Supplementary Table 1. The list of 91 HRV features used for analysis and their description

No	Domain	Short name	Description
1	Time	MeanNN	Mean of all normal-to-normal (NN, R-R) intervals
2	Time	SDNN	Standard deviation of NN intervals; a key indicator of overall HRV variability
3	Time	SDSD	Standard deviation of differences between adjacent RR intervals
4	Time	RMSSD	Root mean square of successive RR interval differences; commonly used as an indicator of parasympathetic (vagal) activity
5	Time	MedianNN	Median of all NN intervals
6	Time	MadNN	Mean absolute deviation from the median of NN intervals
7	Time	MCVNN	Coefficient of variation of NN intervals (SDNN / MeanNN)
8	Time	MCVSD	Relative magnitude of adjacent RR variability (RMSSD / MeanNN)
9	Time	IQRNN	Interquartile range (Q1–Q3) of NN intervals
10	Time	pNN50	Proportion of adjacent RR interval differences exceeding 50 ms
11	Time	pNN20	Proportion of adjacent RR interval differences exceeding 20 ms
12	Time	NNxx	Count of adjacent RR interval differences exceeding 50 ms (or 20 ms if specified)
13	Time	nNNxx	Ratio of NNxx to total RR intervals
14	Time	MinNN	Minimum NN interval
15	Time	MaxNN	Maximum NN interval
16	Time	RangeNN	Range of NN intervals (MaxNN - MinNN)
17	Time	CountNN	Number of normal NN intervals (excluding abnormal beats)
18	Time	TINN	Base width of a triangle modeled on NN histogram
19	Time	HTI	Integrated index based on the mode bin of NN histogram

20	Time	MeanHR	Mean heart rate over the entire recording period (beats per minute)
21	Time	MinHR	Minimum heart rate during the recording period
22	Time	MaxHR	Maximum heart rate during the recording period
23	Time	STDHR	Standard deviation of heart rate over the recording period
24	Time	RangeHR	Range of heart rate (MaxHR - MinHR)
25	Freq (Welch)	Welch_TotalPower	Total power spectrum over the full frequency range (typically 0–0.4 Hz)
26	Freq (Welch)	Welch_VLF	Power in the very low frequency band (0.00–0.04 Hz)
27	Freq (Welch)	Welch_LF	Power in the low frequency band (0.04–0.15 Hz)
28	Freq (Welch)	Welch_HF	Power in the high frequency band (0.15–0.40 Hz)
29	Freq (Welch)	Welch_LFHF	Ratio of LF to HF power
30	Freq (Welch)	Welch_LFnu	Normalized LF power: LF / (Total - VLF) * 100
31	Freq (Welch)	Welch_HFnu	Normalized HF power: HF / (Total - VLF) * 100
32	Freq (Welch)	Welch_RelLF	Relative LF power: LF / (VLF + LF + HF)
33	Freq (Welch)	Welch_RelHF	Relative HF power: HF / (VLF + LF + HF)
34	Freq (Welch)	Welch_RelVLF	Relative VLF power: VLF / (VLF + LF + HF)
35	Freq (Welch)	Welch_LF_Peak	Peak frequency in the LF band (0.04–0.15 Hz)
36	Freq (Welch)	Welch_HF_Peak	Peak frequency in the HF band (0.15–0.40 Hz)
37	Freq (Welch)	Welch_VLF_Peak	Peak frequency in the VLF band (0.00–0.04 Hz), if applicable
38	Freq (Welch)	Welch_PeakPower(LF/HF/VLF)	Peak power value in LF, HF, or VLF band (maximum PSD value)
39	Freq (Welch)	Lomb_TotalPower	Total power spectrum using Lomb-Scargle method
40	Freq (Lomb)	Lomb_VLF	Power in the VLF band (0.00–0.04 Hz)
41	Freq (Lomb)	Lomb_LF	Power in the LF band (0.04–0.15 Hz)

42	Freq (Lomb)	Lomb_HF	Power in the HF band (0.15–0.40 Hz)
43	Freq (Lomb)	Lomb_LFHF	Ratio of LF to HF power
44	Freq (Lomb)	Lomb_LFnu	Normalized LF power using Lomb: LF / (Total - VLF) * 100
45	Freq (Lomb)	Lomb_HFnu	Normalized HF power using Lomb: HF / (Total - VLF) * 100
46	Freq (Lomb)	Lomb_RelLF	Relative LF power using Lomb
47	Freq (Lomb)	Lomb_RelHF	Relative HF power using Lomb
48	Freq (Lomb)	Lomb_RelVLF	Relative VLF power using Lomb
49	Freq (Lomb)	Lomb_LF_Peak	Peak frequency in LF band using Lomb
50	Freq (Lomb)	Lomb_HF_Peak	Peak frequency in HF band using Lomb
51	Freq (Lomb)	Lomb_VLF_Peak	Peak frequency in VLF band using Lomb
52	Freq (Lomb)	Lomb_Log(LF/HF/etc.)	Log-transformed power values (e.g., LF, HF) using Lomb spectrum
53	Freq (AR)	AR_TotalPower	Total power using autoregressive (AR) method
54	Freq (AR)	AR_VLF	Power in VLF band using AR
55	Freq (AR)	AR_LF	Power in LF band using AR
56	Freq (AR)	AR_HF	Power in HF band using AR
57	Freq (AR)	AR_LFHF	Ratio of LF to HF using AR
58	Freq (AR)	AR_LFnu	Normalized LF power using AR
59	Freq (AR)	AR_HFnu	Normalized HF power using AR
60	Freq (AR)	AR_RelLF	Relative LF power using AR
61	Freq (AR)	AR_RelHF	Relative HF power using AR
62	Freq (AR)	AR_RelVLF	Relative VLF power using AR
63	Freq (AR)	AR_LF_Peak	Peak LF frequency using AR
64	Freq (AR)	AR_HF_Peak	Peak HF frequency using AR

65	Freq (AR)	AR_VLF_Peak	Peak VLF frequency using AR
66	Freq (AR)	AR_Order	Model order used in AR estimation (e.g., Burg method)
67	Freq (AR)	SD1	Short-term variability (standard deviation perpendicular to line of identity in Poincaré plot)
68	Freq (AR)	SD2	Long-term variability (standard deviation along the line of identity in Poincaré plot)
69	Freq (AR)	SDRatio	Ratio of short- to long-term variability (SD1/SD2)
70	Freq (AR)	S	Area of ellipse in Poincaré plot ($\pi \times SD1 \times SD2$)
71	Non-Linear (Poincaré)	ApEn	Approximate entropy: estimates irregularity in RR time series
72	Non-Linear (Poincaré)	SampEn	Sample entropy: similar to ApEn but more consistent by excluding self-matches
73	Non-Linear (Poincaré)	PermEn	Permutation entropy: measures entropy based on order patterns in RR series
74	Non-Linear (Poincaré)	FuzzyEn	Fuzzy entropy: entropy measure robust to noise using fuzzy logic
75	Non-Linear (Entropy)	MSE(k)	Multiscale entropy (MSE) at various time scales for complexity analysis
76	Non-Linear (Entropy)	DFA_α1	Fractal scaling exponent over short intervals (seconds to tens of seconds)
77	Non-Linear (Entropy)	DFA_α2	Fractal scaling exponent over longer intervals (tens of seconds to minutes)
78	Non-Linear	Hurst	Hurst exponent indicating long-term memory of the time series; >0.5 persistent,

	(Entropy)		<0.5 anti-persistent
	Non-Linear		
79	(Entropy)	RRate	Recurrence rate: proportion of recurring points in the time series
80	Non-Linear (DFA)	DET	DET: proportion of diagonal lines in the recurrence plot
81	Non-Linear (DFA)	LAM	LAM: proportion of vertical lines in the recurrence plot
82	Non-Linear (DFA)	TT	TT: average length of vertical lines (duration of similar states)
83	Non-Linear (RP)	Lmax	Lmax: longest diagonal line; related to maximal Lyapunov exponent in chaotic systems
84	Non-Linear (RP)	RECSE	RECSE: Shannon entropy of recurrence plot pattern distribution
85	Non-Linear (RP)	LyapExp	Lyapunov exponent: indicator of sensitivity to initial conditions (chaotic behavior)
86	Non-Linear (RP)	CorrDim	Correlation dimension: measure of complexity in phase space
87	Non-Linear (RP)	FracDim	Fractal dimension: geometrical complexity of the time series
88	Non-Linear (RP)	BubbleEn	Bubble entropy: variation of entropy for measuring RR interval irregularity
89	Non-Linear (RP)	RenyiEn	Renyi entropy: generalized entropy based on a parameterized family (includes Shannon, Kolmogorov)
90	Non-Linear (RP)	SpecEn	Spectral entropy: entropy based on power spectrum distribution
91	Non-Linear (RP)	SD1SD2_Ratio	SD1/SD2 ratio: combined index of short- and long-term variability