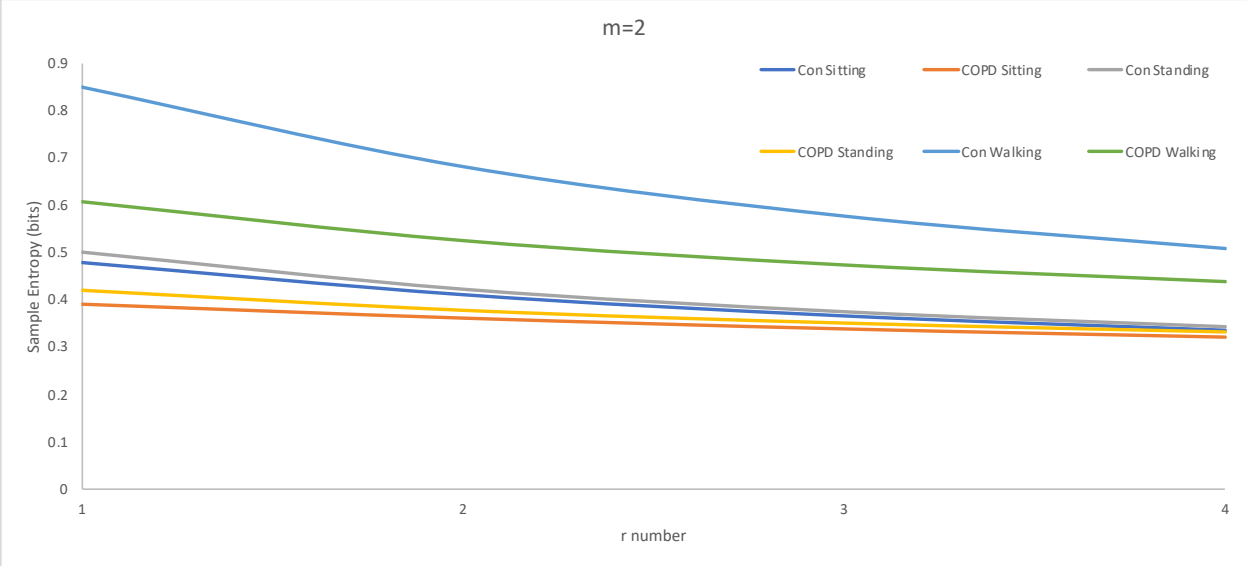
COPD patients have a restricted breathing pattern that persists with increased metabolic demands

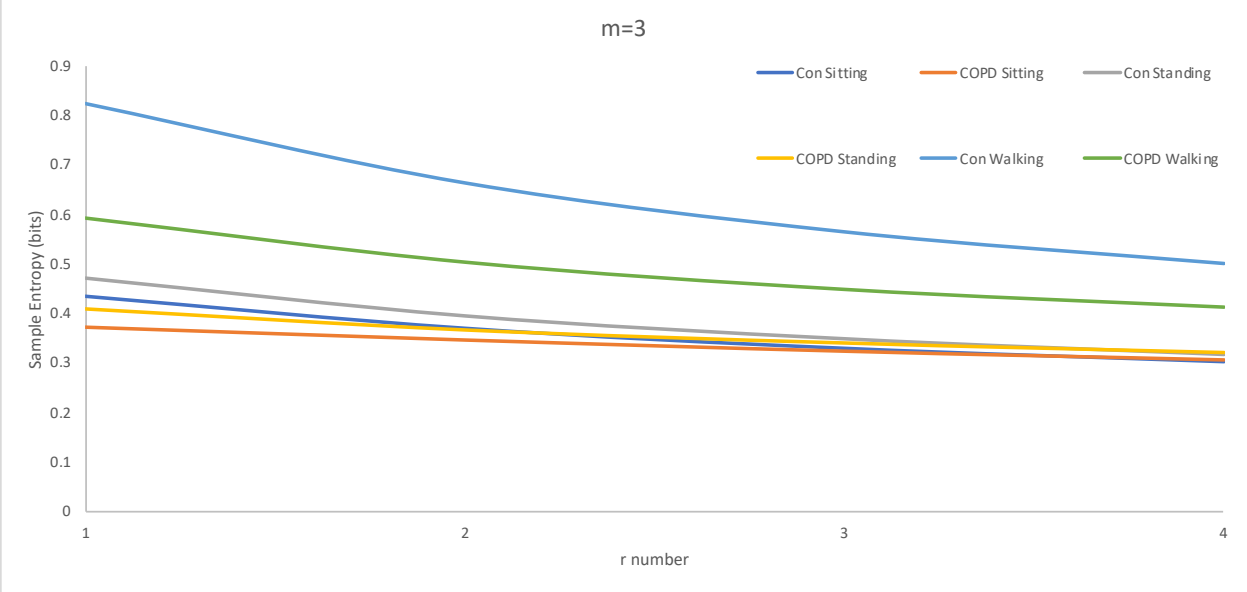
Supplemental Data

Supplemental Figures 1: Determining parameters for sample entropy

Airflow data were down sampled by 5, giving a time series of 5 Hz. Data were subjected to sample entropy analysis using a spread of parameters to determine relative consistency of the results. Parameters used were m of 2 (top) and 3 (bottom), r of 0.15, 0.20, 0.25, and 0.30. N was set at 1200. Results determined that relative consistency of directional differences between conditions was not reliable when m=3 for sitting and standing conditions. Therefore, only r values with an m=2 were considered.

Note: along the x-axis, 1-4 represent r of 0.15, 0.20, 0.25, and 0.30, respectively.





Supplemental Figure 2: Determining steady state VO2

In order to determine steady state, VO2 vs time was plotted for each subject and condition. A sliding window representing 2-minutes of data was used across the entire plot, incrementing the window by one second with each increment. The average VO2 of the 2-minute window that had a slope closest to zero was determined to be steady state. The selection for a representative patient with COPD can be seen in Figure 1. The range is indicated by the dotted lines and the slope is represented as the solid line between the two asterisks.

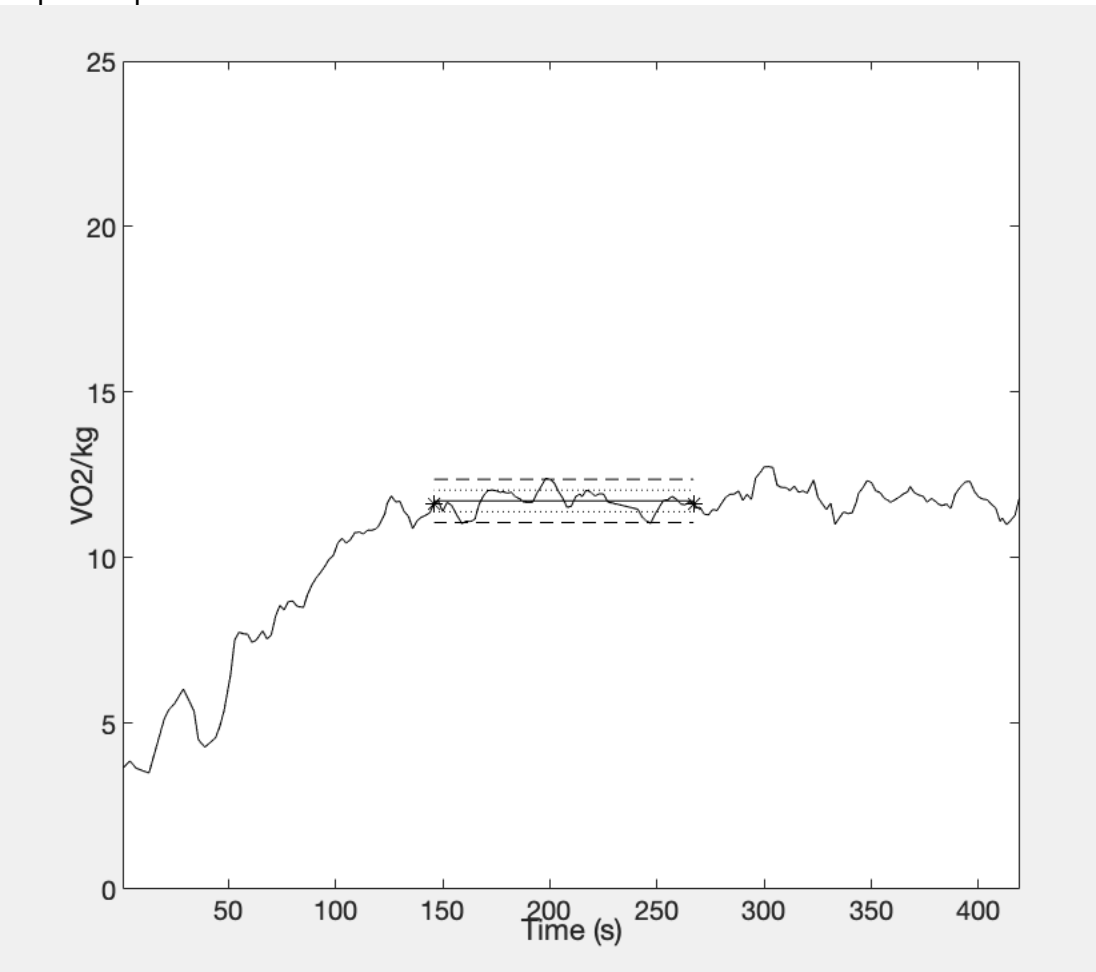


Figure 1. Representative COPD subject

Supplemental Figure 3: VO2 vs entropy

Patients with COPD are shown in white and controls are shown in gray. VO_2 is plotted along the x-axis while entropy is plotted along the y-axis. Seated (circles), standing (square), and walking (diamond) data are plotted.

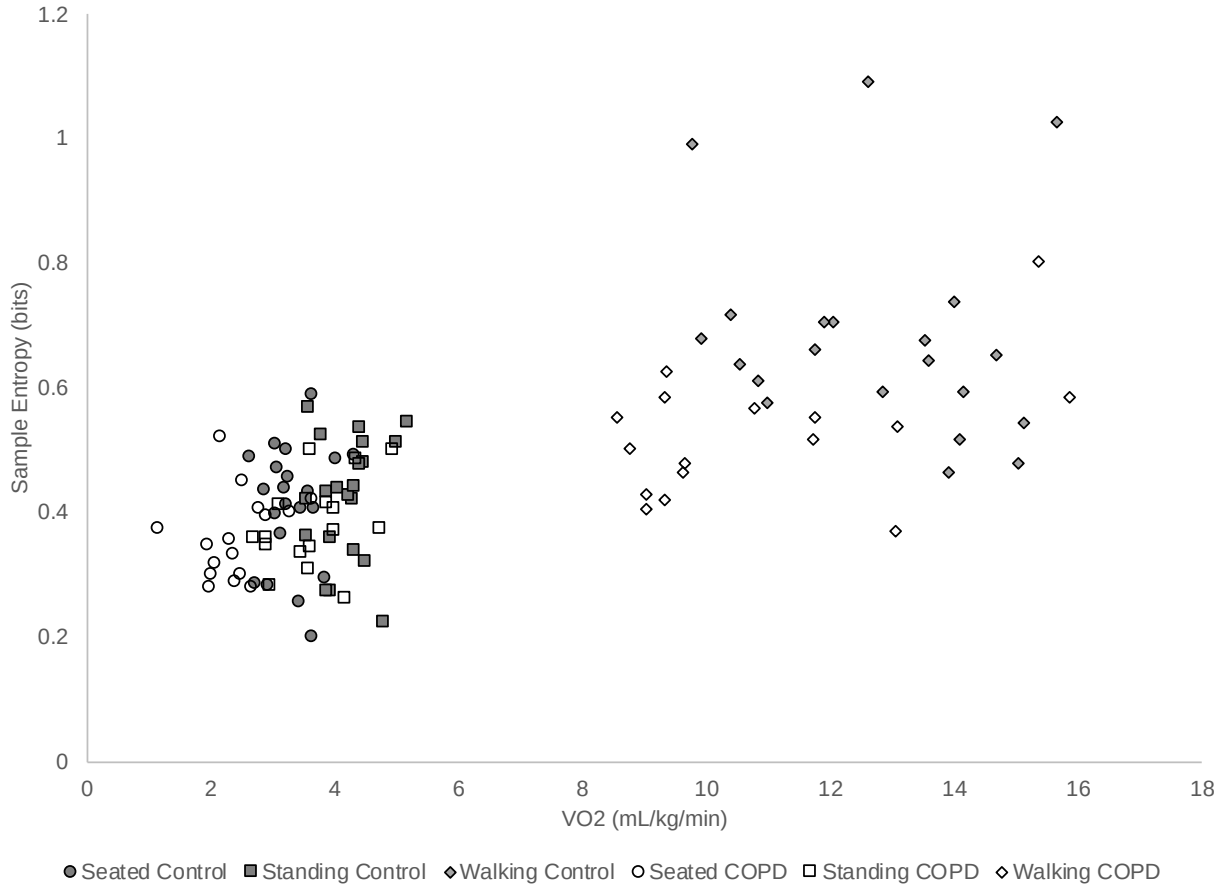


Table 1. Pearson correlations (r-value) and significance (p-value) between VO2 and sample entropy. An orange highlight indicates a moderate correlation.

	Seated		**Standing**		**Walking**	
	r	p	r	p	r	p
All subjects	.29	.09	.32	.05	.25	.14
Control only	.07	.75	.13	.57	-.17	.45
COPD only	.25	.35	.41	.12	.45	.08

Supplemental Figure 4: FEV_1 vs entropy

Patients with COPD are shown in white and controls are shown in gray. FEV1 is plotted along the x-axis while entropy is plotted along the y-axis. Seated (circles), standing (square), and walking (diamond) data are plotted.

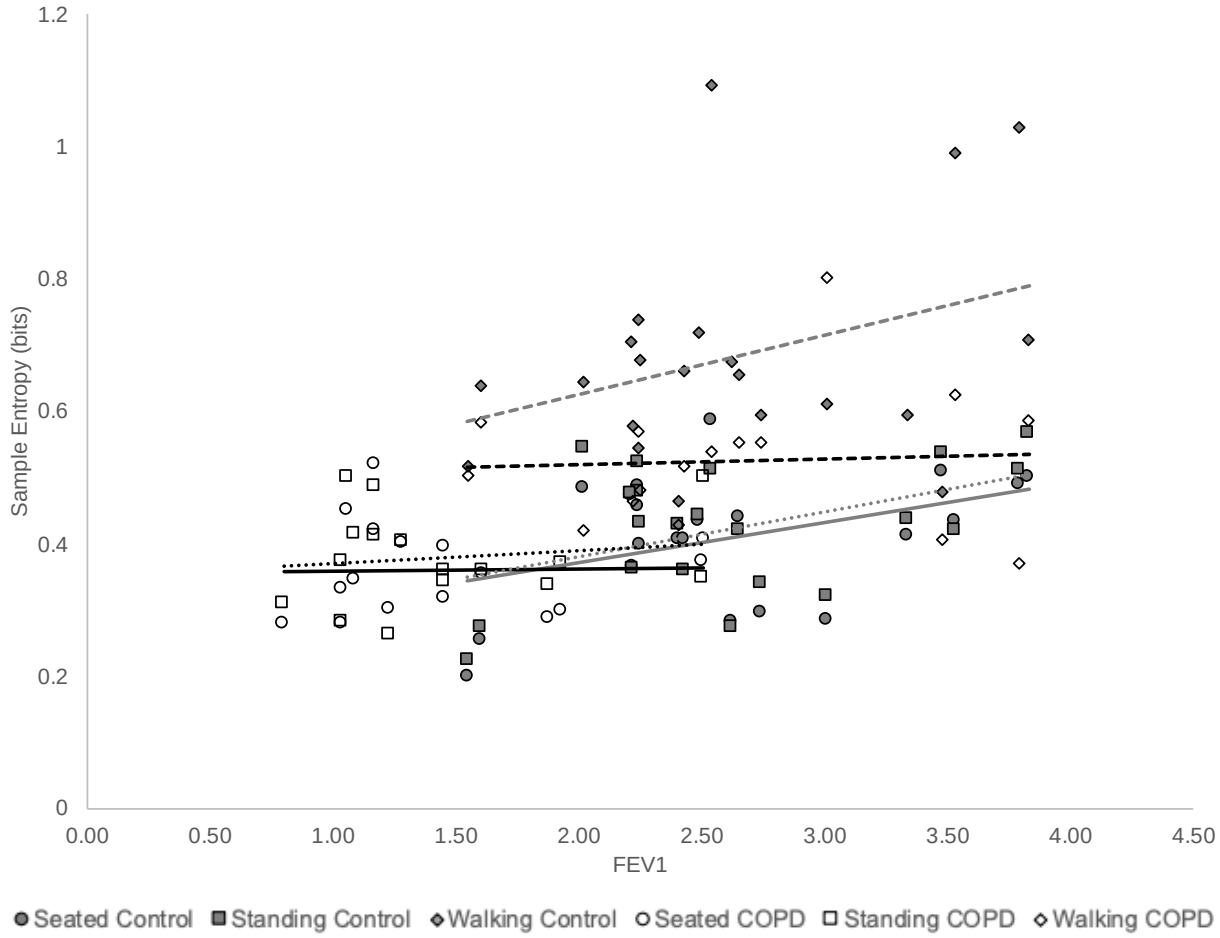


Table 2. Pearson correlations (r-value) and significance (p-value) between FEV_1 and sample entropy. An orange highlight indicates a moderate correlation.

	Seated		**Standing**		**Walking**	
	r	p	r	p	r	p
All subjects	.40	**.02**	.42	**.01**	.54	**.001**
Control only	.41	.07	.45	**.04**	.35	.12
COPD only	.02	.94	.14	.60	.21	.45

Supplemental Figure 5: Interbreath interval variability vs entropy

Patients with COPD are shown in white and controls are shown in gray. FEV1 is plotted along the x-axis while entropy is plotted along the y-axis. Seated (circles), standing (square), and walking (diamond) data are plotted.

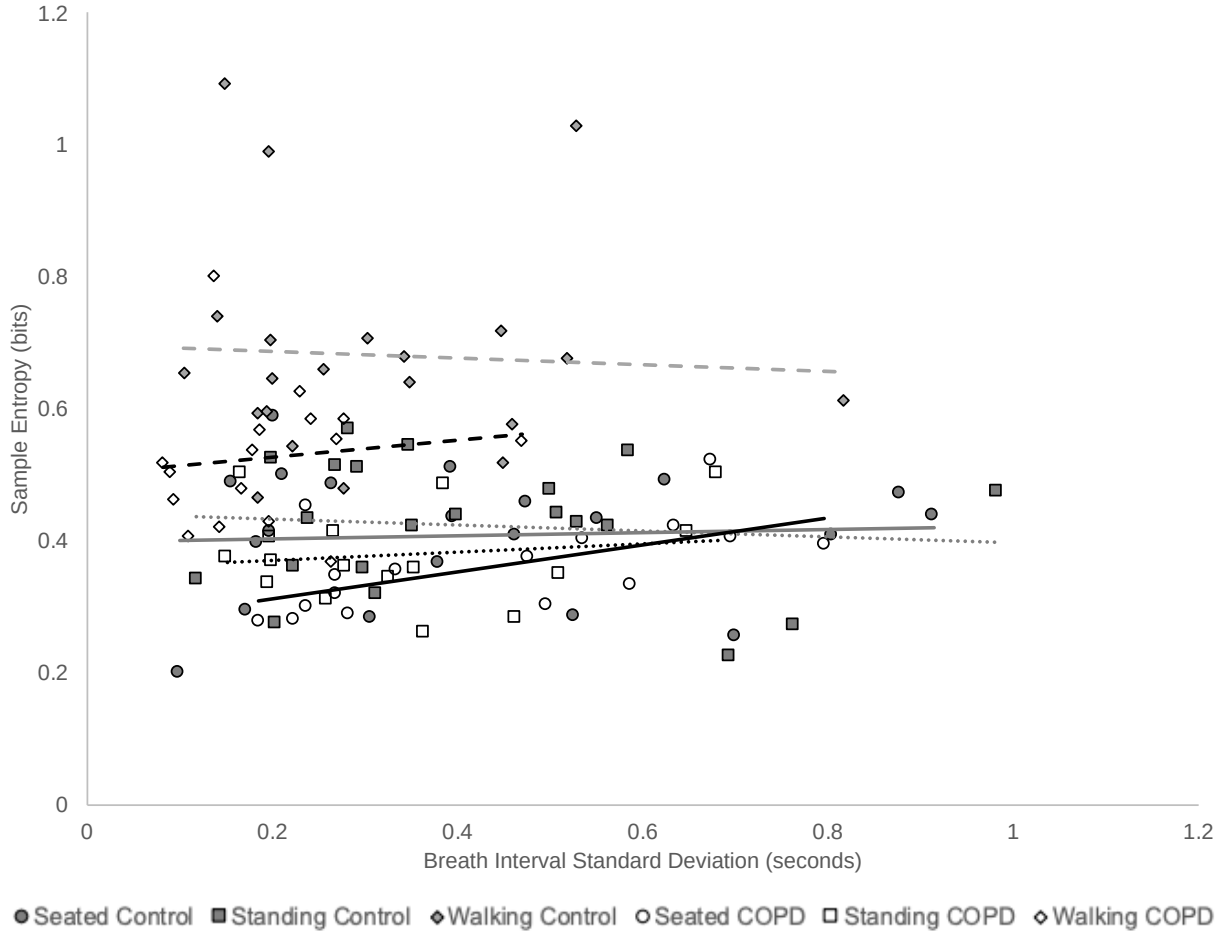


Table 3. Pearson correlations (r-value) and significance (p-value) between variability and sample entropy. An orange indicates a moderate correlation.

	Seated		**Standing**		**Walking**	
	r	p	r	p	r	p
All subjects	.21	.22	.02	.90	.17	.32
Control only	.06	.79	-.09	.68	-.05	.82
COPD only	.60	**.02**	.14	.61	.13	.64