



Multifractal analysis of heart rate variability and laser Doppler flowmetry fluctuations: comparison of results from different numerical methods

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Résumé en anglais

To contribute to the understanding of the complex dynamics in the cardiovascular system (CVS), the central CVS has previously been analyzed through multifractal analyses of heart rate variability (HRV) signals that were shown to bring useful contributions. Similar approaches for the peripheral CVS through the analysis of laser Doppler flowmetry (LDF) signals are comparatively very recent. In this direction, we propose here a study of the peripheral CVS through a multifractal analysis of LDF fluctuations, together with a comparison of the results with those obtained on HRV fluctuations simultaneously recorded. To perform these investigations concerning the biophysics of the CVS, first we have to address the problem of selecting a suitable methodology for multifractal analysis, allowing us to extract meaningful interpretations on biophysical signals. For this purpose, we test four existing methodologies of multifractal analysis. We also present a comparison of their applicability and interpretability when implemented on both simulated multifractal signals of reference and on experimental signals from the CVS. One essential outcome of the study is that the multifractal properties observed from both the LDF fluctuations (peripheral CVS) and the HRV fluctuations (central CVS) appear very close and similar over the studied range of scales relevant to physiology.

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