Variability of Heart Rate in Obese Adolescents: An extensive Investigation

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Introduction

The RR interval can be used to accurately predict HRV. Given their foundation in an electrocardiographic PQRST signature, they are prone to irregular behaviour. In the past, researchers often turned to statistical physics methods when studying such complex systems.

Inexpensive, predictable, and non-invasive HRV monitoring of the sympathetic and parasympathetic branches of the autonomic nervous system is a growing field of study. HRV, or the human reverberation length, is a functional biomarker of ageing that has been studied extensively. Patients with "dynamical illnesses," such as epilepsy, COPD, diabetes mellitus, and others, may be requested to participate in the procedure alongside healthy volunteers in order to discover ANS-related events.

Prior work using chaotic globals examined datasets of overweight children and adolescents. These methods are practical because of the speed with which they can be applied to big datasets, and in particular to short (10-minute) time series that may provide accurate results. This is why they are so helpful. These methods, which favour the Welch or Multi-Taper Method (MTM) power spectra, unfortunately discard phase information. As a result, we need to assess these statistics on teenage obesity with more precision.

Methodology

The settings were Index Medical College, 1000 samples were selected, and samples of obese adults over 100 kg (BMI > 28) were included. Purposive sampling was used. The techniques used for collecting the data were Shannon entropy, Renyi entropy, Tsallis entropy, and Higuchi fractal dimension.

Results

As a measure of central tendency, the mean is used because, in parametric statistics, it is assumed that the relevant datasets have a normal distribution. As a result, the mean is utilized. Because we are unable to normalise the data, we are unable to make meaningful comparisons of means. We used the Anderson-Darling and Ryan-Joiner procedures to determine whether or not the data was normal. Due to the lack of clarity provided by these results, it is not possible to state with absolute certainty whether or not the data follow a normal or non-normal distribution. Because of this, when determining the statistical significance of our findings, we employed both parametric and non-parametric tests. In particular, we make use of ANOVA as well as the Kruskal-Wallis test.

The effect size, also known as the degree to which the various treatments differed from one another, was determined with the help of Cohen's d. A value of 0.9 or higher was deemed to have a big impact size; a value of 0.5 to 0.75 was considered to have a medium effect size; and a value of 0.25 to 0.8 was considered to have a moderate effect size.

There is a significant amount of difference in the outcomes that occur for both the children who are not obese and the children who are overweight. Given the insignificance of the findings obtained using approximate entropy, sample entropy, and DFA, it is not warranted to continue discussing these metrics in any further detail.

There is a possibility that statistical analysis of Shannon entropy, Renyi entropy, and Tsallis entropy will lead to the discovery of significant findings. In each of these three scenarios, the level of disorder gets worse. After that, we determined the maximum k values at which the HFD was most apparent and calculated those values. On Cohen's d, the effect size was deemed to be medium for all kmax values between 11 and 60, and the p value was less than 0.05. Nevertheless, in order to derive the greatest benefit from the algorithm, kmax needs to be adjusted to a value of 20. Concurrently with this change, the proportion of children who did not meet the criteria for either overweight or obesity dropped. It was believed that this was the maximum possible capacity. In order to conduct the HFD study, a minimum of 1,000 RR intervals were required from each group.

However, unlike HFD, Katz's approach benefits from a longer time series. Therefore, a cubic spline interpolation was imposed on the range that went from 1 Hz to 15 Hz. A total of 15,000 samples were collected from each dataset, with a sample rate increase of 1000 for each additional 1 Hz.

An incorrect value of Katz's fractal dimensions was created when the initial time series was interpolated at 1 Hz using a cubic spline. This resulted in the loss of information. This is not allowed since the value range for fractal dimensions must be between 2 and 1. It is a widely held belief that the short duration of the data set is to blame for this embarrassing error (the curve filling almost the entire plane).

Cohen's d = 0.55 suggests a medium effect size for a 2 Hz cubic spline interpolation. On the other hand, Katz's technique exhibited the maximum degree of significance, which indicated a reduction in mean values from normal non-obesity to juvenile obesity. As the length of the time series goes up and the frequency of the cubic spline interpolation goes up to more than 2 Hz, the significant values for all three statistical tests go down steadily.

Conclusion

All three markers of non-linearity have risen in overweight youth, suggesting that future RR interval succession would be less predictable. Higuchi's and Katz's suggested fractal dimensions were used to differentiate between the two classes. Higuchi and Katz conducted the research that led to this realization. We used a kmax of 30 and a total of 1000 data points to get the best possible Higuchi fractal dimension. Because of this, we were able to get the most reliable data. To achieve optimum group separation using Katz's fractal dimension, we needed a 2Hz cubic spline interpolation, which required the collection of 3000 samples. We were able to realise our objective because of this. By using these fractal dimension tactics, typically developing children and adolescents showed a more orderly reaction than their fat counterparts. To me, this makes no logical sense at all. I don't have first-hand knowledge to provide. Due to this, the chaotic global entropy or one of the other three entropies mentioned earlier must be necessary in order to serve as a statistical marker for obesity.

Reference

1 Global Initiative for Chronic Obstructive Lung Disease. Global

strategy for the diagnosis, management, and prevention of

chronic obstructive pulmonary disease. Chron. Respir. Dis. 2010;

7: 131–3.

2 Hajiro T, Nishimura K, Tsukino M. Stages of disease severity and

factors that affect the health status of patients with chronic

obstructive pulmonary disease. Respir. Med. 2000; 94: 841–6.

3 Gudmundsson G, Gislason T, Janson C. Depression, anxiety and

health status after hospitalisation for COPD: a multicentre study

in the Nordic countries. Respir. Med. 2006; 100: 87–93.

4 Antonelli-Incalzi R, Imperiale C, Bellia V. Do GOLD stages of

COPD severity really correspond to differences in health status?

Eur. Respir. J. 2003; 22: 444–9.

5 Carrasco Garrido P, de Miguel Diez J, Rejas Gutierrez J. Negative impact of chronic obstructive pulmonary disease on the health-related quality of life of patients. Results of the EPIDEPOC study. Health Qual. Life Outcomes 2006; 4: 31. doi:10.1186/1477-7525-4-31.

6 Ferrer M, Alonso J, Morera J. Chronic obstructive pulmonary disease stage and health-related quality of life. The quality of life of chronic obstructive pulmonary disease study group. Ann. Intern. Med. 1997; 127: 1072–9.

7 Rutten-van Molken MP, Oostenbrink JB, Tashkin DP et al. Does quality of life of COPD patients as measured by the generic EuroQol five-dimension questionnaire differentiate between COPD severity stages? Chest 2006; 130: 1117–28.

8 Ståhl E, Lindberg A, Jansson SA et al. Health-related quality of life is related to COPD disease severity. Health Qual. Life Outcomes 2005; 3: 56. doi:10.1186/1477-7525-3-56