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Exercise and cardiac function by Tissue Doppler Echocardiography: The Copenhagen City Heart Study

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Background

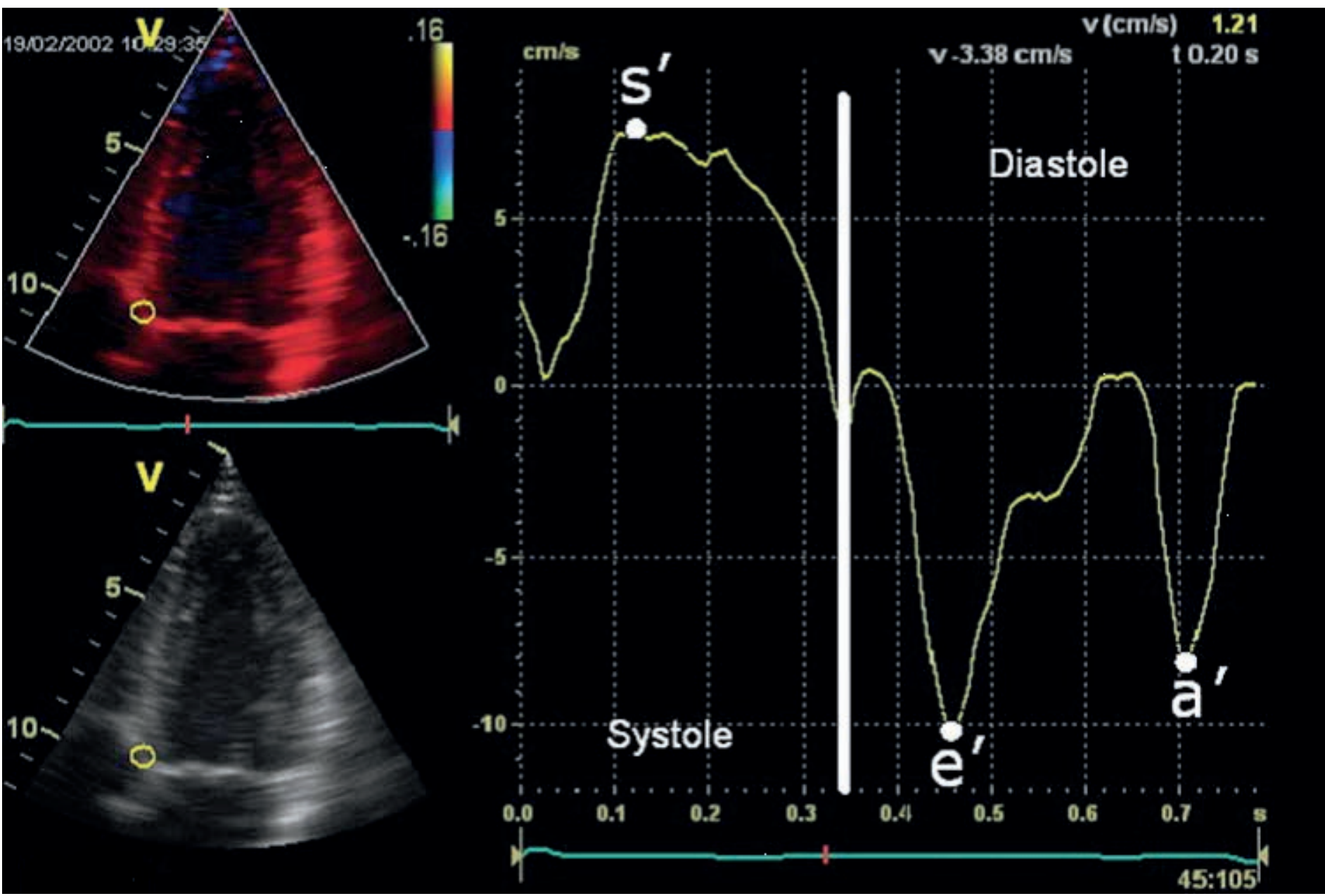
TDI (Tissue Doppler Imaging) is a sensitive marker of myocardial dysfunction and mortality in heart disease and in the general population. Regular physical activity is associated with risk reduction in coronary heart disease and mortality. There is a need for studies to clarify whether exercise has beneficial effects on cardiac function.

Hypothesis

The aim of this study was to test the hypothesis that regular physical exercise is associated with better cardiac function measured by TDI in the general population.

Methods

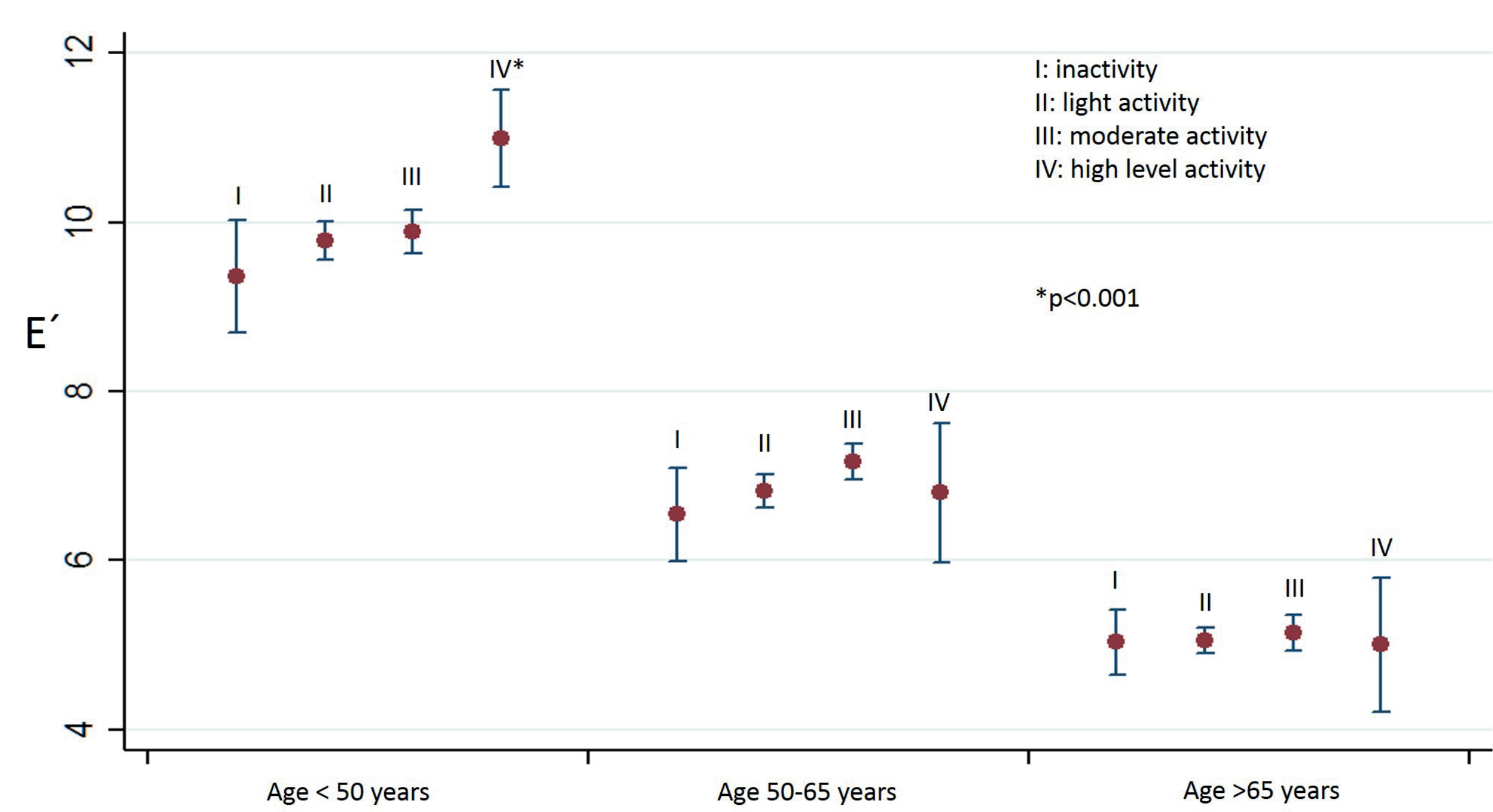
Within a large prospective community-based population study, 2,053 persons were examined by conventional echocardiography and TDI. Peak systolic (s'), early diastolic (e') and late diastolic (a') velocities were measured by colour TDI. Longitudinal displacement (LD) was calculated from the velocity curve during ejection. Statistical tests were performed by linear univariate and multivariable regression analyses, in relation to age groups (<50years, 50-65 years, >65 years) and physical activity level: I (inactivity), II (light activity), III (moderate activity) and IV (high-level activity). These levels were graded from the physical activity questionnaire, which contained information about activity level at work and in leisure time.



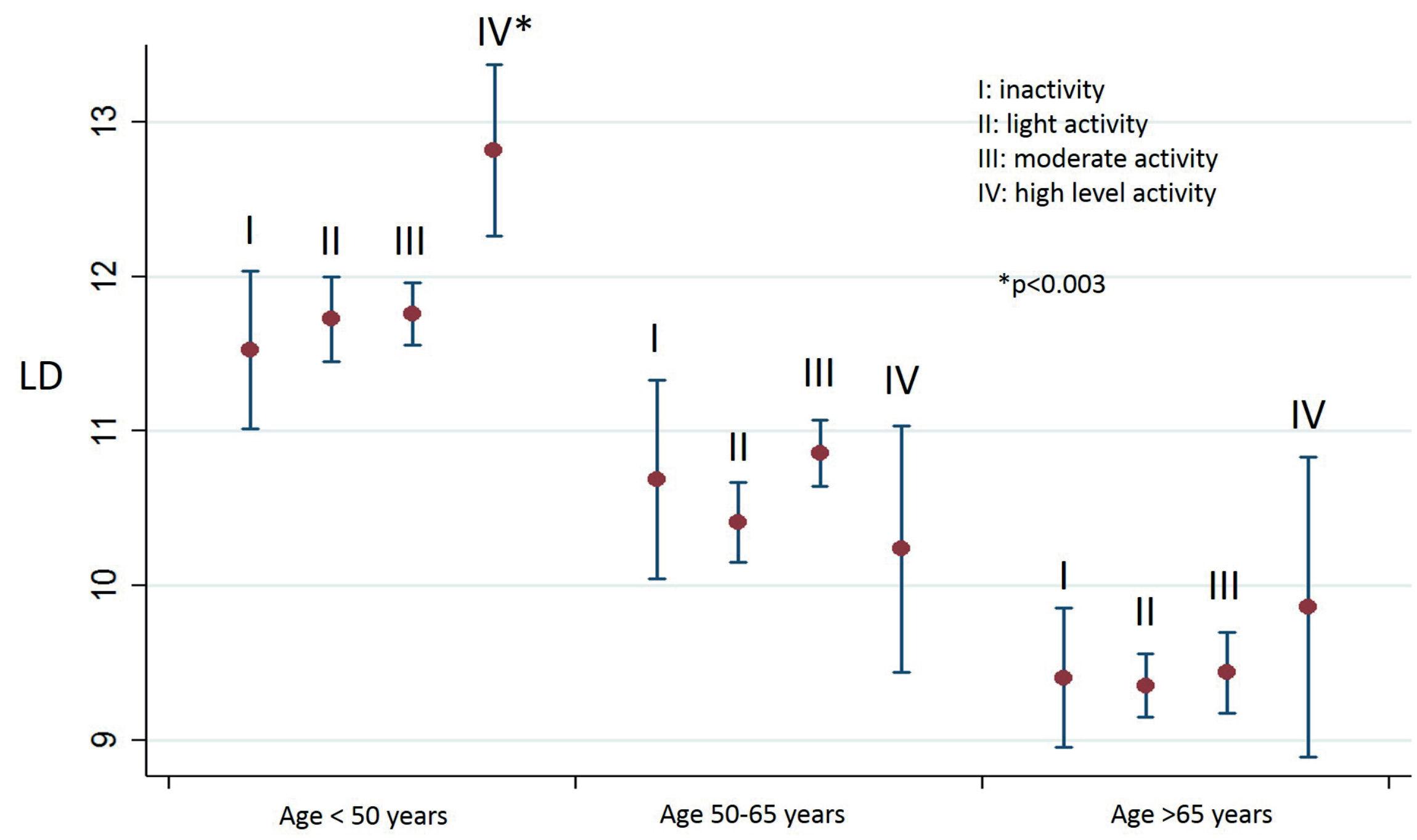
Results

Participants aged<50 years had a significantly higher level of e' and LD in the most active group: $e' = 11.0$ (\pm standard deviation, $SD = 2.0$), $p < 0.001$; $LD = 12.8$ ($SD = 2.1$), $p < 0.003$. This pattern remained significant after adjusting for sex, hypertension, diabetes, and ischaemic heart disease and after Bonferroni correction. Both e' and LD were strongly correlated to age, thus being significantly different

in the three age groups regardless of the activity level. This correlation remained highly significant after adjustments for potential confounders ($p < 0.001$). For e' , there was a significant interaction between age and activity level ($p < 0.001$), which supports the findings of better cardiac function with increasing activity in the young age group.



E' (mean and 95% confidence interval) in relation to age group and activity level.



Longitudinal Displacement (LD, mean and 95% confidence interval) in relation to age group and activity level.

Table 1. Baseline Characteristics of the Participants

	The total population n=2,053	Age 50-59y n=634	Age 50-65y n=659	Age >65 y n=760
Age, y	58.3±16.0	58.7±8.2	58.4±4.4	74.5±6.2
Male sex, %	42.7	45.6	48.7	35.0
Body mass index, kg/m ²	25.5±3.9	24.2±3.3	25.9±3.9	26.1±4.1
Heart rate, bpm	67.1±11.3	64.8±10.8	67.8±11.5	68.3±11.2
Hypertension, %	43.3	11.3	40.7	72.2
Diabetes mellitus, %	10.1	4.6	10.5	14.3
IHD, %	13.9	3.3	11.8	24.5

Table 2. Early diastolic myocardial velocity (e') in relation to age group and activity level

	Age 50-59y	Age 50-65y	Age >65y
Inactivity	9.21 (8.65-9.76)	6.59 (6.01-7.19)	4.96 (4.56-5.37)
Light activity	9.86 (9.60-10.13)	6.86 (6.64-7.08)	5.07 (4.89-5.24)
Moderate activity	9.82 (9.63-10.00)	7.05 (6.86-7.24)	5.16 (4.93-5.40)
High level activity	11.00 (10.53-11.47)	6.80 (6.09-7.51)	5.01 (4.23-5.78)

Table 3. Longitudinal displacement in relation to age group and activity level

	Age 50-59y	Age 50-65y	Age >65y
Inactivity	11.52 (10.91-12.14)	10.69 (10.03-11.35)	9.40 (8.94-9.86)
Light activity	11.73 (11.43-12.02)	10.41 (10.16-10.66)	9.35 (9.16-9.55)
Moderate activity	11.76 (11.55-11.97)	10.86 (10.64-11.07)	9.44 (9.18-9.69)
High level activity	12.82 (12.30-13.34)	10.23 (9.45-11.03)	9.86 (9.02-10.70)

Conclusion

In the general population, the association between increasing level of exercise and better cardiac function was found only in the youngest age group (<50 years old). Among the elder age groups, higher level of activity was not correlated to better cardiac function.

Disclosures:

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