**Supplemental Text (Power et al. 2014)**

Here, we elaborate on several points of the text. 1) we provide more detailed information regarding our interpolation approach. 2) we provide a more thorough description of the analyses that demonstrate that improvements in QC measures over stages of processing can be superficial. 3) we provide a more through description of the analyses that link QC values to quantitative assessments of within-subject changes in correlation.

**1. Methods: Interpolation using temporal masks:** To obtain the frequency content of uncensored data, we apply a least squares spectral analysis adapted for non-uniformly sampled data, as described in [Mathias, 2004]. The method is based on the Lomb-Scargle periodogram [Lomb, 1976].

Consider a time series **x** = (x0,x1,…,xn-1) sampled at nonuniform times **t**=(t0,t1,…,tn-1). Then for any given frequency we can make the following approximation:

Let

Then we can derive -1, which in its expanded form is

The power of the frequency in **x** is . However, , are non-zero since and are not orthogonal when time is non-uniformly sampled. Consequently, the approach described above requires matrix inversion. Matrix inversion, following the Lomb-Scargle technique, is applied by using a time shift θ of the series to make the vectorsand orthogonal for each , which greatly simplifies the math. Substituting these time shifted expressions into (2), we have

.

We can calculate in this manner for a set of frequencies . Once we have done that calculation, we can construct an estimate of the original time series **x**, call it **xest,** from the original least squares approximation:

Notice that the time indices for need not be the same as those for .

Here is the reference table of variable names:

|  |  |
| --- | --- |
| Notation in supplementary | Notation in code |
|  | in\_series(k, :), “:” denotes all voxels |
|  | out\_series(k, :), “:” denotes all voxels |
|  | in\_sample\_time(k) |
|  | out\_sample\_time(i) |
|  |  |
|  | cos\_coeff |
|  | sin\_coeff |