Supplement 1

Excluded data: Of 150 participants scanned, data from three were excluded due to technical problems (no high resolution scan collected, n=2; behavioral data loss, n = 1) and six due to excessive motion (≥ 1TR exceeding 3 mm translation or rotation in ≥ 3 runs). Subjects excluded due to excessive motion were four unmedicated obsessive-compulsive disorder (uOCD) (3 female, ages 11.1, 11.7, 15.1 and 1 male, 11.0 years) and two healthy youth (1 female, 8.5 and 1 male, 9.0 years). Several subjects exhibited excessive motion in 1-2 runs, and thus contributed only 3-4 runs of data for analysis: 3 runs were contributed by 5 healthy youth (3 female, ages 8.9,9.8 and 10.8 and 2 male, ages 11.8 and 10.8 years), and 4 runs by 4 healthy (all male, ages 9.7, 10.3, 12.2 and 14.5 years), 5 medicated obsessive-compulsive disorder (mOCD) (2 female, ages 15.7 and 17.4 and 3 male, ages 11.7, 11.8 and 12.2 years) and 3 uOCD (1 female, ages 14.4 and 2 male, ages 10.6 and 16.7 years) youth.

Patient medications: Among OCD patients, thirty-four were medicated, thirty-three with selective serotonin reuptake inhibitors (3 citalopram, 18 fluoxetine, 2 fluvoxamine, 1 paroxetine, 2 sertraline) and one with guanfacine for comorbid tics. Seven SSRI-treated patients were also taking aripiprazole (n = 1), quetiapine (n = 1), risperidone (n=1), buspirone (n=1), guanfacine (n = 1), methylphenidate (n=1) or risperidone plus methylphenidate (n =1).

Regions of interest (ROIs): The primary ROIs for posterior medial frontal cortex (pMFC) response to errors and interference were defined by the main effects of each contrast in conjunction with an MFC ROI known to preferentially associate with cognitive control processes based on the Neurosynth meta-analysis of nearly 10,000 fMRI studies (1). The MFC ROI included middle and posterior Neurosynth zones because these zones (and not the anterior zone) preferentially activate to cognitive control demands (including errors and interference) and contain dACC and preSMA, respectively (1) --- regions previously established to mediate cognitive control in general, and interference and error processing in specific (2). The pMFC ROI used in error processing analyses was defined by the voxels activated in the error contrast (peak -6, 26, 28; Z = 6.65; k = 494, Table S1) since these voxels were wholly contained within the Neurosynth posterior-middle MFC zones (1) (Fig S1, top panel, red and yellow). The pMFC ROI used in interference analyses was defined by voxels activated in the interference contrast (peak -3, 8, 46; Z = Inf; k = 7917) and masked with Neurosynth posterior-middle MFC zones (1) to yield a volume of k = 817 voxels in the pMFC centered at -3, 8, 46 (Fig S1, bottom panel, red and yellow).

Secondary ROIs included bilateral anterior insula/frontal operculum (aI/fO) and pMFC subregions, the dorsal anterior cingulate (dACC) and pre-supplementary motor area (preSMA). The rationale for examining secondary aI/fO ROIs was based on the established networking of these regions with pMFC (i.e., cingulo-opercular network) at rest (3) and during cognitive control processes, including error and interference response (4). The aI/fO ROIs are defined in the main text. The rationale for examining secondary dACC and preSMA ROIs was based on the preferential association of these subregions with response to errors and interference, respectively (2, 5).

To define dACC and preSMA ROIS for errors and interference, the larger pMFC ROIs for each contrast were subdivided using Neurosynth middle and posterior zones which include the dACC and preSMA, respectively (1). For errors, the dACC ROI contained 420 voxels and the preSMA ROI contained 36 voxels (Figure S1, top panel). For interference, the dACC ROI contained 386 voxels and the preSMA ROI contained 482 voxels (Figure S2, bottom panel).

Supplemental Tables

**Table S1**. Comorbid diagnoses.

| | **OCD (n = 69)*** |
|---|---|
| **Anxiety Disorders (any)** | **27 (39%)** |
| Generalized Anxiety Disorder | 12 (17.4%) |
| Panic Disorder | 3 (4.4%) |
| Separation Anxiety Disorder | 5 (7.2%) |
| Social Anxiety | 5 (7.2%) |
| Specific Phobia | 6 (8.7%) |
| | |
| **Tic Disorders (any)** | **18 (26%)** |
| Tics | 12 (17.4%) |
| Tourettes | 7 (10.1%) |
| | |
| **Subclinical Depression (any)** | **13 (19%)** |
| Depression NOS | 12 (17.4%) |
| Dysthymia | 1 (1.5%) |
| | |
| **Attention Deficit Hyperactivity Disorder** | **9 (13.0%)** |
| | |
| **Other Disorders (any)** | **4 (6%)** |
| Impulse Control Disorder** | 4 (5.8%) |
| Developmental Coordination Disorder | 1 (1.5%) |

Note: *20 patients had obsessive-compulsive disorder (OCD) only; 49 had primary OCD with 1-3 less severe, comorbid diagnoses.

**Impulse control disorders included trichotillomania, skin picking, nail biting

**Table S2**. Error and interference activations across all subjects (Wholebrain analyses)

| Brain region | Cluster[a] | Coordinates[b] | Z scores |
|---|---|---|---|
| Error processing | | | |
| pMFC* | | | |
| Dorsal anterior cingulate cortex[t] | 494 | -6, 26, 28 | 6.65 |
| Left aI/fO* | 343 | -30, 20, -14 | Inf |
| Right aI/fO* | 345 | 36, 23, -5 | Inf |
| Interference processing | | | |
| pMFC* | | | |
| Pre-supplementary motor area[t] | 7917[c] | -3, 8, 46 | Inf |
| Left aI/fO* | 160 | -30, 17, 4 | Inf |
| Right aI/fO* | 235 | 33, 20, 4 | 7.34 |
| Right dorsal prefrontal | 180 | 30, 50, 25 | 6.57 |
| Left precentral | 7917[c] | -33, -7, 61 | Inf |
| Left postcentral | | -39, -16, 52 | Inf |
| Right precentral | | 33, -4, 61 | Inf |
| Left superior parietal | | -21, -64, 46 | Inf |
| Left inferior parietal | | -42, -40, 37 | Inf |
| Right superior parietal | | 27, -58, 49 | Inf |
| Right inferior parietal | | 39, -37, 40 | Inf |
| Left middle occipital | | -27, -70, 28 | Inf |
| Left Thalamus | 159 | -9, -19, 7 | 7.70 |
| Right Thalamus | | 9, -16, 10 | 6.86 |
| Middle posterior cingulate | 63 | 3, -19, 25 | 6.41 |

Note: [a] Brain maps were displayed at a height threshold of $p<0.05$, corrected for familywise error (FWE); clusters were considered significant at $p < .05$, corrected for family wise error across whole brain. Number of voxels in each significant cluster are listed.

[b] Peak coordinates, x, y, z

[c] Refers to the same cluster

*Regions of interest (ROIs): posterior medial frontal cortex (pMFC), anterior insula/frontal operculum (aI/fO).

[t]As shown in Figure S1, pMFC ROIs were defined by activations for error and interference contrasts in conjunction with middle and posterior Neurosynth MFC zones which include dorsal anterior cingulate and pre-supplementary motor areas, respectively. The majority of voxels activated for error-processing were clustered in the middle MFC zone, including the peak activation at -6, 26, 28, justifying designation as "dorsal anterior cingulate cortex," above. By contrast, voxels activated for interference were distributed more evenly across middle and posterior zones; however, the peak activation at -3, 8, 46 fell within the posterior MFC zone, justifying designation of this peak as "pre-supplementary motor area," above.

aI/fO = anterior insula/frontal operculum, FWE = familywise error, MFC = medial frontal cortex, pMFC = posterior medial frontal cortex, ROIs = regions of interest

**Table S3**. Participant characteristics for unmedicated obsessive-compulsive disorder (uOCD), medicated OCD (mOCD) and healthy youth

| | Error Analysis | | | | | Interference Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **uOCD (n = 28)** | **mOCD (n = 23)** | **HC (n = 51)** | **Test Statistic (p-value)** | | **uOCD (n = 35)** | **mOCD (n = 34)** | **HC (n = 72)** | **Test Statistic (p-value)** |
| **Age** | 13.4 ± 3.0 | 15.1 ± 2.3 | 14.1 ± 3.2 | F(2,99) = 2.2 (.12) | | 13.2 ± 3.0 | 14.7 ± 2.4 | 14.0 ± 3.3 | F(2,138) = 2.0 (.14) |
| **Gender** | 15F (56%) | 12F (50%) | 23F (45%) | $\chi^2$(2,102) =.64 (.73) | | 19F (56%) | 16F (46%) | 33F (46%) | $\chi^2$(2,141) = .70 (.71) |
| **SES**[1] | 2.19 ± .48 | 2.22 ± .42 | 2.27 ± .53 | F(2,96) = .24 (.79) | | 2.18 ± .46 | 2.26 ± .51 | 2.24 ± .49 | F(2, 135) = .38 (.68) |
| **CY-BOCS, Present**[2] | 19.5 ± 7.8 | 15.7 ± 6.6 | na | *t(2,49) = 1.8 (.07)* | | 20.2 ± 8.0 | 16.9 ± 7.0 | na | t(2,67) = 1.8 (.07) |
| **CY-BOCS**[1]**, Lifetime** | 26.8 ± 7.2 | 27.6 ± 6.0 | na | t(2,47) = -.42 (.68) | | 27.0 ± 7.0 | 28.7 ± 6.0 | na | t(2,65) = -1.0 (.30) |
| **CY-BOCS**[1]**, Change** | 7.3 ± 7.7 | 11.8 ± 7.5 | na | **t(2,47 ) = -2.1 (.04)** | | 6.8 ± 7.7 | 11.8 ± 7.4 | na | **t(2,65) = -2.75 (.008)** |
| **Illness Duration**[1] | 6.15 ± 4.36 | 6.94 ± 4.20 | na | t(2,48) = -.65 (.52) | | 6.15 ± 4.23 | 6.77 ± 3.84 | na | t(2,66) = -.63 (.53) |
| **AAO**[1] | 7.3 ± 3.0 | 8.1 ± 3.7 | na | t(2,48) = -.91 (.37) | | 7.1 ± 2.7 | 7.9 ± 3.3 | na | t(2,66) = -1.1 (.28) |
| **CBT**[1] | 9 (33%) | 15 (68%) | na | **$\chi^2$(2,49) = 5.9 (.01)** | | 11 (31%) | 20 (59%) | na | **$\chi^2$(2,66) = 6.0 (.01)** |
| **Inc RT** | 1116 ± 283 | 1068 ± 203 | 1060 ± 238 | F(2,99)=.50 (.61) | | 1123 ± 268 | 1105 ± 250 | 1071 ± 220 | F(2,138) = .61 (.54) |
| **Con RT** | 787 ± 200 | 749 ± 144 | 738 ± 171 | F(2,99)=.75 (.47) | | 804 ± 199 | 775 ± 188 | 759 ± 162 | F(2,138) = .72 (.49) |
| **Inc Acc** | .87 ± .06 | .86 ± .08 | .88 ± .07 | F(2,99)=.84 (.43) | | .90 ± .07 | .90 ± .08 | .90 ± .07 | F(2,138) = .86 (.43) |
| **Con Acc** | .99 ± .02 | .99 ± .02 | .98 ± .02 | F(2,99)=.30 (.74) | | 1.0 ± .02 | 1.0 ± .02 | 1.0 ± .02 | F(2,138) = .32 (.73) |
| **Motion**[4] | .20 ± .08 | .19 ± .10 | .19 ± .13 | F(2,99) = .06 (.94) | | .19 ± .08 | .22 ± .13 | .19 ± .13 | F(2,138) = 1.04 (.36) |

Note: Age, AAO, illness duration in years. Motion summarized as mean framewise displacement (6).

[1]Several subjects were missing SES (n=2 HC, 1 uOCD), lifetime C-YBOCS (n= 1 uOCD, 1 mOCD), illness duration and AAO (1 uOCD) or record of CBT exposure (1uOCD, 2 mOCD).

[2]Present CY-BOCS indicate mild to moderate symptom severity; 67 had active OCD symptoms, 2 (1 uOCD and 1 mOCD) had subclinical symptoms (CYBOCS score <6) at assessment.

Acc = Accuracy, AAO = age of onset, Compulsive ScaleCBT = cognitive behavioral therapy exposure, Con = Congruent, CY-BOCS = Child Yale-Brown Obsessive, HC = Healthy Control, Inc = Incongruent, RT = Response time

**Table S4**. Cingulo-opercular network function in pediatric unmedicated obsessive-compulsive disorder (uOCD) medicated obsessive-compulsive disorder (mOCD) and healthy youth (region of interest (ROI) analysis)

| **ERRORS** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **pMFC** | | | **Left aI/fO** | | | **Right aI/fO** | |
| Intercept (grp: HC) | **1.10 ± .28** | **<.001** | | 1.48 ± .25 | <.001 | | 1.42 ± .26 | <.001 |
| grp(uOCD) | .57 ± .48 | .239 | | 0.05 ± .42 | .888 | | .02 ± .45 | .971 |
| grp(mOCD) | **1.79 ± .55** | **.002** | | 0.98 ± .45 | .033 | | 1.78 ± .52 | <.001* |
| Age | *-.26 ± .13* | .051 | | ---------- | --- | | -.13 ± .12 | .290 |
| Inc RT | **-.006 ± .002** | **<.001** | | ---------- | --- | | -0.004 ± .002 | .017 |
| Inc Acc | **11.01 ± 3.07** | **<.001** | | 1.69 ± 3.8 | .660 | | 7.9 ± 2.89 | .007* |
| grp(uOCD) x Age | **.42 ± .19** | **.030** | | ---------- | --- | | .34 ± .17 | .058 |
| grp(mOCD) x Age | .05 ± .26 | .840 | | ---------- | --- | | -.19 ± .25 | .447 |
| grp(uOCD) x Inc RT | **.006 ± .002** | **.010** | | ---------- | --- | | .006 ± .002 | .005* |
| grp(mOCD) x Inc RT | .001 ± .003 | .694 | | ---------- | --- | | .002 ± .002 | .400 |
| grp(uOCD) x Inc Acc | ---------- | --- | | 14.47 ± 6.56 | .030 | | ---------- | --- |
| grp(mOCD) x Inc Acc | ---------- | --- | | 3.55 ± 6.36 | .578 | | ---------- | --- |
| Motion | ---------- | --- | | -3.03 ± 1.57 | .057 | | ---------- | --- |
| Adjusted R-Square | 0.19 | | | 0.12 | | | 0.16 | |
| Model ANOVA | F(9,92)=3.6 (p=.001) | | | F(6,95)=3.3 (p=.006) | | | F (9,92) = 3.1 (p=.003) | |
| **INTERFERENCE** | | | | | | | | |
| | **pMFC** | | | **Left aI/fO** | | | **Right aI/fO** | |
| Intercept (grp:HC) | **.60 ± .07** | **<.001** | | .45 ± .08 | <.001 | | .48 ± .06 | <.001 |
| grp(uOCD) | .03± .13 | .836 | | -.03 ± .15 | .861 | | ---------- | ---- |
| grp(mOCD) | .02 ± .13 | .908 | | -.16 ± .14 | .313 | | ---------- | ---- |
| Age | ---------- | ---- | | ---------- | ---- | | ---------- | ---- |
| Overall RT | **-.001 ± .0005** | **.035** | | -.001 ±.0004 | .053 | | -.001 ± .0003 | <.001* |
| Overall Acc | 1.88 ± 1.82 | .302 | | 4.93 ± 2.04 | .017 | | ---------- | ---- |
| grp(uOCD) x Age | **.10 ± .05** | **.054** | | ---------- | ---- | | ---------- | ---- |
| grp(mOCD)x Age | -.008 ± .07 | .900 | | ---------- | ---- | | ---------- | ---- |
| grp(uOCD) x overall RT | **.002 ± .001** | **.012** | | .001 ± .0007 | .046 | | ---------- | ---- |
| grp(mOCD) x overall RT | .001 ± .001 | .149 | | .0004 ± .001 | .550 | | ---------- | ---- |
| grp(uOCD) x overall Acc | **-7.92 ± 3.27** | **.017** | | -9.36 ± 3.8 | .014 | | ---------- | ---- |
| grp(mOCD) x overall Acc | -4.03 ± 3.02 | .185 | | -6.31 ± 3.5 | .070 | | ---------- | ---- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Motion | ---------- | --- | | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | 0.03 | | | 0.05 | | | 0.08 | |
| Model ANOVA* | F(11,129)= 1.4 (p=.18) | | | F(8,132)=1.9 (p=.07) | | | F(1,139)=13.1 (p<.001) | |

Note: Motion refers to framewise displacement (6). Dashed lines represent eliminated variables.
Post-hoc comparisons of group intercepts showed greater activation in mOCD compared to uOCD in pmFC (β = 1.22 ± .61, p = .05) and right aI/fO (β = 1.76 ± .57, p= .003), but no difference in left aI/fO (β = .92 ± .51, p = .07) for errors, and no differences for interference (p's > .45)
Significance levels were $p < .05$ for pMFC (primary region of interest, bolded) and $p < .013$ for secondary ROIs (asterisked).
Acc = accuracy, aI/fO = anterior insula/frontal operculum, grp = group, HC = healthy controls, Inc = incongruent, pMFC = Posterior medial frontal cortex, RT = response time.

**Table S5**. Posterior medial frontal cortex (pMFC) subregion function in in pediatric obsessive-compulsive disorder (OCD) compared to healthy controls (region of interest (ROI) analysis)

| **ERRORS** | | | | | |
|---|---|---|---|---|---|
| | **dACC** | | | **preSMA** | |
| Intercept (HC) | 1.14 ± .29 | <.001 | | 1.37 ± .32 | .001 |
| Group | .98 ± .41 | .019 | | 0.78 ± .44 | .085 |
| Age | -.25 ± .14 | .067 | | ---------- | --- |
| Inc RT | -.006 ± .002 | .002* | | -.003 ± .001 | .006* |
| Inc Acc | 10.10 ± 3.12 | .002* | | 1.25 ± 4.80 | .795 |
| Group x Age | .39 ± .18 | .031 | | ---------- | --- |
| Group x Inc RT | .005 ± .002 | .027 | | ---------- | --- |
| Group x Inc Acc | ---------- | --- | | 10.9 ± 6.63 | .105 |
| Motion | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | 0.16 | | | 0.11 | |
| Model ANOVA | F(6,95)=4.3 (p<.001) | | | F(4,97)=4.2 (p=.004) | |
| **INTERFERENCE** | | | | | |
| | **dACC** | | | **preSMA** | |
| Intercept (HC) | .62 ± .08 | <.001 | | .60 ± .07 | <.001 |
| Group | -.09 ± .11 | .393 | | .04 ± .11 | .678 |
| Age | -.03 ± .03 | .306 | | ---------- | ---- |
| Overall RT | -.001 ± .0006 | .065 | | -.001 ±.0004 | .040 |

| | | | | | |
|---|---|---|---|---|---|
| Overall Acc | 1.42 ± 1.93 | .463 | | 1.83 ± 1.86 | .327 |
| Group x Age | .07 ± .05 | .149 | | ---------- | ---- |
| Group x overall RT | .002 ± .0007 | .014 | | .001 ± .0005 | .029 |
| Group x overall Acc | -5.52 ± 2.72 | .045 | | -5.25 ± 2.7 | .050 |
| Motion | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | 0.03 | | | 0.03 | |
| Model ANOVA* | F(7,133)= 1.7 (p=.12) | | | F(5,135)=1.9 (p=.10) | |

Note: Motion refers to fractional displacement (6). Dashed lines represent predictor variables eliminated during backwards stepwise regression.

*Significance levels were $p < .013$.

Acc = Accuray, dACC = dorsal anterior cingulate cortex, HC = Healthy controls, Inc = incongruent, pre-SMA = pre-supplementary motor area, RT = response time

**Table S6**. Posterior medial frontal cortex (pMFC) subregion function in in pediatric unmedicated OCD (uOCD), medicated OCD (mOCD) and healthy controls (HC) (region of interest (ROI) analysis)

| **ERRORS** | | | | | |
|---|---|---|---|---|---|
| | **dACC** | | | **preSMA** | |
| Intercept (HC) | 1.13 ± .29 | <.001 | | 1.09 ± .32 | <.001 |
| grp(uOCD) | .60 ± .49 | .23 | | 0.39 ± 53 | .467 |
| grp(mOCD) | 1.77 ± .56 | .002* | | 1.26 ± .57 | .029 |
| Age | -.26 ± .13 | .055 | | ---------- | --- |
| Inc RT | -.006 ± .002 | .001* | | -.003 ± .001 | .008* |
| Inc Acc | 11.06 ± 3.13 | .001* | | 7.21 ± 3.33 | .033 |
| grp(uOCD) x Age | 0.42 ± .19 | .031 | | ---------- | --- |
| grp(mOCD) x Age | .05 ± .27 | .838 | | ---------- | --- |
| grp(uOCD) x Inc RT | .006 ± .002 | .011* | | ---------- | --- |
| grp(mOCD) x Inc RT | .001 ± .003 | .723 | | ---------- | --- |
| grp(uOCD) x Inc Acc | ---------- | --- | | ---------- | --- |
| grp(mOCD) x Inc Acc | ---------- | --- | | ---------- | --- |
| Motion | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | .18 | | | .10 | |
| Model ANOVA | F(9,92)=3.5 (p<.001) | | | F(4,97)=3.94 (p=.005) | |
| **INTERFERENCE** | | | | | |
| | **dACC** | | | **preSMA** | |
| Intercept (HC) | 0.62 ± .08 | <.001 | | 0.60 ± .07 | <.001 |
| Grp (uOCD) | -.04 ± .13 | .767 | | .04 ± .13 | .755 |
| Grp (mOCD) | -.07 ± .14 | .629 | | .04 ± .13 | .734 |
| Age | -.03 ± .03 | .306 | | ---------- | --- |
| Total ACC | 1.42 ± 1.93 | .463 | | 1.83 ± 1.87 | .330 |
| Total RT | -.001 ± .001 | .065 | | -.001 ± .0004 | .042 |
| Grp (uOCD) x Age | .11 ± .05 | .045 | | ---------- | --- |
| Grp (mOCD) x Age | -.001 ± .07 | .990 | | ---------- | --- |
| Grp (uOCD) x Total ACC | -8.05 ± 3.48 | .023 | | -7.56 ± 3.45 | .030 |
| Grp (mOCD) x Total ACC | -3.99 ± 3.22 | .217 | | -3.37 ± 3.17 | .289 |
| Grp (uOCD) x Total RT | .002 ± .001 | .025 | | .001 ± .001 | .047 |
| Grp (mOCD) x Total RT | .001 ± .001 | .110 | | .001 ± .001 | .120 |

| | | | | | |
|---|---|---|---|---|---|
| Motion | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | .03 | | | .02 | |
| Model ANOVA* | F(11,129)=1.43 (p=.17) | | | F(8,132)=1.32 (p=.24) | |

Note: Motion refers to framewise displacement (6). Dashed lines represent eliminated variables.

*Significance levels were $p < .013$.

Acc = accuracy, Grp = group, Inc = incongruent, RT = response time.

**Table S7**. Error-related activations in pediatric obsessive-compulsive disorder (OCD) compared to healthy youth (Wholebrain analysis)

| | Cluster-level statistics* | | | |
|---|---|---|---|---|
| **Predictor** | **$p_{FWE-corr}$** | **k** | **Coordinates** | **Z** |
| **OCD > HC** | | | | |
| **pMFC (preSMA-dACC)* | *.037* | *7* | *12, 17, 61* | *3.77* |
| **OCD x Age, positive effect** | | | | |
| **pMFC (dACC)* | *.021* | *13* | *0, 38, 16* | *3.48* |
| **OCD x overall RT, positive effect** | | | | |
| pMFC (dACC) | .001 | 169 | -6, 29, 7 | 4.18 |
| Left caudate | | | -15, 20, 7 | 4.18 |
| Rostral ACC | | | -12, 41, 4 | 3.90 |

Note: * Clusters are significant at $p < .05$ with correction for family wise error across the whole brain or, if italicized, within search volumes (pMFC, right aI/fO, or left aI/fO)
defined by the main effect of errors.
aI/fO = anterior insula/frontal operculum, pMFC = posterior medial frontal cortex

**Table S8**. Error-related activations in unmedicated OCD (uOCD) and medicated OCD (mOCD) vs. healthy controls (HC) (Wholebrain analysis)

| | Cluster-level statistics* | | | |
|---|---|---|---|---|
| **Predictor** | **$p_{FWE-corr}$** | **k** | **Coordinates** | **Z** |
| **mOCD > HC** | | | | |
| pMFC (dACC) | <.001 | 182 | 3, 23, 13 | 4.84 |
| | | | 0, 20, 28 | 4.02 |
| | | | -21, 41, 7 | 3.86 |
| *(preSMA)* | *.06* | *63* | *12, 17, 61* | *4.46* |
| | | | *12, 20, 52* | *3.57* |
| Right aI/fO | .006 | 112 | 57, 17, -5 | 4.28 |
| | | | 57, 11, 4 | 4.11 |
| **Left aI/fO* | *.028* | *6* | *-30, 29, -2* | *3.77* |
| Bilateral Precuneus | .002 | 146 | -12, -67, 37 | 4.57 |
| | | | -15, -70, 58 | 4.00 |
| | .051 | 66 | 9, -64, 64 | 3.84 |
| Right inf. parietal | .001 | 158 | 54, -34, 34 | 4.54 |
| Right sup. parietal | .032 | 76 | 30, -61, 46 | 4.63 |
| **Inc RT, negative effect** | | | | |
| pMFC (dACC) | <.001 | 196 | -6, 29, 7 | 4.44 |
| | | | -9, 38, 4 | 3.59 |
| Left Caudate | | | -15, 20, 7 | 3.98 |
| **uOCD x Age, positive effect** | | | | |
| **pMFC (dACC)* | *.046* | *5* | *3, 38, 19* | *3.19* |
| **uOCD x IncRT, positive effect** | | | | |
| **pMFC (dACC)* | *.034* | *8* | *6, 35, 22* | *3.39* |
| | | | *3, 32, 28* | *3.20* |

| | | | | |
|---|---|---|---|---|
| Right aI/fO | .032 | 76 | 45, 8, -8 | 4.04 |
| | | | 54, 5, -8 | 3.94 |
| | | | 45, 8, 1 | 3.66 |
| Left caudate | .008 | 106 | -15, 20, 7 | 3.86 |

Note: *Clusters are significant at $p < .05$ with correction for family wise error across the whole brain or, if italicized, within search volumes (pMFC, right aI/fO, or left aI/fO) defined by the main effect of errors.
aI/fO = anterior insula/frontal operculum, pMFC = posterior medial frontal cortex

**Table S9**. Interference-related activations in unmedicated OCD (uOCD) and medicated OCD (mOCD) vs. healthy controls (HC) (Wholebrain analysis)

| | Cluster-level statistics* | | | |
|---|---|---|---|---|
| **Predictor** | **$p_{FWE-corr}$** | **k** | **Coordinates** | **Z** |
| **Tot Acc, positive effect** | | | | |
| *Left aI/fO | .020 | 4 | -30, 17, -2 | 3.32 |
| **uOCD x Age, positive effect** | | | | |
| *pMFC (preSMA-dACC) | .044 | 9 | 0, 8, 55 | 3.45 |
| **uOCD x overall RT, positive effect** | | | | |
| *pMFC (preSMA-dACC) | .002 | 679 | 0, 8, 55 | 4.46 |
| *pMFC (dACC) | .044 | | -6, 23, 26 | 3.60 |
| *Left aI/fO | .015 | 7 | -30, 17, -2 | 3.55 |
| **uOCD x overall Acc, negative effect** | | | | |
| *pMFC (preSMA-dACC) | .009 | 33 | 6, 5, 56 | 4.14 |

| | | | | |
|---|---|---|---|---|
| **mOCD x overall Acc, negative effect** | | | | |
| *Left aI/fO | .020 | 4 | -33, 14, 1 | 3.37 |

Note: *Clusters are significant at $p < .05$ with correction for family wise errors within search volumes (pMFC, right aI/fO, or left aI/fO) defined by the main effect of interference

aI/fO = anterior insula/frontal operculum, pMFC = posterior medial frontal cortex



**Table S10**. Obsessive-compulsive disorder (OCD) severity and cingulo-opercular network function in pediatric unmedicated OCD (uOCD) and medicated OCD (mOCD) (region of interest (ROI)analysis)

| **ERRORS** | | | | | |
|---|---|---|---|---|---|
| | **pMFC** | | **Left aI/fO** | | **Right aI/fO** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intercept (grp:uOCD) | 1.70 ± .34 | <.001 | | 1.65 ± .32 | <.001 | | 1.5 ± .32 | <.001 |
| CYBOCS | **-.11 ± .04** | **.014** | | -.04 ± .03 | .181 | | ---------- | --- |
| Age | .23 ± .12 | .053 | | *.23 ± .11* | *.034* | | .25 ± .12 | .041 |
| Meds | .89 ± .52 | .100 | | .78 ± .48 | .115 | | 1.43 ± .50 | .007* |
| Inc RT | ---------- | --- | | ---------- | --- | | ---------- | --- |
| Inc Acc | **13.45 ± 3.61** | **<.001** | | 9.93 ± 3.28 | .004* | | 8.17 ± 3.37 | .020 |
| CY-BOCs x Meds | .04 ± .08 | .661 | | ---------- | --- | | ---------- | --- |
| Age x Meds | -.18 ± .21 | .382 | | -.40 ± .19 | .042 | | -.27 ± .19 | .164 |
| CY-BOCS x Age | **-.04 ± .02** | **.007** | | -.02 ± .01 | .174 | | ---------- | --- |
| CY-BOCS x Meds x Age | .07 ± .04 | .089 | | ---------- | --- | | ---------- | --- |
| Motion | ---------- | --- | | ---------- | --- | | 7.15 ± 3.39 | .040 |
| Adjusted R-Square | .36 | | | .25 | | | .21 | |
| Model ANOVA | F(8,42)=4.5 (p<.001) | | | F(6,44)=3.8 (p=.004) | | | F (5,45) = 3.6 (.008) | |
| **INTERFERENCE** | | | | | | | | |
| | **pMFC** | | | **Left aI/fO** | | | **Right aI/fO** | |
| Intercept (grp:uOCD) | **.68 ± .10** | **<.001** | | .52 ± .11 | <.001 | | .48 ± .13 | <.001 |
| CY-BOCS | -.01 ± .01 | .240 | | -.03 ± .01 | .003* | | -.0003 ± .02 | .988 |
| Age | .06 ± .04 | .083 | | .02 ± .03 | .471 | | .08 ± .04 | .066 |
| Meds | -.16 ± .15 | .316 | | -.34 ± .17 | .052 | | -.22 ± .20 | .251 |
| Overall RT | ---------- | --- | | ---------- | --- | | ---------- | --- |
| Overall Acc | **-3.86 ± 1.78** | **.034** | | ---------- | --- | | -3.78 ± 2.34 | .111 |
| CY-BOCS x Meds | ---------- | --- | | ---------- | --- | | .001 ± .03 | .959 |
| Age x Meds | -.10 ± .06 | .086 | | ---------- | --- | | -.07 ± .07 | .332 |
| CY-BOCS x Age | **-.01 ± .004** | **.030** | | -.01 ± .004 | .028 | | -.002 ± .01 | .713 |
| CY-BOCS x Meds x Age | ---------- | --- | | ---------- | --- | | -.02 ± .01 | .076 |
| Motion | 1.31 ± .81 | .107 | | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | 0.13 | | | 0.15 | | | 0.05 | |
| Model ANOVA | F(7,61)=2.4 (p=.03) | | | F(4,64)=4.1 (p=.005) | | | F(7,60)=1.5 (p=.18) | |

Note: Motion refers to framewise displacement (6)

Effects of CYBOCs and CYBOCs-by-age interaction on pMFC response to errors were significant only for uOCD, whereas the effects of these terms on pMFC and left aI/fO response to interference were significant across both uOCD and mOCD patient groups.

Acc = accuracy, (aI/fO) = anterior insula/frontal operculum, : aI/fO = anterior insula/frontal operculum, CY-BOCS = Child Yale- Brown Obsessive Compulsive Scale, Inc – incongruent, Meds = medication, mOCD = medicated OCD, uOCD = unmedicated OCD, pMFC = posterior medial frontal cortex, RT = response time

**Table S11**. Obsessive-compulsive disorder (OCD) severity and posterior medial frontal cortex (pMFC) subregion function in pediatric OCD

| **ERRORS** | | | | | |
|---|---|---|---|---|---|
| | **dACC** | | | **preSMA** | |
| Intercept | 1.92 ± .26 | <.001 | | 1.65 ± .32 | <.001 |
| CYBOCS | -.08 ± .04 | .023 | | -.05 ± .03 | .166 |
| Age | .14 ± .09 | .147 | | .17 ± .10 | .102 |
| Inc RT | ---------- | --- | | ---------- | --- |
| Inc Acc | 12.79 ± 3.72 | .001* | | 12.03 ± 4.04 | .005* |
| CY-BOCS x Age | -.02 ± .01 | .070 | | -.03 ± .02 | .052 |
| Motion | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | .30 | | | .23 | |
| Model ANOVA | F(4,46)=6.3 (p<.001) | | | F(4,46)=4.8 (p=.005) | |
| **INTERFERENCE** | | | | | |
| | **dACC** | | | **preSMA** | |
| Intercept | .54 ± .08 | <.001 | | .63 ± .08 | <.001 |
| CY-BOCS | ---------- | --- | | -.005 ± .01 | .591 |
| Age | ---------- | --- | | .02 ± .03 | .508 |
| Overall RT | ---------- | --- | | ---------- | --- |
| Overall Acc | -4.36 ± 1.92 | .026 | | -3.41 ± 1.89 | .074 |
| CY-BOCS x Age | ---------- | --- | | -.008 ± .004 | .061 |
| Motion | 1. 20 ± .72 | .102 | | 1.5 ± .79 | .055 |
| Adjusted R-Square | 0.07 | | | 0.09 | |

| | | | |
|---|---|---|---|
| Model ANOVA | F(2,66)=3.7 (p=.03) | | F(5,63)=2.4 (p=.05) |

Table S12. Obsessive-compulsive disorder (OCD) severity and posterior medial frontal cortex (pMFC) subregion function in pediatric unmedicated OCD (uOCD) and medicated OCD (mOCD) (region of interest (ROI) analysis)

| **ERRORS** | | | | | |
|---|---|---|---|---|---|
| | **dACC** | | | **preSMA** | |
| Intercept (grp:uOCD) | 1.70 ± .34 | <.001 | | 1.65 ± .32 | <.001 |
| CYBOCS | -.11 ± .04 | .012 | | *-.09 ± .05* | *.075* |
| Age | .23 ± .12 | .052 | | .09 ± .11 | .454 |
| Meds | .89 ± .52 | .134 | | .60 ± .59 | .316 |
| Inc RT | ---------- | --- | | -.002 ± .001 | .149 |
| Inc Acc | 13.51 ± 3.69 | <.001* | | 11.73 ± 4.02 | .006* |
| CY-BOCs x Meds | .04 ± .08 | .622 | | .11 ± .08 | .172 |
| Age x Meds | -.18 ± .21 | .396 | | ---------- | --- |
| CY-BOCS x Age | -.04 ± .02 | .005* | | -.04 ± .02 | .026 |
| CY-BOCS x Meds x Age | .07 ± .04 | .083 | | ---------- | --- |
| Motion | ---------- | --- | | ---------- | --- |
| Adjusted R-Square | .36 | | | .25 | |
| Model ANOVA | F(8,42)=4.5 (p<.001) | | | F(7,43)=3.5 (p=.005) | |
| **INTERFERENCE** | | | | | |
| | **dACC** | | | **preSMA** | |
| Intercept (grp:uOCD) | .63 ± .11 | <.001 | | .73 ± .11 | <.001 |
| CY-BOCS | -.02 ± .01 | .172 | | -.01 ± .01 | .352 |
| Age | .07 ± .04 | .073 | | .06 ± .04 | .123 |
| Meds | -.15 ± .16 | .356 | | -.16 ± .16 | .321 |
| Overall RT | ---------- | --- | | ---------- | --- |
| Overall Acc | -4.27 ± 1.89 | .023 | | -3.54 ± 1.86 | .062 |
| CY-BOCS x Meds | ---------- | --- | | ---------- | --- |
| Age x Meds | -.12 ± .06 | .049 | | -.08 ± .06 | .170 |
| CY-BOCS x Age | -.01 ± .004 | .075 | | -.01 ± .004 | .021 |
| CY-BOCS x Meds x Age | ---------- | --- | | ---------- | --- |
| Motion | 1.17 ±.86 | .178 | | 1.46 ± .85 | .089 |
| Adjusted R-Square | 0.12 | | | 0.11 | |
| Model ANOVA | F(7,61)=2.3 (p=.04) | | | F(7,61)=2.2 (p=.05) | |

Note: aI = anterior insula, Acc = accuracy, CY-BOCS = Child Yale- Brown Obsessive Compulsive Scale, Inc = incongruent, Meds = medication, pMFC = Posterior medial frontal cortex, RT = Response time
Motion refers to framewise displacement (6)

**Table S13.** Obsessive-compulsive disorder (OCD) severity and error-related activations unmedicated OCD (uOCD) and medicated OCD (mOCD) vs. healthy controls (HC) (Wholebrain analysis)

| **Predictor** | | **Cluster-level statistics*** | | | |
|---|---|---|---|---|---|
| **ERRORS** | | **$p_{FWE-corr}$** | **k** | **Coordinates** | **Z** |
| **CY-BOCS, negative effect€** | | | | | |
| **pMFC* | | *.010* | *20* | *12, 17, 52* | *3.70* |
| **Med > Unmed** | | | | | |
| Right aI/fO | | .048 | 59 | 57, 17, -5 | 3.82 |
| Precuneus | | .026 | 70 | 3, -58, 61 | 3.92 |
| **Inc RT, negative effect** | | | | | |
| Left Superior Parietal | | .011 | 85 | -27, -52, 55 | 4.23 |
| **Inc Acc, positive effect** | | | | | |
| pMFC | | .022 | 73 | -3, 20, 28 | 4.26 |
| Right middle frontal (6) | | .023 | 72 | 45, 11, 43 | 4.56 |
| **Right aI/fO* | | *.011* | *15* | *36, 26, -5* | *3.89* |
| **CY-BOCS x Age, negative effect€** | | | | | |
| **Posterior medial frontal cortex* | | *.013* | *17* | *-6, 20, 46* | *4.12* |
| **Posterior medial frontal cortex* | | *.019* | *13* | *6, 14, 55* | *3.52* |

Note: * Clusters are significant at $p < .05$ with correction for family wise error across the whole brain or, if italicized, within search volumes (pMFC, right aI/fO, or left aI/fO) defined by the main effect of errors.
€The effects of CYBOCs and CYBOCs-by-age interaction on pMFC response to errors were significant only for uOCD.
aI/fO = anterior insula/frontal operculum, Acc = accuracy, CY-BOCS = Child Yale- Brown Obsessive Compulsive Scale, Inc = incongruent, Meds = Medication, pMFC = posterior medial frontal cortex, RT = response time

**Table S14.** Obsessive-compulsive disorder (OCD) severity and interference-related activations in unmedicated OCD (uOCD) and medicated OCD (mOCD) vs. healthy controls (HC) (Wholebrain analysis)

| **INTERFERENCE** | | | | | |
|---|---|---|---|---|---|
| **CY-BOCS, positive effect** | | | | | |
| Superior medial frontal | | .047 | 64 | 6, 47, 40 | 4.14 |
| Right Inferior Parietal | | .011 | 93 | 57, -55, 37 | 4.23 |
| **Unmed > Med** | | | | | |
| Left Superior Parietal | | .011 | 93 | -27, -46, 40 | 4.48 |
| Left Precuneus | | .029 | 73 | -12, -79, 37 | 4.36 |
| **Age, positive effect** | | | | | |
| Right Superior Parietal | | .005 | 111 | 24, -52, 40 | 4.41 |
| Left Precentral | | .052 | 62 | -42, -1, 34 | 4.16 |
| **Age, negative effect** | | | | | |
| Right Superior Parietal | | .003 | 120 | 51, -73, 28 | |
| Left Superior Parietal | | .018 | 83 | -45, 61, 28 | |
| **Overall RT, negative** | | | | | |
| Right Superior Parietal | | .001 | 143 | 51, -73, 31 | 5.13 |
| **Overall Acc, negative** | | | | | |
| Left Middle Frontal (dlPFC) | | .028 | 74 | -24, 35, 28 | 4.41 |
| **CY-BOCS x Med** | | | | | |
| Right Superior Parietal | | .024 | 77 | 57, -55, 37 | 4.25 |
| **CY-BOCS x Age, positive effect** | | | | | |
| Left Inferior Parietal | | .028 | 74 | -45, -61, 28 | 4.86 |
| Right Superior Parietal | | .019 | 82 | 54, -58, 43 | 4.10 |
| **CY-BOCS x Age, negative effect** | | | | | |
| ** Left aI/fO* | | *.016* | *6* | *-27, 23, 7* | *3.69* |
| Left Inferior Parietal | | .006 | 106 | -27, -52, 37 | 4.94 |
| | | | | -27, -64, 31 | 3.66 |
| **Motion, positive** | | | | | |
| Cerebellum | | <.001 | 193 | 6, -55, 23 | 4.35 |

Note: * Clusters are significant at $p < .05$ with correction for family wise error across the whole brain or, if italicized, within search volumes (pMFC, right aI/fO, or left aI/fO) defined by the main effect of errors.

Motion = mean framewise displacement [28]. Age, AAO, illness duration in years.
[a] SES missing for 2 HC, 1 OCD.
aI/fO = anterior insula/frontal operculum, AAO = age of onset, Acc = accuracy, Con = congruent, CY-BOCS = Child Yale-Brown Obsessive Compulsive Scale, HC = Healthy Control, Inc = incongruent, OCD = Obsessive Compulsive Disorder, pMFC = posterior medial frontal cortex, RT = response time

Supplemental Figures

**Figure S1.** Multisource Interference Task (MSIT) Design

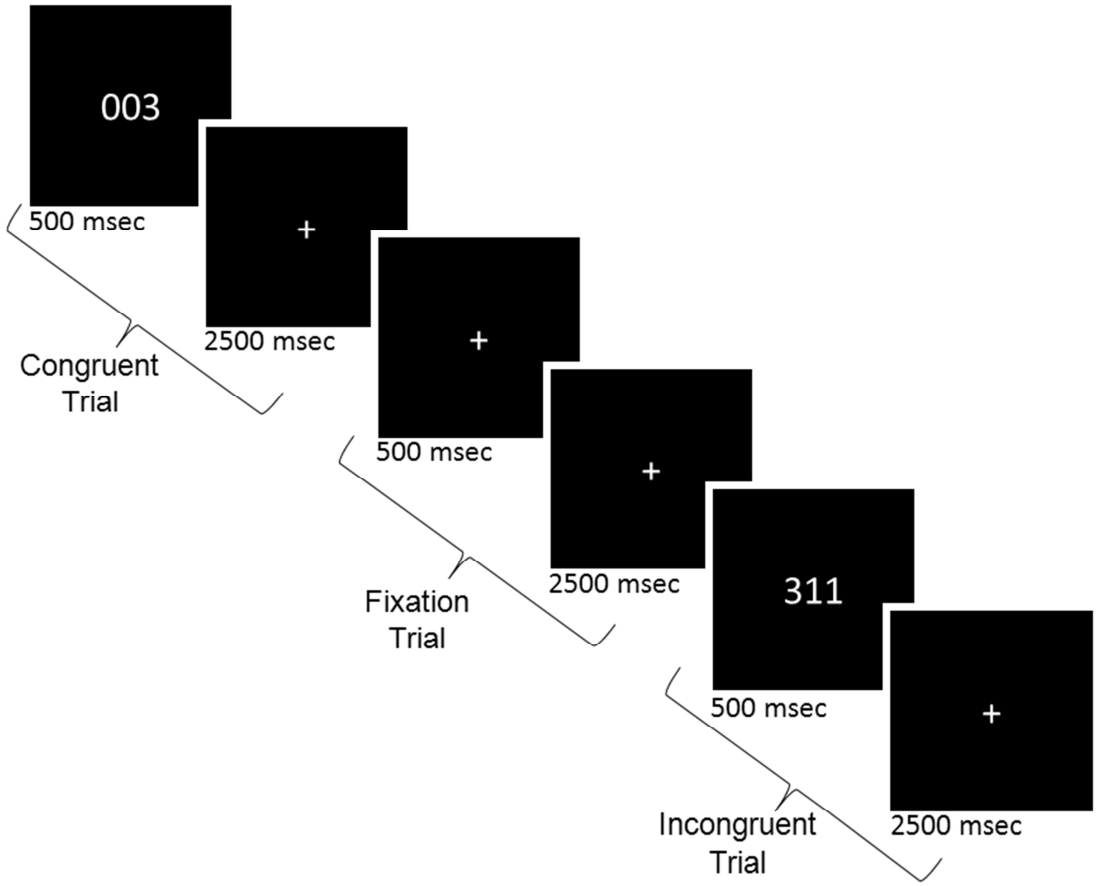
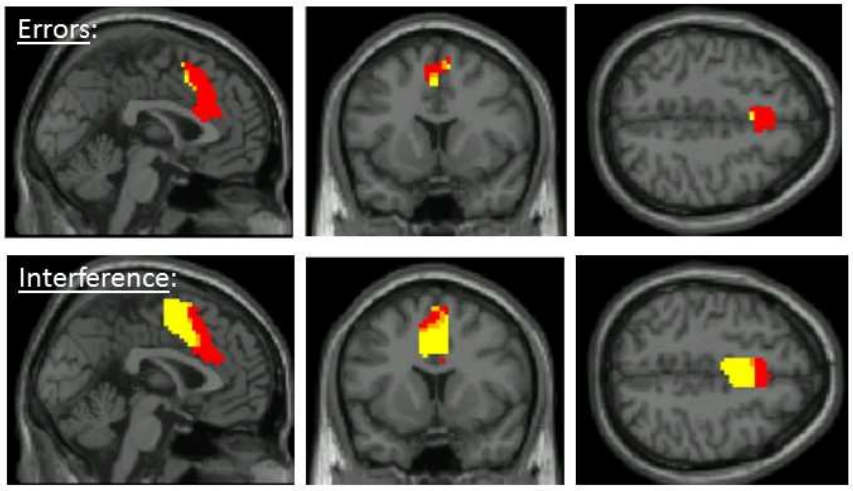


**Figure S2.** Dorsal accuracy (ACC) and pre-supplementary motor area (pre-SMA) region of interests (ROIS)




Note: Dorsal ACC (red) and pre-SMA (yellow) were defined by conjunction of main effects for error and interference contrasts with Neurosynth middle and posterior MFC zones, respectively.
MFC = medial frontal cortex

**Figure S3.** Effects of age and performance on cingulo-opercular network function in pediatric unmedicated OCD (uOCD), medicated OCD (mOCD) and healthy youth (region of interest (ROI) analysis)

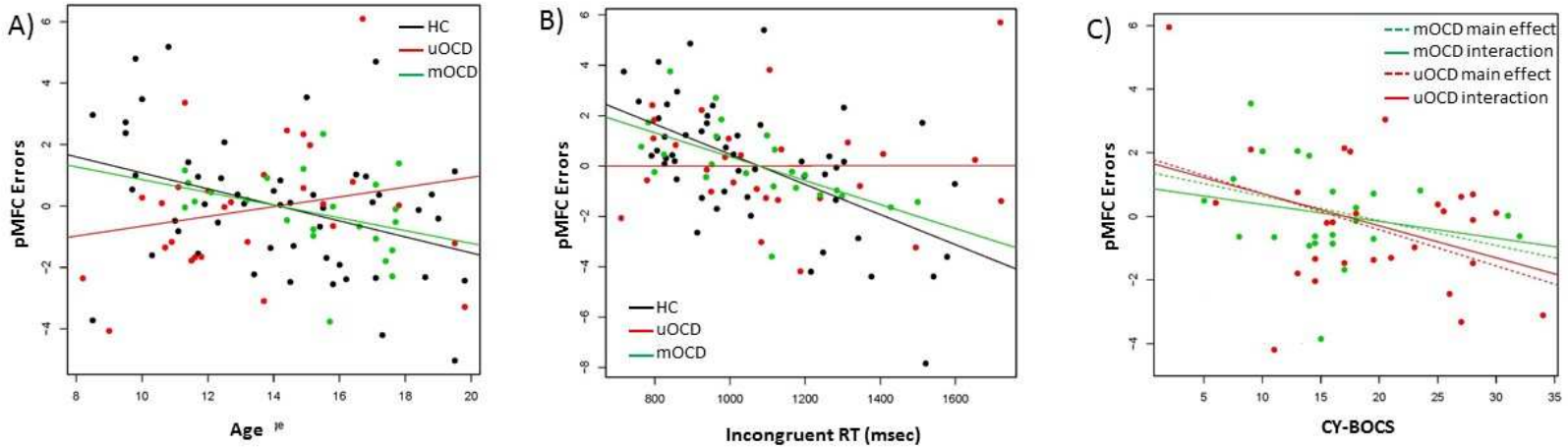
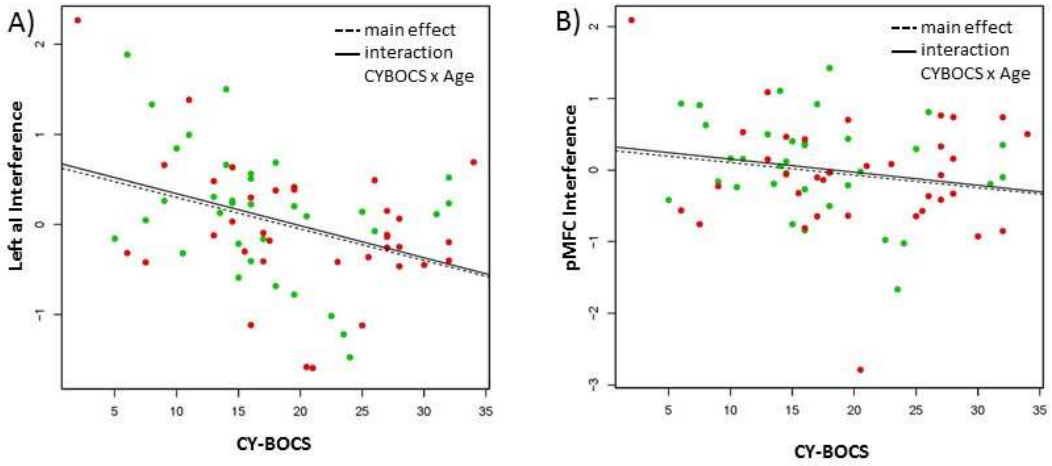


**Figure S4:** Effects of obsessive-compulsive disorder (OCD) severity on cingulo-opercular function in pediatric unmedicated OCD (uOCD) and medicated OCD (mOCD).



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