

## Gender Differences and Heritability of Two Indices of Heart Rate Dynamics: A Twin Study

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Reduced heart rate variability (HRV) is an indication of diminished health. Using two indices of HRV, respiratory sinus arrhythmia (RSA) and approximate entropy (ApEn), we investigated whether women showed larger HRV than men after controlling for a large number of health related covariates. We further tested the genetic and environmental sources of difference and similarity between RSA and ApEn. Subjects were 196 male and 210 female middle-aged twins. Analyses were based on RSA and ApEn values obtained during an 8.5 min. resting condition. Females showed larger HRV than men ( $p < 0.001$  for ApEn;  $p = 0.015$  for RSA) after adjustment for antihypertensive use, smoking, physical activity, BMI, waist circumference, respiration rate, heart period and age. Contraceptive use and menopausal status had no effect on ApEn. These gender differences were confirmed by significant intrapair differences in the opposite sex twin pairs for both ApEn and RSA. Genetic model fitting yielded moderate heritability estimates for RSA (30%) and ApEn (40%). The correlation between RSA and ApEn ( $r = 0.60$ ) could be explained by genetic factors (48%), environmental factors (36%) and age (16%) as predicted by the best fitting model. The present study found support for a gender difference in HRV with women having greater HRV than men even after controlling for a large number of potential confounding covariates. Indices of heart rate dynamics derived from nonlinear dynamical systems theory may be more sensitive than traditional indices of HRV and have the ability to reveal subtle differences with important implications for health and disease.