Multiscale entropy of laser Doppler flowmetry signals in healthy human subjects

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Résumé en anglais	Purpose: The cardiovascular system (CVS) regulation can be studied from acentral viewpoint, through heart rate variability (HRV) data, and from a peripheral viewpoint, through laser Doppler flowmetry (LDF) signals. Both the central and peripheral CVSs are regulated by several interacting mechanisms, each having its own temporal scale. The central CVS has been the subject of many multiscale studies. By contrast, these studies at the level of the peripheral CVS are very recent. Among the multiscale studies performed on the central CVS data, multiscale entropy has been proven to give interesting physiological information for diagnostic purposes. However, no multiscale entropyanalysis has been performed on LDF signals. The authors' goal is therefore to propose a first multiscale entropy study of LDF data recorded in healthy subjects. Methods: The LDF signals recorded in the forearm of seven healthy subjects are processed. Their period sampling is T = 50 ms , and coarse-graining scales from T to 23 T are studied. Also, for validation, the algorithm is first tested on synthetic signals of known theoretical multiscale entropy. Results: The results reveal nonmonotonic evolution of the multiscale entropy of LDF signals, with a maximum at small scales around 7 T and a minimum at longer scales around 18 T , singling out in this way two distinctive scales where the LDF signals undergo specific changes from high to low complexity. This also marks a strong contrast with the HRV signals that usually display a monotonic increase in the evolution of the multiscale entropy. Conclusions: Multiscale entropy of LDF signals in healthy subjects shows variation with scales. Moreover, as the variation pattern observed appears similar for all the tested signals, multiscale entropy could potentially be a useful stationary signature for LDF signals, which otherwise are probe-position and subject dependent. Further work could now be conducted to evaluate possible diagnostic purposes of the multiscale entropy of LDF signals.
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