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A Program to Accurately Identify Peaks in Respiration and EKG Signals for use in Psychophysiological Research

ABSTRACT

Statistical techniques to describe physiological responses in an experiment rely upon correct identification of each breath and heart beat. Accurate measurements are especially important when frequency analyses are performed or short recordings are used. A new program, called "puka", accurately identifies normal beats in EKG signals and the phases of each breath in recordings produced using single strain gauge chest belts. Portions of the well-validated WFDB (WaveForm DataBase) Software Package (www.physionet.org) are used in puka to accurately obtain the time of each normal R wave. A new method of identifying the breaths and pauses in strain gauge belt recordings was developed. This technique locates the points of maximum inspiration and expiration for each breath as well as post-inspiratory and post-expiratory pauses. Analyses to validate the measurements produced by puka indicate that the program correctly locates normal R waves in EKG signals and breaths in strain gauge belt recordings. The program was tested using artificial EKG data, paced respiration recordings from healthy young subjects, and recordings from neurological patients. Puka is flexible and easy to use yet produces accurate timing measurements of breath components and heart beats, which allow more complex and complete statistical analyses. The source code and documentation is freely available on the PhysioNet archive.