

The Time Courses of the Spectral Components of the Reflection Index in Response to the Cold Face Test

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Aims: This study aimed to see if the spectral components in the low (LF) and high frequency (HF) bands of the reflection index (RI) time series (LF_{RI} and HF_{RI}) could reflect increases in sympathetic and vagal activity caused by the cold face test (CFT), thereby extending the functional properties of RI into the frequency domain. We hypothesized that the time course of LF_{RI} and HF_{RI} would increase in response to CFT and would resemble those of the standard autonomic spectral measures, LF of systolic pressure (LF_{SP}) and HF of RR intervals (HF_{RR}).

Methods: To test this hypothesis, arterial pressure and ECG signals recorded from 24 healthy volunteers during CFT were analyzed to extract fiducial points, which were used to form the systolic pressure (SP), diastolic peak pressure (DPP), RI (DPP/SP ratio), and RR time series. These were processed using a time-frequency distribution to obtain the time courses of the LF_{RI} , LF_{SP} , HF_{RI} , and HF_{RR} components, which were compared using coherence and correlation.

Results: The instantaneous LF_{RI} and LF_{SP} components responded to CFT with an initial slight, transient increase that exhibited significant coherence and correlation with each other (Table). The HF_{RI} and HF_{RR} responses showed an initial sharp increase that persisted through the end of CFT and exhibited significant coherence and correlation (Table). The HF responses had greater magnitude and lasted longer than the LF responses.

Conclusions: These findings extend the functional properties of the RI time series into the frequency domain by demonstrating that the characteristic responses of its spectral components reflect the autonomic time-course response induced by CFT: LF_{RI} indicating slight sympathetic activation, and HF_{RI} indicating strong vagal activation. The similarity between the LF_{RI} and HF_{RI} time-course responses with those of the consolidated autonomic spectral measures LF_{SP} and HF_{RR} suggests their potential use as spectral measures of autonomic activity.

Table. Mean values $\pm$ SD of coherence, and correlation of LF_{SP} - LF_{RI} and HF_{RR} - HF_{RI} relations in CFT. N=24.

	LF_{SP} - LF_{RI}	HF_{RR} - HF_{RI}
Coherence	0.67 ± 0.12	0.77 ± 0.10
Correlation	0.64 ± 0.27	0.52 ± 0.38