Chapter 15

Characterization of HRV by Poincare Plot Analysis among the Female Tea Garden Workers of Northern Hilly Regions of West Bengal

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ABSTRACT

Recent research on Heart Rate Variability (HRV) has proven that Poincare Plot is a powerful tool to mark Short Term and Long Term Heart Rate Variability. This study focuses a comprehensive characterization of HRV among the Tea Garden Workers of the Northern Hilly Regions of West Bengal. The characterization, as available from the data sets, projects the average values of SD1 characteristics, that is, Short Term HRV in females as 58.265ms and SD2 as 149.474. The SDRR shows a mean value of 87.298 with a standard deviation of 119.669 and the S Characterization as 16505.99 ms and Standard deviation of 45882.31 ms. The SDRR shows a mean value of 87.298 with a standard deviation of 119.669 and the S Characterization as 16505.99 ms and Standard deviation of 45882.31 ms. ApEn Characterization showed mean value of 0.961 and standard deviation of 0.274.

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INTRODUCTION

The Poincaré plot (PP) is one of the important markers which analyses short as well as long term HR recordings. It is:

- A visual technique which can make use of pattern Recognition and a
- Quantitative one, which includes various parameters (called descriptors) which quantify the information contained in a Poincaré plot (Brennan, Palaniswami, & Kamen, 2001; Brennan, Palaniswami, & Kamen, 2002).

Developed by Henri Poincaré for analyzing complex systems, is used in physics, astronomy, meteorology, mathematical biology, geophysics and medical sciences (Ott, 1993). Medical sciences use it for quantifying the heart rate variability (HRV) and it stands as an effective measure of this marker (Brennan, Palaniswami, & Kamen, 2001; Brennan, Palaniswami, & Kamen, 2002; NASPE, 1996). It summarizes the entire recording, and simultaneously makes it possible to extract the information on short and long time behavior of the heart action. Being highly resistant, a reasonable Poincaré plot may be produced even from a recording containing a considerable amount of outliers and artifacts thus making it advantageous to the Discrete Fourier Transform (DFT) (usually realized by the Fast Fourier Transform (FFT) algorithm), where all outliers and artifacts must be noticed and dealt with. Concluding on information on sinus rhythm is important as many of the conclusions drawn from HRV analysis refer to the sinus rhythm (NASPE, 1996).

HEART RATE VARIABILITY

Heart beats are caused by electrical depolarization of the heart muscle (Eckberg, 1997; Eckberg, 2003; Parati, Saul, & Castiglioni, n.d.; Mrowka, Persson, Theres, & Patzak, 2000). Electrical depolarization of the different parts of heart can be observed on an electrocardiogram (ECG) (Figure 1).

The momentary heart rate and the duration of the RR interval is a consequence of constant interaction between the intrinsic activity of the sinus node and the influence of the autonomic nervous system, various substances circulating in the blood and present in the heart tissues (Eckberg, 2003; Parati, Saul, & Castiglioni, n.d.). Breathing appears to be the most important factor modulating heart rate (Eckberg, 2003; Parati, Saul, & Castiglioni, n.d.; Guzik et al., 2005). The changes in blood pressure modulated by baroreflex are another example of a separate system regulating the heart rate. The control of heart rate is modulated by both sympathetic and parasympathetic branches of autonomic nervous system as well as many

Figure 1. A strip of ECG presenting heart’s electrical activity recorded in a healthy person
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