

Supplementary Figure

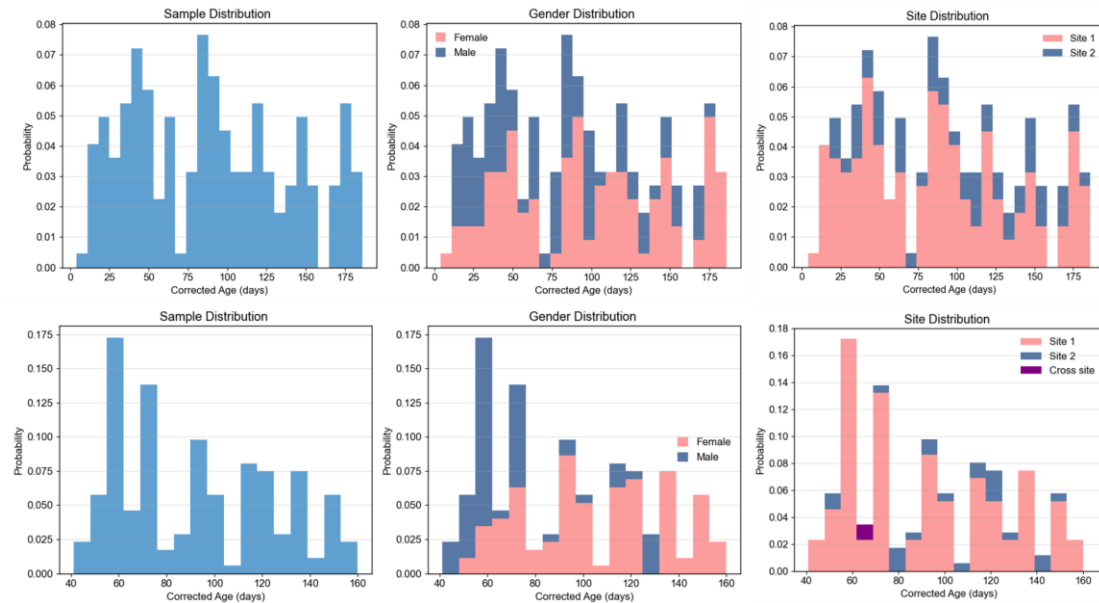


Figure S1. The sample distribution of the infant dataset. The first row: age, gender, site distribution of fMRI scans. The second row: age, gender, site distribution of change rate samples.

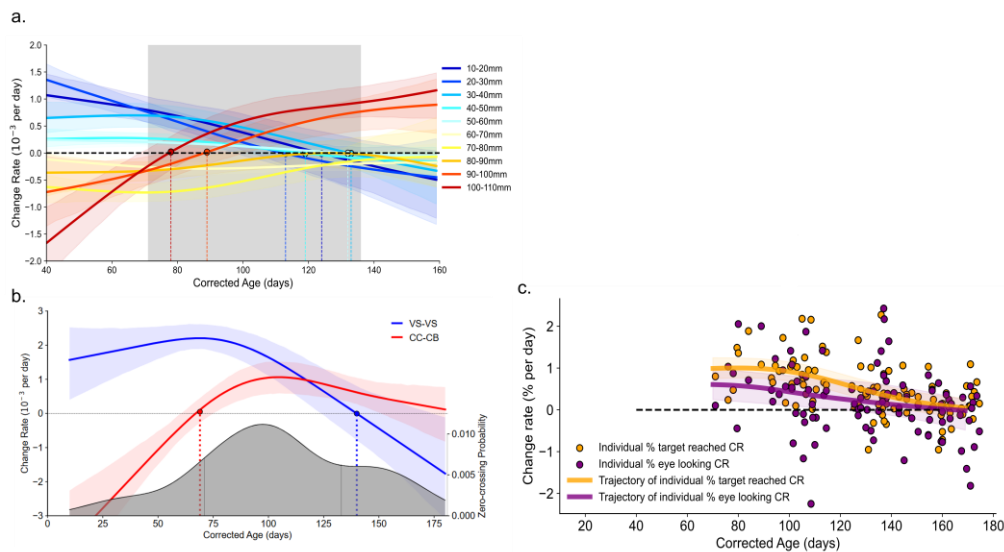
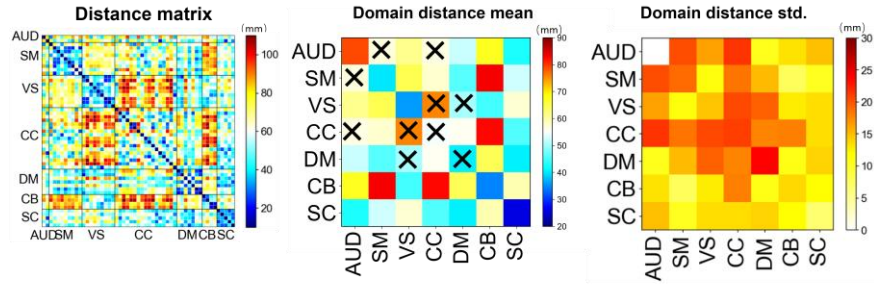


Figure S2. Estimated population CR trajectory using individual CRs. This trajectory estimation method is to first calculate the individual change rates, and then estimate the trajectory of individual change rates. a: CR trajectories within different connectivity distances. b: CR trajectories within domain regions. c: Behavioral CR trajectories for target reached and eye-fixations in the eye tracking experiment. The shaded range is the 2.5-97.5% confidence range which is estimated via 1000 bootstraps. These are consistent with Figure 2.

a. Connectivity Distance



b. Domain-level connectivity CR trajectory

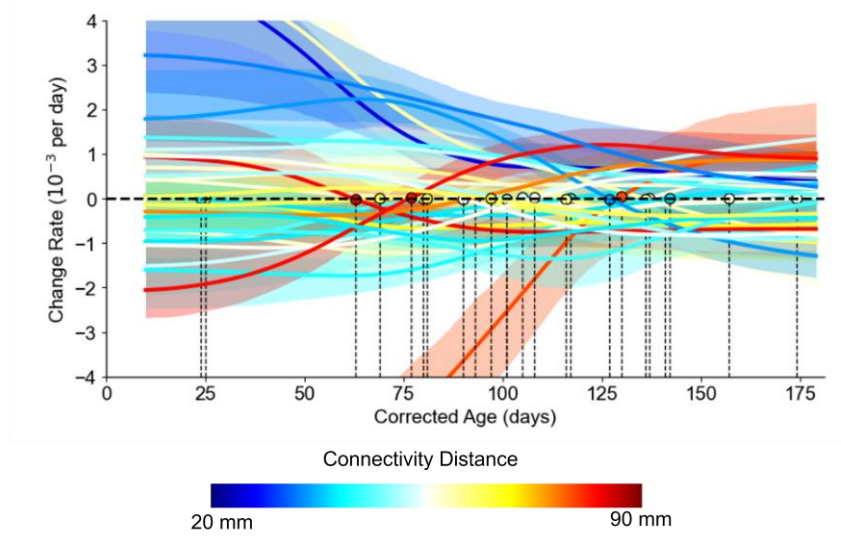
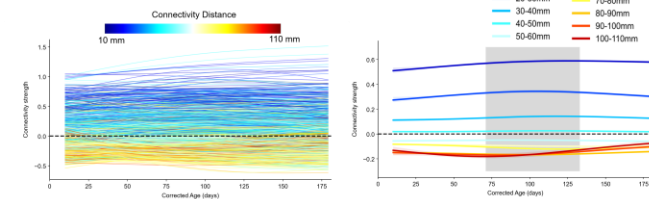


Figure S3. The distance for within-domain network pairs and cross-domain network pairs. a: distance matrix between 53 networks, as well as mean and std. distance within each of domain pairs. The X mark shows its domain distance variance > 20 mm, indicating a high variance in this domain pair. b: domain-level connectivity CR trajectory. Not all domain-level trajectories exhibited clear reversals with distance, reflecting heterogeneity in the spatial distance distributions of their constituent connections, consistent with the primary distance-dependent transition observed at the connection level.

a. Connectivity strength trajectory



b. Domain-level connectivity strength trajectory

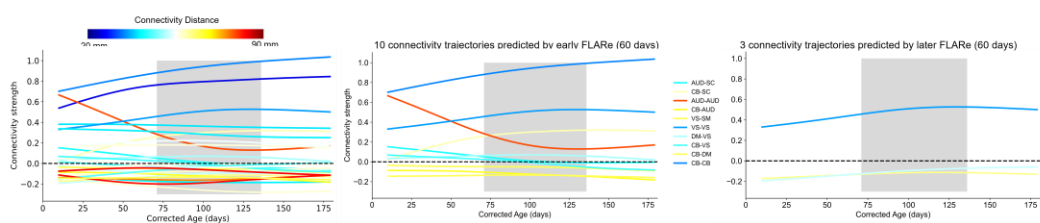


Figure S4. Development trajectory for connectivity strength within 6 months after birth. a. Connectivity strength trajectory for 1378 connections, as well as their distance-averaged trajectories.

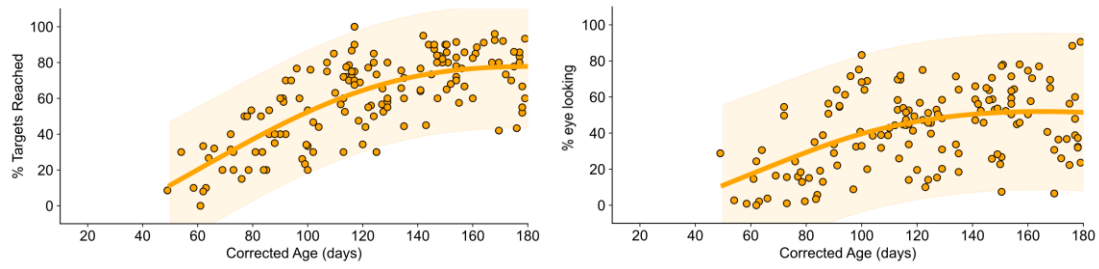
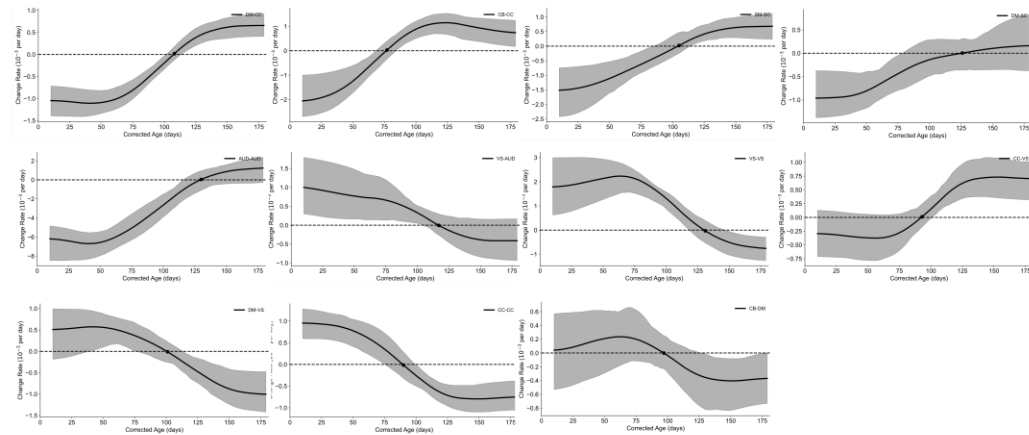


Figure S5. The developmental trajectory for visual behaviors. Left: targets reached (%) and eye looking (%).

a. Domain-level CR trajectory with a reliable transition point during transition period.



b. Domain-level CR trajectory without a transition point or without reliable confidence bands during transition period.

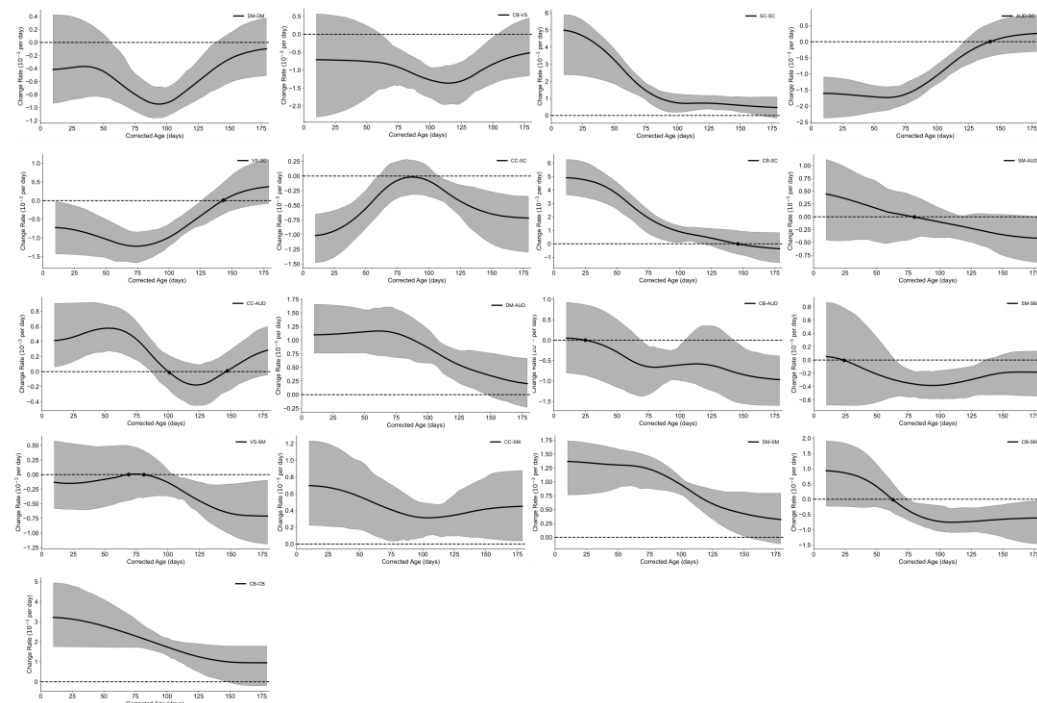


Figure S6. The CR trajectories for within-domain or cross-domain pairs. Top: 11 domain-level connectivity have reversed its sign of change rate during transition period, with significant zero-crossing and one of confidence bands. Bottom: connectivity without the transition of change rates. The contour

indicates the confidence range between 2.5 and 97.5 percentile using 1000 bootstrapping samples. Black line indicates mean trajectory. The black points are zero-crossing points for each mean trajectory.

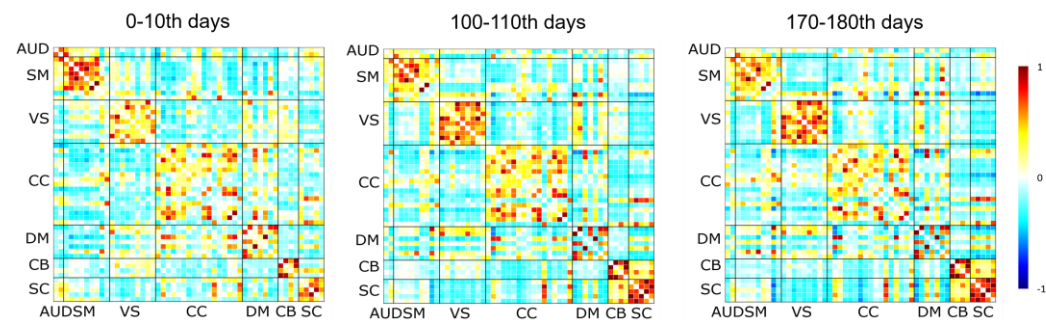


Figure S7. The mean static FNC in three periods: 0-10th days, 100-110th days, 170-180th days

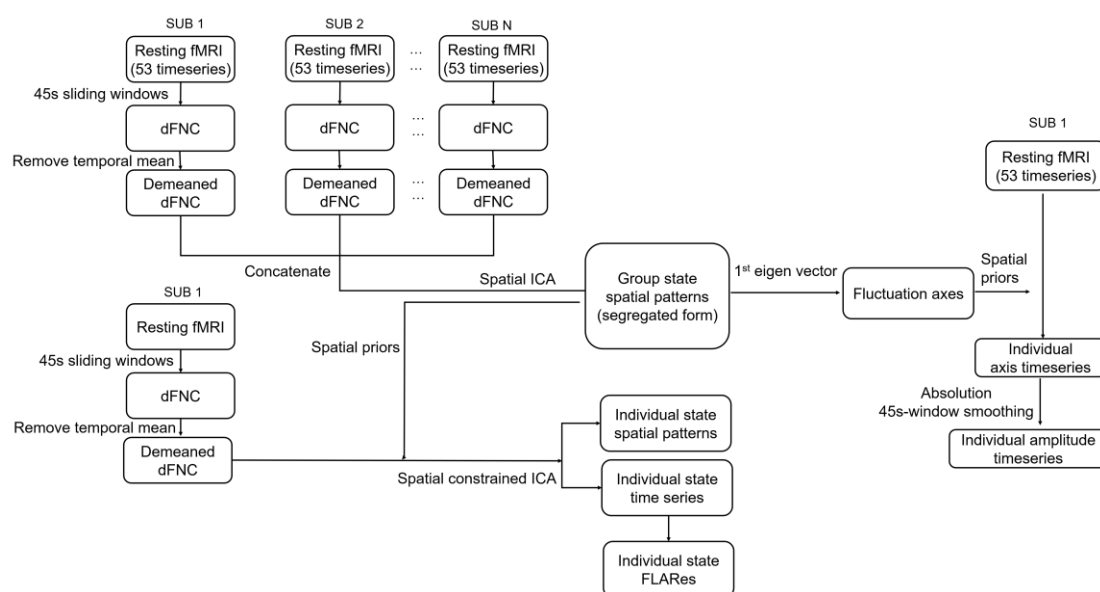


Figure S8. Pipeline for the identification of group state pattern, individual FLARes, fluctuation axes, and axis amplitude. Blind ICA is first used to detect the group state spatial pattern. And we used group state pattern as prior to obtain individual patterns and state timeseries. The FLARes are derived from individual state time series. A fluctuation axis is the 1st eigen vector of a state pattern. We obtain axis timeseries using spatial-constrained ICA with group axis as priors. The amplitude timeseries is the result after absolution and 45s-window smoothing of axis timeseries.

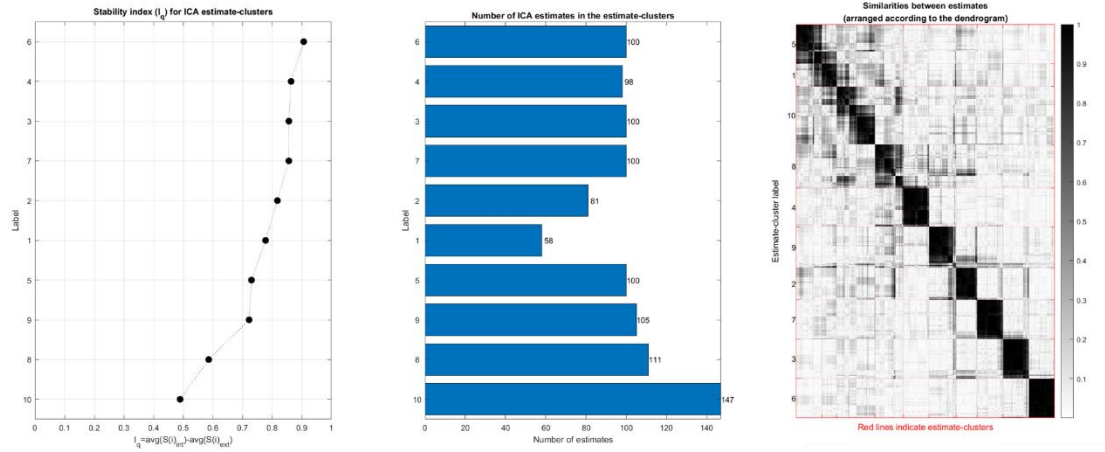


Figure S9. The ICASSO analysis in 100 repeated ICA runs. Left: the ICASSO IQ score for each state. Middle: the sample number in each cluster using combined results from 100 runs. Right: the pattern similarity between different states across 100 runs.

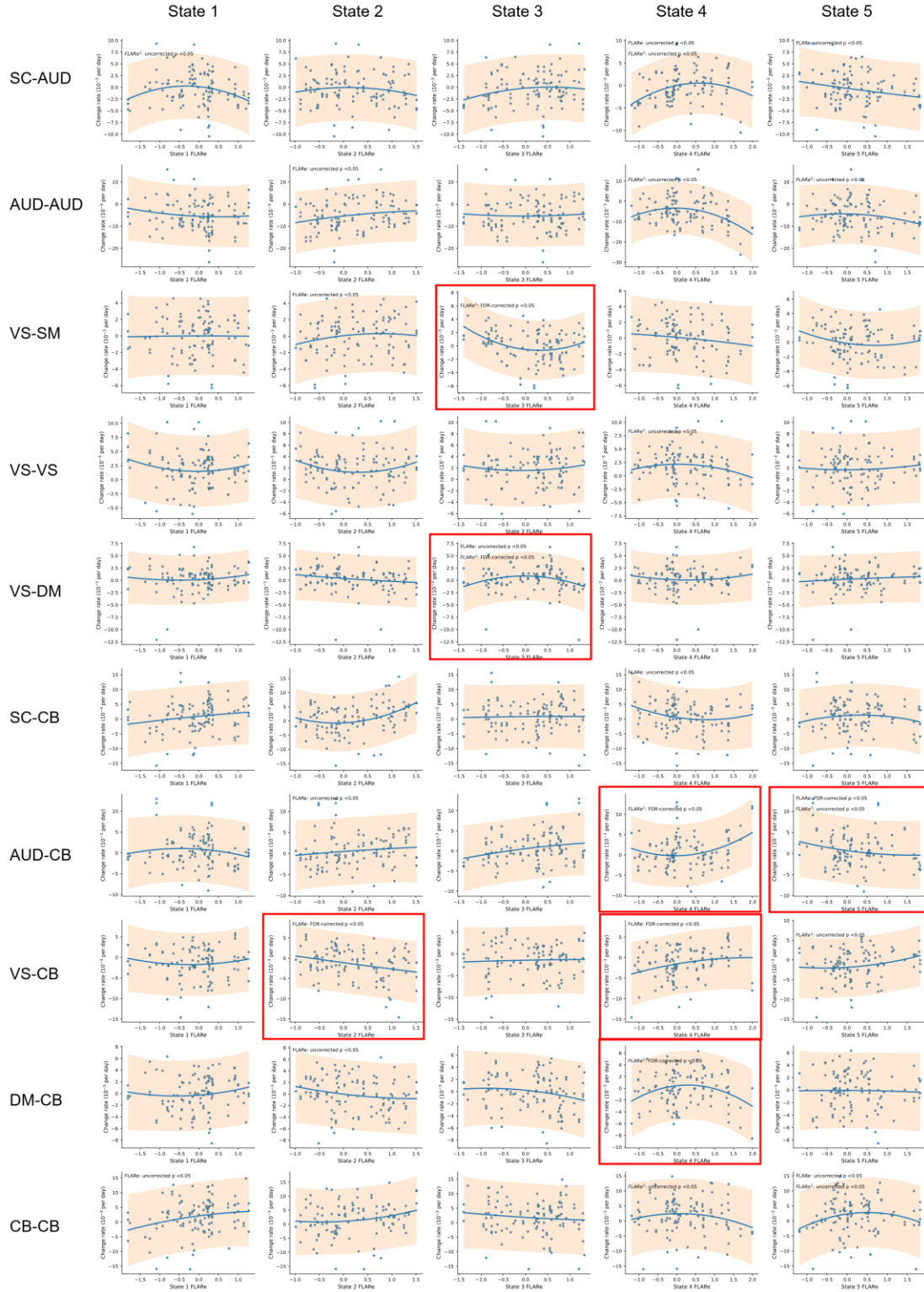


Figure S10. Association analysis between state FLARes and significantly predicted connectivity CRs within a 60-day interval. Each row represents the results from one connection CR. Uncorrected P value < 0.05 are shown in each subplot. Red box indicates there are significant terms ($p < 0.05$) after FDR-correction.

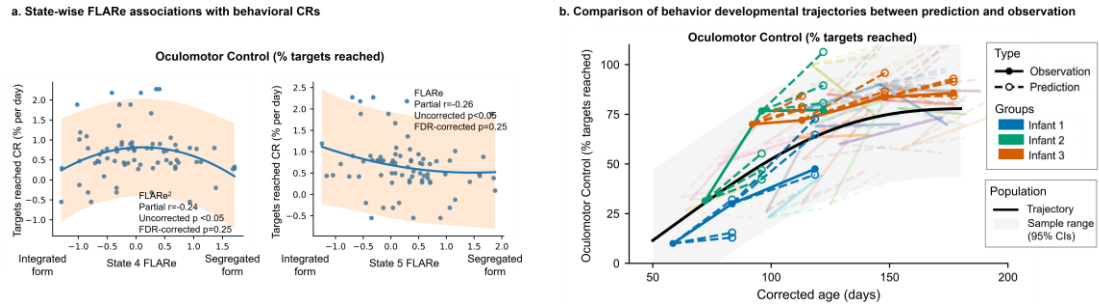


Figure S11. Association analysis between state FLARes and oculomotor control CRs within a 60-day interval. a. state-wise FLARE association with behavior CRs. B: Comparison of oculomotor control development between reconstructed trajectory using predicted CRs and observation trajectory.

Supplementary Table

Table S1. the significance evaluation of the two-month-prior dynamic model prediction on month-scale connectome change rates in 1000 trails

<i>Connectivity</i>	<i>Mean r</i>	<i>Confidence interval (CI)</i>	<i>Degree of freedom (DF)</i>	<i>FDR-corrected p</i>
SC-SC	-0.098	[-0.133, -0.064]	999	1
AUD-SC	0.109	[0.074, 0.144]	999	<0.001
AUD-AUD	0.198	[0.17, 0.225]	999	<0.001
SM-SC	-0.242	[-0.278, -0.205]	999	1
SM-AUD	-0.312	[-0.353, -0.27]	999	1
SM-SM	-0.023	[-0.053, 0.007]	999	1
VS-SC	-0.203	[-0.235, -0.171]	999	1
VS-AUD	-0.03	[-0.063, 0.003]	999	1
VS-SM	0.351	[0.321, 0.381]	999	<0.001
VS-VS	0.1	[0.067, 0.133]	999	<0.001
CC-SC	0.052	[0.018, 0.086]	999	0.014
CC-AUD	-0.225	[-0.271, -0.178]	999	1
CC-SM	-0.07	[-0.1, -0.04]	999	1
CC-VS	-0.044	[-0.087, -0.0]	999	1
CC-CC	-0.206	[-0.231, -0.18]	999	1
DM-SC	0.057	[0.018, 0.095]	999	0.016
DM-AUD	0.012	[-0.02, 0.044]	999	0.529
DM-SM	-0.017	[-0.046, 0.012]	999	1
DM-VS	0.156	[0.126, 0.186]	999	<0.001
DM-CC	0.049	[0.018, 0.08]	999	0.013
DM-DM	-0.281	[-0.307, -0.254]	999	1
CB-SC	0.191	[0.162, 0.219]	999	<0.001
CB-AUD	0.115	[0.067, 0.163]	999	<0.001
CB-SM	-0.226	[-0.263, -0.188]	999	1
CB-VS	0.164	[0.125, 0.203]	999	<0.001
CB-CC	-0.272	[-0.303, -0.241]	999	1
CB-DM	0.229	[0.195, 0.262]	999	<0.001
CB-CB	0.124	[0.098, 0.15]	999	<0.001

Table S2. the significance evaluation of the two-month-later dynamic model prediction on month-scale connectome change rates in 1000 trails

<i>Connectivity</i>	<i>Mean r</i>	<i>Confidence interval (CI)</i>	<i>Degree of freedom (DF)</i>	<i>FDR-corrected p</i>
<i>SC-SC</i>	-0.027	[-0.065, 0.012]	999	1
<i>AUD-SC</i>	-0.448	[-0.475, -0.421]	999	1
<i>AUD-AUD</i>	-0.051	[-0.083, -0.019]	999	1
<i>SM-SC</i>	-0.092	[-0.126, -0.057]	999	1
<i>SM-AUD</i>	-0.183	[-0.226, -0.139]	999	1
<i>SM-SM</i>	-0.171	[-0.209, -0.132]	999	1
<i>VS-SC</i>	-0.233	[-0.267, -0.199]	999	1
<i>VS-AUD</i>	0.111	[0.081, 0.14]	999	<0.001
<i>VS-SM</i>	-0.029	[-0.069, 0.012]	999	1
<i>VS-VS</i>	0.2	[0.173, 0.226]	999	<0.001
<i>CC-SC</i>	-0.304	[-0.346, -0.26]	999	1
<i>CC-AUD</i>	-0.045	[-0.078, -0.011]	999	1
<i>CC-SM</i>	-0.01	[-0.038, 0.018]	999	1
<i>CC-VS</i>	0.054	[0.019, 0.09]	999	0.042
<i>CC-CC</i>	-0.155	[-0.184, -0.126]	999	1
<i>DM-SC</i>	-0.147	[-0.204, -0.089]	999	1
<i>DM-AUD</i>	0.104	[0.075, 0.133]	999	<0.001
<i>DM-SM</i>	-0.396	[-0.426, -0.365]	999	1
<i>DM-VS</i>	-0.287	[-0.327, -0.245]	999	1
<i>DM-CC</i>	0.029	[-0.008, 0.066]	999	0.537
<i>DM-DM</i>	-0.071	[-0.11, -0.031]	999	1
<i>CB-SC</i>	-0.17	[-0.213, -0.127]	999	1
<i>CB-AUD</i>	-0.342	[-0.373, -0.31]	999	1
<i>CB-SM</i>	-0.291	[-0.324, -0.256]	999	1
<i>CB-VS</i>	-0.054	[-0.08, -0.028]	999	1
<i>CB-CC</i>	-0.056	[-0.091, -0.021]	999	1
<i>CB-DM</i>	-0.317	[-0.358, -0.274]	999	1
<i>CB-CB</i>	-0.098	[-0.137, -0.059]	999	1

Table S3. the significance evaluation of the two-month-prior dynamic model prediction on behavior change rates in 1000 trails

<i>Behavior</i>	<i>Mean r</i>	<i>Confidence interval (CI)</i>	<i>Degree of freedom</i>	<i>FDR-corrected p</i>
<i>Targets Reached</i>	0.220	[0.177, 0.262]	999	<0.001
<i>Eyes Looking</i>	0.402	[0.363, 0.440]	999	<0.001

Table S3. the significance evaluation of the two-month-later dynamic model prediction on behavior change rates in 1000 trails

<i>Behavior</i>	<i>Mean r</i>	<i>Confidence interval (CI)</i>	<i>Degree of freedom</i>	<i>FDR-corrected p</i>
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<i>Targets Reached</i>	-0.164	[-0.218, -0.109]	999	1
<i>Eyes Looking</i>	-0.155	[-0.208, -0.101]	999	1