**Supporting information**

**S1 Appendix. Mathematical derivation demonstrating the relationship between linear regression and autocorrelation approaches.**

The linear regression and autocorrelation approaches to measuring motor adaptation are closely related as shown in this mathematical derivation.

Autocorrelation

The general expression for the autocorrelation function for a lag of $τ$ samples is

$Φ\_{xx}\left(τ\right)= \frac{E\left[\left(x\left(t\right)\right)(x\left(t+τ\right)))\right]}{σ\_{x}^{2}}$, [S1]

where $σ\_{x}^{2}$ is the variance of all movement endpoints, x(t) is the movement endpoint at trial t, and x(t+τ) is the movement endpoint at the τth trial following trial t (lag τ). In discrete time, the time index is expressed in samples: $x\_{i}≡x(iT\_{s})$, where $T\_{s}$ is the sampling period, and the first lag is

$Φ\_{x}\left(1\right)= \frac{E\left[\left(x\_{i}\right)(x\_{i+1})\right]}{σ\_{x}^{2}}$. [S2]

Since $cov\left(x\_{i},x\_{i+1} \right)=E\left[x\_{i}x\_{i+1}\right]-μ\_{x}^{2}$, we arrive at

$Φ\_{x}\left(1\right)=\frac{cov\left(x\_{i},x\_{i+1}\right)}{σ\_{x}^{2}}+\frac{μ\_{x}^{2}}{σ\_{x}^{2}}$, [S3]

where µx is the mean of all movement endpoints.

Linear Regression

The general expression for the linear regression is $Y=aX+b$ where *X* is used to predict *Y*. The regression analysis provides the slope *a* and the y-intercept *b.* This is usually solved using a mean-square error criterion. With this criterion, the solution may be expressed probabilistically as

$E\left[X\right]=aX+b$ [S4]

where $E\left[X\right]$ is the expected value of *Y* given *X.* The parameter of interest is *a* which is the regression slope. The mean square error solution for *a* is

$a=\frac{E\left[X\right]E\left[Y\right]- μ\_{X}μ\_{Y}}{σ\_{X}^{2}}$ [S5]

Here, $X=Err\_{i}$ and $Y=ΔErr\_{i}$ so that

$a=K\_{r}=\frac{E\left[Err\_{i} \right]E\left[ΔErr\_{i}\right]- μ\_{Err\_{i}}μ\_{ΔErr\_{i}}}{σ\_{Err\_{i}}^{2}}$ [S6]

The product of the error means $μ\_{Err\_{i}}μ\_{ΔErr\_{i}}$approaches zero for steady-state data, so we simplify *Kr* as

$K\_{r}=\frac{cov\left(Err\_{},ΔErr\_{i}\right)}{σ\_{Err}^{2}}=\frac{cov\left(Err\_{i+1},Err\_{i}\right)}{σ\_{Err}^{2}}-\frac{cov\left(Err\_{i},Err\_{i}\right)}{σ\_{Err}^{2}}=\frac{cov\left(Err\_{i+1},Err\_{i}\right)}{σ\_{Err}^{2}}-1$ [S7]

which further simplifies to:

$K\_{r}=\frac{cov\left(x\_{i+1},x\_{i}\right)}{σ\_{x}^{2}}-1$ [S8]

Autocorrelation and linear regression comparison

Comparing Eq. S3 with Eq. S8, we see that the expressions for ACR(1) and *Kr* for steady-state data differ only by a shift. We can summarize this relationship as

  $K\_{r}=ACR\left(1\right)-1-\frac{μ\_{x}^{2} }{σ\_{x}^{2}}$. [S9]