Heritability of ambulatory pre-ejection period, an index of sympathetic control of cardiac contractility

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Introduction

There is a lack of information on the influence of hereditary factors on individual differences in SNS activity.

The pre-ejection period (PEP) reflects sympathetic control of cardiac contractility and can be measured non-invasively by impedance cardiography.

Our goal was to estimate the heritability of the PEP measured over 24 hours in a real life setting.

Methods

Sample

215 identical twins (77 men), 296 fraternal twins (107 men) and 244 of their siblings (94 men), mean age = 30.6 yrs (SD=10.4).

Procedure & measures

Subjects wore the VU-AMS device that continuously recorded ECG and thoracic impedance (ICG) for 24 hrs.

Since posture and physical activity may affect PEP independently of SNS activity, daytime analyses were restricted to sitting activities.

Pre-ejection period (PEP) was extracted from the large scale ensemble averaged impedance cardiogram.

Statistical analysis

Structural equation modeling (using Mx) decomposed the variance in PEP into additive genetic (A), shared environmental (C) and non-shared environmental sources (E). Age was entered as covariate. Increasingly more parsimonious solutions were tested for significance using likelihood ratio tests.

Results

Table 1: Mean (SD) for PEP (ms) during the four daily periods across all subjects.

	morning	afternoon	evening	night
Men	96.4 (14.9)	95.9 (14.2)	95.7 (13.6)	105.4 (15.4)
Women	99.6 (18.5)	98.2 (17.1)	98.0 (16.2)	104.8 (15.3)

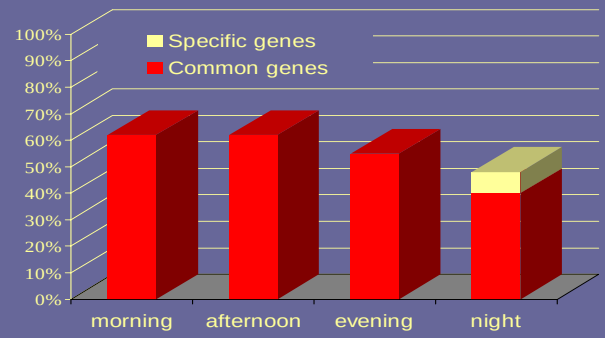

Figure 2: Heritability estimates for PEP

- There were no significant differences in means, variances and covariances between twins and their singleton siblings. Therefore, results on twins generalize to the singleton population.
- Individual differences in PEP were explained by genetic factors and environmental factors unique to each family member. Environmental factors shared by the twins and sibs within a family did not influence PEP.
- A set of common genes influenced individual differences in PEP during the day and night. During the night a second source of genetic variance in PEP emerged.
- Heritability of PEP varied between 62% in the morning and afternoon to 48% during the night (figure 2).

Summary & Conclusion

- **Sympathetic control of cardiac contractility, as measured by PEP, is highly heritable.**
- **In keeping with the known wake/sleep pattern in sympathetic activity, new genes influencing variance in PEP emerged during sleep.**
- **The well-known familial clustering of cardiovascular morbidity and mortality may derive in part from the genetic variance in SNS activity.**