a favorable change in the intrinsic relaxation properties of the left ventricle.

Question:

The higher E/A quotient of physically active persons can be explained by the training bradycardia, or it can be supposed as an independent effect of regular physical exercise?

Methods:

Peak early (E) and atrial blood flow velocities (A) were assessed by Doppler echocardiography at rest in males (N=1237) the E' and A' were assessed by Tissue Doppler Imaging (TDI), (N=144) all the data were collected in Hungary, from 1993–2011. Relationship between E/A and resting heart rate (HR), was determined by linear regression analysis. Pearson correlation coefficients were used to express the connection between heart rate and the transmitral E/A and TDI determined E'/A' quotients in 19–35 yr old males. Student t-test was used to establish the differences between transmitral and TDI determined velocities and indices in athletes and non-athletes.

Results:

The E/A decreased with age, the rate of decrease was slower in the physically trained subjects, except in children. In children, adolescent-young and young adult subjects E/A against HR equations of the athletic and non-athletic groups were similar, differences between the means were only due to the differences of the HR. In the 31–44 yr old males, the intercepts of the athletes' regression lines were higher. The oldest (>44 yr) active subjects showed a significant regression while sedentary males did not. According to the results of TDI it seems that the disturbing effect of the heart rate is really stronger in case of the E/A while there was no significant correlation in the E'/A' values. However, significant differences were seen both in E/A values and in TDI measurements of the medial part of the mitral valve (med. E'/A') between athletes and non-athletes.

Conclusions:

The HR-independent beneficial effect of regular physical training on the diastolic function manifests itself at the older ages. According to our results, the long-term physical training (mainly endurance type) can diminish the age-associated impairment of diastolic function but the impact of resting HR should always be taken into consideration when assessing intergroup differences in the E/A ratio, especially when studying the effect of exercise training upon cardiac function.

Keywords:

echocardiography, athlete's heart, diastolic function, heart rate, aging