The Neurocircuitry of Body Dysmorphic Disorder: A Review

Yihui Cheng[1,2], Himanshu Tyagi[1,3]

1. UCL Queen Square Institute of Neurology, London, UK
2. Medical School, School of Medicine and Veterinary Medicine, University of Glasgow, Glasgow, UK
3. National Hospital for Neurology and Neurosurgery, University College London NHS Foundation Trust, Queen Square, London, UK

Rationale

Body Dysmorphic Disorder (BDD) is a severe neuropsychiatric disorder characterised by preoccupied attention to appearance flaws and subsequent obsessive appearance concerns and compulsive checking or camouflaging behaviours. It has been classified under the spectrum of Obsessive-Compulsive and Related Disorder (OCRD) with similar obsessive-compulsive clinical presentation to Obsessive Compulsive Disorder. [1] However, the underlying pathophysiology of neurocircuits in BDD is still poorly understood.

Objectives and Methods

Objectives: To describe the up-to-date findings of BDD neurobiology, focusing on neuroimaging and psychophysiological studies.

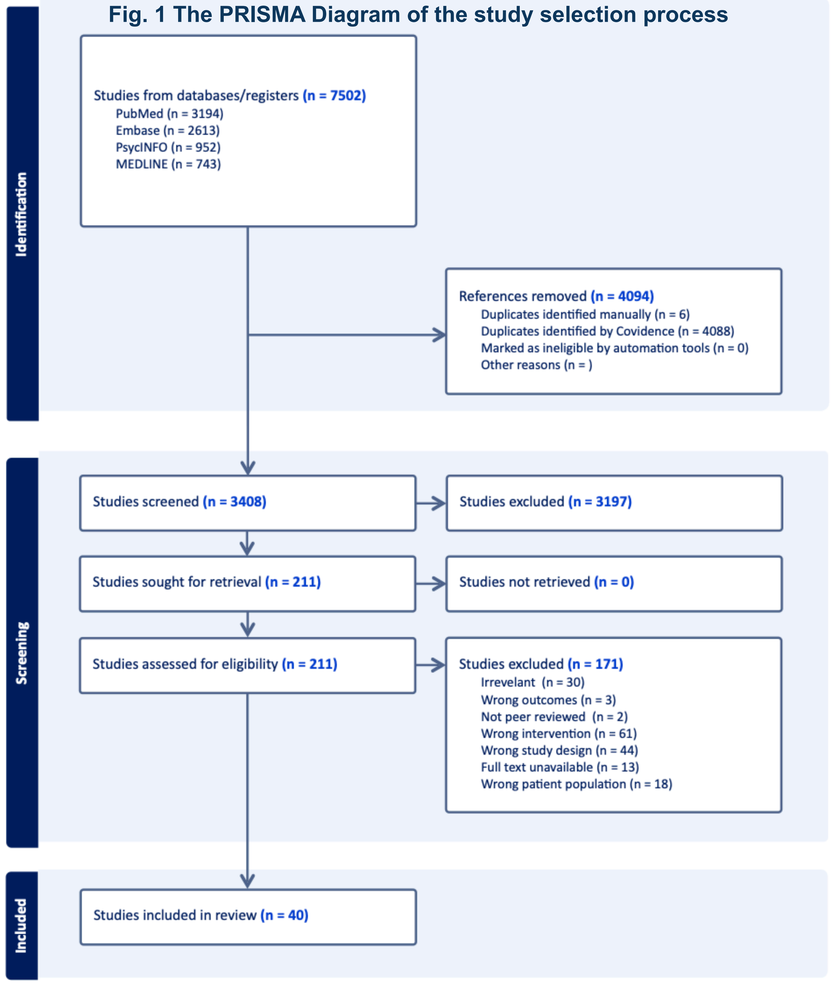
Eligibility Criteria

- **Participants**: Clinical BDD patients
- **Intervention**: Any neuroimaging or psychophysiology interventions
- **Comparison**: Demographically matched healthy controls
- **Outcome**: 1. Significant difference between BDD and HC; 2. Correlation between changes in feature and BDD clinical symptom severity
- **Study design**: Original primary articles on human participants

An updated review using the search keywords from a previous review [2]; Following PRISMA Guidance [3]; Search last conducted on the 1st March 2024 without any date restrictions; Qualitative approach for result synthesis;

Results

Fig. 1 The PRISMA Diagram of the study selection process



Study Characteristics

All studies were published between 2003 and 2023; 40 studies were included. The PRISMA diagram is displayed in Figure 1.

- Morphology studies = 7; Functional MRI and EEG studies = 26; Brain connectivity studies = 7 (One joint DTI and fMRI)
- Total 1716 individuals; 815 BDD patients + 901 healthy controls (HC)

BDD Morphology

Brain volume and cortex thickness: BDD vs. HC - Heterogenous findings

- >Brain regions associated with volume change

- ***Bilateral*** fusiform gyrus (FFG), orbital frontal gyrus (OFC), early extrastriate visual cortex, and thalamus
- ***Left*** anterior cingulate cortex (ACC), inferior parietal region, hippocampus, and amygdala
- *Right* precuneus (PRCU) and superior parietal lobule (SPL)

Regional volume and cortex thickness in clinical symptoms/ illness duration

- ***BDD severity*** (BDD-YBOCS): *bilateral* amygdala, *left* inferior frontal gyrus (IFG) and lateral occipital cortex
- ***Anxiety severity*** (HAM-A): *right* dorsal caudate nucleus, *left* superior temporal cortex thickness
- ***Depression severity*** (HAM-D or MADRS): *left* amygdala
- ***Illness duration***: *bilateral* OFC

BDD EEG

Facial stimuli: ↓ N170 amplitude and abnormal N170 spike —> ↓ **holistic processing (DVS)** and ↑ **detailed processing (VVS)** in BDD

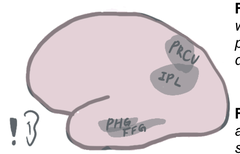


Figure 3. *Hypoactivation brain regions for auditory stimuli identified using a cortical source estimator algorithm*

Startle auditory stimuli: Theta-1 hyperactivity + ↓ Beta-1 oscillation in PPI and PPF —> **orienting** + **attention maintaining** disturbance in BDD [Fig.3]

BDD fMRI

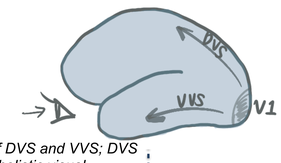


Figure 2. *Mapping of DVS and VVS; DVS was associated with holistic visual processing; VVS was associated with detail processing*

Similar OFC features with OCD: left OFC (right for OCD) hyperactivity when viewing one's own face; right OFC (left for OCD) connectivity positively correlated with BDD-YBOCS

Abnormal amygdala activation and connectivity: heightened sensitivity to negative emotional facial stimuli —> Involvement of temporal limbic circuit; potential altered top-down processing in BDD

Reverse effect of oxytocin on left amygdala regional connectivity: ↓ left amygdala and middle temporal gyrus connectivity (VVS) —> oxytocin was hypothesised to help relieve BDD symptom

IPL= Inferior Parietal lobule; PHG= Parahippocampal gyrus; DVS= Dorsal Visual Stream; VVS= Ventral Visual Stream; PPI= Prepulse inhibition; PPF= Prepulse facilitation
BDD-YBOCS= Yale-Brown Obsessive-Compulsive Scale Modified for Body Dysmorphic Disorder

Conclusion

- Heterogenous findings in BDD morphology could be attributed to its subtle anatomical changes
- An imbalance in BDD visual processing between DVS and VVS
- BDD patients also featured orienting and attention-maintaining disturbances
- Abnormal amygdala activation and connectivity might be associated with top-down visual processing and may be modulated by oxytocin

Reference

1. Regier, D. A., Kuhl, E. A., & Kupfer, D. J. (2013). The DSM-5: Classification and criteria changes. World psychiatry : official journal of the World Psychiatric Association (WPA), 12(2), 92–98. https://doi.org/10.1002/wps.20050
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3. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., … Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ (Clinical research ed.), 372, n71. https://doi.org/10.1136/bmj.n71