

Prediction of response to cognitive-behavioral therapy in obsessive-compulsive disorder: a multivariate analysis of resting state functional connectivity

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Background

- Cognitive-behavioral therapy (CBT) is effective for many for reducing symptoms of obsessive-compulsive disorder (OCD), although the response still varies significantly between individuals.
- Specialized CBT for OCD is limited in availability, expensive, stressful, and time-consuming.
- This underscores the importance of developing reliable predictors of response to treatment to help with clinical decision-making.
- Several studies have examined clinical and neurobiological features pre-treatment that are correlated with response to treatment.^{2,3} Only one has examined functional connectivity as a predictor,⁴ and none have applied multivariate approaches.
- We used a multivariate pattern recognition approach applied to resting state functional connectivity pre-CBT in order to make predictive inferences on the individual patient level, as to their degree of response to treatment.
- We applied the same approaches to pre-treatment symptomatology in order to further elucidate mechanisms of functional connectivity associated with obsessions and compulsions.

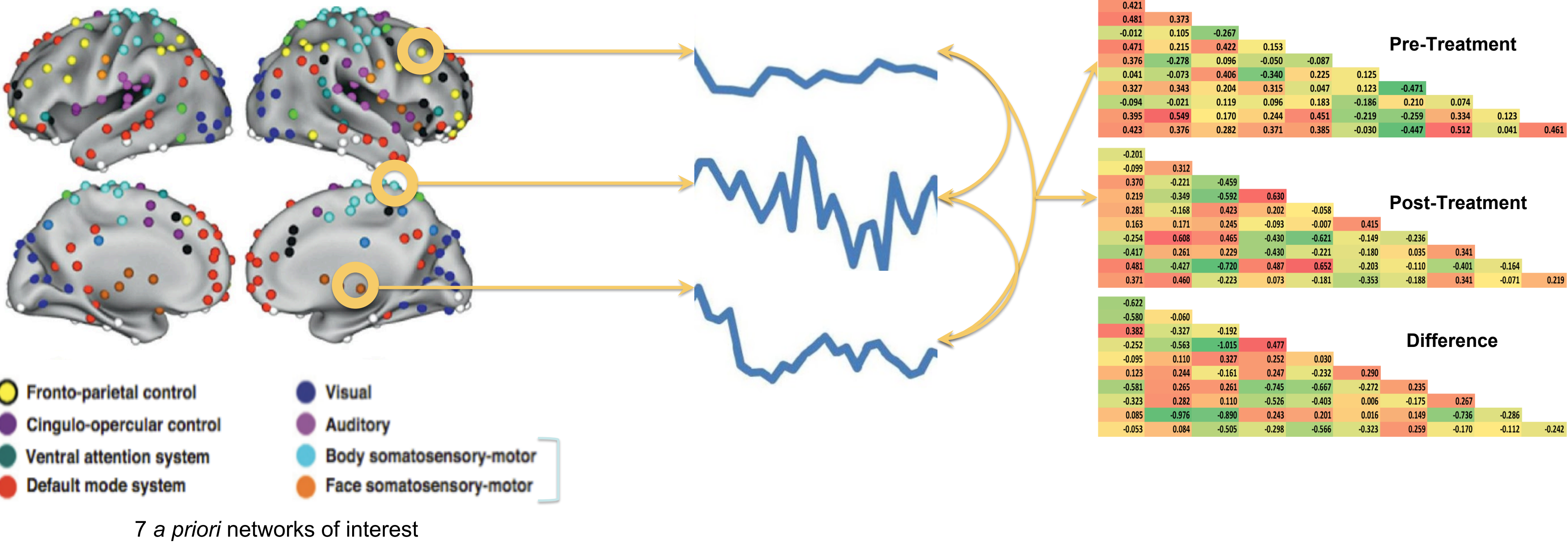
Success with CBT varies. The ability to use insights from a patient's neural activity patterns to predict their response could help adjust our approach or seek alternative treatment methods – saving patients time, money, and energy.

Methods

YBOCS (Yale-Brown Obsessive Compulsive Scale)

- Widely-used measure of severity of obsessions and compulsions in OCD
- Range: 0-40. 5 items index obsession severity; 5 items index compulsion severity

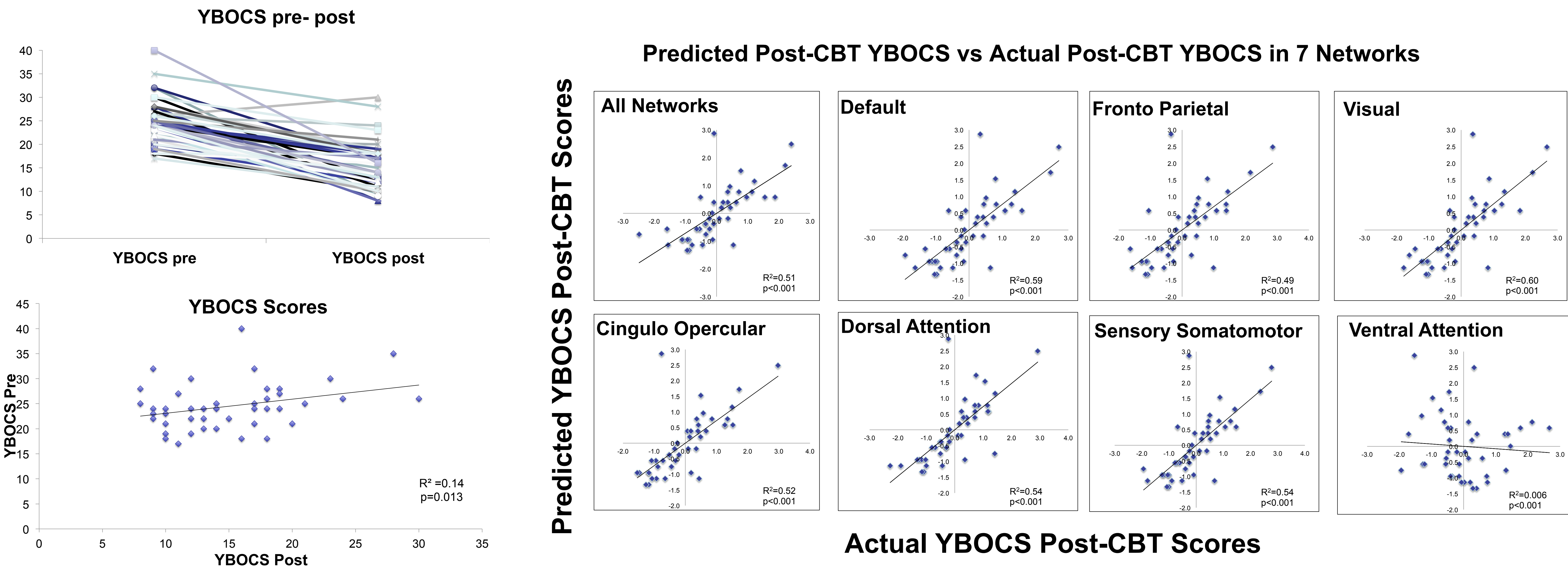
264 Regions of Interest | Mean Time Course | Functional Connectivity



Results

| Characteristics | OCD (N=43) | | P Value |
|-------------------------------------------|------------|------|---------------------|
| | value | SD | |
| Female/male | 21/22 | | |
| Age | 33 | 10.7 | |
| Education, years | 15.6 | 2.4 | |
| WASI IQ | 108.2 | 9.1 | |
| GAS | 57.6 | 8.5 | |
| Number on serotonin-reuptake inhibitor | 14 | | |
| Number with psychiatric comorbidities: | 31 | | |
| Number without psychiatric comorbidities: | 12 | | |
| YBOCS total pre-CBT | 24.5 | 4.7 | |
| YBOCS total post-CBT | 15.0 | 5.2 | <0.001 ¹ |
| YBOCS Obsessions (1-5) pre-CBT | 11.9 | 2.7 | |
| YBOCS Obsessions (1-5) post-CBT | 7.9 | 3.1 | <0.001 ¹ |
| YBOCS Compulsions (6-10) pre-CBT | 12.6 | 2.2 | |
| YBOCS Compulsions (6-10) post-CBT | 7.0 | 2.7 | <0.001 ¹ |
| HAMA pre-CBT | 12.4 | 5.4 | |
| HAMA post-CBT | 8.4 | 5.1 | <0.001 ¹ |
| MADRS pre-CBT | 15.3 | 9.5 | |
| MADRS post-CBT | 10.8 | 8.9 | <0.001 ¹ |
| GAS pre-CBT | 57.6 | 8.5 | |
| GAS post-CBT | 69.6 | 13.3 | <0.001 ¹ |

¹Paired t-test, comparing pre- versus post-CBT



- OCD symptoms improved with CBT; YBOCS decreased on average by 39%.
- YBOCS post-treatment scores are strongly predicted by pre-treatment connectivity in multiple networks combined with pre-treatment YBOCS scores.
- Pre-treatment connectivity is more predictive of YBOCS post-treatment scores than is pre-treatment YBOCS alone.
- Post treatment connectivity shows strong relationship with residual symptom severity (data not shown).

Conclusions

- This represents the first study in OCD to use multivariate pattern recognition approaches to determine neurobiological markers predictive of response to treatment.
- The combination of strength of functional connectivity in multiple networks and pre-treatment OCD symptom severity are highly predictive of symptom severity after intensive CBT.
- Pre-treatment OCD symptom severity by itself is only moderately predictive of symptom severity after treatment, and adding pre-treatment OCD symptoms as a feature only marginally improved the predictive ability beyond network connectivity alone. Thus, brain connectivity may be a more useful prognostic biomarker for response to treatment than patients' subjective reports of symptoms.
- Results have clinical implications for identifying individual OCD patients who will maximally benefit from treatment with intensive CBT, and have implications for further understanding the pathophysiology of OCD.

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