

Background

- Global Efficiency (i.e. functional integration) of the Cingulo-Opercular Network (CON), Fronto-Parietal Network (FPN), and Subcortical Network support cognitive functioning¹ and demonstrate aging effects²
- Preliminary findings from one small study suggest schizophrenia may be associated with accelerated aging (AA) of CON and FPN efficiency³
- The present study was undertaken to: 1) test for presence of AA of CON and FPN in schizophrenia and bipolar disorder; 2) replicate prior studies linking network efficiency to cognition; 3) test for reduced network efficiency in psychosis

Methods

Procedures

The following were collected on 420 individuals:

- Resting-state fMRI on a 3T scanner located at Vanderbilt;
- The Screen for Cognitive Impairment in Psychiatry (SCIP), a brief neuropsychological battery.

Sample Demographics

	Healthy Controls N=179	Schizophrenia N=177	Bipolar Disorder N=64	Statistic
Age (SD)	29.13 (10.60)	28.41 (10.56)	30.08 (11.91)	F(2,417)=.599, p=.55
Gender (M/F)	110/69	126/51	30/34	X ² =12.44, p=.002
Race (W/B/O)	125/42/12	122/47/8	53/5/5	X ² =12.94, p=.044
Parental Education	14.44 (2.26)	14.66 (2.79)	14.60 (2.49)	F(2,373)=.899, p=.408
Personal Education	15.15 (2.22)	13.34 (2.23)	14.22 (1.86)	F(2,392)=29.42, p<.001
General Cognition	0.00 (1.0)	-1.92 (1.69)	-.91 (1.37)	F(2,414)=85.85, p<.001

Generalized Cognitive Deficit

General cognitive ability was measured as the shared variance in performance in all subdomains of the Screen of Cognitive Impairment in Psychiatry (SCIP). Factor scores from the 1st (and only) factor with an eigenvalue>1 was used as an estimated of cognitive ability.

	Factor 1 (57.4% of Total Variance)
Verbal Learning - Immediate	.838
Working Memory	.682
Verbal Fluency	.490
Verbal Learning - Delayed	.741
Processing Speed	.656

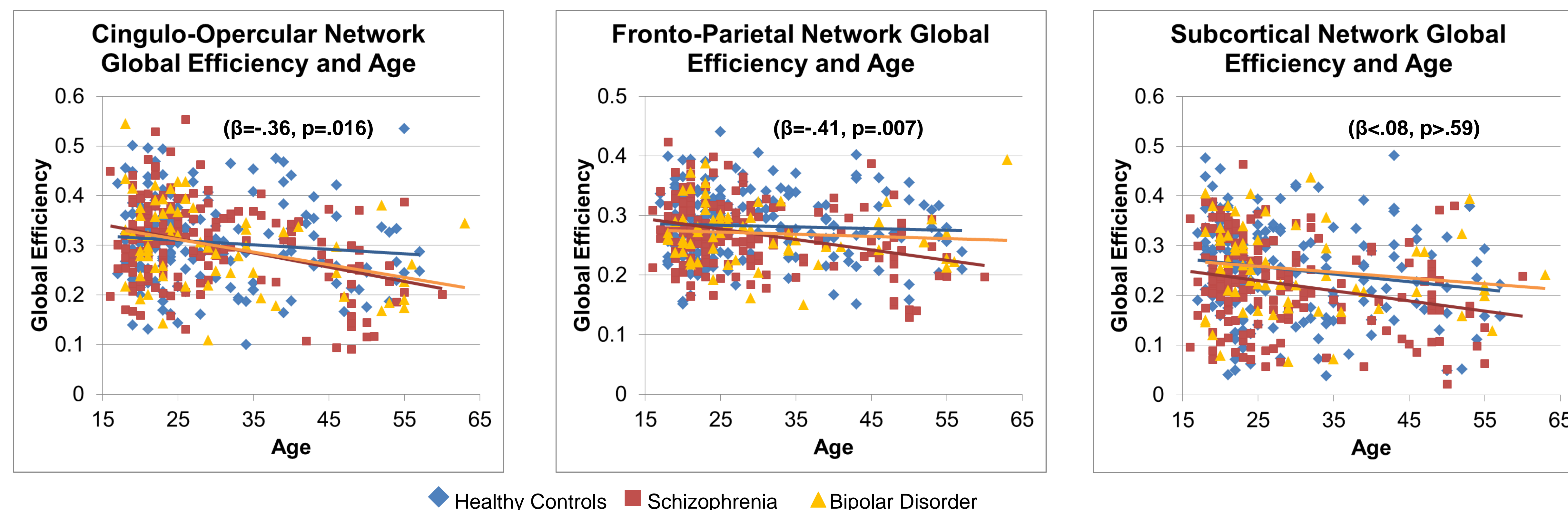
Network Global Efficiency

Functional Connectivity was calculated from the 264 Power ROIs⁴, which designates nodes within the CON, FPN, and Subcortical Network. Global Efficiency within thresholded (5%-10%) networks was calculated for each subject and averaged across thresholds. Global Efficiency was calculated using algorithms from the Brain Connectivity Toolbox⁵

Power et al, 2011

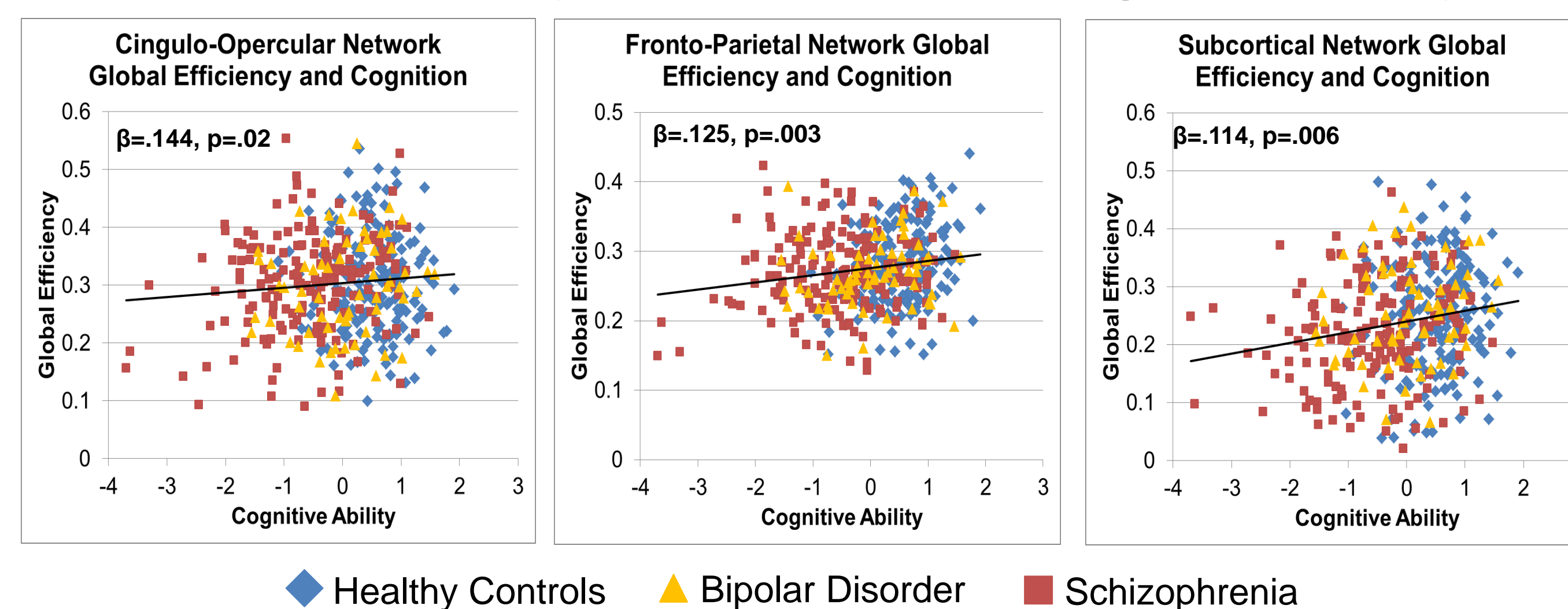
Results

Testing Presence of Accelerated Aging in Schizophrenia and Psychotic Bipolar Disorder



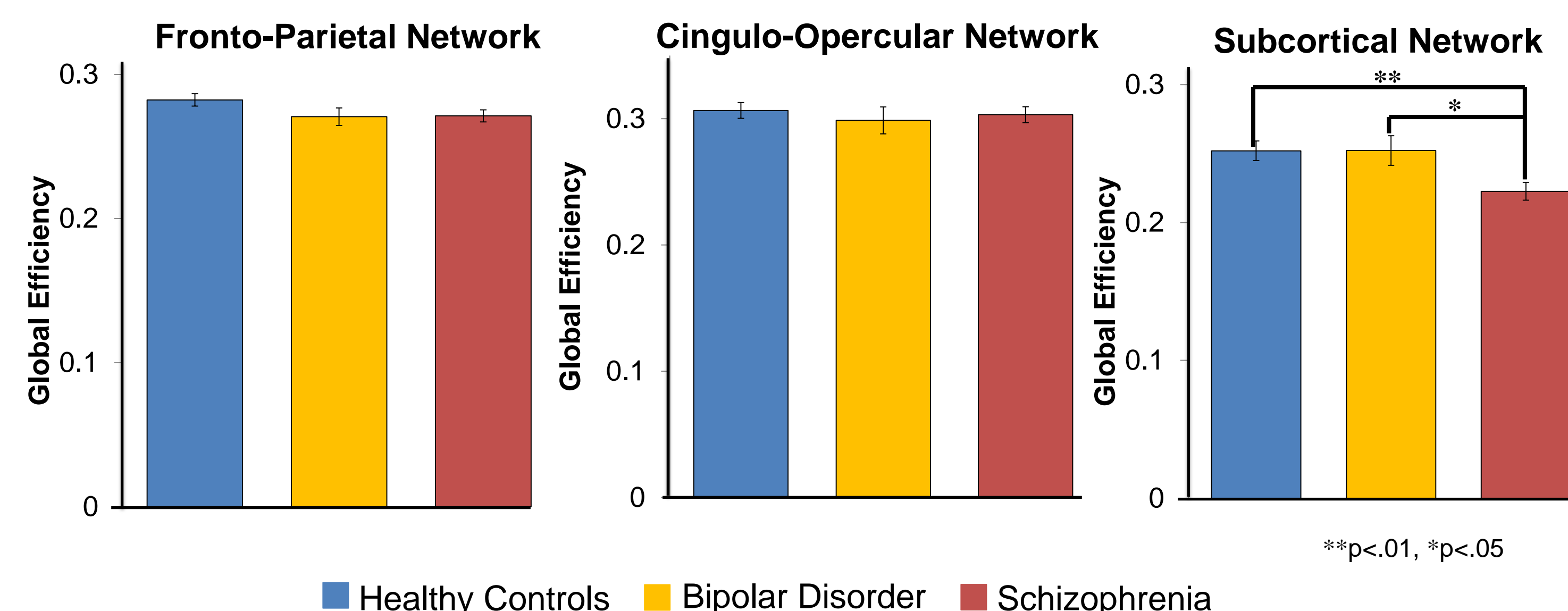
Age was significantly negatively associated with global efficiency in all networks, across all subjects ($p < .001$). A significant group \times age interaction was seen in CON and FPN, but not the Subcortical Network (statistics on graph). Age was significantly correlated with CON efficiency in schizophrenia ($r = -.359$, $p < .001$), and bipolar disorder ($r = -.355$, $p = .004$) but not controls ($r = -.114$, $p = .13$). Age was significantly correlated with FPN efficiency in schizophrenia ($r = -.332$, $p < .001$) not bipolar disorder ($r = -.09$, $p = .479$) or controls ($r = -.052$, $p = .49$).

Network Efficiency Associated with Cognitive Ability



General cognitive ability was significantly associated with CON, FPN, and Subcortical Network global efficiency in linear regressions that included diagnostic group, gender, race, and interaction terms.

Group Differences in Network Global Efficiency



Conclusions

- Efficiency of the CON and FPN, but not the Subcortical Network, decline at an accelerated rate in schizophrenia, replicating previous findings.
- Efficiency of the CON and FPN also support general cognitive ability, suggesting that accelerated decline may impact cognition and ultimately functional outcome in chronic schizophrenia.
- While CON efficiency exhibited evidence of accelerated aging in bipolar disorder, the FPN did not, suggesting that accelerated decline of network integration may be specific to schizophrenia.

References

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