Multiscale compression entropy of microvascular blood flow signals: comparison of results from laser speckle contrast and laser Doppler flowmetry data in healthy subjects

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Auteur	Humeau-Heurtier, Anne [1], Baumert, Mathias [2], Mahé, Guillaume [3], Abraham, Pierre [4]
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Mots-clés	entropy; data compression; nonlinear dynamics; laser speckle contrast imaging; laser Doppler flowmetry [5]
Résumé en anglais	Microvascular perfusion is commonly used to study the peripheral cardiovascular system. Microvascular blood flow can be continuously and non-invasively monitored with laser speckle contrast imaging (LSCI) or with laser Doppler flowmetry (LDF). These two optical-based techniques give perfusion values in arbitrary units. Our goal is to better understand the perfusion time series given by each technique. For this purpose, we propose a nonlinear complexity analysis of LSCI and LDF time series recorded simultaneously in nine healthy subjects. This is performed through the computation of their multiscale compression entropy. The results obtained with LSCI time series computed from different regions of interest (ROI) sizes are examined. Our findings show that, for LSCI and LDF time series, compression entropy values are less than one for all of the scales analyzed. This suggests that, for all scales, there are repetitive structures within the data fluctuations. Moreover, at the largest scales studied, LDF signals seem to have structures that are different from those Entropy 2014, 16 5778 of Gaussian white noise. By opposition, this is not observed for LSCI time series computed from small ROI sizes.
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