# Supplementary Data

### Note on the Intraclass Correlation

The variance ratio used can be found in Shrout and Fleiss (1979) labeled as intraclass correlation coefficient [ICC (1,1)].

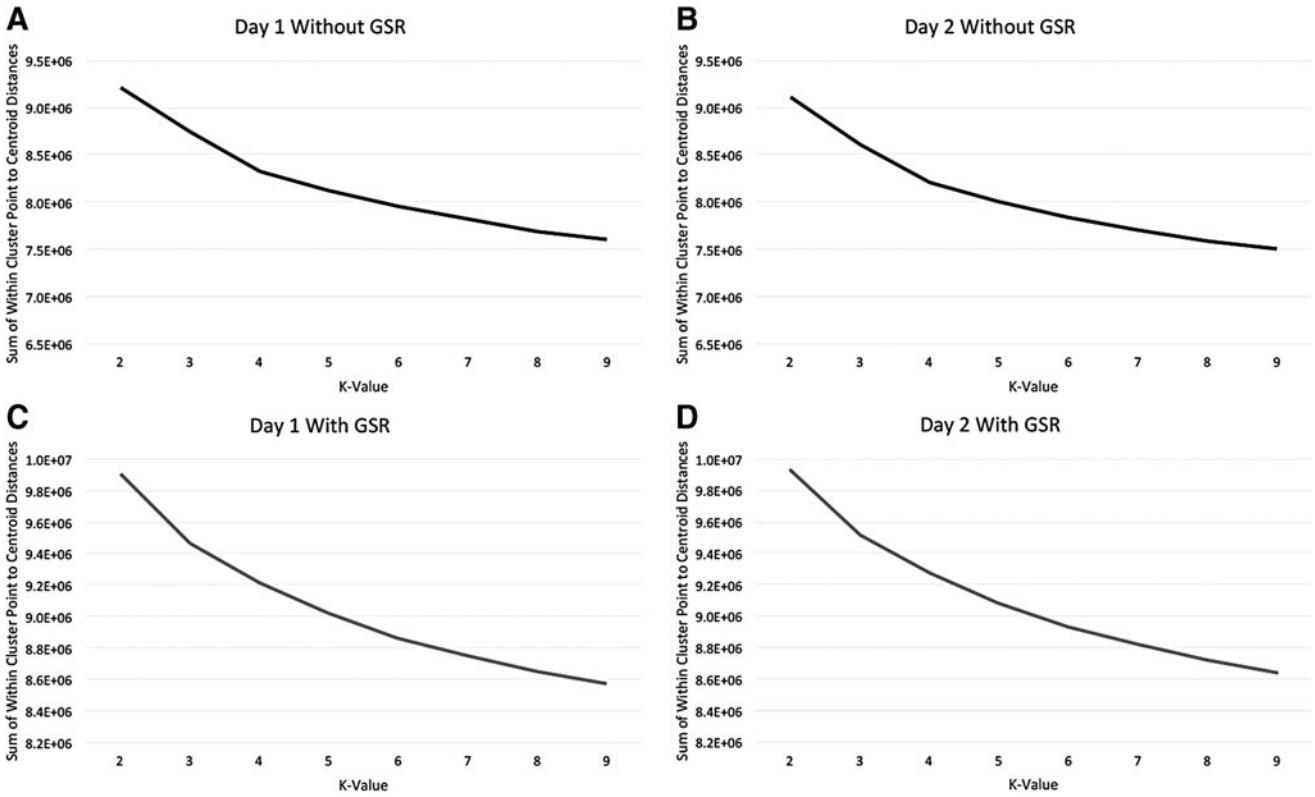
### Supplementary *Post Hoc* Comparisons

*Differences in global signal regression for the time frames of brain states derived before the application of global signal regression*

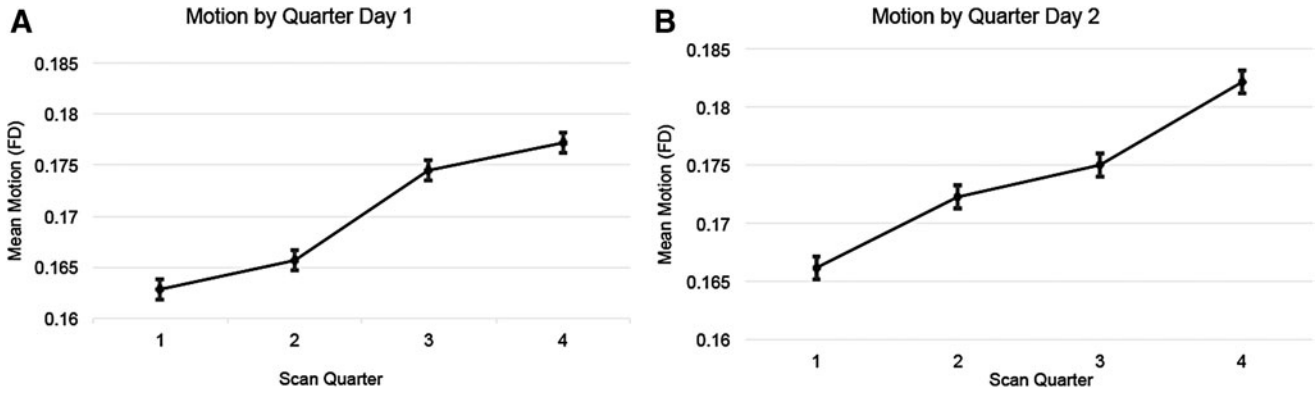
To account for multiple comparisons, a Bonferroni-corrected alpha of 0.0083 applied to each set of tests. For both sessions, the only difference between the average global signal for States 1 and 2 was not significant, $t(99) = 0.916$, $p = 0.362$. During the first session, both mean global signals for State 1, $t(99) = 23.362$, $p < 0.001$, and State 2, $t(99) = 25.159$, $p < 0.001$, were significantly greater than the mean global signal for State 3. State 1, $t(99) = -29.546$, $p < 0.001$, State 2, $t(99) = -26.390$, $p < 0.001$, and State 3, $t(99) = -27.533$, $p < 0.001$, all had mean global signal significantly less than State 4. The same pattern of significant differences was found for the second session's brain states [State 1 vs. 2, $t(99) = 2.245$, $p = 0.027$; State 1 vs. 3, $t(99) = 20.496$, $p < 0.001$; State 1 vs. 4, $t(99) = -25.216$, $p < 0.001$; State 2 vs. 3, $t(99) = 21.102$, $p < 0.001$; State 2 vs. 4, $t(99) = -23.645$, $p < 0.001$; State 3 vs. 4, $t(99) = -23.241$, $p < 0.001$].

*Differences in global signal regression for the time frames of brain states derived after the application of global signal regression*

For the first session, preregression mean global signal was greater for State 1 than State 2, $t(99) = 3.605$, $p < 0.001$, State 3, $t(99) = 5.544$, $p < 0.001$, and State 4, $t(99) = 4.743$, $p < 0.001$. State 2 was significantly greater than State 3, $t(99) = 4.991$, $p < 0.001$, and State 3's mean global signal was significantly less than State 4's, $t(99) = -2.982$, $p = 0.004$. The difference between States 2 and 4 did not reach significance, $t(99) = -0.414$, $p = 0.680$. Things were generally the same for second session with global signal being greater in State 1 than in State 2, $t(99) = 5.133$, $p < 0.001$, State 3, $t(99) = 5.304$, $p < 0.001$, and State 4, $t(99) = 3.762$, $p < 0.001$. State 3's mean global signal was also less than State 4's, $t(99) = -3.470$, $p = 0.001$, as it was for the first session, but State 2 had significantly lower mean global signal than State 4, $t(99) = -3.081$, $p = 0.003$. In addition, the difference between the mean signal for States 2 and 3 was not statistically significant after correction, $t(99) = 2.646$, $p = 0.009$.




**SUPPLEMENTARY FIG. S1.** The *x* axis marks the *k* values and the *y* axis marks the cumulative error across *k* clusters. For the clusters derived before GSR, the kink in the curve occurs at a *k* of 4 for Session 1 **(A)** and Session 2 **(B)**. This *k* value was used for both days, but for the clusters derived after GSR, elbows were present at a *k* of 3 for Session 1 **(C)** and Session 2 **(D)** although elbow is not well formed for Session 2. For the sake of comparison, *k* remained fixed at 4. GSR, global signal regression.




**SUPPLEMENTARY FIG. S2.** Grand average FD for each scan quarter for Session 1 **(A)** and Session 2 **(B)**. The error bars represent the error of the main effect of scan quarter for the given scan day. FD, framewise displacement.

*Differences in motion for brain states derived before the application of global signal regression*

Bonferroni-corrected *post hoc* paired *t* tests for each session's brain states did not yield a significant difference between States 1 and 2, for Session 1, $t(99) = -0.155$, $p = 0.878$, and Session 2, $t(99) = -0.012$, $p = 0.990$, but all other comparisons reached significance. State 3 had the lowest grand average motion on both sessions, while State 4 had the highest (Supplementary Table S4). Motion was greater for State 1 versus State 3, $t(99) = 4.406$, $p < 0.001$, during Sessions 1 and 2, $t(99) = 3.551$, $p = 0.001$. State 2 also exhibited significantly greater motion than State 3 during Session 1, $t(99) = 5.719$, $p < 0.001$, and during Session 2, $t(99) = 3.482$, $p = 0.001$. All states possessed significantly lower grand average motion than State 4 during Session 1 [State 1 vs. 4, $t(99) = -4.803$, $p < 0.001$; State 2 vs. 4, $t(99) = -5.552$, $p < 0.001$; State 3 vs. 4, $t(99) = -9.817$, $p < 0.001$] and during Session 2 [State 1 vs. 4, $t(99) = -6.455$, $p < 0.001$; State 2 vs. 4, $t(99) = -5.824$, $p < 0.001$; State 3 vs. 4, $t(99) = -7.271$, $p < 0.001$].

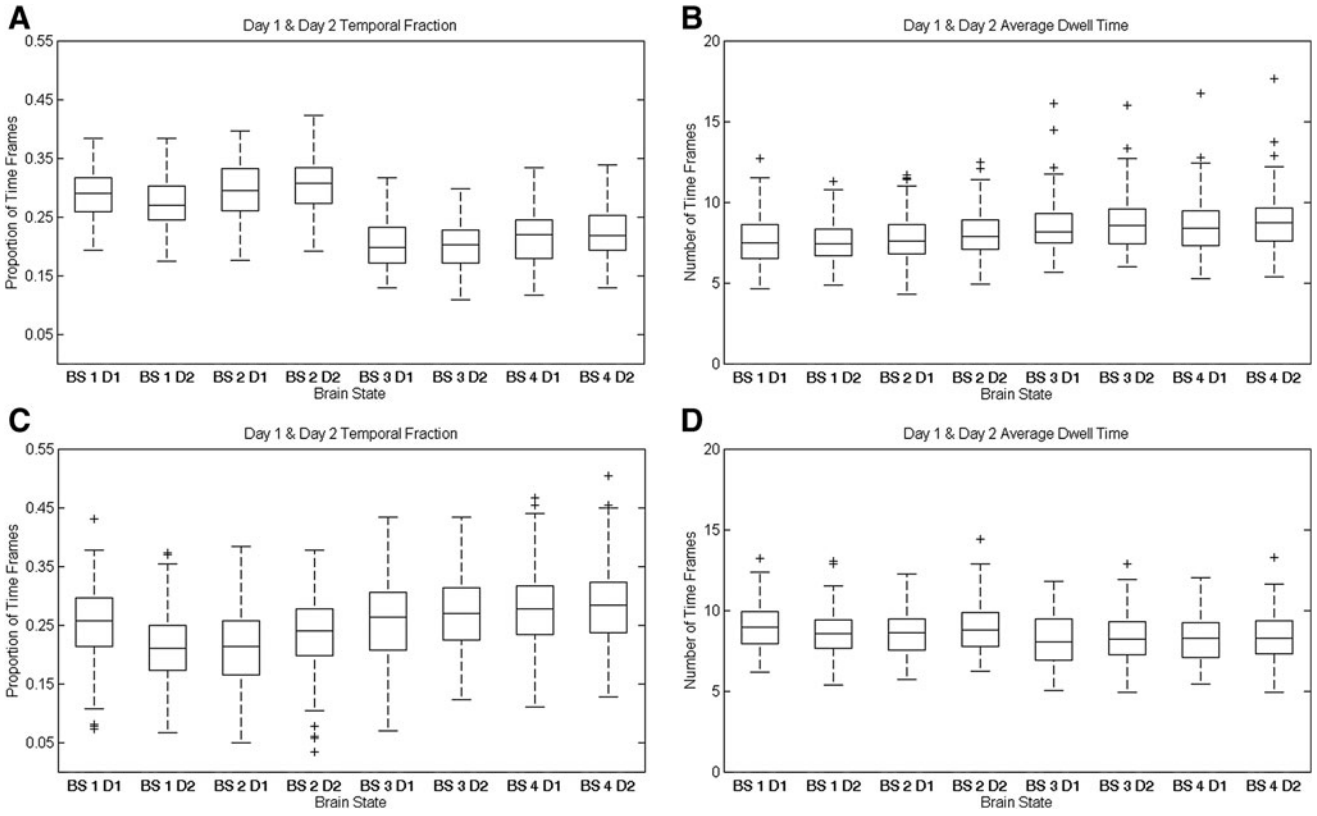
### Supplementary Nonparametric Analysis of Motion

Motion between brain states was accessed with nonparametric methods in addition to analysis of variance. Given the same pattern of results, it is likely that the parametric analysis was robust to normality violations. The Friedman test yielded a chi-square value of 81.180 ($p < 0.001$) for Session 1 and 81.588 ($p < 0.001$) for the brain states derived without global signal regression (GSR). The motion did not significantly differ between states detected post-GSR on Session 1 with chi-square of 5.436 ($p = 0.143$) and Session 2 with a chi-square of 2.292 ($p = 0.514$).

The Wilcoxon signed-rank test determined that the ranks did not differ between States 1 and 2 for Session 1, $z = -1.423$, $p = 0.155$, and Session 2, $z = -1.090$, $p = 0.276$. During Session 1, motion was significantly lower during State 3 than State 1, $z = -4.353$, $p < 0.001$, and motion during State 1 was less than State 4, $z = -5.443$, $p < 0.001$, and State 3 exhibited significantly less motion than State 2, $z = -5.701$, $p < 0.001$. Motion for both State 2, $z = -5.078$, $p < 0.001$, and State 3, $z = -7.588$, $p < 0.001$, was significantly less than State 4. This pattern of significant results was replicated during Session 2 (State 3 vs. 1, $z = -3.538$, $p < 0.001$, State 1 vs. 4, $z = -6.835$, $p < 0.001$, State 3 vs. 2, $z = -3.531$, $p < 0.001$, State 2 vs. 4, $z = -5.580$, $p < 0.001$, State 3 vs. 4, $z = -7.190$, $p < 0.001$).

### Supplementary Reference

Shrout PE, Fleiss JL. 1979. Intraclass correlations: uses in assessing rater reliability. Psychol Bull 86:420–428.




**SUPPLEMENTARY FIG. S3.** Box plots for the temporal fraction and the average dwell time for each scan day (session). The temporal fraction **(A)** and average dwell time **(B)** are presented for the brain states obtained without GSR (days 1 and 2). In the lower panels, the temporal fraction **(C)** and average dwell times **(D)** for the brain states obtained with GSR. The crosses denote outliers.

SUPPLEMENTARY TABLE S1. GLOBAL SIGNAL TEMPORAL STANDARD DEVIATION INDICES OF RELIABILITY

| *Pearson correlation* | *Mean absolute difference* | *Intraclass correlation* |
|---|---|---|
| 0.73* | 3.21 | 0.72* |

An asterisk denotes values that survived the Bonferroni-corrected threshold. $*p < 0.025$.

SUPPLEMENTARY TABLE S2. MEANS AND STANDARD DEVIATIONS OF THE GLOBAL SIGNAL (SIGNAL INTENSITY NORMALIZED TO 10,000) FOR THE TIME FRAMES OF THE BRAIN STATES DERIVED WITHOUT GLOBAL SIGNAL REGRESSION

| *Brain state* | *Mean* | *SD* |
|---|---|---|
| Session 1 | | |
| State 1 | 10,004.262 | 35.377 |
| State 2 | 10,004.079 | 35.484 |
| State 3 | 9,989.320 | 35.679 |
| State 4 | 10,018.200 | 36.130 |
| Session 2 | | |
| State 1 | 10,020.101 | 39.145 |
| State 2 | 10,019.663 | 39.255 |
| State 3 | 10,004.252 | 38.990 |
| State 4 | 10,034.655 | 40.370 |

SD, standard deviation.

Supplementary Table S3. Means and Standard Deviations of the Preregression Global Signal for the Brain States Derived After Global Signal Regression

| *Brain state* | *Mean* | *SD* |
|---|---|---|
| Session 1 | | |
| State 1 | 10,006.277 | 35.414 |
| State 2 | 10,004.293 | 35.614 |
| State 3 | 10,001.782 | 36.549 |
| State 4 | 10,004.526 | 35.024 |
| Session 2 | | |
| State 1 | 10,022.563 | 39.236 |
| State 2 | 10,018.999 | 39.164 |
| State 3 | 10,017.696 | 39.514 |
| State 4 | 10,021.123 | 39.793 |

Supplementary Table S4. Means and Standard Deviations of Motion (Grand Average Framewise Displacement) for the Time Frames of the Brain States Derived Without Global Signal Regression

| *Brain state* | *Mean* | *SD* |
|---|---|---|
| Session 1 | | |
| State 1 | 0.170 | 0.054 |
| State 2 | 0.170 | 0.054 |
| State 3 | 0.164 | 0.049 |
| State 4 | 0.176 | 0.053 |
| Session 2 | | |
| State 1 | 0.174 | 0.060 |
| State 2 | 0.174 | 0.059 |
| State 3 | 0.167 | 0.053 |
| State 4 | 0.182 | 0.060 |

Supplementary Table S5. Means and Standard Deviations of the Average Motion for the Brain States Derived After Global Signal Regression

| *Brain state* | *Mean* | *SD* |
|---|---|---|
| Session 1 | | |
| State 1 | 0.171 | 0.055 |
| State 2 | 0.170 | 0.053 |
| State 3 | 0.168 | 0.051 |
| State 4 | 0.171 | 0.053 |
| Session 2 | | |
| State 1 | 0.176 | 0.061 |
| State 2 | 0.174 | 0.062 |
| State 3 | 0.172 | 0.053 |
| State 4 | 0.175 | 0.058 |

Supplementary Table S6. Brain-State Centroid Indices of Reliability

| *Brain state* | *Pearson correlation* | *Mean absolute difference* | *Intraclass correlation* |
|---|---|---|---|
| Without GSR | | | |
| State 1 | 0.99* | 0.03 | 0.99* |
| State 2 | 0.99* | 0.03 | 0.99* |
| State 3 | 0.97* | 0.05 | 0.95* |
| State 4 | 0.97* | 0.04 | 0.96* |
| With GSR | | | |
| State 1 | 0.99* | 0.07 | 0.98* |
| State 2 | 0.98* | 0.08 | 0.98* |
| State 3 | 0.95* | 0.08 | 0.95* |
| State 4 | 0.99* | 0.03 | 0.99* |

An asterisk denotes values that survived the Bonferroni-corrected threshold. *$p < 0.0125$.

GSR, global signal regression.