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**Approximate Entropies for Stochastic Time Series and EKG Time Series of Patients with Epilepsy and Pseudoseizures** BRIAN VYHNALEK, ULRICH ZURCHER, Cleveland State University, REBECCA O'DWYER, The Neurological Institute, Epilepsy Center, Department of Neurology, Cleveland Clinic, MIRON KAUFMAN, Cleveland State University — A wide range of heart rate irregularities have been reported in small studies of patients with temporal lobe epilepsy [TLE]. We hypothesize that patients with TLE display cardiac dysautonomia in either a subclinical or clinical manner. In a small study, we have retrospectively identified (2003-8) two groups of patients from the epilepsy monitoring unit [EMU] at the Cleveland Clinic. No patients were diagnosed with cardiovascular morbidities. The control group consisted of patients with confirmed pseudoseizures and the experimental group had confirmed right temporal lobe epilepsy through a seizure free outcome after temporal lobectomy. We quantified the heart rate variability using the approximate entropy [ApEn]. We found similar values of the ApEn in all three states of consciousness (awake, sleep, and proceeding seizure onset). In the TLE group, there is some evidence for greater variability in the awake than in either the sleep or proceeding seizure onset. Here we present results for mathematically-generated time series: the heart rate fluctuations $\xi$ follow the $\Gamma$ statistics i.e., $p(\xi) = \Gamma^{-1}(k)\ \xi^k\ \exp(-\xi)$. This probability function has well-known properties and its Shannon entropy can be expressed in terms of the $\Gamma$-function. The parameter $k$ allows us to generate a family of heart rate time series with different statistics. The ApEn calculated for the generated time series for different values of $k$mimic the properties found for the TLE and pseudoseizure group. Our results suggest that the ApEn is an effective tool to probe differences in statistics of heart rate fluctuations.

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