Heritability of Ambulatory Heart Rate Variability

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Reduced heart rate variability (HRV) is associated with an increased risk for cardiac disease and overall mortality. In the laboratory, a significant genetic contribution to HRV has been established by twin and family studies. Heritability estimates ($h^2$) at rest range from 13-35% but during exposure to mental stressors $h^2$ increases to 50%. The present study addresses the genetics of HRV during prolonged periods of ambulatory monitoring in a naturalistic setting.

Methods

- 229 MZ twins (84 men), 309 DZ twins (118 men) and 264 singleton siblings (101 men) from 341 families
- Using the VU-AMS (4.6) ambulatory monitor 24-hour recordings of ECG and ICG were made in naturalistic settings. Band pass filtered ICG yields a respiration signal. RSA was obtained in the time domain from the combined ECG and respiration signals (peak-to-trough method).
- ECG, respiration and motility data were combined with the diary information to divide recording into fragments that were stationary with regard to physical activity and posture. Means for RMSSD and RSA were computed for the morning, afternoon, evening and nighttime periods.
- Age-adjusted twin correlations were computed twice: across all periods, and across periods where subjects were either sitting or lying.
- Mx was used for genetic modeling.

Conclusion

- Heritability of ambulatory RMSSD varies between 33 and 42%
- Heritability of RSA varies between 40 and 54%
- Strong confirmation that genes are important in the regulation of ambulatory HRV.

Power to detect genes increases with heritability of the phenotype. Therefore, we consider ambulatory HRV a useful intermediate phenotype in the search for genetic variation influencing cardiovascular disease risk.