Review article
Ανασκόπηση

Body dysmorphic disorder: Latest neuroanatomical and neuropsychological findings

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Body dysmorphic disorder (BDD) is characterized by a preoccupation with a perceived defect or flaw in physical appearance that is not observable or appears slight to others. It leads to severe distress and functional impairment. Cognitive-behavioural and neurobiological similarities to obsessive compulsive disorder (OCD) have led to its newly conceived classification as an obsessive compulsive related disorder (OCRD). In the process of investigating the neurobiology of BDD, neuroimaging and neuropsychological studies have been conducted. This review presents the most recent research findings and their connection with BDD clinical features. Imaging studies have shown increased total white matter volume and caudate volume asymmetry in BDD patients. These findings are consistent with the striatal topography model of OCRDs. Other studies have showed perfusion deficits in bilateral anterior-medial temporal and occipital regions and asymmetric perfusion in parietal lobes. In addition, correlation between symptom severity and left inferior frontal gyrus volume reflects the degree of detailed, analytic encoding that occurs on day-to-day basis when viewing others and themselves, and that likely underlies their symptoms. Finally, positive correlation between right amygdala volume and symptom severity signifies pathological fear circuitry engagement, hypervigilance and heightened sensitivity to social situations. Neuropsychological studies of BDD reveal deficits in strategic organization, learning and free recall after short and long delays. Executive function deficits are related to spatial working memory and subsequent thinking speed as well as impaired higher level planning ability. BDD patients' organizational strategies tend to focus on detail rather than on larger, global clustering features. They are characterized by abnormal visual processing of both details and global elements, inaccurate processing of global elements and reduced flexibility in switching visual attention between global and local features. Moreover, BDD patients seem to have deficits in identifying facial emotional expressions and they tend to misinterpret expressions of disgust (and others) as anger. Poor insight and ideas of reference, common in BDD, might be related to emotion recognition biases for angry expressions. These findings have been supplemented by combined neuroimaging and neuropsychological studies. Left hemisphere hyperactivity for low and normal spatial frequency face tasks and abnormal activation of the amygdala for high and low spatial frequency face tasks suggests detail encoding and analysis in BDD. Patients may primarily perceive details but they are impaired in their ability to contextualize them holistically.

Key words: Body dysmorphic disorder, neurobiology, neuropsychology.

Introduction

Body dysmorphic disorder (BDD) has been described for over a century.[1] DSM-III first included BDD as "dysmorphophobia", an atypical somatoform disorder. In DSM-IV BDD was classified as a somatoform disorder, while in DSM-5 it is included in the section of Obsessive Compulsive and Related Disorders. BDD is characterized by a preoccupation with a perceived defect in appearance, that is not observable or appears slight to others. BDD causes significant distress and functional impairment but remains under-recognized. Investigation of its neurobiological substrates remains a challenge.

Definition-Clinical features (table 1)

BDD is associated with high levels of anxiety, social avoidance, depressed mood, neuroticism and perfectionism as well as low extroversion and low self-esteem. Most patients receive cosmetic treatment, dermatological, surgical and dental being the most common. BDD appears to respond poorly to such treatments and sometimes deteriorates. Some patients take legal action or are violent towards the clinician because they are dissatisfied with the cosmetic outcome. Many patients have ideas or delusions of reference, believing that other people take special notice or mock them because of their appearance. BDD patients experience impaired psychosocial functioning; about 20% of youths with BDD drop out of school because of their symptoms, while a high proportion of adults and adolescents have been psychiatrically hospitalized.

Table 1. Body Dysmorphic Disorder: DSM 5 Diagnostic Criteria.

A. Preoccupation with one or more perceived defects or flaws in physical appearance that are not observable or appear slight to others.
B. At some point during the course of the disorder, the individual has performed repetitive behaviours (e.g. mirror checking, excessive grooming, skin picking, reassurance seeking) or mental acts (e.g. comparing his or her appearance with that of others) in response to the appearance concerns.
C. The preoccupation causes clinically significant distress or impairment in social, occupational or other important areas of functioning.
D. The appearance preoccupation is not better explained by concerns with body fat or weight in an individual whose symptoms meet diagnostic criteria for an eating disorder.

Specifier: With muscle dysmorphia: The individual is preoccupied with the idea that his or her body is too small or insufficiently muscular. This specifier is used even if the individual is preoccupied with other body areas.
Specifier: Degree of insight.
With good or fair insight: The individual recognizes that the body dysmorphic disorder beliefs are definitely or probably not true or that they may or may not be true.
With poor insight: The individual thinks that the body dysmorphic disorder beliefs are probably true.
With absent insight/delusional beliefs: The individual is completely convinced that the body dysmorphic disorder beliefs are true.

Course and development

Epidemiologic studies report prevalence of 0.7–2.4% in the general population, 9–12% in dermatology settings, 3–16% in cosmetic surgery settings, 8–37% in OCD, 11–13% in social phobia, 26% in trichotillomania and 14–20% in atypical major depressive disorder. Two thirds of individuals have illness onset before age 18. More severe symptoms at intake, longer duration of illness, and the presence of a comorbid personality disorder at intake predict a lower likelihood of remission from BDD.[2] Individuals with disorder onset before 18 are more likely to attempt suicide and their comorbidity is higher.[3] Approximately 80% of individuals with BDD report past or current suicidal ideation, and about 25% have attempted suicide. Approximately 33% report violent behavior that they attribute primarily to BDD (e.g., attacking someone or damaging property). Anger and violence seem to be fueled by anger about looking "deformed", inability to fix the "defect", delusions of reference and dissatisfaction with cosmetic procedures. According to one survey, 12% of plastic surgeons reported they had been threatened physically by a dissatisfied BDD patient.[4] Comorbidity of BDD includes Major Depression (75%), substance use disorders (30–48.9%), OCD (32–33%) and Social Phobia (37–39%).

Neurobiology

Neuroimaging

A recent MRI study found leftward shift in caudate volume asymmetry and greater total white mat-

ter volume in BDD patients compared to controls.[5] Increased total white matter volume, in the absence of increased grey matter volume, might reflect increased volume of myelin per fiber or an increased proportion of glia; these abnormalities could be due to primary developmental processes. Likewise, abnormalities in caudate asymmetry might reflect abnormal developmental processes, asymmetric degeneration or asymmetric anomalies in growth, synaptic plasticity or arborization. These results are consistent with 'the striatal topography model' of Obsessive-Compulsive Spectrum Disorders (OCSD).

A SPECT study showed discrepant findings; relative perfusion deficits in bilateral anterior-medial temporal and occipital regions and asymmetric perfusion in parietal lobes.[6] (Abnormalities in parietal circuits are consistent with the core feature of disturbed perception of body form). From T1 magnetic resonance images, brain volumes of 12 unmedicated subjects with BDD were compared to 12 controls using voxel-based morphometry.[7] There were no differences in total white or grey matter between groups. There were no differences for the inferior frontal gyrus (IFG), amygdala and caudate. However there was a positive correlation between symptom severity (scores on the BDD-YBOCS scale) and left IFG volume. There was also a positive correlation between right amygdala volume and BDD-YBOCS score. The observation of the left IFG varying with severity of BDD symptoms could be a reflection of the degree of detailed, analytic encoding when viewing others and themselves, and that likely underlies the BDD patients' symptoms. Hyperactive amygdala in response to emotional and neutral faces has been found in social phobia, particularly on the right side.[8] Amygdala hyperactivity in BDD may also be related to right amygdala volume, as it varied in proportion to symptom severity.

In another MRI study, brain region volumes of 12 BDD patients were compared to 12 controls.[9] Results showed smaller mean orbito-frontal cortex and anterior cingulate volumes, a trend towards increased thalamic volume and larger mean white matter volume in BDD patients. Findings may be accumulatively interpreted as further evidence for the inclusion of BDD in the OCSD.

Table 2 summarizes the previous results.

Neuropsychology

Deckersbach et al[10] investigated the nature of memory dysfunction in BDD, on 17 BDD patients and 17 controls using the Rey-Osterrieth Complex Figure Test and the California Verbal Learning Test (CVLT), which measure non verbal and verbal memory respectively. BDD patients showed deficits in strategic organization, learning and free recall after short and long delays. However, they did not show problems in storing previously learned information. In the BDD group free recall deficits were statistically mediated by the organizational strategies used during learning trials, focusing on isolated details rather than on global organizational features. These organiza-

Table 2. Neuroimaging studies.

Study	Sample	Method	Results
Rauch et al (2003)	n:16 (BDD 8, C8)	Comparative volumetric MRI study	BDD: ↑Total white matter volume Leftward shift in caudate volume asymmetry
Carey et al (2004)	n:6 (BDD)	SPECT imaging	↓perfusion in bilateral anterior-medial temporal and occipital regions Asymmetrical perfusion in parietal lobes
Feusner et al (2009)	n:24 (BDD 12, C 12)	Comparative volumetric MRI study	↑score BDD-YBOCS → ↑left inferior frontal gyrus and amygdala volume
Atmaca et al (2010)	n:24 (BDD 12, C 12)	Comparative volumetric MRI study	BDD: ↓orbito-frontal cortex and anterior cingulate volume Trend towards ↑ thalamic volume ↑mean white matter volume

tional deficits affected both verbal and non verbal memory performance. These findings are consistent with frontostriatal etiologic models and support the hypothesis that BDD may be conceptualized as an OCSD.[11,12]

On the other hand, recognition deficits of BDD patients in CVLT do not rule out additional involvement of other brain regions, including medial temporal cortex, in the memory deficits observed in BDD patients.

Based on the hypothesis that focus on specific body parts might impair overall face recognition, Buhlmann et al[13] investigated the ability to identify facial expressions of emotion and to discriminate single facial features in BDD patients, OCD patients and controls. The Short Form of the Benton Facial Recognition Test[14] was used, which requires matching a target face with up to three pictures of the same person in a six-stimuli array of faces that vary in terms of angles and lighting. The three groups exhibited no neuropsychological deficits in facial feature processing. BDD patients compared to OCD patients and controls, performed worse at identifying and interpreting emotional facial expressions. BDD patients were as accurate as OCD patients and controls in identifying angry expressions, but they misinterpreted other facial expressions, especially disgusted ones more often as angry. Poor insight and ideas of reference, common in BDD, might be related to emotion recognition biases for angry expressions.

Buhlmann and al[15] investigated whether BDD patients are characterized by recognition biases for threatening facial expressions and whether they exhibit this recognition bias in self-referent or in other-referent situations. BDD patients were less accurate in identifying emotional expressions in self-referent but not in other-referent scenarios. Furthermore they were less accurate in identifying neutral expressions, misinterpreted more neutral expressions as contemptuous and angry, and showed a tendency towards interpreting neutral expressions as disgust.

In order to investigate executive function, Dunai et al[16] assessed 14 BDD patients and 14 controls with tests selected from the Cambridge Neuropsychological Test Automated Battery. Results demonstrated that BDD patients exhibit deficits in executive function related to spatial working memory and subsequent thinking speed. On tasks assessing short-term memory capacity, motor speed and visual memory, patients' performance was similar to controls. There was no association between symptom severity and performance. BDD patients' spatial short-term memory capacity was not compromised, suggesting that the ability to hold spatial information "on line" is not reduced in BDD. However, when they needed to manipulate increasing amounts of spatial information, BDD participants made more errors than controls.

The Stockings of Cambridge task indicated that patients solved fewer problems overall, solved fewer problems in the minimum number of moves and made more moves to solve a problem. This pattern has been observed in schizophrenia[17] and OCD[18] and is thought to be a consequence of poor initial planning, leading to mistakes and pauses for further planning. Poor planning and mistakes could be due to BDD patients' decreased ability to use online processing to manipulate spatial information, indicated by spatial working memory deficits. The executive function deficits suggest frontal involvement in BDD, which is consistent with the idea of BDD as an OCSD.

In order to investigate local and global visual information processing and set-shifting, Kerwin et al[19] recruited 18 BDD patients and 17 controls. Two local-global tasks were used; The Embedded Figures Task (EFT) consists of a complex figure comprised of smaller "embedded" figures; participants were required to select the complex figure that contained an embedded target shape. The Navon task consists of global letters made out of local letters; participants were required to detect a target letter, either at the global or local level, while ignoring information at the other level. Anxiety levels during the tasks were higher in the BDD group. On the EFT BDD patients showed slower and less accurate processing of shapes embedded within complex figures, and slower processing of local as well as global letter stimuli. This can be explained by a possible perceptual strategy in BDD, that consists of piecemeal detail-to-detail scanning of the complex figures whereas the controls may have been aided by a fast global "template" that allows details to be located more easily within it. There was also an inverse relationship between poor insight and performance on the Navon and EFT tasks in the BDD group. The above findings

may be consistent with a bias for attention to high levels of detail, although associated with slower rather than faster processing. On the Navon task the effect of set-shifting between local and global stimuli was examined. The BDD group was slower on switch trials. They were also slower on non-switch trials, but the effect was greater for switch trials and greatest for global-to-local trials. These results suggest abnormal visual processing of both details and global elements, inaccurate processing of global elements and reduced flexibility in switching visual attention between global and local features. BDD patients might spend excessive time fixated on or have problems shifting attention away from local information, which correlates with clinical observations implicating a preoccupation with details in appearance. Slower perceptual processing of local stimuli could lead to explicit awareness of minor flaws that could subsequently exacerbate and maintain BDD symptoms by a ruminative focus on detailed information.

Table 3 presents the main findings of the previous studies.

Neuropsychology and neuroimaging

The first functional imaging study to compare BDD patients to controls examined visual information processing of faces with respect to spatial frequency.[20] Twelve BDD patients and 12 controls underwent f-MRI while matching photographs of faces. Some of the faces were digitally altered to remove the high or low spatial frequencies, which created images that contained configural or detailed information respectively. BDD patients showed greater left hemisphere activity for all face tasks, particularly in lateral aspects of the prefrontal cortex and the temporal lobe. They also activated dorsal anterior cingulate gyrus for the

Table 3. Neuropsychological studies.

Study	Sample	Method	Results
Deckersbach et al (1999)	n=34, (BDD 17, C 17)	RCFT, CVLT	BDD: deficits in strategic organization, learning and free recall Organizational strategies focusing on isolated details rather than on global organizational features
Buhlmann et al (2004)	n=60, (BDD 20, OCD 20, C 20)	BFRT ERT	No neuropsychological deficits in facial feature processing in BDD, OCD and controls BDD: Difficulty in identifying facial expressions, especially disgusted ones BDD: Difficulty in interpreting facial expressions Misinterpretation of disgusted expressions as angry
Buhlmann et al (2006)	n=36, (BDD 18, C 18)	ERQ	BDD: Difficulty in identifying emotional expressions in self-referent scenarios Misinterpretation of neutral expressions as contemptuous and angry.
Dunai et al (2009)	n=28, (BDD 14, C 14)	CANTAB (Spatial Span, Spatial Working Memory, Stockings of Cambridge, Pattern Recognition)	BDD: SWM: more errors, greater effect of task difficulty. Poor information preservation and manipulation SOC: fewer problems solved overall, fewer problems solved in the minimum number of moves, significantly more moves Significant deficits in thinking speed. Poor initial planning
Kerwin et al (2014)	n=35 (BDD 18, C 17)	Embedded Figures Task, Navon Task	BDD: Increased anxiety levels, slower response time, lower accuracy ↑ BABS scale score → slower response time

low spatial frequency (LSF) face task. Controls activated left-sided prefrontal cortex and dorsal anterior cingulate gyrus only for the high spatial frequency (HSF) face task. Greater left-sided activity for LSF and normal faces suggests a predominance of detail encoding and analysis, a pattern evident in controls only for the HSF faces. This suggests that BDD patients may process faces in a piecemeal manner, while controls' perception of faces may be more configural and holistic. These laterality patterns in BDD suggest a bias for local or detail-oriented processing of faces over global processing.

Another finding in the BDD group was abnormal activation of amygdalae for the LSF and HSF tasks. The controls showed activation of the amygdalae for the NSF task, but reduced activity or deactivation for the LSF and HSF tasks. This suggests an abnormal hyper-responsivity of the amygdala that appears specific to LSF and HSF visual information.

Results suggest that BDD participants show fundamental differences from controls in visual processing, with different laterality of activation patterns in areas representing an extended visual processing network, and abnormal amygdala activation. These abnormalities may be associated with BDD patients' perceptual distortions; they may focus on excruciating detail on specific facial features and lose the larger, overall context of the whole face.

Feusner et al[21] studied 17 BDD patients and 16 controls using f-MRI while subjects viewed photographs of their own faces and a familiar face as control stimulus, that were unaltered, altered to include only high spatial frequency, or altered to include only low spatial frequency. Mean aversiveness ratings across all own-face stimuli were higher in BDD patients, regardless of stimuli spatial frequency. BDD patients demonstrated greater activation for the NSF own-face vs familiar-face contrast in the left orbitofrontal cortex (OFC) and the bilateral head of the caudate. The controls demonstrated greater activation for the LSF own-face vs. oval contrast in the left occipital cortex.

Severity of symptoms was positively associated with activation in the right OFC, right head of the caudate, right precentral and postcentral gyri and right dorsal occipital cortex for the NSF own-face vs. familiar-face contrast. Symptom severity was also positively associated with activity in the bilateral head of the caudate and the left OFC. When directly examining the relationship between aversiveness ratings and brain activity within the BDD group, there were significant results only for the LSF own-face vs oval contrast. BDD patients had abnormal brain activation patterns when viewing their own face, showing hypoactivity in primary and secondary visual processing regions for LSF faces and hyperactivity in frontostriatal systems for NSF faces. These suggest aberrant processing of configural and holistic information, which the LSF images convey. Clinically this may account for the impaired ability to perceive the visual gestalt, contributing to distorted perceptions of the individuals' appearance when viewing their face. The individuals may primarily perceive details and are impaired in their ability to contextualize them configurally or holistically.

Feusner et al[22] investigated how viewing faces with emotional expressions affected perception on an identity-matching task. They included BDD and controls, and three stimuli conditions; emotional faces, neutral faces and ovals/circles. BDD patients were less accurate at identity-matching of faces with emotional expressions and had more than twice the error rate for the matching task with emotional faces. The BDD group showed the greatest difference in reaction time from healthy controls for emotional faces, followed by neutral faces and then ovals/circles. However, there was no differential effect on the BDD group of any specific emotion type. In total, these findings suggest that BDD patients have abnormalities in speed and accuracy of processing faces with emotional expressions. This builds on findings from previous studies of abnormal interpretation of emotions,[13,15] to suggest that there may be more fundamental abnormalities for perception of faces with emotional expressions. If BDD subjects excessively rely on details for processing emotional faces as well, this slower strategy may account for delayed reaction times and lower accuracy. The fact that there was no significant group by stimulus effect for the different types of emotion supports a face-processing deficit that occurs for faces with emotional expressions in general, rather than an influence of emotion per se. To respond quickly and accurately to match emotional faces, participants must attend to the facial identity while implicitly inhibiting atten-

tion to the emotional valence. The fact that the BDD group had approximately twice the error rate for the emotional faces suggests that they may have had a more marked failure in inhibition than controls.

Table 4 summarizes the results of the aforementioned studies.

Conclusions

In the process of investigating the neurobiology of BDD, neuroimaging and neuropsychological studies have been conducted during the last two decades. Imaging studies have showed increased total white matter volume and caudate volume asymmetry in BDD patients. These findings are consistent with the striatal topography model of OCSD. Another important finding is the perfusion deficits in bilateral anterior-medial temporal and occipital regions and asymmetric perfusion in parietal lobes. Furthermore, abnormalities in parietal circuits are consistent with the core feature of disturbed perception of body form. In addition, correlation between symptom severity and left inferior frontal gyrus volume reflects the degree of detailed, analytic encoding that occurs on day-to-day basis when viewing others and themselves, and that likely underlies their symptoms. Finally, positive correlation between right amygdala volume and symptom severity signifies pathological fear circuitry engagement, hypervigilance and heightened sensitivity to social situations.

Neuropsychological studies reveal deficits in strategic organization, learning and free recall after short and long delays. Executive function deficits are related to spatial working memory and subsequent thinking speed as well as impaired higher level planning ability. BDD patients' organizational strategies tend to focus on detail rather than on larger, global clustering features. The executive function deficits suggest frontal involvement in BDD, which is consistent with the idea of BDD as an OCSD involving frontal-striatal dysfunction. They are characterized by abnormal visual processing of both details and global elements, inaccurate processing of global elements and reduced flexibility in switching visual attention between global and local features. These findings also suggest that there are significant neuropsychological similarities between BDD and OCD. Moreover, BDD patients seem to have deficits in identifying facial emotional expressions and tend to misinterpret expressions of disgust (and others) as anger. Poor insight and ideas of reference might be related to emotion recognition biases for angry expressions. This hypothesis is further enhanced by BDD patients' tendency to interpret emotional expressions as con-

Table 4. Combined neuroimaging and neuropsychological studies.

Study	Sample	Method	Results
Feusner et al (2007)	n=25 (BDD 12, C 13)	fMRI while matching high, low and normal spatial frequency pictures of faces	BDD: ↑ left hemisphere activity, particularly in lateral aspects of the prefrontal cortex and the temporal lobe for all tasks and in dorsal anterior cingulate gyrus for LSF tasks Controls: ↑ left-sided prefrontal cortex and dorsal anterior cingulate gyrus activity only for HSF tasks
Feusner et al (2010)	n=33 (BDD 17, C 16)	fMRI while matching high, low and normal spatial frequency pictures of the participants' own faces	BDD: ↑ left orbitofrontal cortex and bilateral head of the caudate activation when viewing NSF own pictures Controls: ↑ left occipital cortex activation when viewing LSF own pictures Symptom severity was positively correlated with increased frontostriatal activity
Feusner et al (2009)	n=23 (BDD 12, C 11)	Identity matching task when viewing faces with emotional expressions, neutral expressions and ovals and circles	BDD: twice the error rate for the matching task with emotional faces

temptuous more often in self-referent scenarios than in other-referent ones.

These findings have been supplemented by combined neuroimaging and neuropsychological studies. Left hemisphere hyperactivity for low and normal spatial frequency face tasks and abnormal activation of the amygdala for high and low spatial frequency face tasks suggests detail encoding and analysis in BDD. These abnormalities may be associated with BDD patients' apparent perceptual distortions; they may focus on excruciating detail on specific facial features and lose the larger, overall context of the whole face. Individuals with BDD have abnormal brain activation patterns when viewing their own face, showing hypoactivity in primary and secondary visual processing regions for LSF faces and hyperactivity in frontostriatal systems for NSF faces. Abnormal activation in primary and secondary cortical regions suggests aberrant processing of configural and holistic information, which the LSF images convey. Clinically this may account for the impaired ability to perceive the visual gestalt, contributing to distorted perceptions of the individuals' appearance when viewing their face. The individuals may primarily perceive details and are impaired in their ability to contextualize them configurally or holistically.

Διαταραχή σωματικής δυσμορφίας: Νεότερα νευροανατομικά και νευροψυχολογικά δεδομένα

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Η διαταραχή σωματικής δυσμορφίας (ΔΣΔ) χαρακτηρίζεται από υπερβολική ενασχόληση του ατόμου με ένα φανταστικό ή αδιόρατο από άλλους ελάττωμα της εξωτερικής του εμφάνισης και οδηγεί σε σημαντική δυσφορία και λειτουργική έκπτωση. Οι γνωσιακές-συμπεριφορικές και νευροβιολογικές ομοιότητες της ΔΣΔ με την Ιδεοψυχαναγκαστική Διαταραχή (ΙΨΔ) έχουν οδηγήσει στην ένταξή της στη νεοσυσταθείσα στο DSM-5 διαγνωστική κατηγορία των σχετιζόμενων με την ΙΨΔ διαταραχών. Η παρούσα ανασκόπηση παρουσιάζει τα ευρήματα των πιο πρόσφατων νευροαπεικονιστικών και νευροψυχολογικών μελετών και τη σύνδεσή τους με τα κλινικά χαρακτηριστικά της ΔΣΔ. Οι μελέτες απεικόνισης έχουν αναδείξει αυξημένο όγκο λευκής ουσίας και ασυμμετρία κερκοφόρου πυρήνα σε ασθενείς με ΔΣΔ, ευρήματα που είναι συμβατά με το μοντέλο εντόπισης των διαταραχών του ψυχαναγκαστικού φάσματος στο ραβδωτό σώμα. Επίσης έχουν αναδείξει ελλείμματα αιμάτωσης σε πρόσθιες-έσω κροταφικές και ινιακές περιοχές αμφοτερόπλευρα και ασύμμετρη αιμάτωση στους βρεγματικούς λοβούς. Επιπλέον, η συσχέτιση μεταξύ σοβαρότητας των συμπτωμάτων της ΔΣΔ και του όγκου της αριστερής κάτω μετωπιαίας έλικας αντανακλά τον βαθμό στον οποίο οι ασθενείς επεξεργάζονται με αναλυτικό τρόπο την όψη του εαυτού τους και των άλλων στην καθημερινότητά τους, υπογραμμίζοντας ουσιαστικά τα συμπτώματά τους. Τέλος, η θετική συσχέτιση μεταξύ όγκου της δεξιάς αμυγδαλής και σοβαρότητας συμπτωμάτων σηματοδοτεί την παθολογική λειτουργία κυκλωμάτων φόβου, υπερεπαγρύπνηση και αυξημένη ευαισθησία σε κοινωνικές συνθήκες. Από τις νευροψυχολογικές μελέτες φαίνεται ότι οι ασθενείς με ΔΣΔ χαρακτηρίζονται από ελλείμματα σε στρατηγική οργάνωση, μάθηση και ελεύθερη ανάκληση μετά από μικρή ή μεγάλη χρονοκαθυστέρηση. Τα ελλείμματα στην εκτελεστική λειτουργία αφορούν στη χωρική μνήμη εργασίας και την επακόλουθη ταχύτητα σκέψης, καθώς και τη μειωμένη ικανότητα σχεδιασμού υψηλότερου επιπέδου. Οι οργανωτικές στρατηγικές των ασθενών με ΔΣΔ εστιάζουν σε λεπτομέρειες και όχι σε γενικά, ολιστικά χαρακτηριστικά ομαδοποίησης. Συγκεκριμένα χαρακτηρίζονται από ανωμαλίες στην οπτική επεξεργασία λεπτομερειών και συνόλου, ανακριβή επε-

ξεργασία συνολικών στοιχείων, και μειωμένη ευελιξία στην αλλαγή οπτικής προσοχής μεταξύ συνολικών και μερικών γνωρισμάτων. Ακόμη, οι ασθενείς με ΔΣΔ εμφανίζουν ελλείμματα στην αναγνώριση συναισθηματικών εκφράσεων του προσώπου και συγκεκριμένα στην αναγνώριση εκφράσεων αηδίας, τις οποίες (όπως και άλλες) τείνουν να παρερμηνεύουν ως εκφράσεις θυμού. Η πτωχή εναισθησία και οι ιδέες αναφοράς, συχνές στη ΔΣΔ, θα μπορούσαν να σχετίζονται με την τάση των ασθενών να ερμηνεύουν εκφράσεις του προσώπου ως θυμωμένες. Τα παραπάνω ευρήματα στοιχειοθετήθηκαν περαιτέρω από μελέτες συνδυασμού νευροψυχολογίας και απεικόνισης. Συγκεκριμένα, η μεγαλύτερη ενεργοποίηση του αριστερού ημισφαιρίου για χαμηλής και κανονικής χωρικής συχνότητας εικόνες και η ανώμαλη ενεργοποίηση της αμυγδαλής για υψηλής και χαμηλής συχνότητας δοκιμασίες υπονοούν ότι στη ΔΣΔ κυριαρχεί η λεπτομερειακή κωδικοποίηση και ανάλυση. Τα άτομα με ΔΣΔ μάλλον αντιλαμβάνονται τις λεπτομέρειες αλλά αδυνατούν να τις εντάξουν σε ένα γενικό, ολιστικό πλαίσιο.

Λέξεις ευρετηρίου: Διαταραχή σωματικής δυσμορφίας, νευροανατομία, νευροψυχολογία.

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