

Supplemental information

**Improving cardiovascular risk stratification
through multivariate time-series analysis
of cardiopulmonary exercise test data**

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SUPPLEMENTAL INFORMATION

Supplemental Table S1: Clinical characteristics of the 1399 participants by sex in the training sample (iCOMPEER)

	Men (n=871)	Women (n=528)	P Value
Anthropometrics			
Age, y	58.79 ± 11.83	52.42 ± 13.54	<0.0001
Weight, Kg	86.49 ± 16.0	74.6 ± 15.7	<0.0001
Height, cm	175.3 ± 7.14	164.05 ± 6.96	<0.0001
Body mass index, kg/m ²	28.12 ± 4.7	27.76 ± 5.79	<0.0001
Medical history			
Hypertension, n(%)	704 (80.83)	294 (55.68)	<0.0001
DM type I or II, n(%)	146 (16.76)	46 (8.71)	<0.0001
Chronic kidney disease, n(%)	50 (5.74)	23 (4.36)	0.0006
Asthma or COPD, n(%)	40 (4.59)	26 (4.92)	0.98
Cardiovascular disease, n(%)	655 (75.2)	184 (34.85)	<0.0001
Cardiovascular intervention, n(%)	630 (72.33)	156 (29.55)	<0.0001
Medication			
Antihypertensive drugs, n(%)	623 (71.53)	244 (46.21)	<0.0001
Lipid lowering drugs, n(%)	679 (77.96)	207 (39.2)	<0.0001
Anti-thrombotic drugs, n(%)	674 (77.38)	201 (38.07)	<0.0001
Anti-diabetic drugs, n(%)	128 (14.7)	49 (9.28)	<0.0001
Beta blockers, n(%)	442 (50.75)	190 (35.98)	<0.0001
CCB, n(%)	154 (17.68)	71 (13.45)	<0.0001
ACE or ARB, n(%)	468 (53.73)	151 (28.6)	<0.0001
Diuretics, n(%)	98 (11.25)	62 (11.74)	0.056
Spirometry			
FEV ₁ , L	3.4 ± 0.61	2.56 ± 0.45	<0.0001
FEV ₁ %predicted	102.45 ± 13.9	102.22 ± 13.93	0.40
FVC ₁ , L	4.39 ± 0.73	3.26 ± 0.55	<0.0001
FVC %predicted	104.5 ± 12.68	108.22 ± 14.04	<0.0001
FEV ₁ /FVC (%)	98.18 ± 7.85	94.71 ± 7.18	<0.0001
CPET data at rest			
HR (at rest), beats/min	69.82 ± 12.87	77.23 ± 14.57	<0.0001
SBP (at rest), mm Hg	129.14 ± 19.71	121.78 ± 20.57	<0.0001
DBP (at rest), mm Hg	78.23 ± 11.64	76.73 ± 11.38	0.001
VO ₂ , mL/min	575.66 ± 132.1	464.69 ± 115.68*	<0.0001
PETO ₂ , mm Hg	108.03 ± 5.24	107.83 ± 5.31	0.48
PETCO ₂ , mm Hg	34.44 ± 3.27	34.05 ± 3.31*	0.032
RER	0.84 ± 0.08	0.81 ± 0.08*	<0.0001
CPET data at peak			
Load, watt	184.95 ± 47.44	127.65 ± 36.69	<0.0001
VO ₂ , ml/min	2052.79 ± 558.08	1402.58 ± 368.76	<0.0001
VO ₂ per kg, ml/kg/min	24.12 ± 6.68	19.29 ± 5.44	<0.0001
VO ₂ percentage predicted, %	88.97 ± 19.19	86.11 ± 17.23	0.017
HR, bpm	142.93 ± 23.25	148.05 ± 25.54	<0.0001
HR percentage predicted, %	88.59 ± 12.4	88.15 ± 12.37	0.513
O ₂ pulse, ml/beat	14.38 ± 3.1	9.53 ± 2.05	<0.0001

O ₂ pulse/kg, ml/beat/kg	0.17 ± 0.03	0.13 ± 0.03	<0.0001
SBP, mm Hg	183.86 ± 28.18	163.11 ± 28.35	<0.0001
VE, L/min	81.13 ± 22.51	53.2 ± 13.78	<0.0001
VE/ $\dot{V}CO_2$ slope	29.02 ± 4.33	28.59 ± 4.46	0.0059
PET _{O₂} , mm Hg	115.42 ± 4.95	115.01 ± 4.68	0.12
PET _{CO₂} , mm Hg	37.63 ± 4.21	37.64 ± 4.12	0.97
RER	1.18 ± 0.08	1.16 ± 0.09	<0.0001
Borg score	15.85 ± 1.56	16.03 ± 1.68	0.148

Data are presented as mean ± SD or number of subjects (%). BMI, body mass index; CPET, cardiopulmonary exercise testing; DM, Diabetes mellitus; COPD, chronic obstructive pulmonary disease; CCB, Calcium channel blocker; ACE, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blocker; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; CV, cardiovascular; FEV1, forced expiratory volume in 1 s; FVC, forced vital capacity; HR, heart rate; RER, respiratory exchange ratio; SBP, systolic blood pressure; $\dot{V}CO_2$, rate of carbon dioxide produced; VE, minute ventilation; VE/ $\dot{V}CO_2$ slope, ventilatory efficiency; $\dot{V}O_2$, rate of oxygen uptake.

Supplemental Table S2: Clinical characteristics of men in the training cohort (iCOMPEER) per cluster.

	Cluster 1 (n=81)	Cluster 2 (n=149)	Cluster 3 (n=207)	Cluster 4 (n=252)	Cluster 5 (n=182)
Anthropometrics					
Age, y	45.79 ± 10.59	52.04 ± 11.62*	58.25 ± 9.75*†	62.14 ± 9.96*†‡	66.1 ± 9.06*†‡&
Weight, kg	96.6 ± 22.88	91.55 ± 16.64	87.88 ± 13.82*†	84.33 ± 12.98*†‡	79.27 ± 13.67*†‡&
Height, cm	182.3 ± 6.36	178.3 ± 6.86*	175.89 ± 6.27*†	173.65 ± 6.27*†‡	171.35 ± 6.28*†‡&
Body mass index, kg/m ²	29.03 ± 6.51	28.8 ± 4.93	28.42 ± 4.36	27.98 ± 4.19	26.98 ± 4.33*†‡&
Medical history					
Hypertension, n(%)	46 (56.79)	109 (73.15)*	168 (81.16)*	211 (83.73)*†	170 (93.41)*†‡&
DM type I or II, n(%)	4 (4.94)	20 (13.42)*	28 (13.53)*	44 (17.46)*	50 (27.47)*†‡&
Chronic kidney disease, n(%)	0 (0.0)	2 (1.34)	8 (3.86)	16 (6.35)*†	24 (13.19)*†‡&
Asthma or COPD, n(%)	5 (6.17)	3 (2.01)	4 (1.93)	14 (5.56)‡	14 (7.69) ‡
Cardiovascular disease, n(%)	35 (43.21)	100 (67.11)*	148 (71.5)*	212 (84.13)*†‡	160 (87.91)*†‡
Cardiovascular intervention, n(%)	32 (39.51)	96 (64.43)*	144 (69.57)*	202 (80.16)*†‡	156 (85.71)*†‡
Medication					
Antihypertensive drugs, n(%)	30 (37.04)	88 (59.06)*	148 (71.5)*†	199 (78.97)*†	158 (86.81)*†‡&
Lipid lowering drugs, n(%)	36 (44.44)	96 (64.43)*	163 (78.74)*†	220 (87.3)*†‡	164 (90.11)*†‡
Anti-thrombotic drugs, n(%)	35 (43.21)	106 (71.14)*	154 (74.4)*	216 (85.71)*†‡	163 (89.56)*†‡
Anti-diabetic drugs, n(%)	4 (4.94)	20 (13.42)*	23 (11.11)	36 (14.29)*	45 (24.73)*†‡&
Beta blockers, n(%)	14 (17.28)	61 (40.94)*	96 (46.38)*	150 (59.52)*†‡	121 (66.48)*†‡
CCB, n(%)	4 (4.94)	19 (12.75)	46 (22.22)*†	40 (15.87)*	45 (24.73)*†&
ACE or ARB, n(%)	26 (32.1)	61 (40.94)	106 (51.21)*	153 (60.71)*†‡	122 (67.03)*†‡
Diuretics, n(%)	2 (2.47)	16 (10.74)*	20 (9.66)*	29 (11.51)*	31 (17.03)*‡
Spirometry					
FEV ₁ , L	4.17 ± 0.52	3.82 ± 0.5*	3.44 ± 0.48*†	3.26 ± 0.54*†‡	2.84 ± 0.52*†‡&
FEV ₁ %predicted	104.7 ± 10.46	106.26 ± 11.39	103.27 ± 12.63†	102.81 ± 15.1†	96.79 ± 15.54*†‡&
FVC ₁ , L	5.29 ± 0.58	4.87 ± 0.61*	4.43 ± 0.61*†	4.26 ± 0.64*†‡	3.74 ± 0.63*†‡&
FVC %predicted	107.41 ± 8.38	108.07 ± 11.66	104.74 ± 12.07†	105.29 ± 13.21†	98.83 ± 13.7*†‡&
FEV ₁ /FVC (%)	97.51 ± 6.56	98.55 ± 5.51	98.82 ± 7.02	97.72 ± 8.63	98.07 ± 9.55
CPET data at rest					
HR (at rest), beats/min	71.4 ± 13.35	69.18 ± 12.38	70.43 ± 12.07	68.99 ± 12.46	70.09 ± 14.3

SBP (at rest), mm Hg	122.07 ± 18.5	126.45 ± 18.89	130.27 ± 19.87*	130.92 ± 19.1*†	130.73 ± 20.58*
DBP (at rest), mm Hg	79.52 ± 11.63	79.35 ± 10.94	80.29 ± 11.16	77.46 ± 11.24‡	75.45 ± 12.61*†‡
VO ₂ , mL/min	722.65 ± 131.22	635.73 ± 111.6*	602.15 ± 108.8*†	552.43 ± 103.21*†‡	463.09 ± 103.21*†‡&
PETO ₂ , mm Hg	105.86 ± 4.82	106.79 ± 5.31	107.34 ± 5.12*	108.25 ± 4.85*†	110.51 ± 5.08*†‡&
PETCO ₂ , mm Hg	35.92 ± 2.69	35.55 ± 3.03	34.78 ± 3.07*†	34.2 ± 3.15*†‡	32.85 ± 3.37*†‡&
RER	0.82 ± 0.09	0.83 ± 0.08	0.84 ± 0.09	0.84 ± 0.08	0.86 ± 0.08*†‡&
CPET data at peak					
Load, watt	273.27 ± 34.71	224.93 ± 25.05*	192.78 ± 19.86*†	164.96 ± 19.32*†‡	131.7 ± 22.75*†‡&
VO ₂ , ml/min	3192.86 ± 285.15	2564.76 ± 184.18*	2142.6 ± 116.59*†	1804.13 ± 118.46*†‡	1368.43 ± 188.41*†‡&
VO ₂ per kg, ml/kg/min	34.7 ± 8.0	28.79 ± 4.86*	24.96 ± 3.99*†	21.89 ± 3.6*†‡	17.71 ± 3.69*†‡&
VO ₂ percentage predicted, %	116.22 ± 15.21	102.34 ± 15.16*	92.56 ± 12.01*†	83.83 ± 12.7*†‡	68.95 ± 12.5*†‡&
HR, bpm	170.79 ± 15.33	156.34 ± 18.0*	146.11 ± 17.97*†	136.19 ± 20.32*†‡	125.28 ± 19.98*†‡&
HR percentage predicted, %	98.07 ± 7.09	93.14 ± 9.26*	90.5 ± 11.19*†	86.42 ± 12.72*†‡	81.48 ± 12.6*†‡&
O ₂ pulse, ml/beat	18.8 ± 2.04	16.63 ± 2.27*	14.88 ± 2.0*†	13.55 ± 2.21*†‡	11.14 ± 2.04*†‡&
O ₂ pulse/kg, ml/beat/kg	0.2 ± 0.04	0.19 ± 0.03*	0.17 ± 0.03*†	0.16 ± 0.03*†‡	0.14 ± 0.03*†‡&
SBP, mm Hg	192.73 ± 29.66	190.26 ± 28.43	187.18 ± 27.4	182.0 ± 25.5*†‡	173.46 ± 28.27*†‡&
VE, L/min	115.54 ± 20.61	97.57 ± 16.66*	84.72 ± 15.33*†	73.04 ± 12.75*†‡	59.46 ± 13.91*†‡&
VE/VCO ₂ slope	26.11 ± 2.93	27.5 ± 3.59*	28.59 ± 3.68*†	29.5 ± 4.21*†‡	31.39 ± 4.86*†‡&
PETO ₂ , mm Hg	113.83 ± 4.7	114.93 ± 4.48	115.29 ± 4.96*	115.5 ± 5.16*	116.57 ± 4.85*†‡&
PETCO ₂ , mm Hg	39.64 ± 3.87	38.87 ± 4.04	37.89 ± 4.11*†	37.27 ± 4.03*†	35.94 ± 4.09*†‡&
RER	1.15 ± 0.07	1.17 ± 0.07*	1.17 ± 0.08*	1.18 ± 0.08*	1.2 ± 0.1*†‡
Borg score	16.62 ± 1.32	16.15 ± 1.48*	15.84 ± 1.47*	15.81 ± 1.51*†	15.34 ± 1.69*†‡&

Data are presented as mean ± SD or number of subjects (%). Significance for between-phenogroups differences: *P<0.05 vs Cluster 1; †P<0.05 vs Cluster 2; ‡P<0.05 vs Cluster 3; &P<0.05 vs Cluster 4. BMI, body mass index; CPET, cardiopulmonary exercise testing; DM, Diabetes mellitus; COPD, chronic obstructive pulmonary disease; CCB, Calcium channel blocker; ACE, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blocker; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; CV, cardiovascular; FEV1, forced expiratory volume in 1 s; FVC, forced vital capacity; HR, heart rate; PETO₂, end-tidal partial pressure of oxygen; PETCO₂, end-tidal partial pressure of carbon dioxide; RER, respiratory exchange ratio; SBP, systolic blood pressure; VCO₂, rate of carbon dioxide produced; VE, minute ventilation; VE/VCO₂ slope, ventilatory efficiency; VO₂, rate of oxygen uptake.

Supplemental Table S3: Clinical characteristics of women in the training cohort (iCOMPEER) per cluster.

	Cluster 1 (n=40)	Cluster 2 (n=89)	Cluster 3 (n=158)	Cluster 4 (n=144)	Cluster 5 (n=97)
Anthropometrics					
Age, y	37.94 ± 11.03	45.34 ± 10.73*	49.95 ± 12.17*†	56.48 ± 11.71*†‡	62.89 ± 10.98*†‡&
Weight, kg	85.03 ± 17.39	81.46 ± 16.36	75.09 ± 16.5*†	71.43 ± 12.54*†‡	67.92 ± 12.14*†‡&
Height, cm	170.65 ± 6.78	168.37 ± 6.56	164.1 ± 5.76*†	161.93 ± 6.13*†‡	160.42 ± 6.37*†‡
Body mass index, kg/m ²	29.29 ± 6.1	28.91 ± 6.51	27.97 ± 6.35	27.26 ± 4.68*†	26.49 ± 5.05*†
Medical history					
Hypertension, n(%)	7 (17.5)	35 (39.33)*	79 (50.0)*	90 (62.5)*†‡	83 (85.57)*†‡&
DM type I or II, n(%)	3 (7.5)	2 (2.25)	13 (8.23)	13 (9.03)†	15 (15.46)†
Chronic kidney disease, n(%)	0 (0.0)	0 (0.0)	7 (4.43)†	6 (4.17)	10 (10.31)*†
Asthma or COPD, n(%)	0 (0.0)	2 (2.25)	8 (5.06)	12 (8.33)	4 (4.12)
Cardiovascular disease, n(%)	2 (5.0)	12 (13.48)	43 (27.22)*†	61 (42.36)*†‡	66 (68.04)*†‡&
Cardiovascular intervention, n(%)	0 (0.0)	7 (7.87)	36 (22.78)*†	53 (36.81)*†‡	60 (61.86)*†‡&
Medication					
Antihypertensive drugs, n(%)	4 (10.0)	26 (29.21)*	64 (40.51)*	76 (52.78)*†‡	74 (76.29)*†‡&
Lipid lowering drugs, n(%)	0 (0.0)	14 (15.73)*	51 (32.28)*†	76 (52.78)*†‡	66 (68.04)*†‡&
Anti-thrombotic drugs, n(%)	1 (2.5)	13 (14.61)*	48 (30.38)*†	74 (51.39)*†‡	65 (67.01)*†‡&
Anti-diabetic drugs, n(%)	3 (7.5)	4 (4.49)	15 (9.49)	14 (9.72)	13 (13.4)†
Beta blockers, n(%)	2 (5.0)	13 (14.61)	49 (31.01)*†	63 (43.75)*†‡	63 (64.95)*†‡&
CCB, n(%)	1 (2.5)	4 (4.49)	20 (12.66)†	23 (15.97)*†	23 (23.71)*†‡
ACE or ARB, n(%)	2 (5.0)	16 (17.98)*	34 (21.52)*	47 (32.64)*†‡	52 (53.61)*†‡&
Diuretics, n(%)	1 (2.5)	10 (11.24)	15 (9.49)	19 (13.19)	17 (17.53)*
Spirometry					
FEV ₁ , L	3.17 ± 0.37	2.87 ± 0.39*	2.61 ± 0.39*†	2.44 ± 0.38*†‡	2.07 ± 0.33*†‡&
FEV ₁ %predicted	102.14 ± 8.45	99.57 ± 11.92	101.68 ± 13.35	104.5 ± 14.31†	101.91 ± 17.11
FVC ₁ , L	3.9 ± 0.53	3.57 ± 0.47*	3.31 ± 0.53*†	3.14 ± 0.51*†‡	2.76 ± 0.36*†‡&
FVC %predicted	106.84 ± 9.53	104.78 ± 10.97	107.35 ± 14.27	110.59 ± 14.93†	109.73 ± 15.7†
FEV ₁ /FVC (%)	96.04 ± 6.81	95.01 ± 5.59	95.14 ± 6.73	94.84 ± 6.81	92.82 ± 9.36†
CPET data at rest					
HR (at rest), beats/min	77.75 ± 16.59	80.15 ± 14.01	78.41 ± 14.38	76.15 ± 13.69†	74.02 ± 14.98†‡

SBP (at rest), mm Hg	111.02 ± 14.54	116.02 ± 17.81	119.9 ± 18.64*	124.01 ± 20.08*†	131.25 ± 24.09*†‡&
DBP (at rest), mm Hg	74.3 ± 10.79	77.8 ± 11.24	76.01 ± 11.06	77.62 ± 10.52	76.6 ± 13.1
VO ₂ , mL/min	591.48 ± 110.03	549.66 ± 123.1	475.32 ± 91.67*†	426.2 ± 82.73*†‡	374.28 ± 79.29*†‡&
PETO ₂ , mm Hg	106.4 ± 4.93	107.6 ± 5.12	107.25 ± 4.97	107.79 ± 5.54	109.64 ± 5.37*†‡&
PETCO ₂ , mm Hg	34.7 ± 2.8	34.31 ± 3.04	34.3 ± 3.22	34.16 ± 3.21	33.0 ± 3.77*†‡&
RER	0.79 ± 0.09	0.8 ± 0.08	0.8 ± 0.07	0.81 ± 0.08	0.84 ± 0.09*†‡&
CPET data at peak					
Load, watt	195.0 ± 20.86	160.28 ± 22.16*	134.18 ± 20.95*†	109.83 ± 16.98*†‡	85.77 ± 20.34*†‡&
VO ₂ , ml/min	2203.7 ± 173.59	1770.01 ± 132.92*	1458.06 ± 104.17*†	1207.46 ± 91.15*†‡	934.37 ± 110.37*†‡&
VO ₂ per kg, ml/kg/min	27.05 ± 6.13	22.57 ± 4.63*	20.35 ± 4.65*†	17.4 ± 3.18*†‡	14.13 ± 2.66*†‡&
VO ₂ percentage predicted, %	115.41 ± 12.29	99.3 ± 10.55*	89.22 ± 11.73*†	79.4 ± 10.25*†‡	66.8 ± 10.13*†‡&
HR, bpm	173.4 ± 14.47	162.63 ± 19.78*	152.6 ± 20.22*†	142.67 ± 22.99*†‡	124.8 ± 24.04*†‡&
HR percentage predicted, %	95.31 ± 6.64	93.06 ± 9.54	89.72 ± 10.01*†	87.21 ± 12.45*†	79.51 ± 14.66*†‡&
O ₂ pulse, ml/beat	12.77 ± 1.15	11.02 ± 1.4*	9.72 ± 1.42*†	8.69 ± 1.6*†‡	7.76 ± 1.71*†‡&
O ₂ pulse/kg, ml/beat/kg	0.16 ± 0.03	0.14 ± 0.03*	0.13 ± 0.03*	0.12 ± 0.02*†‡	0.12 ± 0.03*†‡&
SBP, mm Hg	156.45 ± 20.62	164.74 ± 28.11	164.18 ± 29.38	163.4 ± 29.69	162.2 ± 27.15
VE, L/min	76.39 ± 11.62	64.18 ± 9.92*	54.64 ± 9.03*†	48.48 ± 8.45*†‡	38.22 ± 7.46*†‡&
VE/VCO ₂ slope	26.38 ± 3.71	26.85 ± 3.61	28.2 ± 4.31*†	28.92 ± 4.45*†	31.26 ± 4.33*†‡&
PETO ₂ , mm Hg	113.06 ± 4.91	114.68 ± 4.33	114.68 ± 4.41*	115.83 ± 4.98*†	115.42 ± 4.54*
PETCO ₂ , mm Hg	39.84 ± 3.88	38.72 ± 3.76	37.85 ± 4.16*	37.22 ± 3.94*†	36.02 ± 4.0*†‡&
RER	1.14 ± 0.06	1.16 ± 0.07	1.16 ± 0.08	1.18 ± 0.1*†	1.15 ± 0.09&
Borg score	16.48 ± 1.94	16.45 ± 1.56	16.29 ± 1.57	15.77 ± 1.69*†‡	15.4 ± 1.56*†‡

Data are presented as mean ± SD or number of subjects (%). Significance for between-phenogroups differences: *P<0.05 vs Cluster 1; †P<0.05 vs Cluster 2; ‡P<0.05 vs Cluster 3; &P<0.05 vs Cluster 4. BMI, body mass index; CPET, cardiopulmonary exercise testing; DM, Diabetes mellitus; COPD, chronic obstructive pulmonary disease; CCB, Calcium channel blocker; ACE, angiotensin-converting enzyme inhibitors; ARB, angiotensin receptor blocker; HR, heart rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; CV, cardiovascular; FEV1, forced expiratory volume in 1 s; FVC, forced vital capacity; HR, heart rate; PETO₂, end-tidal partial pressure of oxygen; PETCO₂, end-tidal partial pressure of carbon dioxide; RER, respiratory exchange ratio; SBP, systolic blood pressure; VCO₂, rate of carbon dioxide produced; VE, minute ventilation; VE/VCO₂ slope, ventilatory efficiency; VO₂, rate of oxygen uptake.

Supplemental Table S4: Reasons for CPET referral and the exclusion criteria in the training cohort (iCOMPEER).

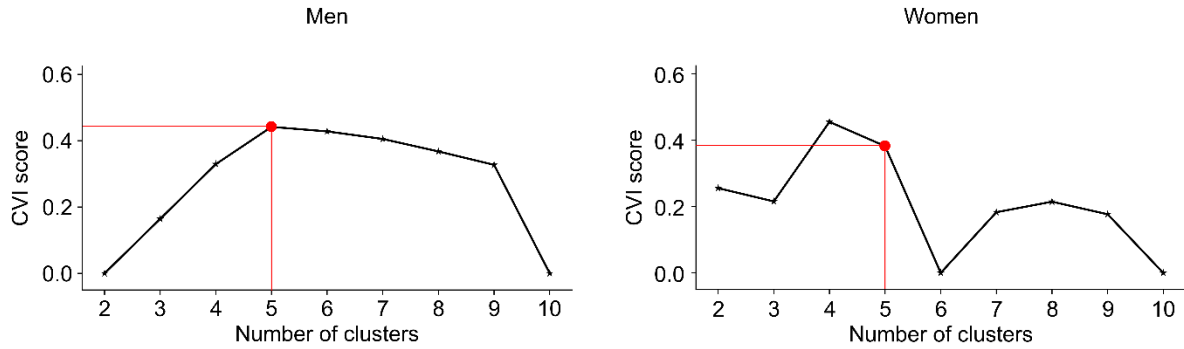
Reasons for referral	Recent revascularisation including PCI CV risk assessment in hypertension, obesity and/or diabetes mellitus Screening before participating in an exercise programme Differential diagnosis of dyspnoea, chronic fatigue syndrome, other exercise-limiting condition
Exclusion criteria	Age < 18 and age > 80 Previous myocardial infarction with left ventricular ejection fraction < 50% Symptomatic heart failure, congenital heart disease, cardiomyopathy, cardiac surgery, artificial pacemaker Auto-immune disease, drug abuse, pregnancy Non-compliance to maximal CPET criteria (VT_2 not reached and/or $RER < 1.05$)

Supplemental Table S5: Formulas used to calculate peak CPET summary metrics

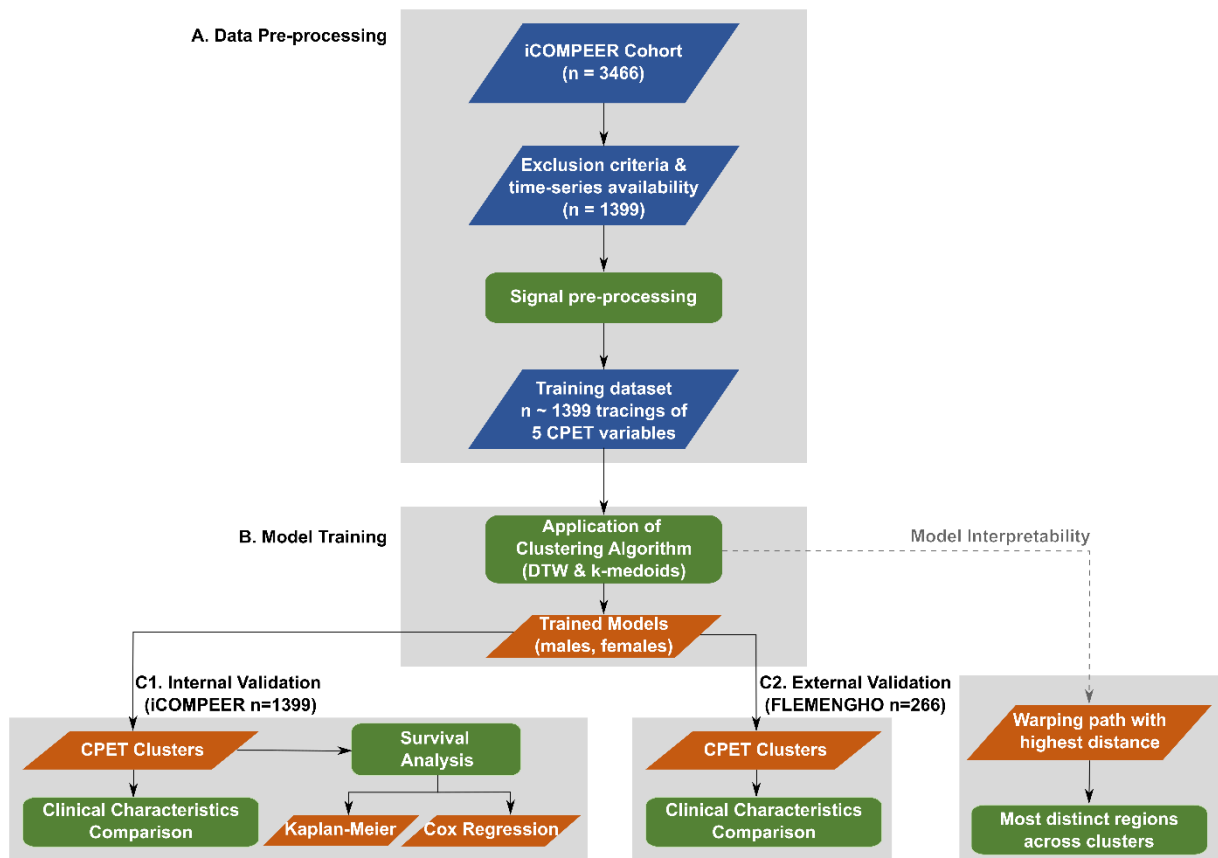
Summary CPET metrics at peak	Formula
O ₂ pulse (ml/beat)	$\frac{VO_2(peak)}{HR(peak)}$
HR percentage predicted	$100 \times \frac{HR}{220 - age}$
Predicted VO ₂ ¹	men: $-69 + 1.48 \times age + 14.02 \times height + 7.44 \times weight - 0.2256 \times age^2$ women: $-588 - 11.33 \times age + 9.13 \times height + 26.88 \times weight - 0.12 \times weight^2$
VO ₂ percentage predicted	$100 \times \frac{VO_2(peak)}{predicted\ VO_2}$

Supplemental Figure S1: Optimal number of clusters based on the selected cluster validity index (CVI). Left panel illustrates the score for each cluster for men and the right panel for women. Red dot in both panels represents the selected value and the respective score

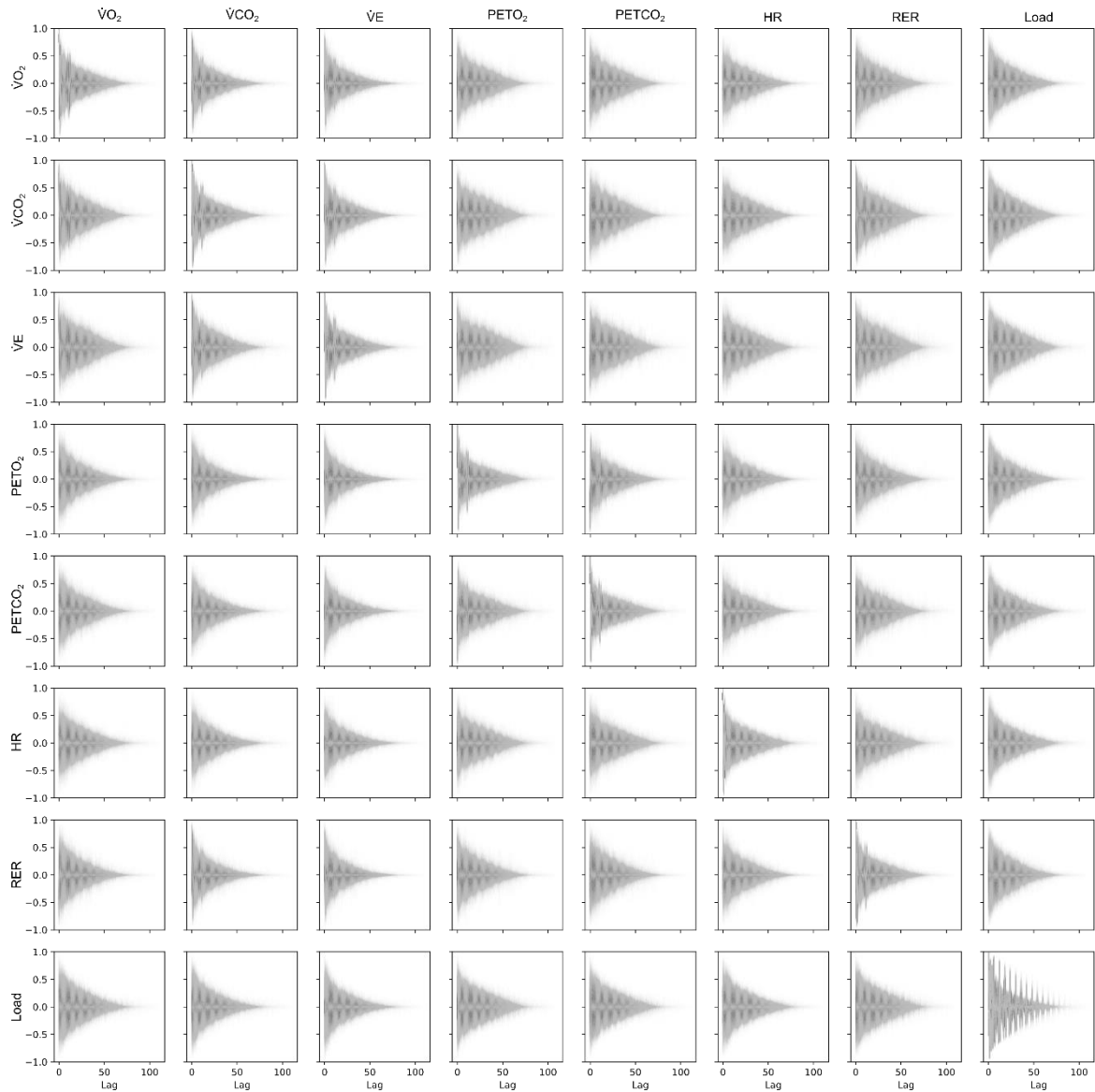
Cluster validity index scores to determine optimal number of clusters



Supplemental Figure S2: Overview of the computational pipeline. Blue and orange parallelograms illustrate the input data and the results of the processing steps respectively. Green rectangles indicate the processing steps, while the flow of the steps are represented by the black arrows



Supplemental Figure S3: Cross-correlation of time series CPET recordings with respect to all potential lags (temporal shifts). Each row and column corresponds to a specific CPET variable with the main diagonal showing the autocorrelation of the investigated parameters. In each sub-figure the x-axes show the time lag of the time series. We observed a higher correlation between $\dot{V}O_2$, $\dot{V}CO_2$, $\dot{V}E$ at small time-lags (or at zero time lag) and between RER and $\dot{V}CO_2$ for zero or small time lags.



Supplemental Figure S4: Spearman's cross-correlation table for zero temporal lag. $\dot{V}O_2$ shows strong correlation with $\dot{V}CO_2$ and $\dot{V}E$.

