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Using theories of delusion formation to explain abnormal beliefs in Body Dysmorphic Disorder (BDD)



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ABSTRACT

Body Dysmorphic Disorder (BDD) is characterised by overvalued or delusional beliefs of 'imagined ugliness'. Delusional beliefs have been explained by a number of cognitive theories, including faulty perceptions, biases in attention, and corruption of semantic memory. Atypical aesthetics may also influence beliefs in BDD. In fourteen BDD patients, compared to controls ($n=14$), we examined these theories of beliefs in a cognitive test battery consisting of perceptual organisation and visual affect perception tasks, a Stroop task using body words, a sentence verification task, a fluency task, and an attractiveness task. BDD patients performed similar to controls on tasks measuring information (bias) processing and aesthetics. However, BDD showed abnormal abilities on semantic processing involving sentence verification and category fluency. There was only a trend finding of impaired performance on perceptual processing tasks in BDD. The findings suggest that the delusional beliefs in BDD may be explained by impaired semantic processing.

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1. Introduction

Body Dysmorphic Disorder (BDD) is characterised by severe dissatisfaction with one's appearance, with a preoccupation with 'imagined' or minor physical flaws. The beliefs held by BDD patients have been shown to vary in terms of the degree of conviction along a continuum from mild to severe (delusional) beliefs (Castle and Rossell, 2006; Labuschagne et al., 2010). These delusional beliefs in BDD are usually not bizarre, but are certainly exaggerated thoughts about their physical appearance, and the conviction about unattractiveness and/or abnormality in appearance causes extreme distress and preoccupation. There is also evidence to suggest that those BDD patients with delusional beliefs show greater morbidity, which was associated with more suicidal attempts, more drug abuse or dependence and less likelihood of receiving treatment (Phillips et al., 2006). Therefore, understanding the beliefs in BDD is essential for our understanding of the progression of the disease (Castle et al., 2006). We are aware of no published study that directly investigated the

cognitive processes involved in the beliefs that BDD patients have, as most studies investigating the beliefs in BDD use measures that are assessing delusional or psychological qualities rather than cognitive aspects of the beliefs. We believe that the strong beliefs held by BDD can at least in part be explained by cognitive abnormalities. Therefore, it remains unclear whether there are cognitive abnormalities that may underpin the creation of appearance-related delusional beliefs in BDD.

There are a few published cognitive studies in BDD that have shown evidence of executive functioning impairments (with poor performances on tasks such as Tower of London and Stockings of Cambridge) as well as memory and learning deficits mediated by executive functioning deficits (Hanes, 1998; Deckersbach et al., 2000; Dunai et al., 2010; Labuschagne et al., 2011). There have also been a handful of studies implicating impaired visual and perceptual abilities and biased processing in the pathogenesis of BDD. For example, emotion recognition studies (Buhlmann et al., 2002a, 2004, 2006) have reported that BDD is associated with impaired facial emotion recognition abilities as well as a perceptual bias towards negative (i.e., angry) emotional face stimuli whereby they are more likely to misinterpret neutral expressions in a negative way. Similarly, a negative interpretive bias was also found in BDD patients when presented with body-related and general scenarios (Buhlmann et al., 2002b) suggesting that biased processing in BDD

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extends beyond that of face recognition. This evidence, together with the strong beliefs about physical appearance, suggests that perceptual and/or social processing abnormalities may be the key cognitive deficits of BDD. Interestingly, a more recent study showed that BDD patients were able to recognise emotions when presented with only the eye region of faces (Buhlmann et al., 2013). Together, we proposed that, based on the previous evidence, BDD may also be associated with perceptual integration abnormalities.

A number of cognitive impairments have been related to delusional thinking including anomalous 'faulty' perceptions (Maher, 1988), difficulties in social cognition and emotional attributions including attentional biases (Bentall et al., 1991; Kinderman et al., 1992; Langdon et al., 2002), aberrant semantic processing (Rossell et al., 1998), Theory of Mind (ToM) deficits (Frith, 1987, 1992) and reasoning abnormalities (Garety, 1991). However, the vast majority of this research has been performed in patients with schizophrenia, and might or might not be applicable to other disorders such as BDD. In a pilot study (Labuschagne et al., 2011) our research group did not identify either ToM or reasoning impairments in four BDD cases; which is supported by a more recent evidence (Reese et al., 2011). We are not ruling out that ToM and/or reasoning deficits could be a part of the neurocognitive profile of BDD, however, these processes are complex and time-consuming to assess, and thus were not a focus of the current work. The current work is based on four theories of cognitive (delusional) processing that may relate to BDD. These are reviewed below.

Firstly, Maher's (1974, 1988) cognitive account of delusions and delusional thinking emphasises 'faulty perceptions' or an abnormality in perceptual processing which involves paradoxically 'normal' reasoning. That is, primary sensory inputs are disturbed and experienced at greater intensities than normal (e.g., the experience of increased vividness of colours) but the explanation, and thus the delusion, is derived via reasoning that is entirely normal (i.e., normal cognitive mechanisms). Therefore, in BDD this may relate to faulty perceptions of body-related concepts.

Secondly, delusional thinking has also been associated with *information processing bias*. Thus, Bentall et al. (1991, 1994, 2001) argued that delusions are a result of a bias in information processing, particularly that of negative events. These negative events have commonly been associated with the nature of the psychopathology such that the preferential encoding of stimuli relate to the main concern (i.e., thought-content specific bias). In the case of BDD, this supports the negative bias previously reported (Buhlmann et al., 2002b, 2006), and these negative events may be linked to negative thoughts and perceptions of their own bodies.

Thirdly, Rossell et al. (1998) articulated a theory of *semantic processing deficits* in which delusions are conceptualised as resulting from a corrupt storage mechanism for semantic information, including knowledge and facts about the world as well as the meanings of words. Rossell et al. (2010) argued that the disturbance of a person's store of information (i.e., aberrant semantic processing), co-jointly with the 'faulty perceptions' identified by Maher (1974, 1988), may result in a bias in the processing of general knowledge. Considering BDD, patients may be more likely to interpret someone laughing behind them as a negative response to their appearance, and this may relate to their belief in their specific 'abnormal' body part, but also their belief that other people pay particular attention to their part.

Finally, in addition to these theories regarding delusional beliefs, Veale et al. (2002, 2003) suggested that *atypical aesthetics* is involved in BDD, such that the appreciation of beauty is seen as playing a role in the development and maintenance of BDD. The theory suggests that patients with BDD are more aesthetically sensitive than the rest of the population and that BDD is associated

with a failure to achieve an internal aesthetic standard. Buhlmann et al. (2008) reported that BDD patients perceived their own attractiveness as significantly lower when compared to an independent assessor, and they rated attractive photographs as significantly more attractive compare to the comparison groups. This heightened aesthetic sensitivity is reinforced by more recent evidence reporting that BDD patients have greater awareness of their aesthetic symmetry, possess a more critical eye and appreciation of aesthetics, and express a greater discrepancy between perceived actual self and their desired ideal self (Lambrou et al., 2011). This aesthetic sensitivity may explain why a small defect in appearance can severely disturb those with BDD. Such a sensitivity triggers their strong beliefs that they are distinct from others and therefore do not fit into the ideal world, and thereby resulting in their unusual (i.e., delusional) thinking.

In the current study, we aimed to characterise that cognitive impairments in BDD using four theories of delusional thinking. We hypothesised that BDD would be associated with; (a) impaired or 'faulty' perceptual processing, (b) bias in information processing, (c) a general knowledge (semantic) processing bias, and (d) atypical aesthetic sensitivity. As a priori hypotheses, we expected that BDD would show perceptual impairments such as impaired emotional face processing, particularly for angry faces (Buhlmann et al., 2002a, 2006); and deficits in tasks involving information processing and thus executive function (Dunai et al., 2010). Deficits in other domains were examined as exploratory hypotheses.

2. Methods

2.1. Subjects

Fourteen BDD patients were recruited from the BDD clinic at St Vincent's Hospital in Melbourne, Australia. BDD patients were diagnosed according to DSM-IV criteria by the study clinician (DJ Castle) using the self-rated Body Dysmorphic Disorder Questionnaire (BDDQ; Phillips et al., 1997) and the clinician-rated Body Dysmorphic Disorder Diagnostic Module (BDD-DM; Phillips et al., 1997). Current BDD severity was also assessed by the study clinician with the clinician-rated Yale-Brown Obsessive-Compulsive Scale modified for BDD (BDD-YBOCS; Goodman et al., 1989; Phillips et al., 1997). Scores on the BDD-YBOCS range from 0 to 48; higher scores indicate more severe symptoms. To assess and identify current Axis I diagnoses, we administered the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown et al., 1994). Our sample of BDD patients experienced, on average, 1.9 (± 1.6) comorbid disorders including major depressive disorder ($n=7$), social phobia ($n=5$), generalised social anxiety disorder ($n=4$), obsessive-compulsive disorder ($n=3$) and panic disorder ($n=3$), although BDD was their primary diagnosis as confirmed by their clinician and the ADIS interview. Twelve out of the 14 patients were on medications including antidepressants and antipsychotics ($n=6$), only antidepressants ($n=3$), only antipsychotics ($n=1$), and antidepressants, antipsychotics and anti-addictive medication ($n=1$). Our BDD sample reported concerns with a wide range of body parts, usually involving more than one concern, and which predominantly involved the face ($n=5$), skin ($n=5$), hair ($n=4$) and nose ($n=4$). Other concerns included breasts ($n=3$), weight ($n=3$), facial hair ($n=2$), teeth ($n=2$) and general body concerns ($n=2$), with single cases reporting concerns with ears ($n=1$), legs ($n=1$) and scrotum ($n=1$).

For comparison, a healthy control group ($n=14$) matched on age, gender and education was recruited through local newspaper advertisements and University noticeboards. We used the ADIS-IV and the control screen from the Structured Clinical Interview for DSM Disorders (SCID; First et al., 1996) to exclude any controls with a history of psychiatric illness and/or alcohol or substance abuse. All participants were between the ages of 18 and 55 years and had an estimated pre-morbid IQ as scored by the National Adult Reading Test (NART; Nelson, 1982) of > 90 . Exclusion criteria for all participants included any neurological disorder (self-report and clinician confirmed for the BDD cohort, and self-report for the controls), insufficient conversational English, and current abuse/dependence of alcohol or drugs. Table 1 presents the details of the demographic information.

2.2. Procedures

Participants were individually assessed during an approximately 3 h session on a single day. All participants completed a test battery of self-rated questionnaires to assess clinical status and cognitive abilities. The clinical assessment was always administered before the cognitive assessments, and all the questionnaires were

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