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Title: The relationship between long-term correlations (self-similarity) in PEF and FEV₁ in COPD

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Body: Introduction: Detrended fluctuation analysis (DFA) quantifies the rate of decay in self-correlation in a time series with an exponent “alpha” that is related to COPD exacerbation frequency. The relationship between α of different spirometric parameters in the same individual on the same days is not known. Methods: We examined data from the London COPD cohort on 28 COPD patients who had recorded both FEV₁ and FVC and PEF on daily diary cards for 300 days. Measurements were made after medication in the morning. At recruitment, these patients had a mean age (SD) 65.3 (9.3) years; FEV₁ 1.08 (0.36) l, FEV₁ % predicted 37.3 (14.1), FEV₁/FVC ratio 0.43 (12.8). DFA has been described (Frey et al Nature. 438: 667-70, 2005). The analysis was also repeated with data collected during exacerbations removed Results: The patients had an α of 0.97 (SD 0.22) for PEF, 0.93 (0.22) for FEV₁ and 0.95 (0.23) for FVC. No differences was seen in any of the estimates ($p>0.24$). Figure 1 illustrates the relationship between alpha for FEV₁ and PEF ($r=0.69$; $p<0.001$). There was no significant difference if data collected during exacerbation data were excluded, PEF α was 0.95 (SD 0.19); FEV₁ α = 0.95 (0.19) and FVC α = 0.97 (SD 0.20). Conclusion: In COPD patients, long-term correlations (self-similarity) exist in daily FEV₁, FVC and PEF. The estimates of α are similar and linearly related to each other.