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Long-time Correlations in Electromyography Signals ULRICH ZURCHER, RACHEL MAYNARD, Physics Department, Cleveland State University — We have previously reported that the mean-square displacement calculated from electromyography time series of low back muscles exhibit a plateau-like behavior for intermediate times [$50\,\mathrm{ms} < t < 0.5\,\mathrm{s}$], so that $\langle [x_t - x_0]^2 \rangle \sim t^0$. This behavior is unexpected, and indicates the presence of long-time correlations in the signal. For fractal Brownian motion, the Hurst exponent calculated from the mean-square displacement and the exponent from the spectral density $P(f) \sim 1/f^\alpha$, $\alpha = 2H + 1$. For the EMG time series $y_i^0 = x_i$, we have generated iterated time series, $y_i^{n+1} = [y_{2i}^n + y_{2i+1}]/2$, and have calculated the corresponding time correlation functions, $C^n(t) = \langle x_{i+t}^n x_i^n \rangle \,/\, \langle (x_i^n)^2 \rangle$. We find that the correlation functions converge to a simple limit, $C(0) = 1$, $C(1) = -0.5$ and $C(n) = 0$ for $n \geq 2$. This limit is consistent with the plateau behavior of the mean- square displacement. We discuss the connection between the behavior of the iterated correlation functions and the properties of the spectrum.

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