An Exploration of the Neurocognitive and Psychological Factors involved in the Development and Maintenance of Body Dysmorphic Disorder

Sarah Nichola Brennan

School of Psychology, Faculty of Health, Arts and Design

Swinburne University

Submitted in partial fulfilment of the Doctor of Psychology (Clinical Psychology)

20 June 2018

Abstract

Body Dysmorphic Disorder (BDD) is characterised by an intense preoccupation with one or more perceived "defects" in physical appearance. Despite the distress and impairment associated with BDD, the disorder remains understudied and poorly understood. In particular, little is known about the factors involved in the development and maintenance of BDD, and how such factors are linked to the manifestation of its symptoms. The clinical presentation of BDD, marked by intrusive thoughts, repetitive behaviours, faulty cognitions and perceptual distortions, has prompted researchers to investigate whether cognitive abnormalities underlie the disorder. A comprehensive understanding of the neurocognitive profile of BDD is far from established.

Study one of this thesis aimed to conduct a broad and comprehensive assessment of the neurocognitive functioning of BDD using the MATRICS Cognitive Consensus Battery (MCCB) within the largest neuropsychological study of BDD to date. The 25 clinical BDD participants compared to 27 IQ-matched non-clinical control participants exhibit a profile of specific cognitive deficits in: reasoning and problem solving, working memory, visual learning and speed of processing. These findings are taken to reflect executive dysfunction and visual processing difficulties specifically in the online manipulation of visual information, and during planning and problem solving.

Study two constituted a secondary smaller neuropsychological study aimed at conducting a closer examination of the two core areas of cognitive impairment identified in study one; executive functioning and visual processing. Contrary to expectation the 11 BDD participants did not show any significant differences to 13 age, sex and IQ matched non-clinical controls on a series of basic executive function measures reflecting inhibition, set-shifting, auditory working memory, and phonemic verbal fluency. In conjunction with the previous research pertaining to executive functions, this result was interpreted to indicate that

BDD does not involve gross executive impairment across the board, but rather more subtle differences affecting more complex top-down processes such as planning, problem solving, organisation and the ability to hold and manipulate information “on-line” with particular respect to visual stimuli. It was also found that compared to non-clinical controls the BDD participants showed significantly impaired visual recall from short-term memory on the Rey’s Complex Figure Test (RCFT). The BDD participants demonstrated a significantly poorer organisational ability compared to controls, tending to recall visual information through fragmented and disjointed single elements rather than by its global organising features. This finding supports the proposed model of BDD involving aberrant global (holistic-oriented) visual processing resulting in overuse and reliance on local (detailed-oriented) visual processing mechanisms.

The third, and final study, of this thesis used a qualitative approach to study lived experience of BDD. Twelve BDD participants underwent an in-depth semi-structured interview regarding their subjective experiences of BDD and the data were analysed using Interpretative Phenomenological Analysis (IPA). The results identified three superordinate themes reflecting the lived experiences of BDD; (1) consumed by the disorder, (2) the flawed self, and (3) intolerance of uncertainty. BDD participants did not explicitly identify subjective awareness of executive or visual dysfunction. Their lived experiences with BDD, however, spoke to a number of links to current conceptual models of BDD including neuropsychological perspectives. These findings are explored in the general discussion of this thesis.

In summary, this study supported previous research showing BDD to be characterised by a specific pattern of cognitive deficits pertaining to the executive functions of reasoning and problem solving, working memory and organisation. It also provided support for aberrant visual processing mechanism marked by a visual global (holistic-oriented) deficit and the

overuse or reliance on local (detailed-oriented) visual processing mechanisms. This proposal holds clinical merit, and may help explain why individuals with this condition tend to over focus and become distressed by minute aspects of their physical appearance. The qualitative research of this thesis suggests shame, Intolerance of Uncertainty (IU) and Not Just Right Experiences (NJRE) are key constructs requiring further attention in cognitive behavioural models of BDD. From the subjective perspective the qualitative accounts also suggest that atypical information processing in BDD extends beyond just visual processing to other sensory processes, a notion that requires empirical testing.

Acknowledgments

First and foremost I would like to express my deepest gratitude to my supervisors Professor Susan Rossell, Dr Neil Thomas and Professor David Castle for their knowledge, expertise and contribution to this project. I would like to thank my primary supervisor Susan for her specific role in the successful completion of this thesis. Your foresight, kindness and ability to provide me with the right advice at the right time has been critical. Susan you were instrumental in getting me over the line, I am forever in your debt. To Neil I would like to say thank you for our brainstorming sessions and your critique of my work. David, thank you for referring your clients to this research and your endorsement of the project. Thank you to Dr Imogen Rehm for sharing your time and expertise in qualitative research and all things obsessive compulsive. Your passion and talent provided me with critical motivation.

To my fellow students who were unfailingly willing to give their time and share their own experiences and to discuss elements of my work and provide ideas and strategies to ensure I kept on track, regardless of time or place. A special thanks to Imogen, Natasha and Faye for the much needed companionship and opportunities for recharge.

Last but not least to my family, especially Mum and Dad who sustained and encouraged me when my resolve faltered and who were always on hand regardless of their geographic location to provide love and encouragement and tedious proof reading what ever the hour.

Declaration

This declaration is to certify that:

1. This thesis contains no material which has been accepted for the award of any other degree or diploma.

2. To the best of my knowledge, this thesis contains no material previously published or written by another person except where due reference is made in the text of this thesis.

3. I warrant that I have obtained, where necessary, permission from the copyright owners to use any third party copyright material.

4. The ideas, development, and writing of this thesis was the principal responsibility of me, the candidate, working under the supervision of Professor Susan Rossell, Dr Neil Thomas, Professor David Castle and Dr Imogen Rehm.

5. This thesis is less than 60,000 words in length, exclusive of tables, bibliographies, and appendices.

_____

Sarah Nichola Brennan

2018

Table of Contents

PART II- EMPIRICAL ANALYSES OF NEUROCOGNITION IN BDD

List of Tables

List of Figures

List of Appendices

List of Common or Important Abbreviations

AN	Anorexia Nervosa
ANOVA	Analysis of Variance
ANCOVA	Analysis of Covariance
MANOVA	Multivariate Analysis of Variance
BABS	Brown Assessment of Beliefs Scale
BDD	Body Dysmorphic Disorder
BDD-DM	Body Dysmorphic Disorder Diagnostic Module
BDD-YBOCS	Yale-Brown Obsessive Compulsive Scale Modified for BDD
CIT	Contour Integration Test
CBT	Cognitive Behaviour Therapy
COWAT	Controlled Oral Word Association Test
CRT	Cognitive Remediation Therapy
CWIT	Colour Word Inference Test (Stoop Test)
DASS	Depression Anxiety Stress Scales
DSB	Digit Span Backwards
DSM	Diagnostic and Statistical Manual of Mental Disorders
GAD	Generalised Anxiety Disorder
IPA	Interpretative Phenomenological Analysis
M	Mean
MDD	Major Depressive Disorder
MCCB	MATRICS Cognitive Consensus Battery
MINI	Mini International Neuropsychiatric Interview
OCD	Obsessive Compulsive Disorder
OCRD	Obsessive Compulsive Related Disorders
RCFT	Rey's Complex Figure Test
SAD	Social Anxiety Disorder (previously known as Social Phobia)
SCID	Structured Clinical Interview for the DSM
SD	Standard Deviation
TMT	Trial Making Test

PART I- INTRODUCTION AND LITERATURE REVIEW

1. CHAPTER 1- Introduction and Thesis Overview

1.1. Introduction and Rationale

Body Dysmorphic Disorder is a psychiatric condition characterised by one or more perceived deficits or flaws in physical appearance, which the individual believes to appear significantly deformed, disfigured or ugly. Despite a lack of awareness of this condition among not only the general public but also professionals, it affects approximately 2% of the general population. BDD has been established with similar prevalence rates and clinical features across a range of countries including Australia, United States, Germany, Turkey and Japan; although, the manifestations of the specific body concerns can vary based on cultural ideals (Neziroglu & Lipman, 2014). People with BDD experience intrusive and upsetting thoughts about their perceived defects, perform repetitive and time consuming behaviours in relation to their body part/s of concern and experience significant distress and functional impairment associated with these persistent symptoms. BDD is associated with a chronic course and without effective treatment is associated with range of negative outcomes including relationship issues, social isolation, poor employment outcomes, unnecessary cosmetic procedures and surgeries, comorbid mental health disorders and high rates of suicidal ideation and attempts (see section 2.5.3 ‘course’).

Despite BDD being a common disorder associated with a severe and chronic course, it remains a relatively understudied; and thus, is still poorly understood. In particular, little is known about the factors involved in the development and maintenance of BDD, and how such factors are linked to the manifestation of its symptoms. Developing a greater understanding of these predisposing and perpetuating factors is paramount; as this information has the ability to inform more effective and comprehensive conceptual models and treatment interventions.

The clinical presentation of BDD, marked by body image distortions, faulty cognitions, intrusive thoughts, poor impulsive control and repetitive behaviours have prompted researchers to question whether fundamental cognitive and/or perceptual abnormalities are involved. A useful method for exploring cognitive functioning is via neuropsychological assessment. While the neurocognitive functioning of BDD is starting to gain some attention in the literature, this remains limited as compared to others disorders, which have an extensive literature describing the pathophysiology of the disorder. The limited research in BDD, to date, has pointed to a range of deficits in BDD in relation to the areas of executive functioning, memory and visual processing. In particular, the preliminary results pertaining to visual functioning in BDD have lead to the proposal that BDD involves aberrant visual processes, specifically a difficulty with engaging global (holistic) visual processing mechanisms, such that individuals with this condition tend to over-rely on local (detailed-oriented) information processing mechanisms. The neurocognitive research, to date, has yielded some conflicting finings and have been subject to a number of limitations including the use of varied neuropsychological test, small sample sizes and a lack of appropriate clinical diagnostic and symptom severity assessment. This has limited the reliability of cross study comparisons and the generalisability of these findings. Therefore, foremost there is a need to perform a large neurocognitive assessment study of BDD using a reliable, valid and repeatable cognitive battery to provide a broad picture of the neuropsychological functioning of this disorder.

1.2. Overview of the Thesis Studies and Aims

The overall proposition of this thesis is that BDD involves specific neurocognitive impairments, which are important the conceptual understanding and treatment of this disorder. Study one of this thesis aimed to address the limitations of previous research by conducting a broad and thorough neurocognitive assessment comparing a large clinical BDD

sample to a matched non-clinical control group on the MATRICS Cognitive Consensus Battery (MCCB). Study two of this thesis built upon the results of study one, by conducting a further examination of the two key areas of cognitive impairment in BDD; executive functioning and visual processing. Study two further aimed to test the proposed model that BDD involves an imbalance to global (holistic) versus local (detailed) visual processing mechanisms via use of the Rey Complex Figure Test (RCFT). The third, and final study, of this thesis, conducted an in-depth qualitative exploration of the lived experiences of a sample of individuals with BDD sample using Interpretative Phenomenological Analysis (IPA). This study was conducted as qualitative research is especially sparse in BDD. There are only a small number of research studies having systematically approached individuals living with this condition to understand their first hand experiences. Such qualitative research has helped identify how these experiences can fit within the current scientific and theoretical models of BDD[1].

1.3 Chapter Overview

This thesis is comprised of four parts. Part I (Chapters 2 & 3) provide the literature review to this thesis. Chapter 2 provides a review of the phenomenology, epidemiology, historical accounts, diagnostic classification and current treatment interventions for BDD. Chapter 3 provides a comprehensive critical review of the neurocognitive research in BDD to date identifying key findings, the clinical implications of the research and identifying gaps within the literature requiring further exploration or replication. As the neuropsychological literature in BDD is limited, this chapter also touches on neurocognitive research pertaining to OCD to which BDD shares a close relationship, and from the neuroimaging research in

[1] The third qualitative study of this thesis was also pursued due to the small sample size obtained in study two which limited the complexity of statistical analysis available to this thesis. Thus, study three provided an extension to the thesis by utilising access to the specialist population group.

BDD. Part II presents the two empirical neuropsychological studies that were conducted for this thesis. Chapter 4 (Study 1) features the broad neuropsychological assessment comparing a moderate sized BDD group to matched non-clinical controls on the comprehensive MCCB battery. Chapter 5 features the additionally exploration of the neuropsychology of BDD by comparing a small group of BDD participants to matched non-clinical control participants on a tailored battery of four executive function measures and three visual processing measures. Part III (Chapter 6) of this thesis comprises the qualitative exploration of the lived experiences of BDD in a small sample of participants with current BDD. Part IV (Chapter 7) concluded this thesis. The major findings of the three studies are summarised and are discussed with implications for advancing conceptual models and treatments for BDD.

2. CHAPTER 2- Phenomenology, Epidemiology and Treatment of Body Dysmorphic Disorder

2.1. Introduction

Throughout history physical attractiveness has been valued and admired with special respect given to those who fit the ideals of the era. While the "perfect" body image has transformed over time, the importance placed on attractiveness has persisted. Most, if not all, individuals have concerns about their appearance and feel the pressure to conform to certain aesthetic models or to simply "look good". However, for some people these concerns reach pathological intensity, causing such extreme distress that it impedes on everyday functioning. Such individuals are identified as having Body Dysmorphic Disorder (BDD). This chapter will discuss the presentation and symptomology of BDD, historical accounts and diagnostic classification, prevalence and other epidemiological findings, comorbidity and clinical overlap between BDD and other relevant psychiatric conditions, and finally it will explore the current treatment interventions available and the associated outcomes.

2.2. Phenomenology

BDD is a highly debilitating psychological condition characterised by a preoccupation with one or more perceived "defects" in physical appearance, which are believed to look deformed, unattractive, or abnormal (American Psychiatric Association [APA], 2013). These perceived abnormalities, however, are not typically observable to others, or where a slight anomaly might exist it is minor; and thus, the individual's distress is grossly disproportionate to the imperfection. This external feedback does little to lessen the conviction of the BDD beliefs or the associated distress. Appearance concerns in BDD can relate to any part of the body; most commonly they concern the size or shape of facial features (e.g. a large nose, small eyes), the quality or quantity of hair (e.g. thinning head hair, too much body hair), the complexion of skin (e.g. redness, acne, freckles or scars) or the general proportion of the face

or the body (Toh, Castle, & Rossell, 2017). Hart and Phillips (2013) found that that more than 25% of BDD patients had at least one concern that related to symmetry (e.g. an asymmetric smile or eyebrows). Phillips (2015) suggested that there has been a common misconception that a diagnosis of BDD is only applicable when individuals are preoccupied with just one specific concern. To the contrary, the research indicates that on average BDD patients typically obsess over 5 to 7 body parts over the course of the disorder. While the vast majority of individuals with BDD describe very specific concerns regarding body parts, some may be embarrassed and reluctant to share or alternatively are just not able to identify exactly what is problematic about their appearance. These individuals may instead describe more vague complaints, for example referring to their overall appearance as "ugly" or "revolting" or reporting that there is something "wrong" or "not right" regarding their appearance (Mufaddel, Osma, Almugaddam, & Jafferany, 2013).

BDD is easily trivialised and should not be misunderstood as vanity, narcissism or as part of normal body image concerns (Veale, 2004). Differentiating BDD from normal body dissatisfaction, these individuals experience persistent, intrusive and painful thoughts and imagery about their perceived deformity, and experience these thoughts as difficult to control. Reflecting this, a diagnosis of BDD requires that these preoccupations are present for at minimum of 1-hour per day (APA, 2013). Although, on average BDD patients report being consumed by relentless thoughts of their perceived deformity for 3 to 8 hours every-day, with some describing periods where it is all they can think about (Phillips, 2009). These intrusive thoughts are associated with intense emotional experiences including anxiety, depression, distress and shame; and in-turn these thoughts drive patients to perform repetitive behaviours usually intended to examine, monitor, disguising or improve the body part (Cororve & Gleaves, 2001; Weingarden & Renshaw, 2015). These behaviours are often carried out in a stereotypical and ritualised manner, and are experienced as extremely difficult to resist. Such

behaviours may include excessive grooming, mirror checking, touching and measuring the body part, hair-pulling, skin-picking and reassurance seeking (Phillips, Menard, Fay, & Weisberg, 2005b). Excessive mirror use is one of the most common repetitive behaviours associated with BDD, and is estimated to affect 80-90% of BDD patients (Veale & Riley, 2001). In addition, some patients feel so compelled to check their appearance that they may use a range of other reflective surfaces such as shop windows, car rear-view mirrors, CDs, the glass face of watches and even the back of cutlery to perform this behaviour, even though such tools further add to a distorted image. With developing technologies and access to recording devices in modern cultures, checking behaviour has extended to include "documenting" the body part by taking numerous photos and videos of one-self and scrutinising the body part through zoom functions and/or monitoring for change over time. Repetitive behaviours can also include mental acts such as scrutinising others and comparing one-self to others (Grant & Phillips, 2005). In the age of the internet, this behaviour is no longer limited to comparisons during social interactions when in contact with others, as there is now an endless imagery and material accessible with a simple search of the internet. Camouflaging with make-up, hats, hair, clothing or hands are also common behaviours; many making sure they never go out in public or allow themselves to be seen by others without these measures in place (Phillips, Menard, & Fay, 2006b).

2.3. Historical Accounts of Body Dysmorphic Disorder

The nature and presentation of BDD prompts a question of whether BDD is a modern-day phenomenon associated with the proliferation of beauty ideals throughout mainstream media and social media. The condition, however, has been described in European literature dating back to the 19th Century. In 1891, the Italian physician Enrico Morselli coined the term "Dysmorphophobia", derived from the Greek word *dysmorphia,* meaning fear of "misshapenness" or "ugliness". While Morselli labelled the condition a phobia, his

writings are reflective of an obsessive-compulsive nature to the disorder. In the excerpt below translated by Jerome, Morselli doesn't merely describe a fear associated with a perceived appearance defect, but also the essence of the intrusive thoughts, emotional responses and the compulsive behaviours which are cognisant of current conceptualisations of BDD (Morselli & Jerome, 2001). He writes:

> *"The condition consists of the sudden appearance and fixation in the consciousness of the idea of one's own deformity; the individual fears he has become deformed (dysmorphos) or might become deformed, and experiences at this thought a feeling of inexpressible disaster….When one of these ideas occupies someone's attention repeatedly on the same day, and aggressively and persistently returns to monopolise his attention, refusing to remit by any conscious effort; and when in particular the emotion accompanying it becomes one of fear, distress, anxiety and anguish, compelling the individual to modify his behaviour and to act in a pre-determined and fixed way then the psychological phenomena has gone beyond the bounds of normal, and may validly be considered to have entered the realm of psychopathology"*
> (Morselli, 1891).

French psychiatrist, Pierre Janet, made the next major historical reference to Dysmorphophobia. Like Morselli's interpretation, Janet considered Dysmorphophobia to be a part of a large group of syndromes with obsessive and compulsive features, and he referred to the condition as "*l'obsession de la honte du corps*", which translates to "obsession with shame of the body". He emphasised the strong feelings of shame experienced by patients with this condition and suggested even at that time in history that it was "a common, yet invariably overlooked condition" (Hsu & Vashi, 2015; Janet & Raymond, 1903). German psychiatrist Emil Kraepelin legitimised the condition when he published it in the 8th edition

of his Textbook of Mental Diseases (Kraepelin, 1915). While he used the term Dysmorphophobia he did not reference Morselli, thus representing the term as if he had coined it himself. Nevertheless, he shared the sentiments of those before him and classified the condition as a "Obsessive-Compulsive Neurosis" (Hsu & Vashi, 2015).

The most-well known case of BDD in the literature is that of Wolf-Man, later known as Sergei Pankejeff, a Russian aristocrat who was given this pseudonym by psychoanalyst Sigmund Freud (1959) based on a reoccurring dream that he experienced involving being watched by white wolves, which he disclosed to Freud during his early psychoanalytic therapy. Wolf-Man later went on to develop BDD symptoms, preoccupied with the belief that his nose was defective. After exhausting all dermatological options he returned to therapy, this time to see psychoanalyst Ruth Brunswick. Many years later, Gardiner published Brunswick's case report titled *The Wolf Man*, whereby she describes her patient's BDD symptoms (Pankejeff, Brunswick, Gardiner, & Freud, 1971). She writes;

> *"Having been told that nothing could be done for his nose because there was nothing wrong with it, he felt unable to go on living in what he considered his irreparable mutilated state… He neglected his daily life and work because he was so engrossed, to the exclusion of all else, in the state of his nose. On the street he looked at himself in every shop-window; he carried a pocket mirror, which he took out every few minutes. First he would powder his nose; a moment later he would inspect it and remove the powder. He would then examine the pores to see if they were enlarging to catch the hole, as it were, in its moment of growth and development. Then he would again powder his nose, put away the mirror and in a moment later bring the process anew…"*
>
> (Brunswick: 1897-1947).

In this short extract, Brunswick reflects the key experiences and symptoms of BDD including suicidal ideation, poor psychosocial functioning, preoccupation with the body part at the expense of all else, a vicious cycle of repetitive mirror checking, the notion of monitoring for sudden "change" in the defect and the search for cosmetic solutions to this psychological phenomena. In summary, these historical accounts reflect that BDD is not merely a product of a modern society's preoccupation with appearance but rather a severe psychiatric disorder, which has been consistently overlooked despite its common prevalence and concerning presentation.

2.4. Diagnostic Classification and Conceptualisation of Body Dysmorphic Disorder.

The Diagnostic and Statistical Manual for Mental Disorders (DSM), published by the APA, is the most widely accepted nosological system for the classification and diagnosis of mental disorders. Despite an early appreciation for the relationship between BDD and Obsessive Compulsive Disorder (OCD) as reflected in the writings of Morselli, Janet, Kraepelin and Brunswick, the classification of the disorder drifted from this thinking in the succeeding decades. Dysmorphophobia had been written about for more than a century, yet there was no reference to the condition or one like it, in either the first (APA, 1952) or second edition (APA, 1968) of the DSM. Dysmorphophobia was first referenced in the third edition of the DSM (DSM-III; APA, 1980) as an example of an Atypical Somatoform Disorder, but it did not include any diagnostic criteria. It was not until 1987, in the revised third edition of the DSM (DSM-III-R; APA, 1987) that Dysmorphophobia, renamed "Body Dysmorphic Disorder", received official diagnostic status. The new title was used as it was argued that the central feature of the disorder was not one of phobic avoidance as was suggested by the original title. BDD was again subsumed under the category of Somatoform Disorders, which are defined as those with the presence of physical symptoms that are not explained by a general medical condition. The DSM-III-R also recognised the lack of insight and the fixed

and intense nature to which some individuals held BDD beliefs. Thus, a patient with beliefs deemed to be "delusional" was excluded from a diagnosis of BDD, and were instead diagnosed with Delusional Disorder Somatic Type, classed under the psychotic disorders. Despite the awkwardness of this system, with BBD classified as both a somatoform disorder and a psychotic disorder, it largely persisted into the next two editions of the DSM. The DSM-IV (APA, 1994) added the "clinically significant" criterion, detailing that the physical appearance preoccupation must be associated with clinically distress and/or functional impairment to receive a diagnosis. The DSM-IV-TR (APA, 2000) allowed for the double coding of the disorder, such that a patient with "delusional" beliefs would receive both a diagnosis of BDD and Delusional Disorder Somatoform Type.

This double coding system received significant criticism, with authors arguing that the classification system was not only awkward but also lacked empirical evidence (Fontenelle, Mendlowicz, Kalaf, & Versiani, 2006a). The original rationale for classifying BDD as a somatoform remains unclear, although seemingly revolved around both BDD and the other somatoform disorders presenting with somatic complaints. BDD, however, has little in common with the other disorders in this grouping (i.e. Hypochondriasis, Pain Disorder, Conversation Disorder), with regard to symptom profile, treatment response, and course of the disorder; furthermore they share very low comorbidity rates suggestive of different aetiological pathways. A study using the Multidimensional Body-Self-Relations Questionnaire found that women with BDD were actually less likely than women in the general population to be alert to symptoms of physical illness (Didie, Kuniega-Pietrzak, & Phillips, 2010). Additionally, while poor insight is undoubtedly a core feature of BDD the differentiation of the delusional and non-delusional variants made little sense with it being argued that the two variants represent the same disorder just with varying levels of insight (Phillips, Hart, Simpson, & Stein, 2014). Indeed research has shown that delusional and non-

delusional BDD share more similarities than differences with regard to demographics, phenomenology, course, co-morbidies and treatment response (Labuschagne, Castle, Dunai, Kyrios, & Rossell, 2010; Phillips, McElroy, Keck, Hudson, & Pope, 1994). Treatment studies have also consistently shown that patients diagnosed with delusional BDD respond equally well to those determined non-delusional patients to monotherapy with serotonin reuptake inhibitors; and although the data is limited, antipsychotic medication do not appear to be efficacious for either form of BDD (Ipser, Sander, & Stein, 2009; Phillipou, Rossell, Wilding, & Castle, 2016).

Over the past 20 years, there has been a return to the early assumption that BDD is related to OCD. Indeed BDD preoccupations resemble OCD obsessions in that they are reoccurring cognitions that are unwanted, intrusive, distressing and difficult to control (Chosak et al., 2008; Toh et al., 2017). Obsessions that are common to both disorders include the need for symmetry and perfection, and intense feelings that "something is not right" (Chosak et al., 2008). These obsessions differ in exact content because BDD patients obsess over their appearance and fear others rejection, whereas in OCD the focus is on a perceived harm that might befall the sufferer or their loved-ones (Phillips & Stein, 2015). Similarly, BDD and OCD patients both respond to these obsessions by engaging in unpleasant, time-consuming and repetitive behaviours. Some compulsions are identical across both disorders such as repeated checking, reassurance seeking, skin picking and hair pulling (Frare, Perugi, Ruffolo, & Toni, 2004). However, it has been suggested that these phenomenologically similar compulsions may have differing outcome for the disorders, with those with ODD generally succeeding in experiencing temporary relief from anxiety with these behaviours, whereas for those with BDD it has been found that compulsions often results in increased anxiety (Allen & Hollander, 2004).

Studies directly comparing the clinical features of BDD and OCD have yielded generally consistent findings. The shared features include sex ratio, age of onset and course of illness (Toh et al., 2017). These studies have also shown that the disorders have equal general impairment and more specifically, equal obsession and compulsion severity (McKay, Neziroglu, & Yaryura-Tobias, 1997; Saxena et al., 2001). In contrast, BDD patients are more likely to be unmarried, unemployed and less educated (Frare et al., 2004). They also have more co-occurring depression, social phobia, substance abuse and suicidal ideation than their OCD cohorts (DeMarco, Li, Phillips, & McElroy, 1998). A further key difference between the disorders is that BDD patients show poorer insight than OCD patients (Phillips et al., 2012). Based on these findings it was determined that BDD and OCD are strongly related yet their differences indicate that BDD in not just a clinical variant of OCD.

On this basis, the current DSM-5, reclassified BDD as an Obsessive Compulsive and Related Disorder (OCRD) alongside the disorders OCD, Hoarding Disorder, Trichotillomania (hair pulling) and Excoriation Disorder (skin picking; APA, 2013). The DSM-5 additionally added Criterion B, which requires that at some point during the course of the disorder that the individual has engaged in compulsive behaviours. Furthermore, in now accepting delusional beliefs in BDD as reflecting a spectrum of insight, the delusional variant was dropped and instead an insight specifier was added to rate current beliefs as having “good or fair insight”, “poor insight” or “absent insight or delusional beliefs”. Finally, a “muscle phobia” specifier was also included to identify any individuals, who have a preoccupation with the idea that their body is too small or not muscular enough. This form of BDD is more common in males than females, and warrants a specifier as it is typically accompanied with more severe pathology including high rates of suicidal ideation and attempts, substance abuse and poorer functional outcomes (Pope et al., 2005). The DSM-5 core criteria are displayed in Table 2.1.

Table 2.1.

Diagnostic and Statistical Manual Fifth Edition Criteria for Body Dysmorphic Disorder.

DSM-5 **BDD Criteria (APA, 2013)**
A. Preoccupation with one or more perceived defects 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 preoccupation is not better explained by concerns with body fat or weight in an individual whose symptoms meet criteria for an eating disorder.

2.5 Epidemiology

2.5.1. Prevalence. The exact prevalence of BDD in the general population has been difficult to determine. Some studies have reported rates as low as 0.7% (Otto, Wilhelm, Cohen, & Harlow, 2001), while others have found rates of 3% (Bienvenu et al., 2000) and even rates as high as 5% (Bohne et al., 2002). However, according to the largest epidemiology study to date, a German nation-wide study of 2552 people, BDD affects approximately 1.7% of the general population (Rief, Buhlmann, Wilhelm, Borkenhagen, & Brähler, 2006). This finding was further replicated in another large study (N=2510), finding a rate of 1.8% (Buhlmann et al., 2010). An Australian university study found a relatively similar rate of 2.3%, this slightly higher estimate could be explained by the age of the sample being around the typical age of onset (Bartsch, 2007).

Despite having a similar prevalence rate to other chronic disorders such as OCD and schizophrenia, BDD is misperceived as a less common phenomenon by both the general community and professionals. This is likely due to the secretive nature of these individuals who may feel too ashamed to disclose their experiences, and a lack of education and skills amongst professionals in assessing and diagnosing this condition (Marques, Weingarden, LeBlanc, & Wilhelm, 2011). Furthermore, in viewing their problem as physical, BDD patients are more likely to seek a cosmetic solution to their concern. This is reflected in the notably higher rates of 7-15% of BDD in cosmetic surgery and dermatology clinics (Aouizerate et al., 2003; Ishigooka et al., 1998; Phillips, Dufresne, Wilkel, & Vittorio, 2000; Sarwer, Wadden, Pertschuk, & Whitaker, 1998).

2.5.2. Onset. Studies have consistently shown that BDD usually begins in adolescence, with a mean age of onset of 16.4 years (Phillips et al., 2005b). However, many patients report that their appearance anxiety was always present (Castle, Rossell, & Kyrios, 2006). Despite the early onset, a formal diagnosis of BDD is not usually made for many years due to an average estimated delay of 11 years before patients seek psychiatric treatment (Pavan et al., 2008; Phillips, 2000). This is very concerning statistic as without treatment BDD can be unremitting and worsen overtime.

2.5.3. Course. Without treatment BDD can be chronic, unremitting, worsen overtime and is associated with several of adverse outcomes. In experiencing strong feelings of personal defectiveness, shame and rejection, social avoidance is common. Research indicates that 40% of BDD patients experience co-morbid Social Anxiety Disorder (SAD: Coles et al., 2006b). BDD also significantly impacts on occupational functioning with 40-50% of patients being unemployed (Phillips et al., 2006a; Phillips et al., 1994). Phillips (2000) found that quality of life for individuals with BDD was not only significantly worse than for healthy controls, but was also lower than those with diabetes, recent myocardial infarction and

clinical depression. BDD patients have markedly high levels of perceived stress, notably higher than for the general population and most psychiatric groups, although comparable to those living with Major Depressive Disorder (MDD; DeMarco, Li, Phillips, & McElroy, 1998). Providing further evidence of the seriousness of this disorder, the literature suggests a strong association between BDD and suicidality, with approximately 80% of individuals experiencing lifetime suicidal ideation and 24%-28% having attempted suicide (Phillips et al., 2005a; Phillips & Menard, 2006). In a prospective study, which followed BDD participants up yearly for up to 4 years, Phillips and Menard (2006) found that completed suicide rates for BDD were 45 times higher than in the US general population. Other outcomes include substance abuse, unnecessary cosmetic surgeries, self-mutilation and psychiatric and medical hospitalisation (Grant, Menard, & Phillips, 2006; Grant, Redden, Leppink, & Odlaug, 2015; Gunstad & Phillips, 2003; Phillips, Grant, Siniscalchi, & Albertini, 2001; Veale & Neziroglu, 2010). In summary, BDD is a chronic condition, with those who are affected having significantly impaired psychological and social functioning.

2.5.4. Gender. BDD differs from other body-image disorders in that it appears to affect males and females equally. This is in contrast with eating disorders, which are more prevalent among females. There are differences between the sexes, with regards to the specific body part/s of concern. A number of studies have shown that males with BDD are more likely to be concerned with genitals, body build and hair, and that women show greater concerns with their skin, breasts, legs and hips (Perugi et al., 1997; Phillips & Diaz, 1997; Phillips et al., 2006b). These gender differences parallel those expressed by healthy individuals, and therefore the body parts of concern appears to be socio-cultural and are likely to be guided by the values and norms proposed and reinforced by the culture and media (Rief et al., 2006).

2.5.5. Culture. While the vast majority of BDD research has been conducted in western cultures, there is increasing research emerging which explores this condition in patients from various countries around the world including Australia (Bartsch, 2007), Japan (Suzuki, Takei, Kawai, Minabe, & Mori, 2003) United States (Koran, Abujaoude, Large, & Serpe, 2008), Germany (Rief et al., 2006), Italy (Perugi et al., 1997b), Netherlands (Mulkens, Kerzel, Merckelbach, & Jansen, 2006), Argentina (Borda, Neziroglu, Santos, Donnelly, & Rivera, 2011), Brazil (Fontenelle et al., 2006b), Saudi Arabia (Ahamed et al., 2016) and Turkey (Cansever, Uzun, Donmez, & Ozsahin, 2003). There is, however, no cross-cultural studies directly comparing the clinical features of BDD across countries or culture. Nevertheless, findings from the literature, in combination with qualitative comparisons of case studies and case series emerging from various countries, highlight many similarities with regard to prevalence rates, demographics and clinical symptoms (Philips & Stein, 2015). While BDD itself does not appear to be culturally specific, it has been suggested that cultural values and preferences do shape the specific BDD concerns, which emerge. For example, being concerned about eyelids and having a small nose appears to be more common in Asian countries as opposed to Western countries.

Of note, the Japanese diagnostic system referenced *Shubokyofu* - "the phobia of deformed body" - as one of four types of Taijin kyofusho, "fear of people", similar to SAD in the DSM-5. The clinical description of Shubokyofu is remarkably similar to that of BDD; although, a key differentiating feature is that BDD patients are concerned about others appraisal of their physical appearance or judging their "defect"; while shubokyofu appears more focused on a fear that one's ugliness will offend others (Suzuki et al., 2003).

2.6. Comorbidity

2.6.1. Depression. Depression is the co-morbid psychiatric disorder most frequently associated with BDD. In a study of 100 BDD patients 94% had a life time diagnosis of MDD (Phillips et al., 1994). Larger studies have indicated a lifetime rate of 74-76%, and a current diagnosis of MDD in 38.2% of BDD patients (Gunstad & Phillips, 2003; Phillips & Kaye, 2007). Beyond comorbidity, both BDD and depression are characterised by low self-esteem, rejection sensitivity, suicidal ideation and feelings of worthlessness and personal defectiveness. It has, therefore, been postulated that BDD is related to depression, with some speculation over the years that BDD could be a mere symptom of depression (Carroll, Yendrek, Degroot, & Fanin, 1994). These disorders also have notable differences. Depressed individuals state that they feel unattractive; however, they do not focus on specific aspects of the body or engage in compulsive behaviour. In fact, depressed individuals usually focus less on appearance, and may even neglect it. It has been found that BDD precedes the onset of depression implying it is not just a symptom, and rather may be the cause of the comorbidity (Phillips, McElroy, Keck, Pope, & Hudson, 1993). This could explain why although there are high rates of depression found in BDD, BDD shows significantly lower lifetime rates of 0-13.8% amongst MDD cohorts (Nierenberg et al., 2002; Villareal, Johnson, & Ballenger, 1995). Phillips and Stout (2006) reported bidirectional longitudinal associations between BDD and depression, in that improvement in one predicted remission in the other, suggesting that this was indicative of joint etiologic processes. However, a closer look at these remission patterns suggested that depression is secondary to BDD because the majority remitted from depression following BDD remission. In the cases where BDD did improve after depression remission was less marked. Finally, BDD responds to Serotonin Reuptake Inhibitors (SRIs) but not non-SRI antidepressants, as does depression (Phillips & Hollander, 2008).

2.6.2. Social Anxiety Disorder. Another disorder highly comorbid with BDD is SAD, previously known as Social Phobia. This is not surprising as all BDD patients avoid social situations in varying degrees (Phillips et al., 1993). In a study of 178 BDD patients, 39.3% had a lifetime prevalence of SAD and 34.3% presented with current ongoing SAD (Coles et al., 2006). Like BDD, SAD is characterised by fears of negative judgment, shame and concerns about public humiliation (Toh, Rossell, & Castle, 2009). In some eastern cultures BDD is actually conceptualised as a form of SAD. For example in the case of the Japanese diagnostic system and *shubokyofu* (Suzuki et al., 2003). A key differing aspect between BDD and SAD, is that BDD patients are concerned about others appraisal of their physical appearance or judgment of their 'defect', while in SAD fears relate to more so to a concern about behaving or saying something wrong in public (Allen & Hollander, 2004). Despite overlap in some clinical features it is generally agreed that SP, like depression, develops after BDD symptoms.

2.6.3. Eating Disorders. There is also a major overlap between BDD and eating disorders especially Anorexia Nervosa (AN). At the core of both disorders is a preoccupation and a distortion of body image. They both engage in similar compulsions such as mirror checking and measuring body parts (Pavan et al., 2008). It is not uncommon for BDD patients to be concerned with weight or for AN patients to have concerns about other aspects of appearance. However, comorbidity studies have yielded conflicting rates ranging from 1% to 39% (Grant, Kim, & Eckert, 2002; S Ruffolo, Phillips, Menard, Fay, & Weisberg, 2006). Grant, Kim, & Eckert (2002) reported that 39% of AN patients also had BDD, but not one of these patients had been diagnosed or had mentioned these concerns to a physician claiming they were too ashamed. Yet, nearly all asserted that the BDD preoccupations were their major problem, and in all except one case, BDD preceded the onset of AN. This begs the question, does AN develop in BDD patients as a means of coping and trying to improve

appearance? It also highlights the issue of potential misdiagnosis (Sobanski & Schmidt, 2000). BDD and AN share markedly similar clinical features; however, disorders need to share more than this to be deemed related. Differing gender-ratios, treatment responses, psychiatric comorbidities, and a lack of familial pattern suggests that these disorders do not share a joint aetiology and should be clinical differentiated.

2.6.4. Obsessive Compulsive Disorder. Studies directly comparing the clinical features of BDD and OCD have yielded generally consistent findings. The shared features include sex ratio, age of onset and course of illness (Phillips & Kaye, 2007). These studies have also shown that the disorders have equivalent general impairment and more specifically, equal levels of obsession and compulsion severity (Saxena et al., 2001). In contrast, BDD patients are more likely to be unmarried, unemployed and less educated (Frare et al., 2004). They also have more co-occurring depression, social phobia, substance abuse and suicidal ideation than their OCD cohorts (DeMarco et al., 1998). Another important finding was that BDD patients had poorer insight and were more likely to be delusional than OCD patients (McKay et al., 1997; Phillips & Kaye, 2007).

BDD and OCD are often comorbid. Rates of current BDD in OCD cohorts have ranged from 7% to 16% (Bienvenu et al., 2000; Stewart, Stack, & Wilhelm, 2008; Wilhelm, Otto, Zucker, & Pollack, 1997) with a lifetime rate as high as 37% (Hollander, Cohen, & Simeon, 1993). Among 293 BDD patients, 26% had current OCD and 37% had a lifetime diagnosis (Gunstad & Phillips, 2003). Akin to OCD, BDD also shows genetic trends. In one study 17% of BDD patient's family members also had the disorder (Hollander et al., 1993) and in a larger study 5.8 % of first degree relatives had BDD (Phillips et al., 2005b). Bienvenu and colleagues (2000) studied OCD patients, healthy controls and their first-degree relatives. They found that not only was BDD more prevalent among OCD patients than controls, but BDD was four times more likely in relatives of OCD patients than in the

relatives of controls. This was irrespective of whether the patient had comorbid BDD or not. In demonstrating familial aggregation between the disorders, the authors concluded that BDD is related to the OCD and belongs in the OCSD.

Finally, BDD and OCD also share treatment responses, with both responding preferentially to SRIs suggesting a shared neuro-chemical pathway (Phillipou et al., 2016). Cognitive and neuroimaging research has identified similar cognitive patterns, particularly executive dysfunction and the involvement of the similar brain regions in BDD and OCD (see chapter 4 of this thesis for further information regarding the neuropsychology of BDD and OCD).

2.7. Current Treatment Intervention for Body Dysmorphic Disorder

Current treatments for BDD involves a combination of psychological and pharmacological interventions, most commonly Cognitive Behavioral Therapy (CBT) and selective SRIs (Phillipou et al., 2016). Despite being included in treatment guidelines (National Institute of Health and Clinical Excellence [NICE], 2005), the evidence base for these treatments in BDD remains very small compared with other mental disorders (Veale & Neziroglu, 2010). To date, there have only been three Randomised Control Trials (RCT) evaluating SRIs (Hollander et al., 1999; Phillips, 2005b; Phillips, Albertini, & Rasmussen, 2002) and four evaluating CBT for BDD (Rosen, Reiter, & Orosan, 1995; Veale et al., 2014; Veale et al., 1996; Wilhelm et al., 2014).

Phillips et al. (2002) conducted a double blind RCT with 74 BDD patients comparing the efficacy of fluoxetine (a selective SRI antidepressant) versus placebo over a 12-week course. Fluoxetine was significantly more effective than a placebo in reducing BDD symptoms as measured by the Yale-Brown Obsessive Compulsive Scale modified for Body Dysmorphic Disorder (BDD-YBOCS). Of the 34 participants who received the active intervention group 53% were classified as treatment responders as opposed to 18% of the

placebo group, as indicated by a reduction of 30% or more in BDD-YBOCS scores. Of note, the researchers excluded participants with lesser BDD symptoms as well as those who displayed suicidality, so the generalisability of these findings is yet to be determined. In an extension of this study, Phillips (2005b) compared 17 BDD patients receiving fluoxetine alone to 11 BDD patients receiving fluoxetine augmented with the antipsychotic pimozide. They found that pimozide augmentation did not result in significant BDD symptom reduction as did fluoxetine. Hollander et al. (1999) investigated the efficacy of two antidepressants in BDD by conducting a 16-week double-blind cross-over design of 8 weeks of clomipramine (a tricyclic antidepressant with serotonergic reuptake blocking qualities) and 8 weeks of desipramine (a tricyclic antidepressant with selective norepinephrine reuptake inhibitor [NRI] qualities). Of the 29 participants enrolled in the study, only 18 completed the 16-week trial, a number reporting disengagement due to side effects associated with desipramine. In analysing the 23 participants who completed at least four weeks of both interventions, the authors concluded that while both antidepressants lead to BDD symptom reduction, this was significantly greater for clomipramine (70% responders) as opposed to desipramine (30% responders), with response determined by a 25% or greater reduction in BDD-YBOCS scores. The authors concluded that SRIs may be more efficacious than NRIs for BDD. Of note these pharmacological RCTs were all conducted more than a decade ago and did not include follow up assessments to assess the sustainability of these treatment outcomes. In summary, pharmacological studies have shown some efficacy for the use of antidepressants in BDD, particularly SSRIs and SRIs. However, it is noted that a number of participants did not respond to these treatments and that even in patients who responded many still meet criteria for BDD highlighting the need for further research into treatment for BDD including non-pharmacological modalities.

In the first RCT of CBT for BDD, Rosen and colleagues randomly allocated 54

women with BDD to a 12-week group-based CBT program specialised for body image or to a no treatment group (wait list). Therapy involved modification of intrusive thoughts of body dissatisfaction and overvalued beliefs about physical appearance, Exposure Response Prevention (ERP), and elimination of body checking. They found reduced scores on the Body Dysmorphic Disorder (BDDE) post treatment and these were retained at a 4.5 month follow up. There however are subject validity concerns regarding the sample used who were all female and reported to primarily be concerned with weight and shape concerns, which could be interpreted as an exclusion criteria for a diagnosis of BDD (APA, 2013). An additional limitation is the use of non-active wait list control group, which doesn't allow for a direct testing of the therapeutic utility of the CBT program beyond attention, time and peer connection.

Veale et al. (1996) randomized 19 individuals with BDD to either 12 weeks of an individually delivered manualised CBT or a control waitlist. Post treatment the intervention group participants showed significant reductions in BDDE, BDD-YBOCS scores and in improvements in depression. Seven of the nine participants in the active group were classed as having either absent or subclinical BDD at the end of the program, versus all participants on the waitlist still meeting full criteria for a diagnosis. The outcomes of this study are promising, although the sample size was small and a follow up assessment was not included to assess the maintenance of these positive outcomes. A more recent study undertaken by the same authors, tested the efficacy of a 12 week CBT program compared to an anxiety management program in a single double blind group parallel-group randomised trial (stratified by the presence of delusional BDD and severity of depression; Veale et al, 2014). The treatment intervention included imagery rescripting, joint formulation regarding maintenance factors, behavioral experiences and in-vivo exposure and habit reversal for cases including skin picking and hair pulling behaviors. At the 12-week end of treatment both

groups had significantly reduced BDD-YBOCS scores, but these were more significantly reduced for participants who received CBT compared to the anxiety management program. This was irrespective of the presence of delusional level beliefs and depression and these gains were maintained for both groups at one-month follow up.

In the final RCT of CBT for study of BDD Wilhelm et al. (2014) implemented a modular individual program for BDD which involved core treatment elements including elements such as psychoeducation, exposure and response treatment, cognitive reconstruction, and optional treatment modules that address symptoms such as skin picking and surgery seeking. Thirty-six adults with BDD were randomized to 22 sessions of immediate individual CBT-BDD over 24 weeks or to a 12-week waitlist (followed by a cross over). After 12-week the intervention and control group did not differ significantly in BDD-YBOCS scores, however 50% of the intervention group were identified as treatment responders (defined by a reduction in BDD-YBOCS scores of 30% or more) relative to only 12% of the control group. After 24 weeks 81% of all participants (immediate CBT-BDD plus waitlisted patients subsequently treated with CBT-BDD) met criteria as treatment responders.

While recent CBT programs have shown some promising results for the treatment of BDD, a recent prospective study has painted a concerning picture for the course for BDD despite access to pharmacological and psychological therapies. Phillips, Menard, Quinn, Didie, and Stout (2013) conducted a 4-year prospective observational follow-up study of 166 adults and adolescents with current BDD at intake to examine the course of the condition. They found that over 4-years the cumulative probability of full remission was 0.20 and for partial remission 0.55, where full remission was defined by minimal or no BDD symptoms and partial remission as less than DSM criteria for at periods of at least 8 consecutive weeks. This finding was irrespective of treatment intervention with the majority of participants having access therapy and medication treatment at intake. More severe BDD symptoms, a

longer duration of BDD and being an adult at intake, predicted a lower likelihood of BDD recovery. Notably a full remission probability of 0.20 is much lower than that established in other clinical disorders using a similar research design including MDD at 0.57 (Keller, 2006), mania at 1.0 (Keller et al 2006), panic disorder at 0.66 and GAD 0.34 (Yonkers et al., 2003).

2.8. Conceptual Models of Body Dysmorphic Disorder

The aetiology of BDD, as with all psychiatric disorders, is multifaceted and complex. It is likely that a number of interconnected developmental, psychosocial, cognitive, neurocognitive and neurobiological factors play a role in both the development and maintenance of this psychiatric condition. The following chapter of this thesis will provide an in-depth and critical review of pertinent factors and theories from a neurocognitive perspective (see chapter 3). As it is beyond the scope of this thesis to provide a thorough review of all proposed developmental and maintenance factors within the BDD literature the author directs the reader to key areas of interest within the field; the role of early adverse experiences including childhood trauma (Didie et al., 2006; Neziroglu, Khemani-Patel & Yaryura-Tobias, 2006) and teasing and bullying (Buhlmann, Cook, Fama & Wilhelm, 2007), aesthetic sensitivity (Lambrou, Veale & Wilson, 2011), shame (Weingarden, Renshaw, Davidson, & Wilhelm, 2017) and perfectionism (Schieber, Kolleo, de Zwann, Muller & Martin, 2013). The author further directs the reader to the emerging cognitive behavioural and social learning models, which provide a formulation based on the empirical research available at the time to help explain how this disorder comes to develop and be maintained. While each of these model includes some new or different features they share the premise that one's feelings and behaviours are determined by the way the individual interprets their experiences and that through modifying maladaptive patterns of thinking, beliefs and behaviours BDD symptoms can be targeted (Veale 2004; Veale et al., 1996: Neziroglu, Khemlani & Veale, 2008; Wilhelm & Neziroglu, 2002).

2.9. Conclusion

In conclusion, BDD is a serious and debilitating disorder. Despite common misperceptions BDD is not a very rare condition, rather it affects approximately 2% of the population, a similar rate to other chronic yet well known conditions such as OCD and Schizophrenia. BDD has been invariably minimised and overlooked both by professionals and the general population. As a result of this lack of understanding and the shame and secrecy inherent to this disorder, BDD is associated with significant delay between onset of symptoms and appropriate diagnosis and delivery of effective treatments. In turn, BDD can be chronic and unremitting and associated with several adverse outcomes including high rates of unemployment, social isolation, substance abuse, unnecessary surgery, self-mutilation and suicidal thoughts and behaviours. Conceptual models and evidence based treatments for BDD remain limited, and thus further research is greatly required to further develop our understanding of this chronic condition.

3. CHAPTER 3: The Neurocognition of Body Dysmorphic Disorder

3.1. Introduction to the Neurocognition of Body Dysmorphic Disorder

Despite the chronic nature and severity of BDD, it remains a relatively under-studied and poorly understood condition. In particular, little is known about the developmental and maintaining factors involved and how such aspects contribute to the clinical symptomology of BDD. As discussed in the previous chapter a better understanding of these factors is paramount to the advancement of effective treatment interventions available to those living with this condition. The clinical presentation of BDD, marked by intrusive thoughts, repetitive behaviours, faulty cognitions and perceptual distortions, has prompted researchers to investigate whether cognitive abnormalities underlie the disorder.

One approach to understanding the neurobiological underpinnings of a clinical disorder is to directly study the central nervous system, for example via the use of structural and functional neuroimaging technologies. Alternatively, neuropsychology is a branch of cognitive psychology, which aims to understand the relationship between discernable psychological processes and/or clinical symptoms, and the corresponding information processing systems and the underlying brain structures and networks involved in these processes. Specifically, this research involves the use of precise neuropsychological tests, which measure core cognitive functions, and in turn can indirectly implicate the involvement of various neuroanatomical structures and systems. Neuropsychological research, therefore, provides a safe, non-invasive technique to studying the relationship between a complex constellation of psychological symptoms and the underlying neuropsychological functioning of a disorder. Furthermore, beyond the ability to provide clues to specific brain structures and circuits, neuropsychological assessment additionally sheds light on how an individual or a group tend to process information and as such it provides important information which can inform treatment interventions and specifically guide how best to deliver these services.

A comprehensive understanding of the neurocognitive profile of BDD is far from established. This is in contrast to other similar psychological conditions such as OCD, which have an extensive literature describing the underlying neuropsychology and pathophysiology of the disorder (Kuelz, Hohagen, & Voderholzer, 2004). While our understanding of neurocognition in BDD is still in its infancy, such research has been rapidly evolving within recent years, with a particular focus on the assessment of visual and perceptual information processing. It has been proposed that BDD is characterised by aberrant visual processing, and specifically that this involves a global (holistic) visual processing deficit, such that individuals with this condition tend to over-rely on local (detailed-oriented) information processing mechanisms. This presents an important line of research as it aligns with the clinical behaviours of the disorder, and may explain how individuals with BDD come to perceive flaws in their appearance, which are not detected by others. In addition to their tendency to become fixated on these minute aspects of themselves at the expense of their overall appearance.

The aim of this current chapter is to review the neurocognitive research to date. This chapter will critically review this research, discuss the implications of the findings in relation to the clinical picture of BDD, and identify gaps within the literature requiring further attention and research replication. As the neuropsychological literature is fairly scarce in BDD and given the close relationship between BDD and OCD, this chapter will commence with a brief introduction to the neuropsychological findings established in OCD, which provides a guide for the directions taken in the BDD field. This chapter will also integrate relevant findings from neuroimaging research to inform this neuropsychological discussion, however given the limits of this thesis, this will not comprise an exhaustive review of the broader neurobiology of BDD (See BDD neurobiology reviews by, Buchanan, Rossell, &

Castle, 2011; Grace, Labuschagne, Kaplan, & Rossell, 2017; Li, Arienzo, & Feusner, 2013; Rossell, Harrison, & Castle, 2015).

3.2. Neuropsychological Research

3.2.1. Neuropsychological of Obsessive Compulsive Disorder. In contrast to BDD, there is an extensive literature examining the neuropsychology of OCD (Kuelz et al., 2004). The most consistent findings in OCD involve deficits in verbal and nonverbal (visual) memory and executive functioning. The broad term *executive function* (also referred to as *cognitive control*) refers to a set of cognitive skills, which are used to control one's cognition and behaviour, and specifically manage ones resources to achieve a goal. Executive functions are considered higher-order abilities and include cognitive processes such as cognitive flexibility, cognitive inhibition, set-shifting, planning, problem solving and organisation, abilities which are known to be dependent on the function of the prefrontal cortex (Hanes, Andrewes, Smith, & Pantelis, 1996). Purcell, Maruff, Kyrios, and Pantelis (1998) examined the neuropsychological performance of OCD using a battery of tests sensitive to the integrity of the frontal and subcortical systems. OCD patients performed similarly to non-clinical controls on a number of tasks, however, showed specific cognitive deficits on tasks of executive function and visual working memory. The authors concluded that this pattern was qualitatively similar to the performance of patients with frontal lobe excisions, and thus suggested that the pathophysiology of OCD involves the frontal-striatal system, a neural network connecting the prefrontal cortex and basal ganglia.

Savage and colleagues (2000) found both verbal and non-verbal (visual) memory to be impaired in 20 OCD participants compared to 20 non-clinical controls using the Californian Verbal Learning Test (CVLT) and Rey's Complex Figure Test (RCFT). Multiple regression analyses, however, revealed that these deficiencies in free recall of both verbal and nonverbal information were significantly mediated by impaired organisational strategies in

the OCD group. This suggests that memory dysfunction in OCD may be secondary to executive dysfunction, namely the inability to effectively engage organisational strategies to better store this information for later recall. This finding of primary executive dysfunction associated with secondary memory deficits has been further replicated by other studies using larger OCD samples (Deckersbach, Otto, Savage, Baer, & Jenike, 2000a; Olley, Malhi, & Sachdev, 2007; Savage et al., 1999). Taken together, researchers have suggested that the pathophysiology of OCD involves the frontal-striatal system.

A frontal-striatal model of OCD has also been supported by neuroimaging studies. Functional imaging studies of OCD have identified activation abnormalities in prefrontal structures when engaging in learning tasks, including areas such as the orbitofrontal cortex (a brain region important in decision making), caudate nucleus (a component of basal ganglia involved in inhibitory control) and anterior cingulate cortex (an area connected to both the limbic and prefrontal cortex, and thus, involved in both decision making and emotion regulation; Saxena & Rauch, 2000). Further support for frontal-striatal involvement in OCD comes from well-documented reports of OCD-like behaviour in neurological disorders known to affect the prefrontal cortex and basal ganglia, including Tourette's syndrome and Huntington's disease (Cummings & Cunningham, 1992; Goodman, Storch, Geffken, & Murphy, 2006). OCD-type behaviour is also found in patients presenting with brain lesions to the frontal regions including the frontal cerebral cortex, cingulate regions and basal ganglia (Berthier, Kulisevsky, Gironell, & Heras, 1996). A multicentre structural neuroimaging study using Magnetic Resonance Imaging (MRI) compared a large sample of 412 OCD patients to 368 non-clinical controls with findings strengthening support for the fronto-striatal model of OCD (De Wit et al., 2014). They found OCD patients relative to controls had significantly reduced white and grey matter volumes across key frontal areas including the dorsomedial prefrontal cortex, anterior cingulate cortex, the inferior frontal gyrus and anterior insula.

Given the symptom parallels between BDD and OCD, it has been of clinical interest to examine whether BDD has a similar pathophysiology to OCD, marked by aberrant executive and memory dysfunction associated with underlying frontal-striatal regions.

3.2.2. Neuropsychological of Body Dysmorphic Disorder. In BDD there are only a relatively small number of studies, which have employed a broad cognitive assessment battery or "classic" standardised neuropsychological tests to support a comprehensive cognitive understanding of the disorder. These studies have limitations including small sample sizes, a lack of appropriate clinical diagnostic and symptom severity assessment, and extraneous influences such as comorbidity and psychotropic medication of clinical participants. Nonetheless, this emerging field of research has identified some notable discrepancies in the neuropsychological profile of BDD samples compared to control samples.

In the very first neuropsychological study of BDD, Hanes (1998) compared the cognitive performance of 14 BDD, 10 OCD, 14 schizophrenia patients and 24 non-clinical controls on an assembled battery of tasks which measured the domains of motor, memory and executive functioning. The BDD and OCD groups showed normal motor function, and visual and verbal learning/memory as measured by the RCFT and the Rey's Auditory Verbal Learning Task (RVLT). The BDD and OCD participants did, however, perform significantly poorer than controls on tasks of executive function, namely on a measure of response inhibition (The Stroop Test) and on planning abilities (New Tower of London). While the schizophrenia group also demonstrated executive functioning abnormalities on these tasks, they showed much poorer performance on these measures and more wide spread neuropsychological difficulties across all tasks. The overall similar cognitive pattern exhibited by the BDD and OCD groups provides support for the relationship between the two disorders, however the finding of normal visual (RCFT) and verbal memory (RVLT) in the

OCD sample was unexpected given past previous research finding. The OCD sample used by Hanes was especially small (n=10) and symptom severity measurements were not provided for any of the clinical samples used, meaning it is possible that this group was not representative of previous studied OCD samples.

In contrast to Hanes (1998), Deckersbach and colleagues (2000) found that 17 BDD participants compared to 17 matched non-clinical controls exhibited both visual (RCFT) and verbal (CVLT) memory deficits. Similar to previous OCD research, multiple regression analyses demonstrated that these memory deficits were mediated by poor organisational strategies in the BDD sample. The authors noted that the BDD patients tended to recall specific isolated details of stimuli rather than their overall organisational information. That is, BDD participants did not effectively utilise the semantic categories available on the CVLT or the holistic visual elements on the RCFT to guide and organise their memory of this information. As highlighted, this finding of impaired strategic organisation leading to secondary difficulties with visual and verbal memory recall has been established in OCD (Savage et al., 2000) and has also been found in AN (Sherman et al., 2006). In the case of BDD, even after partialing-out the effects of organisation, the visual but not the verbal memory deficits remained significant (Deckersbach et al., 2000a). The results of this study support frontal-striatal involvement in the pathophysiology of BDD, however it also suggests that other fundamental memory structures may be involved. A limitation of the study was the substantial number (35%) of BDD participants that had a current comorbid diagnosis of OCD, while it is not unusual for these disorders to be comorbid, it raises the question of whether the findings are specific to BDD or reflect the effects of OCD symptomology.

An Australian research group administered select tests from the computerised Cambridge Neuropsychological Test Automated Battery (CANTAB), known to tap core executive and visual memory functions, to a sample of 14 BDD participants and 14 non-

clinical control participants (Dunai, Labuschagne, Castle, Kyrios, & Rossell, 2009). They found that BDD participants exhibited executive functioning deficits on measures of visuospatial working memory (Token Search), spatial planning and problem solving skills (Stockings of Cambridge) as well as reduced thinking speed on this latter task. By contrast BDD participants were found to perform similarly to control participants on a task of visual recognition (Pattern Recognition) and visual memory span (Spatial Span). The authors suggested that their findings were broadly consistent with Hanes (1998) and Deckersbach et al., (2000) in that they support executive dysfunction in BDD. The authors suggested that the equivalent functioning of BDD participants and controls on measures of visual spatial span and visual pattern recognition may indicate that these more basic visual skills, namely of being able to briefly hold spatial information 'on-line' but not necessarily engage in complex manipulation or longer-term memory storage/retrieval of this information, may be uncompromised in BDD. It should be noted that the visual spatial span results did show a trend towards significance with the BDD sample performing poorer than controls, thus suggesting that further research needs to be completed.

In a follow up study, this research group compared the CANTAB results of their BDD cohort with previously published data for 23 OCD participants (Labuschagne, Rossell, Dunai, Castle, & Kyrios, 2013). The results showed an equivalent pattern across most domains, however, the BDD participants, but not OCD participants, demonstrated significantly poorer performance on the Stockings of Cambridge as compared to controls. The authors suggest that this may represent the existence of more severe problem solving and planning deficits in BDD as compared to OCD. This is of clinically relevance, as BDD participants consistently show poorer insight and a tendency towards more "delusional" level beliefs compared to OCD participants (Phillips et al., 2012). BDD participants may therefore experience more

difficulty with executive functions including thinking and reasoning processes than those with OCD.

A recently published study by Toh, Castle, and Rossell (2015) has provided the first broad and comprehensive study of general cognition in BDD, via use of the Repeatable Battery of the Assessment of Neuropsychological Status (RBANS). The RBANS is a standardised test battery tapping into five core indices of cognition; Immediate Memory (Verbal), Visuospatial Construction, Language, Attention and Delayed Memory (Verbal and Visual). This study compared 21 BDD, 19 OCD patients and 21 age, gender and Intelligent Quotient (IQ) matched controls. BDD and OCD participants exhibited similar cognitive profiles across the RBANS indices with deficits identified on two of the five domains relative to controls; Immediate Memory (Verbal) and Attention. The finding of intact performance on the immediate and delayed tasks of verbal learning and visuospatial construction tasks in both BDD and OCD groups is unexpected given the parallels between these tasks and previous findings on the CVLT, RVLT and RCFT (Deckersbach et al., 2000; Savage et al., 2000). Of note, is that the visuospatial construction measure used in the RBANS is a more rudimentary visual learning and memory task as compared to the RCFT. Thus, the absence of any differences on this task could be seen to support the assertion that more basic visual skills remain intact in BDD whereas it is the manipulation, storage and retrieval of more complex visual information that appears to be affected in BDD (Dunai et al., 2009). Nonetheless, these findings are consistent with Hanes (1998) who also did not establish visual or verbal learning/memory difficulties in BDD.

The BDD and OCD groups in Toh et al. (2015) also showed normal performance on the semantic fluency task, which is one of the most-widely established measures of executive and frontal lobe functioning (Alvarez & Emory, 2006). In contrast, other studies have found verbal fluency to be disrupted in BDD, although one showed impaired semantic (categorical)

fluency but not phonological (letter) fluency, and the other showed the reverse finding (Labuschagne, Castle, & Rossell, 2011; Rossell, Labuschagne, Dunai, Kyrios, & Castle, 2014). This is, however, consistent with the verbal fluency investigations of OCD with studies showing diverging results (Kuelz et al., 2004). Perhaps these mixed results are indicative of the complexity of verbal fluency as a cognitive measure, with the cortical pathways utilised depending largely on the resources and specific strategies an individual employs to perform the task.

In Toh et al. (2015), the BDD and OCD groups did, however, demonstrate verbal learning impairments on a story memory task, which involved the learning, immediate and delayed recall of various elements of a verbally presented short story. It is possible that the clinical participants specifically encountered difficulty with this task but not list learning as this task relies on more complex executive functions. For example, superior performance would require strategic organisational techniques such as 'pegging' or 'chaining', whereby a person mentally links words to images or numerical patterns, a process which also taps into visual processes for best recall performance.

Of note, the RBANS was not specially designed for the investigation of neurocognition in mental health populations, but rather for assessment of patients with frank lesions, and thus may not be sensitive enough to detect more subtle differences between BDD and control groups. Indeed, the authors of this study emphasised that both clinical and non-participants performed at "ceiling level" on a number of the RBANS subtests which may have contributed to a lack of significant group differences on some of the cognitive domains. Finally, the finding of impaired attention in both BDD and OCD on the RBANS is a fairly novel finding, with attention not having been previously directly studied in BDD. Most neuropsychological studies of OCD show normal attention span, sustained attention and selective attention relative to control samples (Kuelz et al., 2004). Of note, however, is that

the subtests classed as the "attention" measures in the RBANS (Digit Span and Coding) are also accepted measures of verbal and visual working memory, especially the backwards condition of digit span and the optional ability to memorise the visual code to improve speed of performance on Coding. As such, further assessments of attentional processes in BDD are warranted.

In summary, there have been relatively few traditional neuropsychological investigations into broad cognitive domains in BDD, which is in contrast to similarly chronic disorders such as OCD. The research reviewed here suggests impairments in high-order executive processes including planning and decision-making as well as possible visual and verbal memory deficits. Nevertheless, the research has also reflected a number of discrepancies, for example on investigations of visual learning/memory using the RCFT, verbal learning/memory using measures such as RVLT and CVLT and on verbal fluency, highlighting the need for further neuropsychological examination and robust replication of these preliminary findings. BDD samples have typically been small, and thus, replication of these findings within larger samples would be meaningful. In particular, there is a need for further broad and comprehensive assessments of core cognitive domains, such as that undertaken by Toh et al. (2015), however conceivably with an alternative battery that provides a broader range of performance to be analysed. Further insights into the underlying neurobiological mechanisms of BDD can be obtained from the neuroimaging research. These will be briefly reviewed in the next section.

3.3. Neuroimaging Research

3.3.1. Structural neuroimaging studies. Structural neuroimaging (morphometric) research provides a direct assessment of underlying brain structure in BDD. There have only been five MRI studies to date, which overall have provided support for frontal-striatal circuit involvement in BDD, although some discrepancies have been found in the exact regions

implicated. Rauch and colleagues (2003) conducting the first MRI study in BDD, found greater total white matter and a leftward shift in the caudate nucleus. The involvement of the caudate nucleus is of interest given the importance of this region in OCD and the role this structure plays in organising incoming information and other cognitive processes involved in executive functions and memory. However, this study used only 8 BDD participants and had no control group. Thus, these results must be considered with caution. Atmaca et al. (2010) used MRI to compare 12 unmediated male BDD participants with no psychiatric comorbidities to 12 non-clinical male control participants. They also found increased total white matter volumes as well as a significantly smaller orbitofrontal cortex (region involved in decision making) and anterior cingulate cortex (involved in both executive functions such as decision making and emotional regulation); cortical structures that have also been identified in the pathophysiology of OCD (Saxena & Rauch, 2000).

In a larger study by Buchanan et al. (2014), similar findings were replicated with 20 BDD participants relative to 20 matched non-clinical controls. This included reduced brain volumes in the right orbitofrontal cortex, and specifically, the left dorsal anterior cingulate cortex, the dorsal region being specifically recognised for its role in cognitive control processes (Shenhav, Cohen, & Botvinick, 2016). This study additionally identified volume reductions in the left amygdala (also known as the ‘fear centre’ and involved in emotional responses and memory) and the left thalamus (involved in relaying sensory impulses from various parts of the body to the cerebral cortex), although these differences no longer reached significance after covarying for total brain volume. While, Feusner et al. (2009), did not identify a significant volume reduction in the amygdala in their BDD sample (n=12) compared to controls (n=12) they did find left amygdala volume to be significantly correlated with BDD symptoms severity. Overall, these findings, especially those relating to key frontal structures (anterior cingulate cortex and orbitofrontal cortex) and extending to the caudate

nucleus of the basal ganglia are consistent with findings of reductions in frontal-striatal brain regions in OCD, although the role of the amygdala has not previously been identified in OCD studies.

Diverging from these findings, however, a recently published morphometric study, which currently constitutes the largest MRI study of BDD, found no significant volumetric or cortical thickness differences when comparing 49 BDD participants to 44 non-clinical controls (Madsen et al., 2015). The study's methodology does not provide any insights as to why the previous findings were not discovered in this sample, in that all participants were medication free, all right handed and psychiatric comorbidities were excluded with the exception of anxiety and depression related diagnoses. The sample also demonstrated equivalent or more severe BDD symptoms than those in the previous research, with an average BDD-YBOCS score in the severe range. This finding therefore may indicate that BDD is not characterised by prominent abnormalities in brain morphometry, and that the previously identified abnormalities may have resulted from other factors such as small sample sizes, unrepresentative gendered samples (all male or all female), the influence of psychotropic medication or specific psychiatric comorbidities. However, one argument against this conclusion is that OCD, with which BDD shares notable commonalities, has also been found to have cortical thickness anomalies and these findings can not be reduced to sampling issues as they have been replicated across high quality and sizeable samples (Nakamae et al., 2012). The authors of the current study therefore suggested that if BDD is marked by morphometric abnormalities that they may be more subtle or heterogeneous than in OCD, thus making them harder to detect (Madsen et al., 2015). This emphasises the need for further large-scale neuroimaging research in BDD.

3.3.2. Functional neuroimaging studies of faces. The investigation of visual information processing has been of particular interest in BDD given the core clinical

symptom of a misperception of appearance-based flaws. Following Deckersbach et al., (2000) assertion that BDD patients tend to focus on specific isolated details over global organisation features, a series of neuroimaging studies utilising face processing tasks have been conducted to more closely examine the way in which individuals with BDD process appearance-relevant visual stimuli.

Feusner and colleagues investigated the use of 'global' verses 'local' visual processing in BDD. Local visual processing involves processing a stimulus by its individual and rich details and elements, whereas global processing involves absorbing the overall form of a stimulus, for example by noticing broader configural relationships between elements (Beilharz, Castle, Grace, & Rossell, 2017). In their first BDD fMRI study, 12 BDD participants and 13 non-clinical controls were required to match photographs of other peoples faces which all displayed neural emotional expressions while in the scanner (Feusner, Townsend, Bystritsky, & Bookheimer, 2007). The photographs were modified to create three conditions; unaltered images, high spatial frequency images (where all low frequency information was removed to promote detailed oriented processing) and low spatial frequency images (where all high detail information were removed thus encouraging global processing). The study found left hemisphere hyperactivity in BDD participants relative to controls, particularly in the lateral prefrontal cortex and lateral temporal lobe regions on all conditions, including the dorsal anterior cingulate on the low spatial frequency (holistic) condition. This was in contrast to controls that demonstrated the expected right hemispheric dominance, and only recruited left hemispheric prefrontal and dorsal anterior cingulate activity when processing the high spatial frequency (detailed) photos. Predominant left sided activity in BDD participants even when observing low spatial frequency and unaltered images (meaning configural data was available) suggest a misapplication of detailed visual processing mechanisms, a pattern typically reserved for when there is only high detail information

available. This was understood to indicate that BDD patients attach unnecessary significance to small details when processing faces rather than processing them holistically through right hemisphere activation (Feusner et al., 2007).

In an extension of this study, Feusner and colleagues (2010b) used fMRI to examine how 17 unmediated BDD participants and 16 non-clinical controls passively processed their own-faces as compared to familiar faces of others (famous actors). They again modified the stimuli so that photographs were either unaltered, high spatial frequency or low spatial frequency. They found abnormal hyperactivity in the left orbitofrontal cortex and bilateral head of the caudate in the BDD sample for both unaltered own-face and unaltered other-faces. The BDD group also showed hypoactivity in the left visual cortex (occipital cortex and extrastriate regions) when viewing low spatial frequency images. The abnormal heighten activity in the left orbitofrontal cortex was also found to be correlated with BDD symptom severity as measured by the BDD-YBOCS (Feusner et al., 2010b). Taken together these two studies provide support for there being an imbalance in visual global verses local processing mechanisms in BDD. Specifically, that individuals with BDD tend to engage unnecessary 'detail-oriented' left hemispheric mechanisms when processing faces, to the extent that they attempt to engage these processes and extract detail even when presented with images that don't have any. The findings of these studies also suggest that this mechanism occurs both when viewing their own faces as well as that of others.

A separate study, performed further data analysis on the fMRI data from Feusner et al. (2010b) and established a relationship between anxiety and activity in the limbic and visual systems. They found a non-linear relationship between anxiety and activity in the right visual ventral system, and a linear relationship between anxiety and activity in the left visual ventral system for the BDD sample. This relationship was stronger for own-face stimuli versus familiar-face. Furthermore, they found that for both BDD participants and controls

that activation in the amygdala (the fear centre) was positively correlated with activity in the ventral visual pathway. This finding supports previous MRI research suggesting the amygdala might play a role in the symptoms of BDD (Buchanan et al., 2014; Feusner et al., 2009). On a behavioural and evolutionary level an increased ability to extract fine details may be useful when under threat. Anxiety may, therefore, be partly responsible for the abnormal detailed processing observed in BDD leading to the perception of appearance-flaws and continued cycle of detailed processing especially sensitive to viewing ones own image (Bohon, Hembacher, Moller, Moody, & Feusner, 2012).

3.3.3 Functional neuroimaging studies of neutral objects. Each of the neuroimaging studies described above has used appearance-relevant stimulus, that is, ones own face or other's faces. However, the preliminary findings of the neuropsychological batteries described earlier (Deckersbach et al., 2000a) would suggest that visual processing difficulties in BDD may occur even with general visual stimuli, not only the emotionally laden stimulus of faces. An important question, therefore, is whether visual processing variations in BDD exist just for the processing of faces or appearance relevant images or whether they extend to visual processing of more neutral objects. Addressing this question, Feusner and colleagues (2011) assessed how individuals compared to controls visually process non-appearance related stimuli during an fMRI study. 14 BDD participants and 14 non-clinical controls were required to match photographs of houses that were either unaltered, high spatial frequency or low spatial frequency. The BDD group showed abnormal hypoactivity in higher-order visual processing systems (including the parahippocampal gyrus, lingual gyrus, and precuneus) when viewing low spatial frequency (holistic) images. This finding is consistent with the previously identified global processing deficit, and suggests that visual processing in BDD involves a tendency towards aberrant global processing which

extends to the processing of general stimuli as well as appearance relevant material (Feusner, Hembacher, Moller, & Moody, 2011).

3.4. Other Visual Processing Research

3.4.1. Inverted Face Studies. Inverted face processing research provides a novel avenue to study global verses local visual processing in BDD. Inverted face tasks involve subjects viewing sequences of faces both upright and inverted. In general, people are significantly slower and less accurate when processing inverted faces as compared to upright faces, a phenomenon labelled the "face inversion effect". This consistent finding is suggested to occur because humans have a holistic (global) template for quick and accurate processing of upright faces, but that this template does not apply when faces are inverted, as this is not a typically occurring situation in the natural environment. Thus, when faces are experimentally inverted people must turn to left-hemispheric detail-oriented visual processing mechanisms, as their primed propensity for holistic face processing is no longer accessible.

Using this paradigm, one study found that 18 BDD participants compared to 17 non-clinical controls had a diminished face inversion effect, that is, they were faster although not more accurate at matching inverted faces (Feusner et al., 2010a). This finding suggests that individuals with BDD have a greater propensity towards detailed processing of information, or it could be interpreted as a deficiency in recruiting holistic processing, resulting in them utilising a piecemeal processing approach with faces. Of note, Feusner et al. (2010a) only found this difference in their longer exposure condition whereby the face stimuli was shown for 5000 milliseconds (ms) as compared to the shorter condition of 500 ms. This is likely due to the longer condition allowing enough time for more detailed encoding to take place, thus the BDD participant's advantage was only exposed in this longer condition. Supporting this interpretation, an all-female study, showed that 12 BDD participants compared to 16 controls had an enhanced ability to accurately identifying inverted famous faces in a design that

involved unlimited duration to the stimuli (Jefferies, Laws, & Fineberg, 2012). Alternatively another study which endeavoured to further explore the inversion effect in BDD, using stimuli of both faces and houses, found no differences between BDD and control participants on either speed or accuracy on any of the conditions. Of note, is that they only displayed the stimuli for the shorter duration time of 250ms (Monzani, Krebs, Anson, Veale, & Mataix-Cols, 2013). Thus, it would appear that BDD participants tend to process faces in a more detailed manner than controls, resulting in a reduced face inversion effect, but that this only occurs when sufficient time is available to do so. This finding regarding duration of exposure is of clinical relevance given the tendency for individuals with BDD to engage in long mirror gazing sessions leading to distress (Windheim, Veale, & Anson, 2011). The face inversion literature, and specifically the findings regarding length of exposure suggest that detail-oriented processing in BDD may not be a purely 'automatic' response to processing visual stimuli, but rather may reflect learnt tendency towards this type of processing when there is a longer exposure to stimuli. If this tendency is indeed a preference or a learnt response, there may be an opportunity to modify or override these patterned responses through treatment interventions. This notion, however, requires further empirical investigation.

Taken together, these face inversion tasks converge with the aforementioned findings from neuropsychological and neuroimaging research, which have shown abnormal brain activations during visual encoding, and an imbalance in global verses local visual processing mechanisms marked by a possible impairment in holistic processing or a superior yet misused propensity for detailed oriented processing. Future visual processing studies are warranted and would benefit from further investigation of stimuli duration to assess the impact this has on visual processing mechanisms in BDD.

3.4.2. Flaw and symmetry detection studies. Another means of investigating visual processing in BDD includes experimental designs involving the detection of flaws or

symmetry anomalies in facial stimuli. Yaryura-Tobias and collegues (2002) found that 10 BDD participants and 10 OCD participants relative to 10 non-clinical controls perceived distortions in computerised images of their own faces that were not actually present. This equivalent finding in the BDD and OCD sample is of interest, as although there are significant parallels between the disorders in terms of their clinical symptoms and neuropsychological profile, OCD does not involve the perception of appearance-based flaws. Alternatively, Reese, McNally, and Wilhelm (2010) compared 20 BDD, 20 OCD and 20 non-clinical controls and found no differences between the groups in their ability to detect asymmetry modifications made to images of other people's faces. One interpretation of these results could be that inaccurate flaw detection only occurs in BDD when viewing ones own image, indeed this fits with the clinical symptoms of BDD in which individuals are fixated on flaws they detect in their own appearance and not others, with the exception of cases of BDD by- proxy (Greenberg, Limoncelli, & Wilhelm, 2017). Yet this interpretation does not align with the broader visual processing research, which has demonstrated that visual processing anomalies in BDD occur not only for stimuli of own face, but also stimuli of other's faces and even non-appearance related stimuli. A third flaw detection study found that 21 BDD participants were significantly more accurate than two control groups, 19 dermatological patients with a disfiguring condition and 20 dermatological patients with a non-disfiguring condition, at identifying subtle changes made to the facial features on stimuli of other peoples faces (Stangier, Adam-Schwebe, Müller, & Wolter, 2008).

Integrating the results of these flaw and symmetry detection studies is challenging given the limited number of studies available, small sample sizes, variations in stimuli including duration times, whether the modifications were actually made or not, and the use of own face stimuli verses other face stimuli. Nonetheless, two out of three of these studies can

be seen to support the notion that BDD involves heightened detailed-oriented visual processing, which may contribute towards clinical perceptions of appearance flaws.

Furthermore, as highlighted by McCurdy-McKinnon and Feusner (2017) there are also key differences in the methodologies of the latter two flaw/symmetry detection studies which may help explain their conflicting results. Firstly, Reese et al. (2010) showed participants two faces next to one another and asked them to simply make a dichotomous choice as to which face was 'overall' more symmetrical, a task that would engage configural processing mechanisms due to its design and its explicit instructions to process the symmetry of the face holistically. Whereas the Stangier et al. (2008) study involved showing participants an unaltered face image for 1000ms followed by a modified image of that same face for 200ms, and asking the participant to rate on a 5-point scale the extent to which the face had changed. Of note, the modifications to the faces in this study involved adjustments to very specific and detailed elements to areas of the face known to be common BDD concerns; skin pustules, scars, hair density, nose size and spacing between the eyes. With the exception of the last item (spacing between the eyes) these changes would have relied on detailed visual processing mechanisms. Thus, it can be understood that Reese et al. (2010) found that BDD participants performed equally to controls on a task of holistic face processing, in which participants were explicitly instructed to draw their attention to the global symmetry of the image. Whereas, Stangier et al. (2008) showed further evidence that BDD participants demonstrate superior detailed oriented visual processing than controls in a face processing task. A possible interpretation of these findings could be that individuals with BDD can in fact appropriately utilise holistic visual processing mechanisms when explicitly prompted to do so, although this may not be their natural tendency in real-life situations. This may suggest that individuals with BDD have a strong "preference" towards detailed-oriented visual processing rather than a core neurobiological impairment in their ability to process

information more globally. This again highlights the possibility that the global and local processes tendencies in BDD may be emendable to modification through treatment interventions.

However, of further note, the Stangier et al. (2008) study demonstrated an enhanced ability to detect subtle flaws in faces, which is interpreted as reflecting enhanced detailed (local) processing in BDD within a very short duration of exposure (200ms). This study therefore diverges from the inverted face processing tasks, which indicated that detailed face processing in BDD only takes place when a longer exposure (5000ms plus) is allowed. It is possible that flaw detection stimuli and inverted faces stimuli represent distinctive tasks, which do not allow this level of comparison. It may also be possible that the exposure to the unaltered face for 1000ms just prior to the target stimulus in Stangier et al. (2008), boosted the BDD participants ability to engage these preferred local processing mechanisms more quickly than in previous face studies. Nonetheless, this study also raises the possibility that detailed verses global processing anomalies in BDD can occur at a much earlier phase of exposure (within 0.25 seconds), which could imply that these processes represent a more automatic and involuntary mechanism. Thus, further research is warranted to explore global verses local visual processing in BDD with particular exploration of exposure times with a goal of determining at what level of visual perception do individuals with BDD differ to those without the condition in their reliance on these alternate systems.

In summary, the flaw and symmetry detection research has revealed some mixed findings. Nonetheless, two out of three of these studies support the notion that BDD involves heightened detailed-oriented visual processing, which may be contributing towards the clinical perception of appearance flaws.

3.4.3. Gestalt Studies. Finally, a handful of recent studies have attempted to further investigate visual processing in BDD through the use of gestalt-like stimuli. Gestalt

principals posit that humans attempt to process stimuli in their most simple form, and thus, visually and psychologically attempt to make order out of chaos by viewing the 'whole' of a visual representation rather than focusing on all of it's singular parts. Similar to the face inversion effect it has been speculated that individuals with BDD may be less susceptible to gestalt visual illusions as they are dependant on holistic visual perceptual organisation trumping more detailed-oriented processes.

Kerwin, Hovav, Hellemann, and Feusner (2014) used two such tasks: The Embedded Figures Task (EFT) and a Navon Task. The EFT involved showing participants a simple target shape and asking them to identify which of three complex figures contained the target shape within its image. Longer response times and errors were seen as reflecting slower local processing, and as such they hypothesised that individuals with BDD would be faster than controls on this measure due to their theorised superiority with detailed processing. The Navon is a well-studied paradigm, which involves letter stimuli, which has both a global and a local aspect in that a large (global) letter is shaped out of small (local) letters. The Navon used in the study-required participants to identify a target letter (either a H or a T), which could either occur at the local or the global level. The authors anticipated that BDD participants would again perform better than controls on the local trials of the Navon. Contrary to these expectations, BDD participants (n=18) relative to non-clinical controls (n=16) showed significantly slower and less accurate performance on the EFT and were significantly slower but not less accurate than controls on both the local and global trials of the Navon. Despite not finding enhanced speed and accuracy on these tasks in the BDD group as anticipated, the results still show that those with BDD as compared to those without the condition show significant differences in their performance on local versus global visual processing tasks. The authors suggest that the results may still support a bias in attention to detail, but one involving slower processing rather than faster processing times. Indeed, the

Navon results showed BDD participants to perform significantly slower on both global and local trials but their accuracy was equal to controls, perhaps because imbalances in their global versus local processing resulted in a trade-off where they took longer but performed equally accurately. Furthermore, the assumption that the EFT is a 'local' visual processing measure may also be a misrepresentation given it requires the ability to both see the broad visuospatial construct as well as identifying specific details located within it. Thus, the BDD group's poorer performance on this task may be understood as more broadly reflecting aberrant visual perceptual organisation, as previously suggested on the RCFT used by Deckersbach et al., (2000). Finally, the Navon Task used in this study required the participants to consistently shift their attention between global and local details. Thus the BDD groups slower performance on both global and local trials on this measure may also reflect a difficulty with set-shifting a core executive function and thus could be seen as providing support for a frontal-striatal model of BDD as supported by the previous neuropsychological and neuroimaging research.

Monzani and colleagues (2013) also investigated visual processing mechanisms using a version of the Navon within their larger sample of 25 BDD participants and 25 non-clinical controls. In contrast to Kerwin et al. (2014), they found no differences between the BDD and control group, with both groups demonstrating faster response times on the global condition (identifying the larger letter made up of smaller letters) compared to the local condition (identifying the smaller letters used to make up one large letter) suggestive of a normal global precedence effect. Of note, the Navon task used in this study differs in key ways to that used by Kerwin et al. (2014). Firstly they presented the Navon stimuli for a shorter duration of 500ms, which is noteworthy, given the previous research suggesting that BDD visual processing does not differ at this short exposure time. Furthermore, they also administered the test in separate blocks, each block explicitly prompting the participant to either identify

the local letter or the global letter and thus there was no reliance on set shifting in this study. A possible explanation therefore, which was also indicated by the flaw and symmetry detection research reviewed above, is that visual abnormalities in BDD may stem from more of a tendency or preference towards detailed visual processing which occurs when given the opportunity and time, as opposed to a fundamental impairment to global or local systems processing per se. Further empirical research, however, is needed to examine global versus local processing in BDD and assess whether the differences reflect more of a processing preference and choice as compared to an inability to appropriately recruit globally systems when appropriate.

Finally, Silverstein and colleagues (2015) compared 20 BDD, 20 OCD, 24 schizophrenia patients and 20 non-clinical controls on two other gestalt-type tests. The Ebbinghaus Illusion is an illusion, which occurs when humans perceive a target circle as different in size depending on the size of the circles which surrounding, with it appearing larger when surrounded by smaller circles and smaller when surrounded by larger circles. The Contour Integration Test is a widely used measure of perceptual organisation and involves the ability to detect or make a judgement about a closed contour made up of non-continuous elements embedded within a full page of randomly oriented elements. In their study the schizophrenia group, but not BDD or OCD groups showed impairments relative to controls on both tasks. Rossell et al. (2014) also found BDD and control participants to perform similarly on the Contour Integration Test.

Overall, visual processing studies using gestalt-like stimuli in BDD have yielded conflicting results, with some showing imbalances in global and local visual processing and others showing BDD groups have no difficulties relative to controls. One possibility is that the aberrant global processing observed in BDD is a result of higher-level top–down perceptual processes rather than a bottom-up perceptual dysfunction. This may

explain some of the conflicting research findings depending on duration of exposure and explicit instructions provided. Another factor here is the precise measures being used and their power to tap into the exact visual processing functions of interest in BDD.

3.5. Conclusions

In summary, the emerging neuropsychological research in BDD has highlighted a range of cognitive discrepancies when comparing individuals with BDD to those without the condition. Classic neuropsychological research has been limited, but the research findings to date point to the involvement of higher order executive processes, and possible visual and verbal memory deficits. Neuroimaging studies have identified abnormalities in key prefrontal structures including the orbitofrontal cortex, caudate nucleus, anterior cingulate cortex as well as the amygdala, which supports a frontal-striatal model of BDD similar to that proposed in OCD. Various research approaches (i.e. the neuroimaging of face processing, face inversion, flaw detection and gestalt tests) have indicated that BDD may specifically involve aberrant visual processing; specifically in relation to global versus local processing systems. This fits with the clinical symptoms of BDD, namely the perception and fixation of specific flaws in one's appearance. There, however, have been some discrepancies in this research as well as limitations including small sample sizes and comorbidity issues which all accentuate the need for further cognitive research.

PART II- EMPIRICAL ANALYSES OF NEUROCOGNITION IN BDD

4. CHAPTER 4- An Examination of the Neurocognition of Body Dysmorphic Disorder using the MATRICS Cognitive Consensus Battery

4.1. Introduction

4.1.1. Introduction and Rationale. As highlighted, there have been relatively few investigations of the neuropsychological profile of BDD, which is opposed to other chronic psychiatric disorders such as OCD. The neuropsychological research, to date, (see section 4.2.2) has indicated that BDD is characterised by impairments in high-order executive functions including planning, problem solving and organisational, as well as possible visual and verbal learning and memory deficits. The research, however, has revealed some discrepant findings and has been subject to several limitations including small sample sizes, a lack of systematic clinical diagnostic and symptom severity assessment, and possible external influences such as psychiatric comorbidity and medication use in clinical samples. As such, there is a need for further robust investigation into the neurocognitive functioning of BDD.

There is a remaining gap in the neuropsychological research, with a need for a broad and comprehensive assessment of core neurocognitive functions with an ample sample size to determine which domains are affected in BDD. Such information could provide clarification and replication of the previous research findings as well as identify novel cognitive functions that are important in BDD.

Toh et al. (2015) are the only study to date to utilise a broad, comprehensive and repeatable cognitive battery to study neurocognition in BDD. The battery they used, the RBANS, was not designed for the assessment of mental health populations and as such may not be sensitive enough to fully capture the neuropsychological profile of this condition. At present there is no specific cognitive battery for use in BDD or related clinical disorders such as OCD. The MATRICS Cognitive Consensus Battery (MCCB; Nuechterlein & Green, 2006) was designed to examine the major cognitive impairments associated with psychosis and

related psychiatric disorders. It is proposed that the MCCB could be a useful tool for studying BDD as it measures a broad range of cognitive processes, including those previously identified as being compromised in BDD, as well as other domains not yet tested in BDD but known to be important to other mental health disorders. Furthermore, the MCCB is a standardised, repeatable and accessible battery, thus allowing opportunity for further replication using these test measures. Finally, the subtests included in the MCCB have a broader "within-test variability" as compared to those designed for testing brain injury patients (i.e. RBANS), and as such should reduce the risk of ceiling or floor effects impacting on the results. To the authors' knowledge this is the first study to use the MCCB to study the neuropsychological profile of BDD.

4.1.2. Aim. The aim of this study is to improve the understanding of BDD by comprehensively investigating the neuropsychological profile of BDD. This study sets out to replicate previous research findings and also to examine cognitive domains not yet investigated. This study will achieve this by administering a standardised battery, the MCCB, which measures the core cognitive domains of speed of processing, attention and vigilance, working memory (nonverbal and verbal), verbal learning, visual learning, reasoning and problem solving, and social cognition.

4.1.3. Hypotheses. Based on the research reviewed in Chapter 3, it was hypothesised that BDD participants would perform significantly poorer than non-clinical control participants on the domains of working memory, verbal learning, visual learning and reasoning and problem solving. As there was either no research available or discrepant findings regarding the remaining cognitive functions, specific predictions were not made for the domains of speed of processing, attention and vigilance and social cognition. This study however will explore whether BDD participants differ to controls on their performance on these indices.

4.2. Method

4.2.1. Participants. Fifty-two individuals participated in this study. This included 25 individuals (15 females and 10 male) with a current and primary diagnosis of BDD, and 27 control participants (16 females and 11 males) with no psychiatric diagnoses. The groups were matched closely on gender distribution, years of age, years of education and Intelligent Quotient (IQ). All clinical participants were recruited via two Melbourne based BDD specialists; Professor David Castle a psychiatrist at the St Vincent's Hospital, and Dr Ben Buchanan a clinical psychologist at Foundation Psychology Victoria (See letter of invitation, Appendix A). These two clinics receive a broad range of referrals via a variety of professionals including GPs, psychologists, psychiatrists and cosmetic specialists. For all BDD participants, BDD was determined as their current and primary diagnosis as assessed by both the treating clinician and via a clinical diagnostic assessment conducted by the student researcher, a provisional psychologist. Control participants were recruited via advertisements (see Appendix B) distributed throughout the local community (i.e. libraries, cafes, bookstores, medical centres and universities). Control participants were carefully selected to ensure group-wise matching.

For inclusion in the study all participants were required to be between 18 to 65 years of age, have an estimated IQ above 70 (to ensure no participant meet criteria for an intellectual disability), and have adequate proficiency in both spoken and written English. Exclusion criteria for both groups included any neurological disorder, a severe head injury, current alcohol or drug abuse requiring clinical intervention and any current or past psychotic illness. Control participants were excluded if they had a current or past psychiatric illness or a significant family history of mental illness.

4.2.2 Materials.[2]

4.2.2.1. Screening and clinical assessment materials. A *Clinical Demographic Record Form* (Appendix C) specifically designed for this study was administered to all participants to gather demographic information and relevant personal history including age, gender, ethnicity, education, and medical/psychiatric history.

The *MINI International Neuropsychiatric Interview* (MINI 6.0; Lecrubier et al., 1997; Sheehan et al., 1997) (Lecrubier et al., 1997; Sheehan et al., 1997)is a short structured interview, which assesses the major psychiatric disorders of DSM-IV and ICD-10. It was administered to all participants and takes between 15-30 minutes. The MINI has good convergent validity with the Composite International Diagnostic Interview (CIDI) and the Structured Clinical Interview for DSM Disorders (SCID-P). It also has excellent inter-rater (.88-1) and test-retest reliability (.76-1; Lecrubier et al., 1997; Sheehan et al., 1997). This measure was used to confirm that control participants did not meet criteria for a clinical psychiatric disorder, and to identify any comorbid diagnoses in the BDD group. Where comorbidities were identified in the BDD group, the examiner explored the participant's symptomology to ensure BDD was the primary clinical presentation. All comorbid disorders were recorded and are presented in the results section. Of an initial 29 recruited control participants two of these were excluded on the basis of displaying eating disorder behaviour, leaving a remaining 27 controls. No BDD participants were excluded based on the MINI assessment. Please note at the time of testing there were no published structured interviews (MINI or SCID) based on the current DSM-5 criteria.

The *Body Dysmorphic Disorder Diagnostic Module* (BDD-DM; Phillips, 1994; Appendix D) a reliable clinician-administered diagnostic tool was administered to all

[2] Psychometric properties have been included where possible.

participants to screen for BDD based on DSM-IV criteria. This measure was included immediately after the MINI 6.0, which does not specifically assess for BDD. For the purpose of this study, Phillips' BDD-DM was adapted with the addition of an extra criterion (the presence of repetitive behaviours over the course of the disorder) to reflect the latest DSM-5 changes to BDD (See Appendix D). The BDD-DM has been found to have excellent agreement with the Body Dysmorphic Disorder Questionnaire (Dufresne, Phillips, Vittorio, & Wilkel, 2001). Of an initial 26-recruited BDD participants, one individual was excluded on the basis of this assessment, as BDD symptoms were sub-threshold, thus leaving 25 BDD participants in the final sample.

The *Wechsler Test of Adult Reading* (WTAR; Wechsler, 2001; Appendix E) was administered to all participants to obtain an IQ estimate. The WTAR is a reading test, which involves pronouncing 50 irregularly spelled words. The rationale for using unusual or irregular pronunciations is to minimise the assessment of the person's current ability to apply standard pronunciation rules and rather to test prior learning. The WTAR provides an indication of intellectual functioning by translating scores into equivalent Wechsler Adult Intelligence Scale (WAIS) IQ scores. The WTAR has high internal consistency (.87-.95) and very good test-retest reliability (>.90; Wechsler, 2001). In an Australian sample the WTAR showed high concurrent validity was with Verbal IQ (.81) and Full scale IQ (.78) on the WAIS-III (Mathias, Bowden, & Barrett Woodbridge, 2007).

The *Zung Self-Rating Depression Scale* (ZSDS; Zung, 1965; Appendix F)[3] is a brief measure of current affective, psychological and somatic symptoms of depression which was administered to both participant groups. It requires the examinee to indicate how much each

[3] Please note an amendment was made to the study materials to include the DASS-21 after testing had commenced. This amendment was made as the DASS-21 was determined to provide a more psychometrically sound measure of depression with the added benefits of providing measures of anxiety and stress. An experimenter error resulted in the ZSDS being withdrawn from the questionnaire package when the DASS-21 was introduced. As such the first half of recruited participants (n=25) completed the ZSDS and the latter half (n=27) the DASS-21. As the two recruitment waves had a similar number of total participants and equal composite of controls to clinical participants a decision was made to retain both depression measures scores in this study.

of the 20-items reflect how they had been feeling over the past two weeks, using a 4-point Likert scale ranging from 'none of the time' to 'most of the time'. The ZSDS has demonstrated moderate to good reliability and validity (Campbell, Maynard, Roberti, & Emmanuel, 2012).

The Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995; Appendix G)[2] is a 21-item self-report scale designed to measure symptoms common to both depression and anxiety in both clinical and non-clinical populations, which was administered to both groups in the current study. The scale is comprised of three subscales (Depression, Anxiety and Stress) each with seven items that are rated on a 4-point Likert scale from 'never' to 'almost always'. The DASS-21 subscales have demonstrated good internal consistency (range of $\alpha = 0.82 – 0.94$), divergent validity, and convergent validity in clinical and non-clinical samples (Antony, Bieling, Cox, Enns, & Swinson, 1998; Henry & Crawford, 2005).

The *Yale-Brown Obsessive Compulsive Scale Modified for BDD* (BDD-YBOCS; Phillips, Hollander, Rasmussen, & Aronowitz, 1997: Appendix H) is a 12-item semi-structured clinician administered interview that assesses BDD symptom severity during the last week. The interview takes approximately 15 minutes and was administered to clinical participants only. The BDD-YBOCS produces subscale scores for Obsessions (range 0-20), Compulsions (range 0-20) and Insight/Avoidance (range 0-8), as well as a total symptom severity (range 0 to 48). The BDD-YBOCS has good test-retest reliability (.88), internal consistency (.80) and excellent inter-rater reliability for the total score and subscales of the measure (.79-1). The BDD-YBOCS is a valid measure showing appropriate convergent and discriminant validity (Phillips et al., 1997).

The Brown Assessment of Beliefs Scale (BABS; Eisen et al., 1998; Appendix I) is a 7-item clinician-rated scale that measures the degree of conviction and insight associated with

their primary obsession or delusional belief over the past week. The BABS assesses the persons conviction that their belief is accurate, perceptions of others views of the belief, possible explanations for any differences between the person's beliefs and that of others, and whether the person could be convinced that their belief is not accurate and ideas of reference related to the belief. The first 6 items of the measure are summed to create a total score that ranges from 0-24 where higher scores indicate poorer insight. As a categorical measure this measure also provides cut-points for classifying the total score according to categories of insight (excellent, good, fair, poor and delusional). Phillips, Hart, Menard, and Eisen (2013b) evaluated the psychometric properties of the BABS in a large BDD sample and found it had good inter-rater reliability (.96), test-retest reliability (.77) and internal consistency (.87). It additionally demonstrated good discriminant validity.

4.2.2.2. Neurocognitive assessment. The *MATRICS Consensus Cognitive Battery* (MCCB; Nuechterlein & Green, 2006) is a seven-domain battery, which was initially developed to examine the major cognitive impairments associated with psychosis and related psychiatric disorders, however it includes a range of measures which measure cognitive processes known to be interrupted in common mental health disorders. The MCCB consists of 10 individually administered tests that measure cognitive performance in the following domains; speed of processing, attention and vigilance, working memory, verbal learning, visual learning, reasoning and problem solving and social cognition. The MCCB is a reliable and valid tool, with high test-retest reliability (.68-.85), relationship to functional outcome, practicality and tolerability (Nuechterlein et al., 2008). Overall, the battery takes between 60-90 minutes to complete. The 7 cognitive domains and 10 subtests within are detailed below.

4.2.2.2.1 Speed of processing. The speed of processing domain is made up of three subtests, which aim to measure cognitive and sensorimotor speed. The first *Symbol Coding* (SC) is drawn from the Brief Assessment of Cognition in Schizophrenia (BACS). This task is

a timed paper-and-pencil test in which the participant uses a coding system to match digits that correspond to nonsense symbols. The variable reflects the total number of digits correctly matched with symbols in a 90 second trial. The second subtest *Categorical Fluency* (Fluency) is an oral test in which participant are required to name as many animals as possible in 60 second trial. This variable reflects the total number of animals named in the 1-minute period minus repetitions, nonsense or non-animal words. The final subtest, *Trial Making Test: Part A* (TMT-A) is a timed pencil-and-paper test where the participant connects numbers which have been placed irregularly across an A4 sheet of paper. The variable measured here is the amount of time in seconds taken to connect all the numbers in their correct numerical order.

4.2.2.2.2. Attention and vigilance. This domain reflects just one test, the *Continuous Performance Test- Identical Pairs* (CPT-IP). This is a computer-administered measure of sustained attention; the participant is required to press a response button every time they see the same number consecutively flash on the screen in trials of 2-digit, 3-digit and 4-digit numbers. The variable generated reflects the ability to discriminate identical pairs from nearly identical pairs across the three conditions.

4.2.2.2.3. Working memory. This domain constitutes two subtests. The first a visual task of working memory called *Spatial Span* (SS) from the Wechsler Memory Scale-Third Edition (WMS-III). This test uses a plastic board with 10 irregularly spaced cubes and the participant is required to tap the cubes in the same (or reverse) sequence as the experimenter. The variable reflected is the sum of trials correct for both the forward and backward conditions. The second test is a verbal measure of working memory, *Letter Number Span* (LNS), an orally administered test where the participant is required to mentally re-order a string of numbers and letters into their respective numerical and alphabetical orders and

repeat this verbally to the examiner. The variable used is the total number of trials performed correctly.

4.2.2.2.4. Verbal Learning. Verbal learning is measured by the *Hopkins Verbal Learning Test- Revised* (HVLT-R) an orally administered test in which a list of 12 words from three sematic taxonomies (animals, precious stones, and human dwellings) are read to the participant who is then required to recall as many words as possible across three learning trials delivered consecutively. The HVLT-R has high test-retest reliability and its construct, concurrent and discriminative validity has been well established (Benedict, Schretlen, Groninger, & Brandt, 1998). This variable reflects the total number of words recalled correctly across the three trials.

4.2.2.2.5. Visual Learning. The *Brief Visuospatial Memory Test Revised* (BVMT-R) is a visual learning test, which involves reproducing basic geometric figures from memory. An A4 stimulus page with 6 simple geometric figures is shown to the participant for 10 seconds before it is removed. The participant is then asked to draw as many figures as possible in their correct location on a blank A4 page. This is repeated for a total of 3 trials. Reliability coefficients for the BVMT-R range from .96 - .97 for the three learning trials and .97 for total recall. Test-retest reliability coefficients range from .60 to .84. The BVMT-R appropriately correlates most strongly with other tests of visual memory and less strongly with tests of verbal memory (Benedict, Schretlen, Groninger, Dobraski, & Shpritz, 1996). Each recalled drawing is allocated a score between 0-2 points based on accuracy and spatial location. This variable reflects the sum of recall scores across the three learning trials.

4.2.2.2.6. Reasoning and problem solving. This domain comprises one test, called *Mazes*, from the Neuropsychological Assessment Battery (NAB). This test is a measure of foresight, planning and impulse control, which are core executive functioning processes. This is a timed paper-and-pencil measure in which up to seven mazes are administered to the

participant each increasing in difficulty. The variable reflects a sum of scores for each of the mazes completed accurately within specified time limits. The faster participants completed the maze the more points were available.

4.2.2.2.7. Social cognition. The *Mayer-Salovey-Caruso Emotional Intelligence* (MSCEIT) was used to assess social cognition. This is a paper-pen multiple-choice questionnaire, which requires the participant to indicate the effectiveness of various solutions to different social and emotional problems. This measure assesses how participants manage and integrate emotions into their thinking and decision-making. The variable used here is the computer derived 'Managing Emotions' scores.

4.2.3. Procedure. This research project has received ethical approval by the Human Research Ethics Committee (HREC) of both St Vincent's Hospital and Swinburne University (See Appendix J and K). The study has been carried out in accordance with the National Statement on Ethical Conduct in Human Research (National Health and Medical Research Council, 2007) and the Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects (World Health Organisation, 2013). Prior to testing, a written and verbal explanation of the study was given to all participants. Participants were reminded that their participation was voluntary and written informed consent was obtained on the relevant Participant Information and Consent Form (PICF; See Appendix L and M). Participants attended two testing sessions conducted either at Swinburne University, the Monash Alfred Psychiatry Research Centre or at St Vincent's Hospital depending on which site was most convenient for the participant. These sessions were approximately 1-2 hours and participants were provided with opportunities to take rest breaks between activities to avoid fatigue. At the end of the testing sessions participants were reimbursed at a rate of $25 per session. Participants were provided with a scanned copy of their PICF to ensure they had all contact information in the event that they had any questions or concerns at a later time. Participants

were able to indicate on the PICF whether they wished to receive a brief summary of the results when available.

4.2.4. Data analysis. One-way between-groups Analysis of Variance (ANOVA) were used to compare the BDD and control group on basic demographics and clinical variables to ensure close matching of the groups. A p value of P=≤ 0.05 was applied to identify significant group differences on these participant characteristics. The study hypotheses were then tested using a between-groups Multivariate Analysis of Variance (MANOVA) comparing whether the BDD and control group differed on overall cognitive performance in addition to examining their performance on each of the cognitive domains of the MCCB. As MANOVA analysis automatically excludes cases listwise when there is missing data, the MANOVA was followed by a series of one-way between-groups ANOVA to explore the domain data within the full sample. Pearson's correlations were conducted to explore the relationships between demographic and cognitive variables to identify any potential covariate variables. Variables which were found to correlate with any of the cognitive domains at a significance level of P= ≤ 0.01 were then reanalysed using one-way Analysis of Covariance (ANCOVA). Finally, further exploratory one-way between-groups ANOVA were conducted at a subtest level to evaluate which specific tests the groups performed differently on. Bonferroni correction was utilised on all analysis of variance tests used to test the hypotheses to control for the number of analyses conducted and to minimise the chance of type 1 error. A more stringent p value of P=≤ 0.01 was applied to the Persons correlations to adjust for multiplicity.

4.3. Results

4.3.1. Data screening and general considerations. Data were analysed using the IBM SPSS Statistical Package, Version 24.0. Raw data were screened and plotted to assess normality and search for outliers. Skewness and Kurtosis statistics were also examined and were within acceptable levels. For all analysis of variance tests appropriate preliminary assumption testing was conducted including assessing normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, multicollinearity and singularity, and no serious violations were noted. Where Levene's homogeneity of variance test was violated Welsh statistic was used as an alternative.

There was no missing data at the item level on any of the questionnaires used in this study. There were however two cases where the depression measure was missed (ZSDS) which was Missing at Complete Random (MCAR). This missing data was dealt with by pairwise deletion. Missing data on the cognitive tests includes; TMT-A (1 participant; 1.9%), LNS (1 participant; 1.9%), BVMT-R (1 participant; 1.9%), Fluency (2 participants; 3.8%), MSCEIT (2 participants; 3.8%), CPT-IP (5 participants; 9.6%). This missing data is explained by a small number of participants being unable to complete the full battery of tests within the allocated session time, thus either the participant or examiner elected to leave some tests incomplete. As the order of the cognitive tests was randomised to reduce fatigue effects, this missing data does not disproportionately affect specific measures. The CPT-IP does show a notably higher rate of missing data, as in addition to the aforementioned reason there was also technological difficulty associated with this computer based test which resulted in some lost data. Due to the moderate sample size this missing data was excluded pairwise to analyse all of the data available, with the exception of the MANOVA analysis, which automatically excludes cases listwise.

4.3.2. Background characteristics and clinical presentation.

4.3.2.1. Basic demographic characteristics. Table 4.1 presents the demographic characteristics of both the BDD and non-clinical control group. There were similar proportions of males and females in each of the participant groups. Participants in the BDD group were notably more likely to be single, with 68% of the sample currently single (including single never married, separated or divorced) as opposed to 25.9% being single in the control group. Unemployment rates were also notably high in the BDD sample with 32% of the BDD group currently unemployed as compared to only 3.7% of the control group.

Table 4.1

Number and Frequencies (%) for Participant Demographic Variables

Demographic Variables		BDD Sample (N=25)	Control Sample (N=27)
Gender			
	Female	15 (60.0)	16 (59.3)
	Male	10 (40.0)	11 (40.7)
Employment Status			
	Employed	12 (48.0)	23 (85.2)
	Unemployed	8 (32.0)	1 (3.7)
	Student	3 (12.0)	3 (11.1)
	Retired	2 (8.0)	0 (0.0)
Education			
	Post-Graduate Degree	3 (12.0)	8 (29.6)
	Undergraduate Degree	6 (24.0)	10 (37.0)
	Vocational Program	5 (20.0)	4 (14.8)
	Secondary School	9 (36.0)	5 (18.5)
	Primary School	2 (8.0)	0 (0.0)
Relationship Status			
	Single (never married)	15(60.0)	6 (22.2)
	Relationship	0 (0.0)	7 (25.9)
	Defacto Relationship	3 (12.0)	6 (22.2)
	Married	5 (20.0)	7 (25.9)
	Separated/Divorced	2 (8.0)	1 (3.7)
Nationality **(Country of birth)**			
	Australia	22 (88.0)	17 (63.0)
	UK & Ireland	0 (0.0)	4 (14.8)
	Europe	2 (8.0)	1 (3.7)
	North America & Canada	0 (0.0)	1 (3.7)
	Central & Sth America	0 (0.0)	2 (7.4)
	Middle East	0 (0.0)	2 (7.4)
	South Asia (Indian subcontinent)	1 (4.0)	0 (0.0)

4.3.2.2. Comparing group matching. As indicated, one-way between-groups ANOVAs were conducted to compare the BDD and control group on the demographic variables of years of age, estimated IQ, years of education, depression and anxiety. Descriptive data and ANOVA results are presented in Table 4.2.

Table 4.2

Demographic and Clinical Characteristics of BDD and Control Participants

	BDD	Controls	Group Comparison			
	Mean (SD)	Mean (SD)	F	df	p	d
Age	37.48 (13.36)	33.63 (10.12)	1.39	1,50	.245	0.32
Years of Education	15.14 (3.09)	16.43 (1.92)	3.31	1,50	.075	-0.50
WTAR	108.40 (9.50)	112.48 (6.31)	3.38	1,50	.073	-0.51
ZSDS[b]	44.54 (10.00)	29.08 (6.54)	20.53	1,23	<. 001**	1.83
DASS-D[b]	7.58 (5.05)	2.38 (2.06)	11.01[a]	1,23	.005**	1.35
DASS-A[b]	3.42 (3.20)	1.08 (1.66)	5.39	1,23	.030*	0.92
BDD-YBOC	24.68 (7.32)	-	-	-	-	-
BABS	13.96 (6.43)	-	-	-	-	-

Note: **= p≤ .01 (2-tailed), *p≤. 05 (2-tailed), a = Welsh statistic used, d = Cohen's d effect size b= participant numbers are smaller on depression and anxiety measures as the first wave of participants recruited completed the ZSDS and the second wave the DASS-21 depression measure (wave 1 n=25, wave 2 n=27), WTAR= Wechsler Test of Adult Reading, ZSDS= Zung Self-Rated Depression Scale, DASS-D= Depression, Anxiety and Stress Scale (Depression Subscale) DASS-A= Depression, Anxiety and Stress Scale (Anxiety Subscale), BDD-YBOCS=, Yale Brown Obsessive BABS=

As can be seen in Table 4.2, the groups did not differ significantly in years of age, years of education or estimated IQ as measured by the WTAR. The BDD group, however, showed significantly higher rates of depression and anxiety compared to controls as measured by the ZSDS, DASS-D and the DASS-A. Due to these significant group differences, anxiety and depression variables cannot be reliably used as covariates in the subsequent analyses (Miller & Chapman, 2001).

4.3.2.3. The clinical characteristics of the BDD sample. On average, the BDD patients presented with 2-3 body concerns, with the total number of concerns ranging from 1 to 7. Nevertheless, all BDD participants were able to locate one core concern, which was associated with the most distress. The most common concerns related to skin complexion (e.g. acne, scars, skin conditions, freckles, moles), hair (e.g. head hair loss, excessive or too dark body hair) and facial features (e.g. the shape or size of the nose, eyes, or lips). Table 4.3 presents a summary of the body parts of concerns and how common each of these concerns were within this sample.

Table 4.3

A summary of BDD Appearance Concerns

Body Part of Concern	**Number of Participants Endorsing [b]**
Skin Complexion	13
Hair	8
Head	2
Face	7
Nose	6
Eyes	3
Eye brows	1
Teeth	3
Mouth	1
Cheeks	1
Ears	1
Lips	2
Jaw	2
Chin	4
Neck	2
Body Frame or Symmetry	3
Body Shape or Weight [a]	6
Breasts	3

Note:
a. No subject was excessively concerned with body shape or weight alone.
b. As patients experienced multiple areas of concerns the total number of patients experiencing these concerns exceeds the total number of patients. All clinical participants with multiple areas of concern however were able to identify their most prominent one.

Regarding symptom severity, the BDD sample on average had a total BDD-YBOCS score that was categorised in the 'Moderate-Severe' range (M=24.68, SD= 7.32, Range=11-37). A similar severity to the BDD samples used in previous studies in this area (Deckersbach et al., 2000b; Dunai et al., 2009; Toh et al., 2015). Additionally, the sample's averaged total BABS score (M=13.96, SD=6.43, Range=4-24) classified the sample as demonstrating 'poor insight' into their beliefs. The total duration of illness of the BDD condition ranged from 6 months to 48 years (M= 13.98 years, SD=11.48 years).

On average the BDD group were assessed to have between 0-4 comorbid psychiatric conditions including Major Depressive Disorder (15 participants; 60%), General Anxiety Disorder (9 participants; 36%), Panic Disorder (9 participants; 36%), Obsessive Compulsive Disorder (6 participants; 24%), Social Anxiety Disorder (4 participants; 16%), Dysthymia (2 participants; 8%), Substance Abuse (2 participants; 8%) and Bipolar Disorder (1 participant; 4 %). Furthermore, 15 participants (60%) of the sample disclosed experiencing current suicidal ideation ranging from mild to high suicidal risk. 19 participants (76%) were currently being treated with psychiatric medications most commonly antidepressant medications.

4.3.3. Group comparisons on cognitive performance. The between-groups MANOVA using the seven cognitive domains of the MCCB revealed a statistically significant difference between the BDD and control group on the combined dependant variables, F (7, 38) = 6.448, P= >.001; Pillai's Trace = .54; partial eta squared = .54. Thus, follow-up ANOVAs on each of the domains were performed. While each of the cognitive domains reflects an independent measure of cognition, Bonferroni adjustment was still utilised to reduce the risk of type 1 error with multiple testing. Thus, the more stringent significance alpha value of p=≤0.007 was applied to identify meaningful group differences. As can be seen in Table 5.4, the BDD participants performed significantly poorer than non-clinical controls on the domains of speed of processing, working memory, visual learning and reasoning and problem solving. Further, these differences showed large to very large effect sizes using Cohen's d. The groups did not significantly differ on the remaining domains of attention and vigilance, verbal learning or social cognition.

Table 4.4

Mean, Standard Deviation and ANOVA Results Comparing the BDD and Control Group's Performance on the Cognitive Domains of the MCCB.

	BDD	Control	Group Comparison			
	Mean (SD)	Mean (SD)	F	df	P	d
Speed of Processing	48.52 (10.88)	59.07 (9.63)	13.76	1, 50	.001**	-1.02
Attention and Vigilance	48.48 (10.19)	51.54 (10.69)	0.99	1, 45	.324	-0.29
Working Memory	43.12 (8.26)	56.48 (7.74)	36.29	1, 50	<.001**	-1.67
Verbal Learning	45.12 (10.88)	52.22 (10.87)	5.54	1, 50	.023	-0.65
Visual Learning	45.33 (9.92)	57.70 (5.09)	30.27[a]	1, 49	<.001**	-1.57
Reasoning/Problem Solving	45.92 (9.27)	55.15 (7.68)	15.37	1,50	<. 001**	-1.08
Social Cognition	49.88 (10.35)	53.12 (9.50)	1.33	1, 48	.254	-0.33

Note: **= p≤ .001 (2-tailed), *p≤. 007 (2-tailed), a = Welsh statistic used, d = Cohen's d effect size. Please note that the degrees of freedom differ slightly for each cognitive domain due to the missing data described above.

While the groups did not differ significantly on estimated IQ, as measured by the WTAR, on average there was a 4-point lower IQ for the BDD group and a trend towards this becoming a significant difference at p=0.07 (see Table 4.2). Moreover, there is established relationship between IQ and specific cognitive domains including processing speed, memory and executive functioning (Friedman et al., 2006; Mohn, Sundet, & Rund, 2014). Thus, the relationship between IQ and all 7 cognitive domains of the MCCB was further examined using a series of Pearson's Product Moment Correlations. Given group difference on depression and anxiety scores, correlations between cognitive domains and these clinical symptoms were also analysed. Given the large number of correlations conducted in a moderate sample size, a more stringent alpha of p= ≤0.01 was used in place of Bonferroni correction, which would be considered too conservative here.

Table 4.5

Pearson Product Moment Correlations between Cognitive Domains of the MCCB and Measures of IQ, Depression and Anxiety.

	WTAR	ZSDS	DASS-D	DASS-A
Speed of Processing	.36*	-.29	-.32	-.26
Attention and Vigilance	.34	-.02	.10	-.37
Working Memory	.48**	-.34	-.31	-.14
Verbal Learning	.35*	-.37	-.34	-.01
Visual Learning	.35	-.49	-.02	-.01
Reasoning/Problem Solving	.36*	-.13	-.08	.00
Social Cognition	-.05	-.09	.09	-.26

Note: ** =p≤ .001(2-tailed), *= p≤ .01 (2-tailed), WTAR= Wechsler Test of Adult Reading, ZSDS= Zung Self-Rated Depression Scale, DASS-D= Depression, Anxiety and Stress Scale (Depression Subscale) DASS-A= Depression, Anxiety and Stress Scale (Anxiety Subscale).

Despite the finding of significantly higher rates of depression and anxiety levels in the BDD group compared to the control group, these results reveal that depression and anxiety scores do not correlate significantly with any of the MCCB cognitive domains. This finding suggests that depression and anxiety symptoms did not significantly influence cognitive performance, and thus these factors do not account for the significant group differences identified in cognitive performance.

The WTAR scores, however, showed moderate positive correlations with the cognitive domains of speed of processing, working memory, verbal learning, and reasoning and problem solving. This indicates that IQ while not significantly different between the groups, does have an influence on these cognitive domains. Given the significant correlations between IQ and a number of the cognitive domains, the moderate sample size used and the importance of this

variable throughout the literature in relation to the cognitive tasks under investigation, it was conservatively decided to use this IQ as a covariate.

One-way between-groups Analysis of Covariance (ANCOVA), controlling for IQ were run to re-analyses the four domains that were found to be significantly correlated with the WTAR scores. Bonferroni correction was applied with an alpha value of p=≤0.01 to reduce type 1 error and identify meaningful group differences while controlling for IQ.

Table 4.6

ANCOVA Analyses Comparing the BDD and Control Group on Speed of Processing, Working Memory, Visual Learning, and Reasoning and Problem Solving, Controlling for IQ.

	Group Comparison		
	F	df	P
Speed of Processing	10.12	1,49	.003*
Working Memory	30.87	1, 49	<. 001**
Verbal Learning	3.28	1,49	.076
Reasoning/Problem Solving	11.57	1,49	.001**

Note: **= p≤ .001 (2-tailed), *= p<. 01 (2-tailed).

As can be seen in Table 4.6, after adjusting for IQ scores, the group differences on speed of processing, working memory, and reasoning and problem solving remain statistically significant. Furthermore, after controlling for IQ, the difference between the groups on verbal learning is still does not significant.

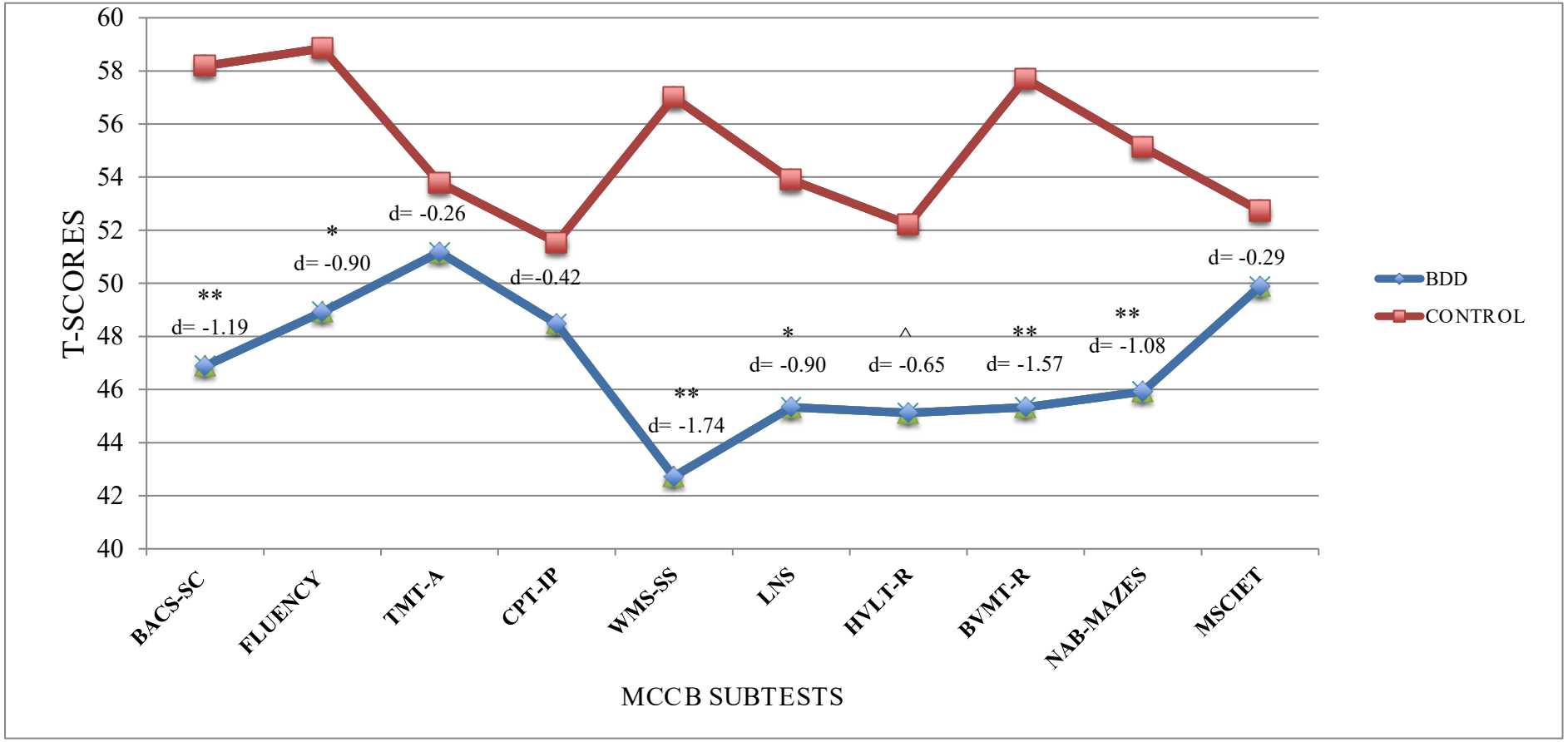
Finally, as the seven cognitive domains of the MCCB are made up of a total of 10 subtests, exploratory ANOVAs were performed to identify which specific tests the groups differed on. Bonferroni adjustment with an alpha value of p=≤0.005 was set to determine significant differences at the subtest level. As can be seen in Figure 4.1 below, the BDD group

performed significantly poorer on the speed of processing tasks of symbol coding (BACS-SC) and animal fluency (FLUENCY), but not on the trail making measure (TMT-A). The results of the working memory domain reveal that the BDD group performed significantly poorer on both visual working memory as tested by spatial span (WMS-SS) and on verbal working memory as measured by letter Number Span (LNS), although this difference was much greater for visual working memory. All other domains included one subtest and thus these results are the same as presented earlier at the domain level. An interpretation of these differences at the subtest level will be explored in the discussion.

To determine whether severity of BDD symptoms were associated with deficits in cognition, Pearson's Product Moment correlations were run between each of the MCCB domains and BDD-YBOCS scores. Using a conservative alpha of $p=\leq 0.01$, BDD-YBOCS scores did not significantly correlate with any of the MCCB cognitive scores.

Figure 4.1

ANOVA results comparing the BDD Group Relative to Control Group on the subtests of the MCCB.



Note: **=p≤0.001 (2-tailed), * =p≤0.005 (2-tailed), ^= a trend detected at p=≤0.05, BACS-SC= Brief Assessment of Cognition in Schizophrenia- Symbol Coding, Fluency= Category Fluency: Animal Naming, TMT-A= Trail Making Test-Part A, CPT= Continuous Performance Task Identical Pairs, WMS-SS= Working Memory Spatial Span, LNS= Letter Number Span, HVLT-R= Hopkins Verbal Learning Test - Revised, BVMT-R= Brief Visuospatial Memory Test-Revised, MSCIET= Mayor-Salovey-Caruso Emotional Intelligence Test.

4.4. Discussion

4.4.1. In relation to the aims and hypotheses. The current study employed the MCCB to provide a broad and comprehensive assessment of the neurocognitive profile of BDD and represents the largest neuropsychological investigation of BDD to date. This study aimed to replicate previous research findings of aberrant cognitive processes in the areas of executive function and memory, and to explore cognitive domains not previously tested. The results showed BDD participants to exhibit deficits in specific cognitive areas as compared to age, sex and IQ-matched non-clinical control participants. As hypothesised, BDD participants performed significantly poorer than control participants on the domains of working memory, visual learning and reasoning and problem solving. In contrast, the BDD group did not perform significantly poorer than controls on the domain of verbal learning as had been anticipated. On the remaining cognitive domains for which predictions were not made, it was found that BDD participants relative to controls showed impaired speed of processing but not attention and vigilance or social cognition. Each of the significant findings showed large to very large effect sizes and these findings remained significant after controlling for the influence of IQ. Correlations suggest that symptoms such as anxiety, stress and depression did not unduly impact on cognitive performance. Thus, the BDD group's impaired performance on the specific indices of reasoning and problem solving, speed of processing, working memory and visual learning, are taken to reflect meaningful group differences.

4.4.2. In relation to previous research. The results of this study are largely consistent with previous neuropsychological research and support assertions of executive dysfunction and memory deficits in BDD consistent with a fronto-striatal model. The reasoning and problem-solving index was measured by the Mazes subtest, which is essentially an executive function measure, yet more specifically reflects the ability to engage in problem solving, planning and foresight in the context of a visual-motor exercise. This

finding is consistent with Hanes (1998) who also found planning difficulties on the NTOL, and Dunai et al. (2009) who showed problem solving and planning deficits on the SOC. It is noted that the Mazes subtest involves motor abilities, is time sensitive and does not allow for the separate analysis of the unique contributions. Thus, given impairments were also detected on the speed of processing index, it is possible that slower cognitive and/or motor processing skills could be responsible for the impairment detected on the reasoning and problem solving domain. This, however, is considered unlikely, as previous research has established normal motor skills in BDD and the existence of both pure decision making difficulties as well as a lowered cognitive speed on the SOC (Dunai et al., 2009; Hanes, 1998). Further, the Mazes subtest provides lengthy duration times for the completion of each maze and multiple opportunities before discontinuation is activated. Thus, it is interpreted that the results on this index support BDD involving deficits in high-order planning, problem solving and decision making abilities. This finding is of particular relevance given the established role of executive dysfunction in OCD (Snyder, Kaiser, Warren, & Heller, 2014). It is also clinically relevant given BDD is a disorder marked by difficulty controlling one's cognitive processes, as evidenced by repetitive intrusive thoughts, compulsive performance of unhelpful ritualised behaviours and poor insight into thoughts and beliefs. Executive functions, however, are much broader than that measured by Mazes. Future research should therefore assess a wider range of executive functions such as response inhibition, set shifting, and cognitive flexibility, abilities that are not included in the MCCB.

The speed of processing domain of the MCCB is made up of three subtests; the BASC-SC, FLUENCY and TMT-A. The BDD group only performed significantly poorer than the controls on the two former subtests but not TMT-A. This is noteworthy as while each of these measures processing speed, TMT-A is a more pure measure of psychomotor speed than the other two, which are known to also tap into high-order executive abilities.

Semantic animal fluency for example is a well-documented measure of executive control, as it requires the performance of several tasks simultaneously. The examinee is required to focus on the task at hand, to employ organisational strategies to best tap helpful categorical systems, to access words that meet the test restraints, to avoid repetition and finally they must then shift strategies when they encounter a cognitive block, all of which rely on executive processes (Shao, Janse, Visser, & Meyer, 2014). Similarly, Symbol Coding while a common measure of processing of speed is also a complex test. Research has shown that while speed plays a key role on symbol coding performance so does the ability to engage incidental visual learning and memory processes (Joy, Kaplan, & Fein, 2004). This occurs because examinees that are able to memorise the unique visual symbol and corresponding numbers (the code) excel on this task as they are no longer required to waste time cross referencing. Given the current study's additional findings of impaired visual learning and working memory, it is likely that the BDD participants were much less able to utilise this strategy to bolster their speed on this test. It is therefore possible that executive dysfunction and memory difficulties contributed to the BDD group performance being poorer on the BASC-SC and FLUENCY subtests. This of course does not exclude the possibility that core processing speed difficulties are also part of the neuropsychological profile of BDD. It is suggested that further assessment of processing speed in BDD is needed to determine whether these lower order processes are uniquely affected or whether this result has occurred due to high-order executive dysfunction.

The results of this study suggest that the neuropsychological profile of BDD involves aberrant working memory processes. Working memory, also considered a principal executive function, can be defined as the "executive" aspect of short-term memory as it involves the ability to temporarily hold information "online" while engaging in some form of manipulation to that information within a brief period of time, usually a matter of seconds

(Baddeley, 1992). The working memory domain of the MCCB comprised both a visual working memory measure (WMS-SS) and an auditory working memory measure (LNS). The results on the WMS-SS demonstrated an especially large effect size, with the BDD group on average performing 1.7 standard deviations below the control group. This finding is consistent with Dunai et al. (2009) who also demonstrated poor visual working memory on the Token Search subtest of the CANTAB. It is in direct conflict with another result from the Dunai study, as they also administered a computerise version of spatial span and reported normal functioning in BDD as compared to controls. This is surprising as the spatial span of the MCCB and CANTAB are reasonably similar, however it is possible that some of the minor variations between these versions could explain this conflicting result. For example, the CANTAB version reaches a maximum sequence of 9 blocks as opposed to 10 blocks on the MCCB. The CANTAB version also allows 3 trials at each sequencing level as opposed to 2 thus allowing more opportunity for continuation and higher scores. Thus, the CANTAB could be considered to use a "simpler" version of spatial span. Furthermore, a closer look at the results from the former study revealed a trend towards a significant difference on spatial span ($p=0.03$) with the controls outperforming the BDD participants (Dunai et al., 2009). It may be that in the context of their smaller sample size, and difference spatial span version that this difference didn't reach significance. Taken together, it would appear that visual working memory, namely the ability to store and work with visuospatial information in short-term memory, is compromised in BDD. As spatial span is reliant on the ability to perceive and mentally organise visuospatial information this finding also supports other previous neurocognitive and neuroimaging studies, which have broadly shown aberrant visual processing mechanisms in BDD (Deckersbach et al., 2000b; Feusner et al., 2010b).

In addition to visual working memory impairment this study also demonstrated auditory working memory difficulties as measured by LNS. This is the first study to

specifically test auditory working memory in BDD. The finding however aligns with Toh et al. (2015) who found impaired immediate and delayed memory on the auditory story memory subtest from the RBANS. It also broadly supports previous neuropsychological research which has indicated that aberrant cognitive processes in BDD are not merely limited to affecting visual material but extend to other stimuli (Deckersbach et al., 2000b). Certainly, if higher-order frontal processes are responsible for the memory impairments seen in BDD it would be reasonable to assume this would impact on both visual and auditory memory processes. It is worth noting, that the working memory deficit found in BDD was much greater on the visual working memory task as compared to the auditory one. Of interest, past research on the LNS has also established that while a large variance of performance on this test is explained by auditory working memory it also requires access to visuospatial functions (Crowe, 2000). This is logical given examinees tend to engage in the visual mentalisation of letters and numbers to support their ability to sequence this information in this task. Future research should endeavour to conduct further assessment of auditory working memory in BDD, using tests, which have been shown to be less reliant on visuospatial functions such as Digit Span.

Visual memory was further assessed by the visual learning index of the MCCB as measured by the BVMT-R. This test is a measure of visual short-term memory, which is also referred to as “learning”. The BVMT-R specifically tests the ability to quickly encode and then recall from short-term memory specific visual details and their corresponding visuospatial location. Similar to the WMS-SS the BVMT-R also demonstrated an especially large effect size, suggesting again that BDD involves a prominent impairment associated with visual processes and memory. This finding supports Deckersbach et al. (2000b) who showed BDD participants to have impaired performance on the RCFT. The BVMT-R and RCFT are fairly similar measures, although the BVMT-R uses less complex visual stimuli and involves

shorter but repeated exposure to the visual stimulus as compared to the RCFT. Deckersbach et al. (2000b) included post hoc multiple regression analyses, which revealed that organisational strategies partially but not fully explained the visual memory deficits they found on the RCFT, suggesting that core visual memory deficits are involved in BDD above and beyond organisational challenges. Unfortunately, the nature of the BVMT-R measure did not allow for this level of analysis, however future research using the BVMT-R could explore the unique contributions of the accuracy of the local details recalled versus their spatial location accuracy with a larger clinical sample and study scope. Nonetheless, this result does align with the theory that individuals with BDD have difficulty processing and memorising details within their holistic context as this test requires the examinee to not only recall the specific figures but also to pinpoint these details within their appropriate spatial location. The finding of visuospatial memory dysfunction in BDD is of particular clinical relevance as such difficulties could explain how individuals with this disorder come to see flaws or distortions in their appearance, their experience of 'not knowing' or being unable to remember their appearance accurately and their tendency to over focus on small physical anomalies in the absence of their broader and holistic body image.

It is acknowledged that along with Deckersbach et al. (2000b), our results contradict the findings Hanes (1998) who found normal visual memory in BDD on the RCFT. However, as highlighted earlier, Hanes (1998) also showed normal performance on the RCFT by the OCD group, which is in contrast to a substantial literature, indicating impaired visual learning in this population (Boone, Ananth, Philpott, Kaur, & Djenderedjian, 1991; Savage et al., 1999; Savage et al., 2000). Of note, Hanes (1998) used a relatively small sample size and did not conduct any clinical assessment of symptom severity. Thus, it would appear this discrepancy could reflect differences in the BDD sample adopted by Hanes (1998) as compared to the samples used both in the current study and by Deckersbach and colleagues

(2000), which demonstrate similar “moderately-severe” BDD symptoms as measured by the BDD-YBOCS.

An unexpected finding of the current study was that BDD participants did not perform significantly poorer than controls on the verbal learning index. This result was unanticipated as previous research had shown BDD participants to have impaired verbal memory on the CVLT, a test which is an analogous to the HVLT-R (Deckersbach et al., 2000b). The previous study did uncover that impaired organisational strategies used by the BDD participants fully accounted for their poor verbal memory. This is opposed to the RCFT findings whereby visual memory remained significantly impaired even after controlling for poor strategic approach (Deckersbach et al., 2000b). Given the current study did show a trend towards a significant difference on the verbal learning domain (P=. 023), it could be interpreted that higher-order organisational difficulties may have contributed to both visual and verbal memory performance in the current study as they did in Deckersbach et al. (2000b), but that in the absence of pure verbal memory problem this influence did not reach an interpretable difference on the HVLT-R. This interpretation remains preliminary and further empirical testing of verbal learning/memory is recommended to identify whether BDD participants do experience difficulty in this area and if so, if this is purely a result of high-order difficulty recruiting organisational strategies. Nonetheless, the finding that BDD participants did not perform significantly poorer than controls on the verbal learning domain provides further evidence that cognitive processing, encoding and retrieval of visual more so than verbal information is the predominant marker of the neuropsychological profile of BDD.

The finding of normal attentional processes in BDD would appear to conflict Toh et al. (2015) who reported impaired attention using the RBANS. However, as previously highlighted, the attentional index of the RBANS is made up of Digit Span and Symbol Coding, tests which tap other executive functions such as set-shifting and working memory.

In fact, Digit Span most closely parallels LNS and the RBANS Symbol Coding subtest is equivalent to the symbol coding test used in this study, both of which we also showed to be impaired, thus reflecting consistency between these studies. Our finding of equivalent performance on CPT-IP, a sustained attention measure, suggests that while other executive functions such as planning, problem solving, and working memory appear to be compromised in BDD, the more basic function of sustained attention appears to remain unaffected. This finding provides further support to the similarities between the BDD and OCD neuropsychological profile, with OCD research largely supporting normal sustained attention in OCD also (Kuelz et al., 2004). Previous neuropsychological studies of BDD have been limited in their inability to rule out the possible influence of intrusive thoughts which could be argued are distracting BDD participants and thus contributing to their poor performance on various cognitive measures. Thus, our finding of normal attention and vigilance, discounts this possibility as the CPT-IP would be especially sensitive to such influences due to its long duration and need for sustained and unwavering focus.

Finally, this study uncovered that BDD participants and controls performed equivocally on the social cognition index as measured by the MSCEIT. The MSCEIT is an emotional intelligence test that assesses one's ability to manage and integrate emotions into decision making by verbally presenting participants with a range of social dilemmas and possible responses. This result suggests that emotional intelligence and problem solving in the social domain is not an area of difficulty in BDD. Previous research however has identified emotional processing difficulties and a negative interpretative bias in ambiguous social situations among individuals with BDD (Buhlmann, Etcoff, & Wilhelm, 2006b; Buhlmann et al., 2002). However, all of these studies have used methodologies involving the visual processing of emotions as displayed on faces or have orally presented social scenarios in first person language that specifically relate to anxiety provoking body image scenarios

(e.g. “someone is looking/laughing in your direction”). Alternately the MSCEIT is a very general social cognition measure that always uses third person, for example “Jane who is having financial problems” or “Andrew who is not receiving credit for his hard work” and further does not include any appearance-specific scenarios. Therefore, it would appear that emotional and social impairment in BDD stems from overwhelming feelings of anxiety, body-shame and feelings of personal defectiveness rather than from a deficiency in social and emotional “intelligence” per se.

4.4.3. Summary and clinical implications. In summary this study found that the neuropsychological profile of BDD involves impairment to executive functions including reasoning, problem solving and working memory. It also found a reduced processing speed among BDD participants, however, as the specific measures detecting this also rely heavily on executive processes and working memory this finding requires further investigation. Finally, visual learning/memory was found to be impaired in BDD but the same was not observed for the verbal domain. It therefore appears that cognitive processes associated with accurately perceiving, encoding and recalling visual details and visuospatial information is predominately affected in BDD. The finding that visual processing and memory are aberrant in BDD, is of particular clinical relevance as BDD involves the perception of physical flaws and distortions, doubt regarding the existence and memory of one’s physical appearance and an over-focus on minute physical details at the exclusion of one’s broader and holistic body image. Visual processing and memory difficulties may also help explain the common BDD experience of body image distortions such as perceiving one’s features to “change” from one viewing to the next. Furthermore, the broad finding of memory dysfunction is relevant given symptoms of repetitive doubt, inability to trust one’s perception and constant checking behaviours. Although this study did not directly compare BDD and OCD participants, it did identify a neuropsychological profile marked by executive dysfunction and memory deficits

as also established in OCD (Boone et al., 1991; Deckersbach et al., 2000a; Greisberg & McKay, 2003; Savage et al., 1999; Snyder et al., 2014). The similar neuropsychological profile between these two disorders provides further support for the re-conceptualisation and classification of BDD as an OCRD. A more comprehensive discussion of the implications of the neurocognitive findings of this thesis and how this may relate to treatment interventions for people living with this disorder will be discussed in integrative discussion presented in chapter 8.

4.4.4. Methodological considerations. A key strength of the current study is the moderate size of the clinical sample obtained, which currently represents the largest broad neuropsychological study of BDD to date. Recruitment of BDD participants is invariably challenging given the ongoing lack of clinical expertise and treatments available to this population in addition to their intense experiences of shame reducing their likelihood of accessing psychological supports and thus connecting with clinical research. The current study has also addressed a limitation facing some of the previous research, by performing thorough clinical assessments of all participants to confirm diagnoses and assess symptom severity. This study therefore contributes to the literature having replicated previous research findings of there being specific neurocognitive impairments associated with BDD within an ample size, using appropriate clinical assessment and standardised neuropsychological tools. The current study also has several limitations. Firstly, the clinical participants in this study were currently or recently involved with psychological and or psychiatric interventions for BDD, including a high proportion of the sample using anti-depressant medication during the testing period. The use of psychotropic medication has been criticised in the neuropsychological research due to the possible impacts such medication could have on various cognitive process. The results of the study showed no relationship between anxiety and depression symptoms and cognitive performance on any of the MCCB domains, reducing

the likelihood of this being an explanation for the specific impairments identified in this study. Nonetheless, if viable, future research could benefit from replication of the current study in a non-medicated BDD group. The current study additionally included BDD participants with comorbid mental health disorders, however it did exclude those with a comorbid psychotic illness or substance disorder. This was deemed appropriate as experiences of depression, anxiety, social phobia and agoraphobia are integral aspects of the BDD disorder, and thus, including these comorbidities provides a representative sample and greater generalisability of the results. It is acknowledged that this study included 6 BDD participants who meet criteria for comorbid OCD. Again this is representative but poses challenges in being able to compare the results with the neuropsychological profile of OCD. It is noted that all participants who meet criteria for comorbid OCD underwent thorough clinical assessment of these specific symptoms. These participants were identified both by the student researcher and the treating clinicians as having current and primary BDD, which was also the condition for which they were accessing mental health services. These participants were also identified to have OCD as they identified to having some obsessions and compulsions that were not appearance related and caused them distress or impairment. While future research could attempt to address this limitation by excluding any BDD participants with comorbid OCD, it could also be argued that this approach would create a less accurate and generalisable picture of BDD. Furthermore, in light of the current trend towards more transdiagnositic symptom assessment over segregation of participants based on trivial margins between diagnostic categories, it could be argued that it is most appropriate to continue to include these participants with an increased focus on clinical assessment of these unique symptoms (e.g. obsessions, compulsions, checking behaviours, insight levels etc.) over and beyond the overarching diagnosis.

4.4.5. Conclusion. In conclusion, this study found that compared to age, sex and IQ matched controls, participants with BDD show a specific pattern of cognitive deficits relating to reasoning and problem solving, working memory, visual learning and speed of processing. Of note, the memory impairments were greatest for those tasks involving the processing, encoding, manipulation and retrieval of visual-based stimuli. These findings are taken to reflect executive dysfunction specifically in the online manipulation of visual information and in planning and problem solving abilities. It is recommended that future research perform further neuropsychological investigations of executive functions including those aspects not assessed within the MCCB such as set shifting, inhibition and cognitive flexibility. It is also recommended that visual processing and memory be further explored given the strength of this finding in the current study and the possible relationship between this neuropsychological process and clinical symptoms observed in BDD. Overall, the results of this study support there being frontal-striatal involvement in the pathophysiology of BDD as also implicated by the previous neuropsychological and neuroimaging studies of BDD.

5. CHAPTER 5 - A CLOSER LOOK AT EXECUTIVE FUNCTIONING AND VISUAL PROCESSING IN BDD

5.1. Introduction

5.1.1. Introduction and Rationale. Previous neuropsychological research, including the results presented in the previous chapter of this thesis, point to their being two primary areas of cognitive impairment associated with BDD; executive dysfunction and aberrant visual processing. The purpose of the current study is to build upon the previous research findings by conducting a small yet specialised investigation into executive and visual processes in BDD.

To recap, executive functions refers to a set of higher-order cognitive abilities, which regulate, control and recruit lower-level cognitive functions to perform goal-directed and future-oriented behaviours (Stuss & Alexander, 2000). Cognitive processes which are considered "executive" include planning, decision-making, problem solving, abstract thinking, organisation, working memory, cognitive flexibility, inhibition and set-shifting. These functions have been clustered together under this title, as they are known to be dependent on the integrity and functioning of the pre-frontal cortex (Alvarez & Emory, 2006). For a full review of the literature pertaining to executive functioning in BDD, refer to section 3.2.2 of this thesis. To briefly summarise, previous research has identified executive difficulties in BDD in the following areas; planning and problem solving as measured by the NTOL and SOC (Dunai, Labuschagne, Castle, Kyrios, & Rossell, 2009; Hanes, 1998), organisation as demonstrated by strategic approach to the RCFT and CVLT (Deckersbach et al., 2000), visuospatial working memory as measured by Token Search (Dunai et al., 2009) and auditory working memory as measured by Digit Span (Toh, Castle, & Rossell, 2015). Verbal fluency, a widely used measure of frontal lobe functioning, has yielded mixed results in BDD with one study finding normal semantic fluency in BDD relative to controls (Toh et

al., 2015), another finding impaired semantic yet intact phonemic fluency (Rossell, Labuschagne, Dunai, Kyrios, & Castle, 2014), and the third study finding impaired phonemic but intact semantic fluency (Labuschagne, Castle, & Rossell, 2011), although the latter study was a small case series.

Adding to the literature, the results of study one of this thesis provided further evidence that higher-order executive processes are involved in BDD, in what is currently the largest neuropsychological study of BDD (N=52). Specifically, it was found that BDD participants performed significantly poorer than non-clinical controls on reasoning and problem solving as measured by the mazes, auditory working memory as reflected by LNS and visual working memory as reflected by spatial span. Furthermore, the BDD group also performed significantly poorer than controls on semantic fluency and symbol coding. While the MCCB classes these later tasks under the domain of speed of processing, they are also widely accepted measures of executive functioning due to their reliance on multiple higher-order cognitive functions (Keefe & Harvey, 2015; Shao et al., 2014). This interpretation was further reinforced by the BDD group's equivalent performance to the controls on TMT-A, a more basic measure of psychomotor speed. Executive functions, however, comprise a much broader range of abilities than those measured by the MCCB. Therefore, the current study aims to extend the knowledge of executive functioning in BDD by administering a tailored battery of four "classic" executive function measures.

As highlighted, visual processing, including the perception of visual information, as well as the ability to encode and recall that visual information from memory, has been another key area of interest in the BDD neurocognitive field. For a detailed review of previous research concerning visual functioning in BDD, refer to the literature review presented in chapter 3. The theory that BDD involves an imbalance in global (holistic) versus local (detailed) visual processing mechanisms has gained notable attention and traction in the

literature in recent years (Beilharz et al., 2017). To recap, local visual processing refers to processing a stimulus by focusing on its individual and rich details and elements, whereas global processing involves absorbing the overall form of a stimulus, for example by noticing the broader configural relationships between elements. The model that BDD involves difficulties with more global visual processing mechanisms and an overreliance on detailed visual processing holds clinical value. It aligns with the symptomology of BDD and may help explain how individuals with this condition come to perceive and fixate on minute aspects of their physical appearance, at the expense of viewing themselves more holistically. This theory first emerged following the works of Deckersbach et al. (2000b) using the RCFT. They found that BDD (n=17) and control participants (n=17) performed equally well in their ability to accurately copy a complex visual image; however, the BDD group performed significantly worse than controls when asked to immediately recall this visual information from short-term memory. A closer look at the results revealed that while the groups performed equally in their accuracy on the copy condition their organisational approach to this task differed significantly. Namely, the control participants tended to reproduce the stimuli using the core configural qualities of the image, whereas BDD participants tended to recall the stimuli via a more piecemeal and isolated approach. Regression analysis revealed that the group differences in immediate recall were partially mediated by the BDD group's impaired organisational approach. This result on the RCFT has also been identified in OCD and AN cohorts (Deckersbach et al., 2000a; Sherman et al., 2006). However, in the case of BDD, organisational strategy could not fully account for poor visual short-term memory, thus indicating that BDD involves visual encoding and/or memory retrieval difficulties above and beyond what can be explained by executive impairments (Deckersbach et al., 2000b). On the basis of these results, the authors concluded that BDD may involve a deficit in the use of global visual processing mechanisms, resulting in a misapplication or overreliance on

detailed visual processing.

Of note, despite being one of the most widely referenced neuropsychological studies in BDD, these RCFT findings have never been replicated, and a small study by Hanes (1998) showed no differences between a BDD, OCD and control group on this measure. The previous study of this thesis also established visual learning and memory difficulties using the BVMT, which supports the finding from Deckersbach et al. (2000b). The BVMT is a similar measure to the RCFT, although more limited in its capacity to analyse organisational approach and consider global verses local visual mechanisms.

The proposal that BDD involves an imbalance in global versus local visual processing mechanisms has received strong support from neuroimaging research. Feusner and colleagues conducted a series of fMRI studies, in which BDD and control participants were required to match photographs of faces while in the scanner (Feusner et al., 2010b; Feusner et al., 2007). The images were modified to create three conditions; unaltered images, high spatial frequency images (where all low frequency information was removed to promote detailed oriented processing) and low spatial frequency images (where all high detail information were removed thus to promote global processing). They found left hemisphere hyperactivity in BDD participants relative to controls, particularly in the lateral prefrontal cortex and lateral temporal lobe regions on all conditions, including the dorsal anterior cingulate on the low spatial frequency (holistic) condition. This was in contrast to controls that demonstrated the expected right hemispheric dominance, and only recruited left hemispheric prefrontal and dorsal anterior cingulate activity when processing the high spatial frequency (detailed) photos. Predominant left sided activity in BDD participants even when observing low spatial frequency and unaltered images (meaning configural data was available to extract) suggests a misapplication of detailed visual processing mechanisms, a pattern typically reserved for when there is only high detail information available. This pattern of left hemispheric detailed

oriented processing in BDD was replicated in a study using neural images (houses) rather than faces, demonstrating that aberrant global versus local visual processing in BDD extends to the processing of general stimuli not only appearance relevant material (Feusner et al., 2011)

Finally, neurocognitive researchers have attempted to test the theory of a global visual processing deficit or alternatively an overreliance on detailed processing mechanisms in BDD via a number of novel visual processing paradigms, including inverted face experiments, flaw and symmetry detection tests and the use of gestalt stimuli. The results of these studies have yielded some conflicting findings with some studies detecting imbalances in global and local visual processing in BDD (Feusner et al., 2010a; Jefferies et al., 2012; Kerwin et al., 2014; Stangier et al., 2008; Yaryura-Tobias et al., 2002), and others showing BDD groups to have no difficulties relative to controls on these tasks (Monzani et al., 2013; Reese et al., 2010; Rossell et al., 2014; Silverstein et al., 2015). In particular, previous research using the Navon letter paradigm has yielded contradictory findings with Kerwin et al. (2014) showing BDD participants to be significantly slower but not less accurate that non-clinical controls on both local and global trials of the test. While, Monzani et al. (2013) detected no differences between BDD and non-clinical control participants on speed or accuracy of either the local or global trials in their experiment. As highlighted in Chapter 3, there are however several key differences between these two studies, which limits the ability to directly contrast their results and thus supports further replication of this test in BDD samples. Refer to Chapter 3 for a detailed review of the previous research in visual processing in BDD.

Thus in addition to an exploration of executive functioning in BDD, another principal objective of the current study is to further explore visual processing and memory processes in BDD, by administering three visual tasks, which are suitable for studying global and/or local visual processing mechanisms, including the RCFT to address replication of the results of

Deckersbach et al. (2000b).

5.1.2. Aim. Based on the findings of the previous MCCB study, the present study aimed to undertake a closer examination of executive functioning and visual processing in BDD. It was anticipated that this information would further the knowledge surrounding these cognitive areas in BDD and provide a clearer picture of the neuropsychological profile of the disorder. This study selected four widely used executive function measures and three visual processing tests, which are amenable to exploring global and local visual processing mechanisms. These measures were elected based on identified gaps within the literature, suitability to test the proposed models and based on the need to replicate previous research findings.

5.1.3. Hypotheses. Based on the literature review presented in chapter 4, it was hypothesised that BDD participants would perform significantly poorer than non-clinical control participants on all four measures of executive functioning. Drawing on the findings from Deckersbach et al. (2000b), it was hypothesised that BDD and non-clinical control participants would perform equally on accuracy of the RCFT copy condition. BDD participants were predicted to perform significantly poorer than the controls on the immediate recall condition. Deckersbach et al. (2000b) did not include the delayed recall condition of the RCFT in their study, however given the previous impairments found on the immediate recall condition it was anticipated that BDD participants would also perform significantly poorer than controls on the RCFT delayed recall condition. It was additionally anticipated that the BDD group would demonstrate poorer organisational performance than controls on the RCFT conditions. It was further hypothesised that BDD participants would perform poorer than controls on the global visual processing measure, the Contour Integration Task

(CIT)[4]. Finally, it was predicted that BDD participants would perform less accurately and slower than controls on the Navon global condition, but faster and more accurate than controls on the Navon local condition[4].

5.2. Method

5.2.1 Participants. Twenty-four individuals participated in the current study. This included eleven participants (6 males and 5 females) with a current and primary diagnosis of BDD and thirteen control participants (7 males and 6 females) with no psychiatric history. All of the participants in this study first completed study one (see Chapter 4) and accepted an invitation to attend a follow-up cognitive testing appointment. Please refer to section 4.2.1 for a full description of participant information including recruitment details and inclusion/exclusion criteria.

5.2.2 Materials.

6.2.2.1. Screening and clinical assessment measures. Screening and clinical assessment information collected in study one, including demographic information from the clinical record form and clinical information from the MINI-6, BDD-DM and WTAR, were reused in the current study to avoid unnecessary repetition. The DASS-21, BDD-YBOCS and BABS were re-administered to ensure accurate and current symptom severity measurement. Please refer to section 4.2.2.1 for a full description of these screening and assessment measures.

[4] Please note that the research reviewed in chapter 4, pertaining to the use of both of the Navon and Contour Intergration Tasks by previous researchers was not published and available to the author at the time the current studies were designed and carried out (Kerwin et al., 2014; Monzani et al., 2013; Rossell et al., 2014; Silverstein et al., 2015). Knowledge of these previous studies would have resulted in alternative visual processing tests having been selected or at least modified versions of these paradigms to address the limitations identified by the past research. This previous research has been integrated into the literature review to ensure relevance and currency of this work and to allow for a thorough interpretation of the findings of this current study. The study hypotheses however have not been adapted in light of this new information and rather reflect the researchers original predictions based on a model of BDD involving a global visual processing deficit and/or a heightened local visual processing system.

5.2.2.2 Measures of executive functioning

5.2.2.2.1. Delis-Kaplan Executive Function System (D-KEFS) Colour-Word Inference Test (CWIT; Delis, Kaplan, & Kramer, 2001). The CWIT is based on the classic Stoop test, which measures the ability to inhibit overlearned or prepotent responses in the face of conflicting information (Stroop, 1935). It reflects the executive functions of response inhibition, set-shifting and cognitive flexibility. The D-KEFS CWIT consists of four conditions; colour naming, word reading, inhibition and inhibition/switching. The first two conditions are baseline measures and simply require the participant to first name the colour of a series of square patches presented on a page and then to read out loud a series of colour-words which were all printed in black ink. The third inhibition condition represents the traditional Stroop test and requires participants to name the ink colour of words denoting a conflicting colour (i.e., Red, Green, Blue). The D-KEFS CWIT includes an additional condition, which involves switching back and forth between naming the dissonant ink colours and reading the words, thus this condition reflects both inhibition and ability to shift between the two tasks. For each of these conditions participants were asked to perform the task as quickly as possible without making errors. Completion time in seconds for the two executive function conditions (inhibition and inhibition/switching) were converted into scaled scores corrected for years of age. The internal consistency for the D-KEFS CWIT has been found to range between .62-.86 and test-retest reliability for the inhibition condition is very high (Delis et al., 2001).

5.2.2.2.2. Trial Making Test-Part B (TMT-B; Reitan, 1986). The TMT was originally developed as part of the Army Individual Test Battery (1944) and is now a standard component of many neuropsychological batteries. TMT-B is a continuation of TMT-A, which was included as a speed of processing measure in the MCCB battery administered in study one (see Chapter 5). TMT-B is a widely accepted executive function measure which

relies on a number of mental processes including visual search and scanning abilities, sequencing, set-shifting, cognitive flexibility and psychomotor speed. Similar to TMT-A, TMT-B requires the examinee to connect 25 circles distributed irregularly across a sheet of A4-paper as quickly as possible. Part B however includes both numbers (1-13) as well as letters (A-L) and the participant is required to draw lines to connect the circles in an ascending pattern shifting between the numbers and letters (i.e., 1-A-2-B-3-C etc.). If the examinee makes an error the examiner interrupts, so that the examinee can fix the error and then continue the trial. The TMT-B score reflects the raw number of seconds taken to connect all 25 circles in their correct order (theoretical range 0-300 seconds).

5.2.2.2.3. Digit Span-Backwards. Digit Span is an auditory learning and working memory test, and a subtest of the WMS-III (Wechsler, 1997). Digit Span is made of two subtest; Digit Span Forward (DSF) and Digit Span Backwards (DSB). In DSF the examiner reads a sequence of numbers and the participant is required to verbally repeat the string of digits in the same order. On DSB, the examiner reads an alternative sequence of numbers and the examinee is required to repeat the digits in reverse order. DSF is considered a simple span test as it primarily taps short-term auditory memory, whereas DSB additionally tests an individual's ability to manipulate verbal information while in temporary storage, thus also tapping into working memory and mental manipulation. Both subtests were administered in the current study, however only DSB will be analysed here as a measure of executive functioning.

5.2.2.2.4. Controlled Oral Word Association Test (COWAT: Benton, 1969). The COWAT is a brief verbal fluency test, which requires participants to generate as many words as possible starting with the letters F, A and S, with a 60 second time limit per letter. The COWAT is a phonemic (letter) fluency test as opposed to the semantic (animal) fluency task as was used in study one. In addition to being a measure of verbal fluency, the COWAT is

also a widely accepted test of executive function, which is sensitive to the integrity of the frontal lobe. This is because the COWAT relies upon cognitive processes such as cognitive organisation, initiation, switching, maintenance of effort and ability to conduct a non-routine search for words based on a specific letter rather than on their categorical function. The COWAT demonstrates good internal consistency (0.83) and acceptable test retest reliability (0.74; Ruff, Light, Parker, & Levin, 1996).

5.2.2.3 Measures of visual processing.

5.2.2.3.1 Navon. The Navon task is a visual processing measure, which is well suited to comparing global verses local visual processing mechanisms. The paradigm consists of computer-generated stimuli depicting a large global capital letter, either an S or a H, which is made-up of several smaller capital letters, either all Ss or all Hs. The task has two conditions, a local and global condition, which was administered in separate blocks of 96 trials (total of 192 trials). At the start of each block the participants were asked to attend to either the small (local) letters or the large (global) letters and to identify whether this letter was either a H or S by pressing the corresponding keyboard letter. Participants were asked to respond as quickly as possible, with the stimuli remaining on the screen until the participant provided a key response. The order the conditions were administered were randomised to reduce any practice or fatigue effects. The outcome variables reflect the response time and percentage of accurately identified letters for both the global and local trials. Figure 5.1 below displays the Navon stimuli.

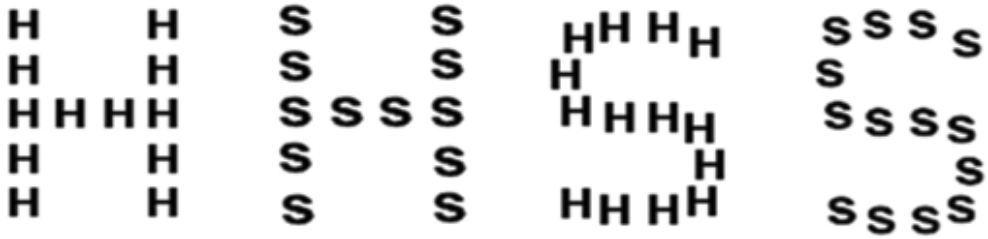


Figure 5.1. The Navon Stimuli.

5.2.2.3.2. Contour Integration Task (CIT; Kovács, Polat, Pennefather, Chandna, & Norcia, 2000). The CIT measures perceptual organisation and contour integration. It is based on the Gestalt theory of visual perception, which purports that people tend to organise small piece-sized visual elements into unified wholes based on their attributes. The task-required participants to identify a closed-path contour (outline) composed of Gabor elements embedded within a background of randomly oriented distractor elements, which exist to create a visual noise in the image. The experimental stimuli consisted of 15 rectangular cards (A4 size) each containing one circle or oval shaped contour. Participants were allotted 30 seconds to view each card and identify the contour by tracing its outline. Each card presented increased difficulty with the Gabor elements become smaller and denser, thus making the contour more challenging to locate. When a participant was unable to identify the contour within the time limit, the previous card was re-administered in inverted form to remove memory of the contour location. If the participant successfully identified the contour again, the following card (previously failed card) was re-attempted in its upright orientation. If the contour was not successfully identified at this second attempt the CIT was discontinued and the last correctly identified card was recorded. If the participant was successful the task continued. Each correctly traced contour was allocated one score, thus a score of 0-15 was possible. Figure 5.2. below displays an example contour integration card with a circle contour located at the bottom-left side of the card.

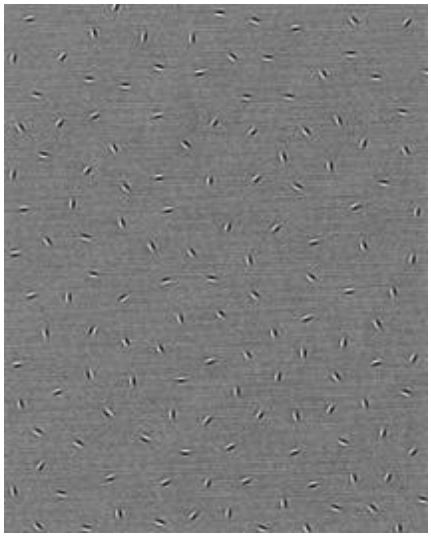


Figure 5.2. Example of Contour Integration Test Card (Kovács et al., 2000).

5.2.2.3.4. Rey-Osterrieth Complex Figure Test (RCFT; Osterrieth, 1944). The RCFT is a widely used test of visual memory and visuospatial construction abilities. The RCFT requires participants to reproduce a complex geometric figure (8inch x 11inch), see figure 6.3 below. The test has three trials, first the participant is asked to copy the figure (copy), then immediately after, and without prior notice, the examiner removes the source and copied figure, and asks the participant to redraw the figure from memory (immediate recall), and finally the participant is again asked to draw the figure from memory after a 25-minute delay (delayed recall). Participants were engaged in alternative activities during the time delay, although care was taken to ensure no other visual based tasks were presented during this time. Participants drew the figure with coloured felt-tip markers and were prompted by the examiner to change markers each time they commenced a new element of the figure. Thus, this created a record of sequences allowing for analysis of strategic approach.

The RCFT can be reproduced in a variety of different ways, and the figure has several components, some which are considered more global organisational features (i.e. the main rectangle) and others which are more detailed local features (i.e. the circle with three dots) which can be considered to be local level details. These complexities thus allow for

measurement of both visual memory recall as well as analysis of organisational approach employed during the encoding process. That is, the degree to which participants utilised the global features of the RCFT image to aid their memory of this figure.

The copy, immediate recall and delayed recall trials of the RCFT were scored for accuracy using Taylor's adaption of Osterreith's 18-element system, whereby each of the 18 elements of the figure were allocated up to 2 points based on judgments of both correct construction and correct spatial placement (Taylor, 1959). Total accuracy scores for each trial have a theoretical range of 0-36. The copy, immediate recall and delayed recall trials were then further analysed for organisational strategy, using an adaption to Binder's (1982) system, which was developed by Savage and described in full in Savage et al. (1999, 2000). Briefly, the geometric figure is divided into five-core configural (global) elements; the base rectangle, two diagonal lines, the vertical midline, the horizontal midline, and the vertex of the triangle on the right. Participants receive points for constructing each core element as an unfragmented unit. Construction accuracy is not considered in this score. The base rectangle receives 2 points if constructed as an unfragmented unit, while the other 5 configural elements can be assigned 1 point, resulting in an organisational score ranging from 0 to 6 points.

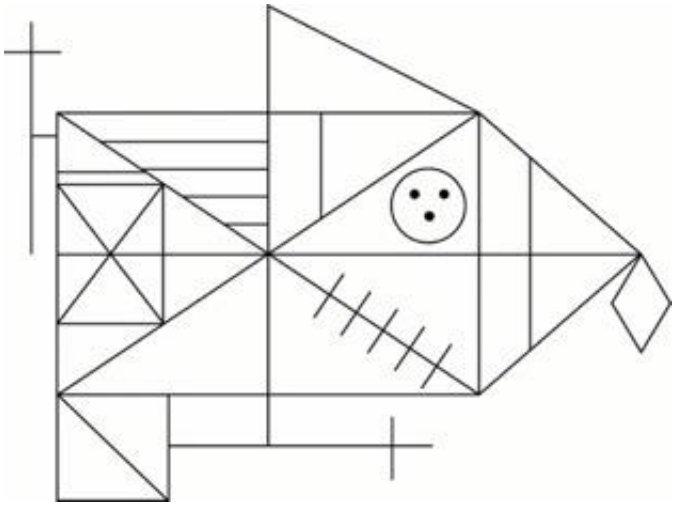


Figure 5.3. The RCFT stimulus (Osterrieth, 1944).

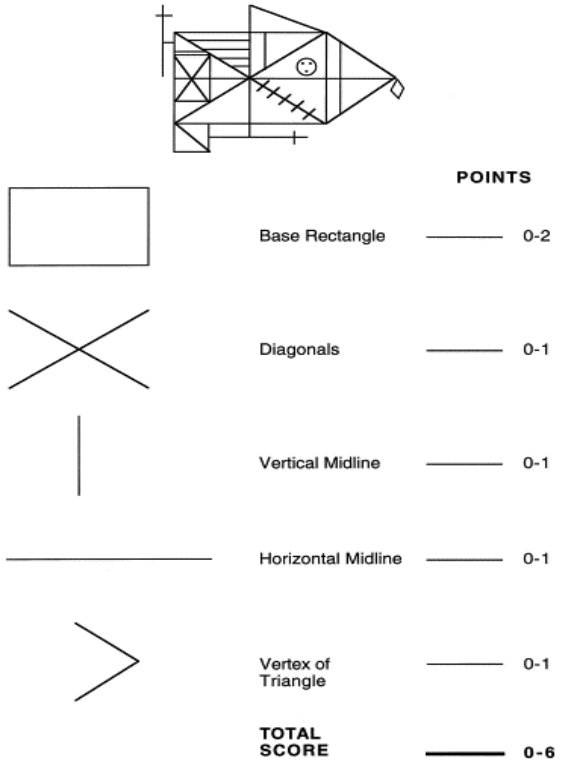


Figure 5.4. RCFT Organisation Scoring System (Binder, 1982; Savage et al., 1999)

5.2.3. Procedure. See section 4.6.3 for a detailed description of procedural information including ethics approval, informed consent process and debriefing procedures. Briefly, participants attended a testing session at a site of convenience; either Swinburne University, the Monash Alfred Psychiatry Research Centre or at St Vincent's Hospital. The session was approximately 1.5 hours in duration and participants were provided with opportunities to take rest breaks between activities to avoid fatigue. At the end of the testing session participants were reimbursed at a rate of $25.

5.2.4. Data analysis. To ensure close matching of the groups, a series of one-way between-groups ANOVA were used to compare the BDD and control group on basic demographics, clinical variables, and estimated IQ as measured by the WTAR. A p-value of $P=\leq 0.05$ was applied to identify any significant group differences on these basic characteristics. The study hypotheses were then tested using a series of one way between-

groups ANOVA comparing whether the BDD and control group differed on their performance on the executive function and visual processing measures. Given the exploratory nature of this study, in addition to a number of these tests reflecting distinct cognitive functions, Bonferroni adjustment across all group comparisons was considered too conservative. In its place a conservative p-value of P=≤ 0.01 was applied to minimise type 1 error while also allowing for an exploratory evaluation of the data. Additionally, a Mixed Between-Within Subjects ANOVA was performed on the RCFT results to explore whether there was an interaction and/or main effects associated with the two groups and the three conditions of this measure on both accuracy and organisational scores. Finally Pearson's correlations were conducted to explore the relationships between any significant cognitive findings and the clinical outcome variables. A p value of P=≤ 0.01 was applied to the Persons correlations to adjust for multiplicity.

5.3. Results

5.3.1. Data screening and general considerations. See section 4.2.4. of the previous chapter, for a description of the statistical software, data screening/cleaning procedures and assumption testing which was conducted for all quantitative data used in this thesis. It is acknowledged that the Levene's homogeneity of variance test was significant on the RCFT accuracy data, a violation that cannot be controlled within the SPSS Mixed Between-Within Subjects ANOVA. This violation is predictable due to the ceiling effects associated with the RCFT, particularly on the copy condition. Transformations to the original RCFT data were conducted using logarithm (LG10), square root (SQRT) and Inverse, to explore a solution to this violation, however none of these transformations fully normalised this data. Given the F-test is robust to heterogeneity of variance and the group sizes being relatively similar, a decision was made to proceed with the Mixed Between-Within Subjects ANOVA using the

original data, with caution made when interpreting the results. These findings are further complimented by the one-way between-groups ANOVA results on the RCFT in which the Welsh test was able to correct for this violation.

There was no missing data at the item or measure level on any of the questionnaires used in this study. On the cognitive tests, only the Navon was subject to missing data (6 participants; 25%). This is a notable rate of missing data, which was due to a technology issue associated with this computer-based test, resulting in lost data after administration. This data was lost at random and therefore the results of Navon have been retained, it is acknowledged that this measure reflects an especially small sample size and thus must be considered with this in mind.

5.3.2. Demographics, clinical characteristics and group matching. As can be seen in Table 5.1, the groups did not differ significantly on years of age, years of education or estimated IQ, demonstrating appropriate matching of the groups. As to be expected, the BDD group had significantly higher rates of depression, anxiety and stress measured by the DASS-21. Regarding symptom severity, the BDD sample had an average total BDD-YBOCS score that was categorised in the 'Moderate-Severe' range (M= 25.64, SD= 7.41, Range= 14-36), a similar symptom severity to the BDD samples used in previous cognitive research studies (Deckersbach et al., 2000b; Dunai et al., 2009; Toh et al., 2015). The average total BABS score (M=11.00, SD= 5.00, Range= 7-19) indicates that the BDD group on average showed 'good insight'. This score however falls just within this category of good insight (0-11), with poor insight indicated by score above 12 (Eisen et al., 1998).

Table 5.1.

Demographic and Clinical Characteristics of BDD and Control Participants.

	BDD	Controls	Group Comparison			
	Mean (SD)	Mean (SD)	F	df	p	D
Age	38.64 (13.86)	33.69 (10.13)	1.02	1,22	.324	0.41
Years of Education	16.23 (4.30)	17.04 (2.17)	.322 [a]	1,22	.579	-0.24
WTAR	111.64 (5.37)	114.77 (4.69)	2.33	1,22	.141	-0.04
DASS-21 Total	18.00 (10.58)	6.15 (5.41)	11.28[a]	1,22	.005**	1.40
DASS-D	7.82 (5.23)	2.38(2.06)	10.49[a]	1,22	.007**	1.37
DASS-A	3.64 (3.26)	1.08 (1.66)	6.16	1,22	.021*	0.99
DASS-S	6.55 (4.08)	2.69 (3.03)	7.01	1,22	.015*	1.07
BDD-YBOCS	25.64 (7.41)	-	-	-	-	-
BABS	11.00 (5.00)	-	-	-	-	-

Note: **= p≤ .01 (2-tailed), *p≤. 05 (2-tailed), a = Welsh statistic used, d = Cohen's d effect size, WTAR= Wechsler Test of Adult Reading, DASS-21 Total= Depression, Anxiety and Stress Scale (Total Score), DASS-D= Depression, Anxiety and Stress Scale (Depression Subscale) DASS-A= Depression, Anxiety and Stress Scale (Anxiety) Subscale, DASS-A= Depression, Anxiety and Stress Scale (Stress Subscale), BDD YBOCS= Yale-Brown Obsessive Compulsive Scale Modified for Body Dysmorphic Disorder, BABS= Brown Assessment of Beliefs Scale.

5.3.3. Group comparisons on executive functioning measures. As shown in Table 5.2, one-way ANOVAs revealed that the BDD group and control group did not differ significantly on any of the executive functioning measures including the CWIT inhibition and inhibition/switching condition, TMT-B, DSB, or any of the COWAT letter conditions. The limited statistical power associated with the current study's small sample size (N = 24) may have played a role in some of executive functioning group differences not reaching statistical significance. Post hoc power analyses were conducted using G*power (Erdfelder, Faul, & Buchner, 1996) revealing that on the basis of the obtained effect sizes (See table 5.2) and a

significance value of $p=\leq 0.01$ the following approximate sample sizes would be required in order to obtain sufficient power at Cohen's (1988) recommended level of $\beta= .80$; CWIT Inhibition (N=74), TMT-B (N=1172), DSB (N=28) and COWAT total (N=154). The power analysis therefore supports replication of these tests with larger sample sizes especially with respect of the executive function tests of CWIT and the DSB which have moderate to large effect sizes (See table 5.2).

Table 5.2.

Mean, Standard Deviation and ANOVA results comparing the BDD and control group's performance on the executive functioning measures.

	BDD	Control	Group Comparison			
	Mean (SD)	Mean (SD)	F	df	P	d
CWIT						
Inhibition	11.45 (2.62)	12.46 (2.33)	0.99	1,22	.330	-0.41
Inhibition/Switching	11.55 (1.97)	11.38 (2.33)	0.03	1,22	.858	0.08
Trail Making						
TMT-B	61.18 (22.72)	58.08 (35.76)	0.62	1,22	.806	0.10
Digit Span						
DSB	8.09 (1.50)	6.92 (1.80)	2.89	1,22	.103	0.71
COWAT						
Letter F	16.50 (4.63)	18.69 (6.61)	0.79	1,22	.383	-0.38
Letter A	14.60 (3.75)	15.15 (4.79)	0.09	1,22	.766	-0.13
Letter S	18.00 (4.52)	18.85 (5.00)	0.18	1,22	.679	-0.18
Total	49.10 (11.32)	52.69 (14.40)	0.42	1,22	.524	-0.28

Note: **= p< .001 (2-tailed), *p<. 01 (2-tailed), d = Cohen's d effect size, CWIT= Colour-Word Inference Test (Stoop), TMT-B= Trial Making Test-Part B, DSB= Digit Span Backwards, COWA= Controlled Oral Word Association.

Table 5.3.

Mean, Standard Deviation and ANOVA results comparing the BDD and control group's performance on the visual processing measures.

	BDD Mean (SD)	Control Mean (SD)	Group Comparison F	df	P	d
Navon						
Global Accuracy (%)	98.18 (1.73)	98.03 (1.98)	0.03	1,17	.867	0.08
Global RT (ms)	661.56 (222.63)	570.86 (93.69)	1.49	1,17	.239	0.53
Local Accuracy (%)	98.96 (0.97)	97.82 (2.16)	1.91	1,17	.188	0.68
Local RT (ms)	660.92 (87.50)	609.53 (57.46)	2.39	1,17	.141	0.69
Global–Local Accuracy (%)	3.25 (1.58)	6.91 (9.17)	1.23	1,17	.283	-0.53
Global – Local RT (ms)	0.62 (153.35)	-38.55(101.51)	0.45	1,17	.511	0.31
Contour Integration						
CIT	9.82 (1.78)	9.15 (2.08)	0.69	1,22	.414	0.35
RCFT						
Copy Accuracy	33.82 (2.52)	35.15 (1.52)	2.36[a]	1,22	.144	-0.63
IR Accuracy	17.32 (6.93)	25.15 (2.80)	12.36[a]	1,22	.004**	-1.48
DR Accuracy	16.36 (6.41)	24.69 (3.21)	17.00	1,22	<.001**	-1.64
Copy Organisation	3.27 (1.79)	3.62 (1.56)	0.25	1,22	.621	-0.21
IR Organisation	2.09 (1.76)	3.85 (1.28)	7.98	1,22	.010*	-1.14
DR Organisation	1.91 (1.76)	4.00 (0.91)	14.01	1,22	.001**	-1.49

Note: **= p< .001 (2-tailed), *p<. 01 (2-tailed), a= Welsh statistic used, d = Cohen's d effect size, RT=Response Time ms= Milliseconds, %=percentage correct, CIT= Contour Integration Test, RCFT= Rey-Osterrieth Complex Figure Test, IR= Immediate Recall, DR= delayed recall.

5.3.4. Group comparisons on visual processing measures. As presented in table 5.3, the BDD and control group did not differ significantly in their performance on the local or global trials of the Navon on either accuracy or response times. Furthermore, the BDD and control group also did not differ in their performed on the CIT. Post hoc power analyses using G*power (Erdfelder et al., 1996) revealed that on the basis of the obtained effect sizes (See table 5.3) and a significance value of p=≤0.01 the following approximate sample sizes would be required to obtain a power of β= .80 to detect significant differences; Navon Global- Local Accuracy (N=46) and CIT (N=100). Thus, replication of these tests with larger sample sizes is recommended, particularly with the Navon given the moderate effect size reported here (See table 5.3).

A mixed between-within subjects ANOVA was performed to investigate whether the BDD group and control group differed on accuracy scores across the three trials of the RCFT (copy, immediate recall and delayed recall). There was a significant interaction between group and trial condition, Wilks' Lambda= .70, F (2,21)= 4.53, p=. 02. This indicated that the two groups showed a different pattern of accuracy performance across the three RCFT trials. There was a substantial main effect for RCFT condition, Wilks' Lambda= .13, F (2,21)= 72.57, p=<. 001. This indicated that overall accuracy performance was significantly different across the three RCFT trials, with accuracy greatest for the copy condition (M=34.54, SD=2.11), and reduced for the immediate condition (M=21.56; SD= 6.39) and delayed recall conditions (M= 20.88, SD=6.42). Additionally, there was a significant main effect for group, F (1,22) = 18.32, p=<.001, indicating that overall BDD group (M=22.5; SD=4.22) performed significantly poorer than the control group (M=28.33; SD=2.51) on their accuracy performance on the RCFT.

The one-way ANOVAs presented in Table 5.3 clarify that the BDD and control group were not significantly different on the copy trial of the RCFT, but that the BDD participants

were significantly poorer than controls in recalling this visual information from memory, both on the immediate recall condition and the 25-minute delayed recall condition. Indeed, the BDD group copied 94% of the figure accurately in the copy condition, which then reduced to 48% at immediate recall, and then to 45% at delayed recall. This was in contrast to the control group who on average copied 98% of the figure accurately in the copy trial, followed by 70% of the figure at immediate recall and still recalling 69% of this image accurately after the 25-minute delay. This pattern is depicted in figure 5.5 below.

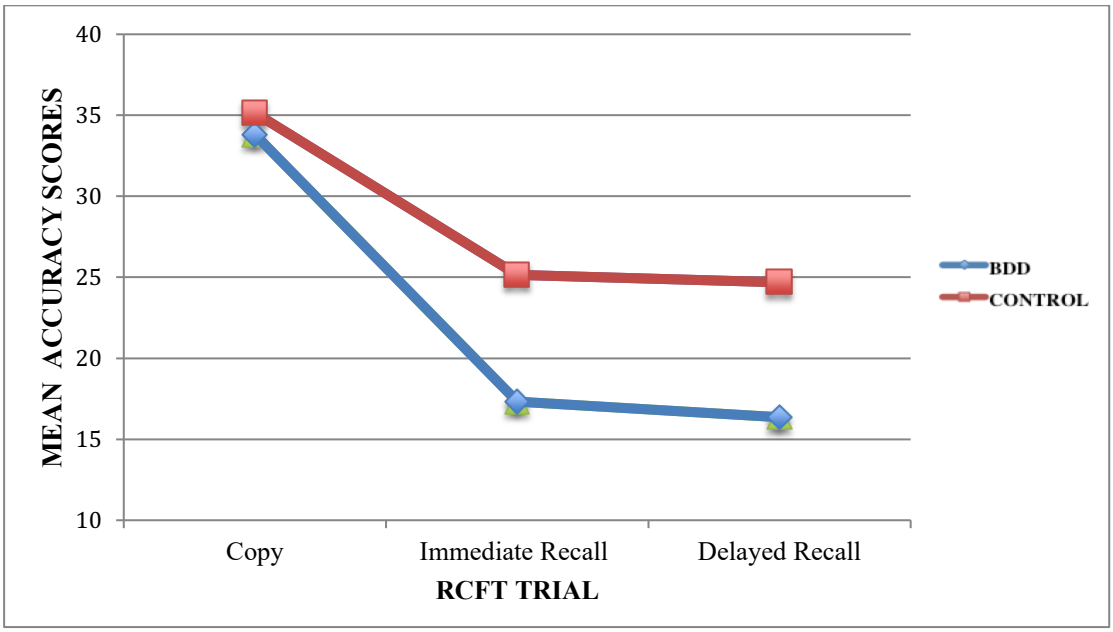


Figure 5.5. Comparison of BDD and control group's accuracy performance on the RCFT.

As can be seen in figure 5.5, both groups lost the most majority of information between the copy and immediate recall condition, but what was maintained at immediate recall for both groups was largely preserved after the 25-minute delay. The loss of information therefore occurred at the short-term memory stage, but was significantly greater for those with BDD as compared to those without the condition.

An additional mixed between-within subjects ANOVA was performed to investigate whether the BDD group and control group differed in their organisational approach across the three trials of the RCFT (copy, immediate recall and delayed recall). There was a significant

interaction between group and trial condition, Wilks' Lambda= .57 , F (2,21)= 8.07, p=. 003. This indicates that the two groups showed a different pattern of organisational approach across the three RCFT trials. There main effect for RCFT condition was not significant, Wilks' Lambda= .82, F (2,21)= 2.27, p=. 130. This indicated that overall organisational scores did not significantly differ across the copy condition (M=3.46; SD=1.64), immediate recall condition (M=3.04; SD=1.73) and delayed recall condition (M=3.04, SD=1.71). There was a significant main effect for group, F (1,22) = 6.36, p=.01, which indicated that the overall the BDD group (M=2.42; SD=1.77) performed significantly poorer than the control group (M=3.82; SD=1.25) on their organisational approach to the RCFT.

The one-way ANOVAs presented in Table 5.3 clarify that the BDD and control group did not differ significantly in their organisational approach on the copy condition of the RCFT. The BDD group did however utilise these global organisational features significantly less than controls on both the immediate and delayed recall conditions. As is depicted in Figure 5.6 below, the BDD and control a showed very different organisational pattern across the RCFT trials. The control group increasingly relied upon the configural and organisational elements of the RCFT which each trial, as evidenced by their increasing organisational scores. Alternatively, the BDD group although no different in their organisational approach during the copy condition, received poorer organisational score with each passing trial suggesting a lack of utility or inability to access these global strategic elements.

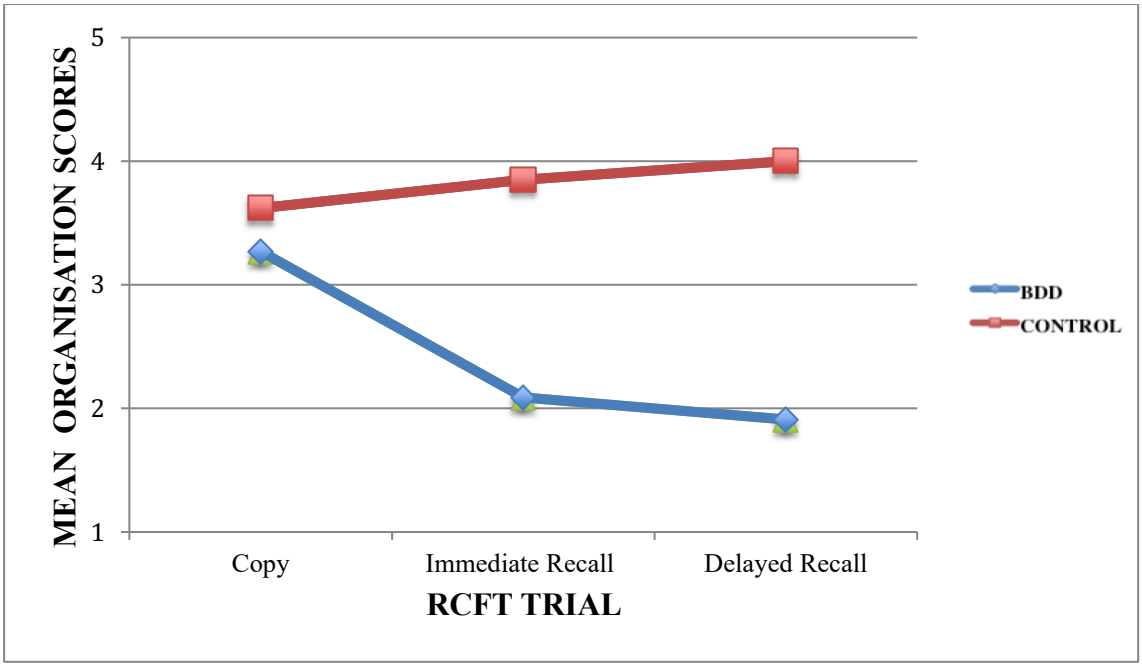
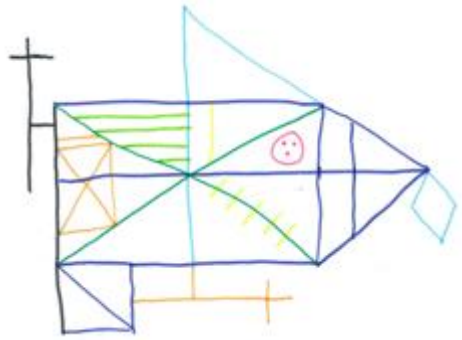
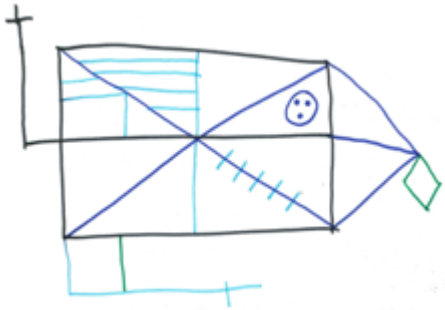
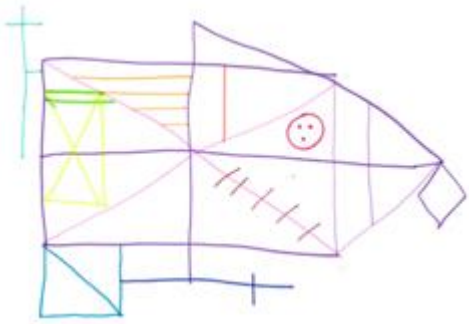
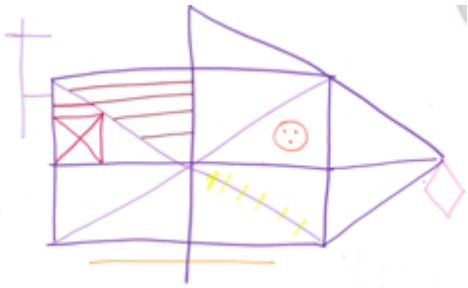
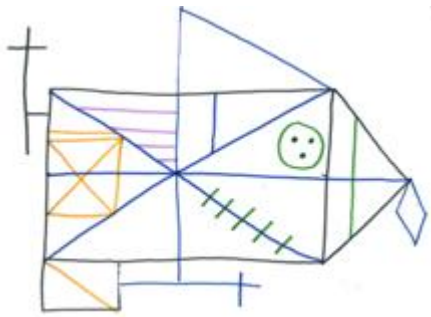
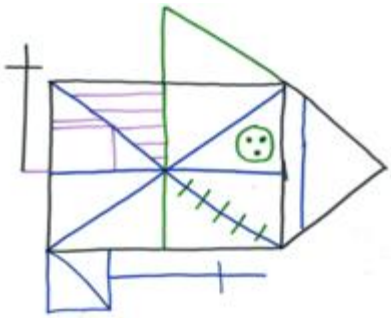


Figure 5.6. Comparison of BDD and control group's organisation performance on the RCFT.

The Pearson's Product Moment correlations revealed no significant relationship between clinical variables such as WTAR, DASS-21 and BDD-YBOCS scores with any of the cognitive variables scores from the CWIT, TMT-B, DSB, COWA, Navon or the CIT. The DASS-21 total score however demonstrated a moderate negative relationship with the RCFT immediate recall (r=-.54**, p=. 007) and delayed recall (r=-.54**, p=.006) accuracy scores, but no relationship with the RCFT organisational scores. As the groups differed significantly on the DASS-21 scores, this cannot be reliably used as covariates in the analysis. (Miller & Chapman, 2001).

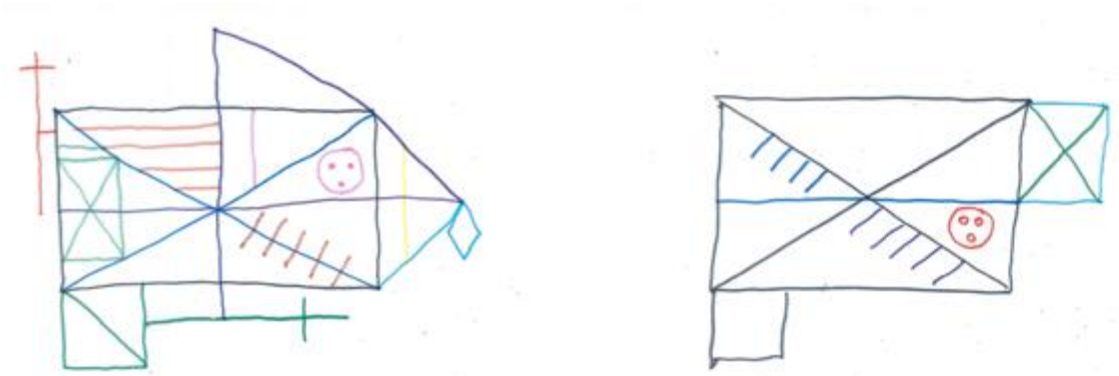
To further illustrate the RCFT results qualitative examples of three control and three BDD participants are displayed in Figure 5.7 below. As can be seen in these examples, the comparison between the kinds of visual elements recalled by the BDD participants differs quite markedly to those recalled by the control participants. The control participants consistently recalled the core global features of the base rectangle, diagonal line, vertical midline, horizontal midline and vertex of the triangle, with some minor details missing from

the images. By contrast the BDD participants immediate recall often missed these core global organisational features, but yet they still recalled intricate local details such as the circle with the three dots, the small diamond, the crosses, or the consecutive parallel lines. Most markedly, BDD participant two, reproduced 4 very specific local details in their accurate spatial location in the absence of any global features. This qualitative representation has been included as these images provide rich information not fully captured by either the accuracy scoring systems of Taylor (1957) or the modified Binder (1982) organisational scoring systems. While these images are subjective, and not all BDD participants showed these profound visual recall impairments, care has been taken to select equivalent examples across the groups. These examples depict neither the best nor worst performance, but rather demonstrate poor-average performance relative to each group's performance range.

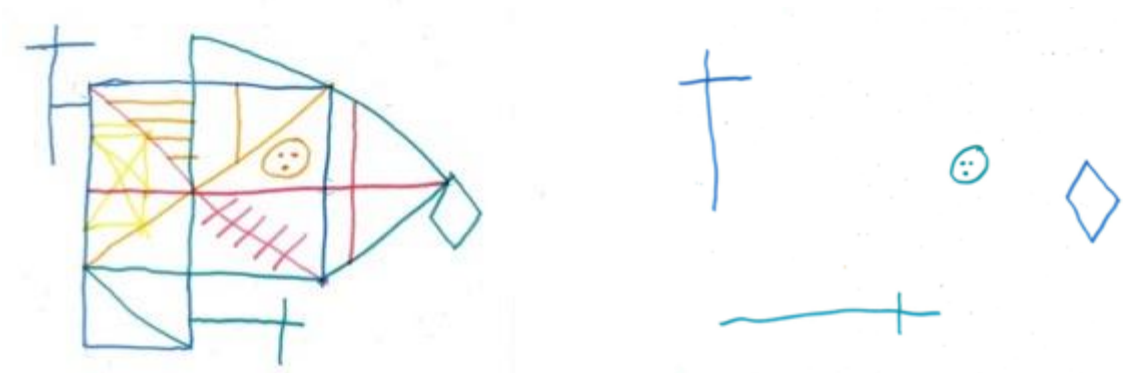
Copy Trial	Immediate Recall Trial
Control Participant 1 (Male, 35yo)	
	
Control Participant 2 (Female, 60yo)	
	
Control Participant 3 (Female, 27yo)	
	

Copy Trial **Immediate Recall Trial**

BDD Participant 1 (Male, 54yo)



BDD Participant 2 (Male 39)



BDD Participant 3 (Female, 44yo)

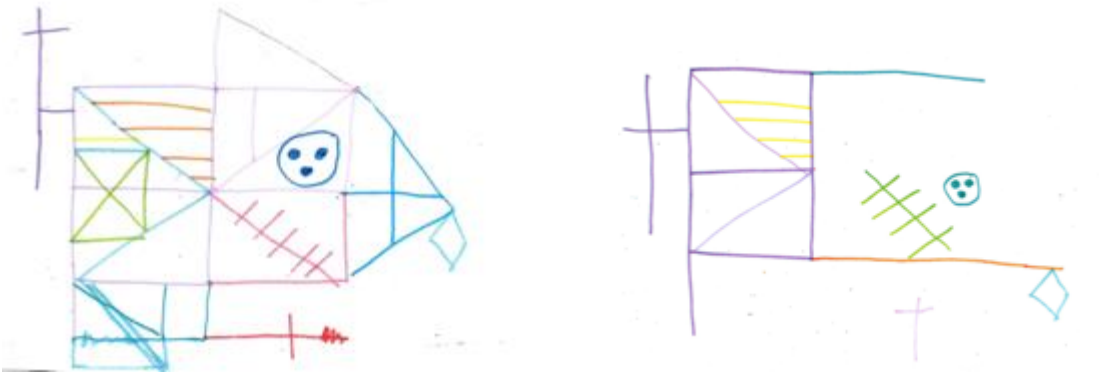


Figure 5.7. Qualitative examples of control and BDD participants' performance on copy and immediate recall trials of the RCFT.

5.4. Discussion.

5.4.1. In relation to the aims and hypotheses. The current study set out to perform a closer examination of two key cognitive areas in BDD; executive function and visual processing. It aimed to achieve this by administering a selective battery of four commonly used executive functioning measures (CWIT, TMT-B, DSB, digit span and the COWAT) and three visual processing measures suitable for the study of global versus local visual processing mechanisms (Navon, CIT and RCFT) to compare a small clinical BDD sample to a matched non-clinical control group. In contrast to the hypotheses, the BDD group did not perform more poorly than the control group on any of the executive function measures in this study. The hypothesis that BDD participants would perform significantly poorer than controls on the CIT, a gestalt measure that is proposed to rely on global visual processing mechanisms, was also not supported. Furthermore, the hypothesis that BDD participants would be significantly slower and less accurate than controls on the Navon global condition yet faster and more accurate that controls on the Navon local condition, was also not supported. Rather, the BDD and control group showed no significant differences in their accuracy or response times on either condition of the Navon.

The findings on the RCFT, however, supported the study hypotheses. BDD participant's showed no difference on their accuracy performance compared to the control participants on the copy condition, yet performed significantly poorer on both the immediate recall and delayed recall conditions .The BDD group also demonstrated an impaired organisational approach on both the immediate and delayed recall conditions, although not on the copy condition, reflecting a deficiency in global visual mechanisms associated with the encoding and/or retrieval of visual information from short-term memory.

5.4.2. In relation to previous research. The finding of no executive functioning difficulties between BDD and control participants in the current study was somewhat

surprising given the considerable research base indicating otherwise. This includes the previous neuropsychological studies showing executive dysfunction in the areas of planning, problem solving, and working memory (Dunai et al., 2009; Hanes, 1998; Toh et al., 2015). As well as the results of a number of structural neuroimaging studies showing reduced brain volumes in key frontal structures including the orbitofrontal cortex, anterior cingulate cortex and basal ganglia (Atmaca et al., 2010; Buchanan et al., 2014; Feusner et al., 2009). Nonetheless, as has been highlighted, executive functions are diverse and multifaceted, and as such the results of this study could be interpreted to suggest that while executive processes such as planning, problem solving and working memory are affected in BDD, the executive areas tested by the measures in this study including response inhibition and set-shifting may remain unaffected in this population. However, segregating these precise executive functions is difficult as many cognitive tests, including those employed in the current study rely upon a number of executive processes working together, and the tests available which reflect a singular executive process often lack the sensitivity required to identify meaningful group differences (Miyake et al., 2000) Although the four tests selected in this study are among the most established measures of executive function and have strong evidence showing their relationship with the functioning of the prefrontal cortex, they are also fairly rudimentary tests commonly used to assess patients with frank lesions to the frontal cortex resulting in profound executive difficulties (Demakis, 2004). Thus, the lack of group differences on executive functioning found in this study may be more indicative of the basic nature of the exact tests employed.

The current study found no difference between the groups on the COWAT, a phonemic verbal fluency measure. The previous study of this thesis found impaired sematic fluency among BDD participants compared to controls. This mixed result is not unusual as phonemic and semantic verbal fluency reflect different neurological processes, with semantic

fluency more reliant on the executive ability of organisation and phonemic more dependant on set-shifting abilities (Shao et al., 2014). This result therefore aligns with other findings in this current study, such as no difference between the groups on the CWIT (stroop), which is predominantly a set-shifting measure. This result is in accordance with the results of Rossell et al. (2014) who also found semantic but not phonemic fluency to be impaired in BDD.

The current study found no differences between the groups on DSB, a measure of auditory working memory. This is in contrast to the previous MCCB study of this thesis, which found impaired auditory working memory in BDD compared to controls on the LNS, although the deficit on the auditory working memory subtest was to a lesser degree than the visual working memory subtest. As established by previous research the LNS not only reflects auditory working memory but also depends on visuospatial functions (Crowe, 2000). This is opposed to DSB, which is a more pure auditory working measure. Thus in integrating these results, it may be that BDD is marked by a core visual working memory deficit, and that auditory working memory may not be uniquely or as strongly affected. This notion however requires further exploration given the small sample size used in the current study and the results of Toh et al. (2015) who did show impaired DSB in BDD.

Taking the executive function results of the previous and current neuropsychological study together, the findings suggest that BDD is not marked by gross executive impairments across the board, but rather involves more subtle differences relating to higher-order top-down processes such as planning, problem solving, organisation and the ability to hold and manipulate information ‘on-line’ (working memory), especially with respect to visual stimuli. This interpretation may support the assertions by Madsen et al. (2015) who based on their fMRI findings concluded that executive variations in BDD do not reflect gross localised brain morphometry damage but rather reflect more subtle and heterogeneous cognitive differences.

Thus, it would make sense that while BDD participants perform poorly on some executive processes others remain integral.

In contrast to the hypotheses, this study found no differences between BDD and control participants on the Navon, a task deemed suitable for comparing global versus local visual processing mechanisms. This finding is in contrast to Kerwin and colleagues (2014) who found BDD participants to be significantly slower but no less accurate than controls on both the global and local conditions of the Navon. Their result while also departing from their predictions, were interpreted to still support a bias in attention to detail in BDD, but one involving slower rather than faster processing times (Kerwin et al., 2014). Our finding however supports Monzani et al. (2013) who also found no differences between BDD and control participants on the Navon. Of note, the current study and Monzani et al. (2013) used very similar test paradigms involving administering of the local and global trails in separate blocks and using explicit instruction to the participants to attend to either the big (global) letter or the small (local) letter at the start of each block. This is notably different design to Kerwin et al. (2014) who presented the global and local trials together and asked the participants to identify a target letter, regardless of whether this letter occurred at the local or global level thus requiring the participants to flexibly shift between local and global processing throughout the test. Therefore one interpretation of these mixed results is that the BDD participant's poorer performance on the Navon task used by Kerwin et al. (2014), was because of the involvement of executive functions such as flexibility, set-shifting and/or speed of processing rather than as a result of the detailed oriented visual tendencies. In line with this interpretation the authors reported that when the BDD participants had to shift their attention between the different levels of stimuli (global verses local) that their performance worsened. Another important difference was that both the current study and Monzani et al. (2013) explicitly directed the participants to process the stimuli either globally or locally.

Another possible explanation could be that aberrant visual processes in BDD may stem from a preferred tendency towards detailed visual approaches as opposed to a more fundamental impairment per se. Thus, when give instructed to process visual material globally BDD participants may be able to momentarily adopt this practice even if this is not their natural tendency in real-life situations. Further empirical research is warranted to examine this proposal and assess how and when visual processing mechanisms in BDD diverge from typical patterns observed in controls and whether this operates as a core neurological deficit or learnt tendency. Further investigations using the Navon in BDD would benefit from adapting the stimuli to provide shorter and longer exposure times as well as contrasting conditions that rely on additional executive processes such as cognitive flexibility and set-shifting, as well as those that do not to address these remaining questions.

The current study found no differences between BDD and control participants on the CIT, a measure of perceptual organisation and contour intergration. This supports the findings from two recent publications which also did not find any difference between these particpant groups on the CIT (Rossell et al., 2014; Silverstein et al., 2015). The CIT was selected for the current study based on its gestalt qualities and the inference that it reflected global visual processing mechanisms, specifically the ability to organise small piece-sized visual elements (the contours) into a unified whole based on their attributes. However, as reflected by the group mean scores this measure demonstrated very limited score variability across all participants, with the vast majority of individuals receiving a score of 10 out of 15 for the test. Therefore care must be taken in interpreting this result as providing evidence against a global visual processing deficit in BDD. Further research should explore using other contour or gestalt stimuli to test global processing in BDD, particularly tasks which are more complex and challenging and offer greater within test variability.

The current study findings on the RCFT replicate those of Deckersbach et al. (2000b) and support the model of aberrant global (holistic) versus local (detailed) visual processing in BDD. This finding also supports the previous neuroimaging research which showed BDD participants to engage in predominant left-hemispheric detailed-oriented visual processing even in situations target stimuli would be more effectively and efficiently processed using holistic right hemispheric processing mechanisms (Feusner et al., 2011; Feusner et al., 2010b; Feusner et al., 2007). Further, our findings support the assertion that impaired global processing and an overreliance on detailed processing occurs not only for emotionally invoking appearance related stimuli but also for abstract non-appearance images (Feusner et al., 2011). This study further replicated Deckersbach et al. (2000b) by finding significantly impaired organisational approach to the RCFT in BDD participants as compared to controls, with BDD participants tending to recall information in an isolated piece-meal approach as opposed to control participants who were more likely to utilised the broad configural elements offered by the image. Due to the small sample size used in the current study, regression analysis were not feasible to explore the degree to which organisational strategy explained poor visual recall. However, as opposed to Deckersbach et al. (2000b) this study did not show significantly impaired organisational construction on the RCFT copy condition. Rather, the BDD participants constructed the image using these global elements when copying the picture, but then struggled to call upon these global structures when retrieving visual information from short-term memory. Thus, the findings of this study show that poor visual recall on the RCFT cannot be attributed to an inability to visually perceive these global attributes in the first place, but rather a difficulty associated with successfully encoding and/or retrieving this useful configural information from short-term memory.

5.4.3. Summary and clinical implications. In summary, the results of the current study support a model of aberrant visual processing and short-term memory in BDD;

specifically one involving impaired use of global mechanisms and an over focus on detailed visual elements. What is not clear is at what exact stage of the visual system do these aberrant processes take place (i.e. basic perceptual input, encoding, storage, and/or retrieval) and whether this anomaly constitutes a fundamental biological deficit (a bottom-up process) or a learnt approach and/or preference when processing visual stimuli (a top-down process). The finding of no differences between BDD and control participants on the Navon in the current study, in combination with the previous research on the Navon (Kerwin et al., 2014; Monzani et al., 2013) may suggest that BDD participants are able to accurately and efficiently engage global visual processing mechanisms when provided explicit instructions to do. This notion echoes the reflections from the previous face inversion and flaw and symmetry detection research (see chapter 3), which also inferred that aberrant visual processes in BDD could be patterned tendency and thus may be amendable to change. Given the small sample size of the current study, and the different methodologies used across the previous studies to arrive at this conclusion, future research is required to test and substantiate this notion within the one study. However, the notion that visual processing anomalies in BDD reflect a top-down mechanism which could be susceptible to modification aligns with contemporary commentary in the literature (Beilharz et al., 2017; McCurdy-McKinnon & Feusner, 2017). Refer to the general discussion of this thesis (chapter 7) for a more discussion of the theoretical and treatment implications of these findings

5.4.4. Methodological considerations. Refer to section 4.4.3 of the previous chapter, which addresses the limitations relevant to both study one and the current study with regards to sample characteristics such as the inclusion of clinical participants who are active treatment seekers, using medication and who have comorbid mental health conditions. An added limitation of this current study is its small sample size and the reduced power associated with its findings. Given the scope of this doctoral project this sample was deemed

acceptable to retain as a complimentary secondary study to the previous moderately large neuropsychological study of this thesis. Further, given the challenges recruiting this specific clinical population, samples of this size are not uncommon in the published BDD literature (Deckersbach et al., 2000b; Hanes, 1998; Labuschagne et al., 2013). Despite the reduced power associated with the small sample size this study found significant visual short-term memory deficits and organisational approach difficulties in the BDD group compared to the controls on the RCFT. These finding are further bolstered in that they replicates previous research by Deckersbach et al. (2000b) and supports the finding of visual learning/memory impairment identified in the previous larger study of this thesis. It is acknowledged that in the current study the RCFT results showed a moderate negative relationship with the RCFT accuracy scores, thus the possibility that comorbid symptoms of anxiety and depression contributed to poor visual recall can not be eliminated. This possibility however is less tenable, given the DASS-21 showed no relationship with the RCFT organisational scores in addition to depression and anxiety showing no relationship with visual learning/memory in the previous MCCB study. Nonetheless, the RCFT has proven to be an advantageous tool for studying visual processing and memory in BDD, and thus future research using a larger sample is recommended which could allow for the analysis and control of these possible extraneous factors.

5.4.5. Conclusion. In conclusion, the current study found that BDD participants did not show any significant differences to age, sex and IQ matched controls on a series of basic executive function measures reflective of inhibition, set-shifting, auditory working memory, and phonemic verbal fluency. In conjunction with the previous research pertaining to executive functions in BDD, this result was interpreted to indicate that BDD does not involve gross executive impairment across the board, but rather more subtle differences affecting more complex top-down processes such as planning, problem solving, organisation and the

ability to hold and manipulate information ‘on-line’ with particular respect to visual stimuli. This study further found that compared to age, sex and IQ matched controls participants with BDD showed impaired visual encoding and/or visual recall from short-term memory. Further, the BDD participants relative to controls demonstrated a significantly poorer organisational ability, tending to recall visual information by fragmented and disjointed single elements as opposed rather than by its global organizing features. This finding replicates those of Deckersbach et al. (2000b) and supports the theory that BDD involves impaired global visual processing mechanisms and an over-focus on detailed visual processing. It is recommended that future research further explore the role of visual processing in BDD including identification of how and when these aberrant occur, whether these processes are emendable to modification and the specificity of this finding to BDD by controlling for extraneous variables such as anxiety and depression.

PART III- QUALITATIVE ANALYSIS OF SUBJECTIVE EXPERIENCE IN BDD

6. CHAPTER 6 – A Qualitative Exploration of the Lived Experiences of Body Dysmorphic Disorder

6.1 Introduction and Rationale

As established through the earlier literature review of this thesis, BDD is a complex and distressing condition, which remains poorly understood despite receiving increased attention and exposure in the literature and media over the past two decades. The impact of BDD remains significant as reflected by high rates of unemployment, social isolation and suicidal acts (Angelakis, Gooding, & Panagioti, 2016; Phillips, Quinn, & Stout, 2008). It is also a condition that continues to be challenging to detect sufficiently early, to accurately diagnose and successfully treat via pharmaceutical and/or psychological interventions (Marques et al., 2011; Phillips, Menard, Quinn, Didie, & Stout, 2013a). Research, to date, has endeavoured to understand the clinical symptoms, underlying constructs, and possible aetiological factors associated with BDD, predominantly using quantitative methods. Such research studies have utilised approaches such as psychometric questionnaires, brain imaging and neuropsychological testing, which have been crucial to the development of the current knowledge base surrounding the disorder. This includes for example; the understanding of a continuum of insight characteristic of BDD rather than viewing BDD as a delusional disorder; identification of the many parallels between BDD and OCD resulting in the reclassification of BDD as an OCRD; the identification of core beliefs characteristic of BDD and the proposal of a cognitive behaviour model (i.e. 'self as an aesthetic object'); and the cognitive evidence indicating executive dysfunction and aberrant visual processing and memory biases underlying the disorder (Chosak et al., 2008; Feusner et al., 2010b; Phillips, 2004; Phillips et al., 2010; Veale, 2004). There has, however, been a dearth of qualitative research published in the field. Early accounts of BDD in the literature have included case descriptions, and the direction of quantitative research has been informed and driven by experts in the field, and their direct experiences working with patients with BDD (Gardiner, 1971; Phillips, 2005a). However, only a small number of research studies have systematically

approached individuals with BDD to ask about their first-hand experiences. The current study, therefore, aimed to address this gap in the literature by studying the lived experiences of individuals with BDD. It is not claimed that qualitative research provides a superior approach, but rather that such methods provide an entirely different source of knowledge. It is therefore suggested that ongoing quantitative research focusing on areas such as cognitions and beliefs, neuropsychological processes and neuroimaging integrated with experiential (i.e., qualitative) research could provide an improved level of understanding of this disorder, and lead to better treatments for BDD.

At the time the current study was designed and executed, there was only one published study of BDD utilising a qualitative method of enquiry. In the United Kingdom, Silver and colleagues (2010) interviewed 11 individuals with BDD with a combined approach of using participant's self photographs and a narrative analysis to understand the way in which people with BDD perceived their appearance (Silver & Reavey, 2010; Silver, Reavey, & Fineberg, 2010). They identified themes of increased threat perception resulting in disordered interpersonal relationships; a wish for regularity and symmetry in physical appearance; idealisation of childhood self; a sense of duty to look good; and a focus on specific details rather than on ugliness (Silver et al., 2010). The authors reported that participants responded positively to this methodology, and called for additional qualitative studies to build a deeper and richer understanding of the BDD experience.

Accordingly, further qualitative studies have emerged over the past two years. The same research group (Silver & Farrants, 2015) again utilised the photo elicitation technique with 10 individuals who self-identified as having BDD to examine their experiences of mirror gazing. Participants described mirrors as controlling, imprisoning and disempowering forces that had a crippling and paralysing impact on their lives. They experienced their reflection in the mirror as "monstrously offensive" and many described themselves by using non-human

entities. Finally, it was found that motivations for mirror gazing were complex, confusing and at times masochistic (punitive; Silvery & Farrants 2015). A recent Australian study applied an inductive thematic analysis to explore how eight individuals with BDD experienced appearance-related behaviours, including but not limited to mirror gazing. They identified three core themes that summarised the participant's experiences with BDD behaviours; routine and repetitive, safety through control, and natural and automatic. They reported that appearance behaviours in BDD were complex, and that they did not appear to follow a straightforward model of reward and punishment. They found that some behaviour, such as camouflaging through the use of make-up, could provide a sense of relief and reassurance, whereas other behaviours such as mirror checking could be experienced as highly distressing. The authors described a paradoxical pattern, whereby participants were seemingly dissatisfied with BDD behaviours, yet also derived comfort, reassurance and sense of identity from them. The authors suggested that different types or categories of BDD behaviours may exist reflecting different underlying functions and motivations for the individual (Oakes, Collison, & Milne-Home, 2016).

Finally, a recent qualitative study was published in Sweden, addressing a similar objective to the current study, namely, to explore personal experiences of living with this disorder (Brohede, Wijma, Wijma, & Blomberg, 2016). They additionally elected to focus on participant's experiences with the health care system. The authors approached this task using interpretative description, a relatively new qualitative approach originating from grounded theory. They found that notions of "imprisonment" and "abnormality" were central to the BDD experience. They identified six themes; being absorbed in time-consuming procedures, facing tensions between one's own ideal and perceived reality, a sense of becoming the disorder, feeling restricted in one's life, attempting to reduce one's problem's (through avoidance and safety behaviours), and striving to receive care but encountering difficulties

with the health care system. Participants identified various challenges in attempting to access health care supports including feeling that they were not being taken seriously or were misunderstood, a lack of knowledge specific to BDD among health professionals, a lack of referral options and having to wait a lengthy time period before accessing appropriate care. These health care findings are of course specific to the country of study yet parallel international accounts throughout the literature.

Interpretative Phenomenological Analysis (IPA) is a qualitative research method, which is increasingly being adopted in the areas of clinical, health and counselling psychology (Smith, 2011). It has been found advantageous in studying the lived experiences of other OCRDs including OCD, Hoarding Disorder and Trichotillomania (Kellett, Greenhalgh, Beail, & Ridgway, 2010; Murphy & Perera-Delcourt, 2014; Rehm, Nedeljkovic, Thomas, & Moulding, 2015). IPA goes beyond thematic description to create a rich and in-depth interpretation of how a relatively small sample of individuals perceive, appraise and "make sense" of their subjective life experiences (Smith & Osborn, 2008; Smith, 1996). IPA is respectful to the participant's knowledge and wisdom, by assuming individuals are self-reflective beings who are not only capable of, but actively seek to, engage in meaningful interpretation of the their life experiences. IPA further recognises the impossibility of directly and purely accessing an individual's psychological world, and thus, promotes a method of double hermeneutics; a dual interpretative process. Firstly, the participant is making sense of their world, and secondly, the researcher works to decode that meaning; that is, the researcher is trying to make sense of the participant's meaning making (Smith & Osborn, 2008). IPA shares with cognitive and clinical psychology a concern with mental processes, and thus, in this approach the researcher is encouraged to draw upon psychological concepts and theoretical knowledge to help guide them in making sense of the participant's perceptions, emotions and experiences. IPA values a smaller number of participants examined in depth

over a broader descriptive analysis of a large sample. While the answer to sample size is to be considered on a study-by-study basis it has been recommended that a clinical psychology doctoral thesis should aim for a sample of between 4 to 10 participants to ensure a detailed interpretative account of each cases is possible (Hefferon & Gil-Rodriguez, 2011; Turpin et al., 1997).

This study therefore aims to build upon existing qualitative research by employing IPA to study the lived experiences of individuals with BDD. It is argued that it is fundamental to study patient's personal perspectives to identify how these experiences fit within current theoretical models and treatment recommendations. It is hoped that such knowledge has the potential to enrich the literature and inform health care professionals and treatment practices. As this study uses a qualitative approach no hypotheses were generated prior to the interviews and analysis being carried out. However, important research questions exist based on the literature review and the previous research studies conducted as part of this thesis. These research questions included;

1. What were the subjective experiences of living with BDD? Further, what were the subjective experiences of specific BDD symptomology such as obsessions and compulsions, and how do these experiences fit with the current clinical descriptions and theoretical understandings of BDD?
2. What factors or aspects of living with BDD were associated with the most distress and/or impairment?
3. How did these experiences impact upon the individual's relationship with others, themselves and the world?
4. What did individuals living with BDD attribute the development of this condition to, or what function did they perceive BDD symptoms to have for them?

5. What, if any, aberrant perceptual or information processing experiences did individuals living with this condition experience? That is, did they identify any difficulties with their visual perception or cognitive control functions?[5]

6.2 Method

6.2.1. Design. A qualitative research design, using IPA (Smith, 1996; Smith & Osborn, 2008) was employed. IPA was selected due to its focus on carrying out an in-depth exploration of how a relatively small sample of individuals perceive, appraise and "make sense" of their subjective life experiences. See full detailed description of IPA in introduction above.

This study additionally incorporated a thorough clinical assessment involving examiner-administered diagnostic screening and measurement of BDD symptomatology as well as self-administered questionnaires of putative related constructs such as obsessional beliefs, perfectionism, shame and self-ambivalence. Each of these questionnaires were selected based on their relevance to current CBT models of BDD and/or other OCRD. Of particular interest, a measure of shame and self-ambivalence (uncertainty about self) have been included as despite these constructs having been considered important to BDD since early conceptions of the disorder and the continued reference to these constructs within theoretical and anecdotal accounts of the disorder, there remains limited empirical research to support an understanding of the nature and role of shame and self-ambivalence to the development and/or maintenance of BDD. The quantitative questionnaires primarily served to provide a detailed description of the sample's characteristics. Further, guidelines for the publication of qualitative studies in psychology assert that triangulation through the inclusion of external evidence such as quantitative data provides increased credibility and validity to

[5] This hypothesis was based on the findings of the previous neuropsychological studies of this thesis (see chapter 4 and 5) showing executive dysfunction and visual processing/memory impairments in BDD.

qualitative research findings (Elliott, Fischer, & Rennie, 1999). The clinical assessment and quantitative questionnaires were therefore also administered to a matched control sample to provide an appropriate comparison group for this data.

6.2.2. Participants.

6.2.2.1. Clinical participants. A convenience sample of 12 participants (7 females and 5 males) was selected based on their experience with BDD. Participants were eligible if they were aged ≥18 years of age, were proficient in spoken and written English and had a current and primary diagnosis of BDD. Participants had each been diagnosed with BDD by their treating professional and this diagnosis was further supported by the clinical assessment carried out by the student researcher (a provisional psychologist with training in these assessment processes). Participants were ineligible if they had a neurological disorder, current alcohol or drug abuse requiring clinical attention and a current or lifetime psychotic disorder. Participants with other psychological comorbidities, however, were included. All clinical participants in this study previously participated in one or more of the neuropsychological studies associated with the broader thesis, 12 of whom agreed to take part. Participants were recruited via two Melbourne based specialist BDD services (see Chapter 4, section 4.2.1. for further recruitment information).

6.2.2.2. Control participants. A convenience sample of 12 control participants (7 female, 5 male) were recruited via advertisements (see Appendix B) distributed throughout the local community (e.g. libraries, cafes, bookstores, medical centres and universities). Control participants were eligible if they were aged ≥18 years, were proficient in spoken and written English and had no current or past mental health diagnoses. This control group served as comparison for the quantitative measures only and were carefully selected to ensure group wise matching on age, gender and years of education.

6.2.3. Measures. Several quantitative clinician-rated measures were used to assess BDD symptomology and severity, and to screen for comorbid diagnoses in the BDD group. Relevant measures were also used to screen control participants to ensure they did not meet criteria for a mental health disorder. All participants completed quantitative questionnaires measuring obsessional beliefs, perfectionism, shame and self-ambivalence. Demographic information and diagnostic assessments did not require re-administration for the BDD participants as this data was already obtained in the earlier studies associated with this thesis and thus remained valid. However, measures of current symptoms that were time-specific (i.e., those asking participant to rate themselves based on the past 1-2 weeks) were re-administered to ensure accuracy of this data. The control group completed all measures except for the BDD-YBOCS, the BABS and the Semi-Structured Qualitative Interview.

A *Clinical Demographic Record Form* (Appendix C) was administered to all participants to gather demographic information and relevant personal history including age, gender, ethnicity, education and medical history.

The *MINI International Neuropsychiatric Interview* (MINI 6.0; Lecrubier et al., 1997; Sheehan et al., 1997) is a short structured interview, which assesses the major psychiatric disorders of DSM-IV and ICD-10. The MINI has good convergent validity with the Composite International Diagnostic Interview (CIDI) and the Structured Clinical Interview for DSM Disorders (SCID-P). It also has excellent inter-rater (.88-1) and test-retest reliability (.76-1; Lecrubier et al., 1997; Sheehan et al., 1997). The measure was used to identify any comorbid diagnoses. Where comorbidities existed, the examiner explored the participant's symptomology to ensure BDD was still the primary clinical presentation.

The *Body Dysmorphic Disorder Diagnostic Module* (BDD-DM; Phillips, 1994; Appendix D) a reliable clinician-administered diagnostic tool was administered to all participants to screen for BDD based on DSM-IV criteria. This measure was included to

compliment the MINI 6.0, which does not specifically assess for BDD. For the purposes of this study the Phillips' BDD-DM was adapted with the addition of an extra criterion (the presence of repetitive behaviours over the course of the disorder) to reflect the latest DSM-5 changes to BDD (See Appendix D). The BDD-DM has been found to have excellent agreement with the Body Dysmorphic Disorder Questionnaire (Dufresne et al., 2001).

The *Depression Anxiety Stress Scales-21* (DASS-21; Lovibond & Lovibond, 1995; Appendix G) is a 21-item self-report scale designed to measure symptoms common to both depression and anxiety in both clinical and non-clinical populations. The scale is comprised of three subscales (Depression, Anxiety and Stress) each with seven items that are rated on a 4-point Likert scale from 'never' to 'almost always'. The DASS-21 subscales have demonstrated good internal consistency (range of $\alpha = 0.82 – 0.94$), divergent validity, and convergent validity in clinical and non-clinical samples (Antony et al., 1998; Henry & Crawford, 2005).

The *Yale-Brown Obsessive Compulsive Scale Modified for BDD* (BDD-YBOCS; Phillips, Hollander, Rasmussen, & Aronowitz, 1997: Appendix H) is a 12-item semi-structured clinician administered interview that assesses BDD symptom severity during the last week. The BDD-YBOCS produces subscale scores for Obsessions (range 0-20), Compulsions (range 0-20) and Insight/Avoidance (range 0-8), as well as a total symptom severity (range 0 to 48). The BDD-YBOCS has good test-retest reliability (.88), internal consistency (.80) and excellent inter-rater reliability for the total score and subscales of the measure (.79-1). The BDD-YBOCS is a valid measure showing appropriate convergent and discriminant validity (Phillips et al., 1997).

The *Brown Assessment of Beliefs Scale* (BABS; Eisen et al., 1998; Appendix I) is a 7-item clinician-rated scale that measures the degree of conviction and insight associated with a primary obsession or delusional belief over the past week. The BABS assesses the persons conviction that their belief is accurate, perceptions of others views of the belief, possible

explanations for any differences between the person's beliefs and that of others, and whether the person could be convinced that their belief is not accurate and ideas of reference related to the belief. The first 6 items are summed to create a dimensional total score ranging from 0-24 where higher scores indicate poorer insight. As a categorical measure this measure also provides cut-points for classifying the total score according to categories of insight (excellent, good, fair, poor and delusional). Phillips et al. (2013b) evaluated the psychometric properties of the BABS in a large BDD sample and found it had good inter-rater reliability (.96), test-retest reliability (.77) and internal consistency (.87) and demonstrated good discriminant validity.

The *Obsessive Beliefs Questionnaire* (OBQ-44; OCCWG, 2005; See Appendix N) is a 44-item self-report scale that measures beliefs associated with OCD across three subscales; responsibility and threat estimation (RT: "Harmful events will happen unless I am careful") perfectionism and certainty (PC: "I must be certain of all my decisions") and importance and control of thoughts (ICT: "Having nasty thoughts means I am a terrible person"). The OBQ-44 has good internal consistency (.90-.93) and strong correlations with other OCD measures (Tolin, Worhunsky, & Maltby, 2006).

The *Frost Multidimensional Perfectionism Scale* (FMPS; Frost, Marten, Lahart, & Rosenblate, 1990; Appendix O) is a 35-item self-report measure of perfectionism consisting of six subscales; Concern Over Mistakes (CM), Doubts About Actions (D), Personal Standards (PS), Parental Criticism (PC) Parental Expectations (PE) and Organization (O). Internal consistency for the subscales range from .77 to .93 (Frost et al., 1990). The scale shows good construct validity with high correlations with other perfectionism scales (Burns, 1983; Garner, Olmstead, & Polivy, 1983). It also demonstrates good construct validity with low correlations with depression scales (Blatt, D'Afflitti, & Quinlan, 1976).

The *Experience of Shame Scale* (ESS; Andrews & Hunter, 1997; See Appendix P) is 25-item self-rated questionnaire which measures three areas of shame; Character (shame about personal habits, manner with others, what sort of person you are and personal ability) Behaviour (shame about doing something wrong, saying something stupid, and failure in competitive situations) and Body (feeling ashamed of one's body or body parts). Each item is rated on a 4-point scale indicating the frequency of experiencing, thinking about and avoidance in relation to any of these three areas of shame in the past year. Scores are totalled allowing total score of between 25-100. The ESS has been shown to have high internal consistency for total score ($\alpha = .92$), characterological shame ($\alpha = .90$), behavioural shame ($\alpha = .87$) and bodily shame ($\alpha = .86$). The ESS also demonstrates good test–retest reliability when measured over 11 weeks ($r = .83$; Andrews, Qian, & Valentine, 2002)

The *Self-Ambivalence Measure* (SAM; Bhar & Kyrios, 2007; See Appendix Q) is a 19-item self-rated questionnaire measuring self-ambivalence, which is defined as a preoccupation with a changeable and dichotomous self-concept. Guidano and Liotti (1983) conceptualise self-ambivalence as the presence of conflicting beliefs about self-characteristics, uncertainty about self-worth, and a preoccupation with establishing the "truth" about one's moral standing, lovability and self-worth. Example items include " I have mixed feelings about my self-worth", "I question whether I am morally a good or a bad person" and "I feel I am full of contradictions". Questions are answered on a five-point scale ranging from "Not at all" to "Agree totally". Total scores range from 0-76 with higher scores indicating greater self-ambivalence. The SAM has demonstrated satisfactory psychometric properties with good reliability, divergent and convergent validity (Bhar & Kyrios, 2007; Tisher, Allen, & Crouch, 2014). The SAM has been shown to significantly related to obsessive-compulsive symptoms and related beliefs and to discriminate between those with

OCD and healthy controls, although not between individuals with OCD and other anxiety disorders (Phillips, Moulding, Kyrios, Nedeljkovic, & Mancuso, 2011).

A *Semi-Structured Qualitative Interview* was developed by the authors to explore participants' subjective experience of living with BDD (refer to Appendix R). As per the qualitative approach of IPA a small set of standard questions and prompts were developed which enquired about 1) onset and early course of BDD; 2) thoughts, emotions and behaviours associated with BDD; 3) impact of BDD on every-day life; and 4) participant's reflections on the aetiology and function of BDD symptomology. There was a focus on establishing rapport and a sense of safety before exploring more sensitive issues, on being flexible with the ordering of questions, on following the participant's line of interest and on using brief and clear questions and/or prompts to gently steer the interview and support transitioning between topics. The interview technique of 'funneling' was used such that the interviewer asked questions about broad topics first to allow the respondent to reflect general views followed by using prompts and probes to direct the participant to a more specific points. Each interview commenced with the statement and question of *"I am interested in understanding your personal experiences of Body Dysmorphic Disorder and the meaning you attribute to experiencing these appearance based concerns. Could you start by telling me about what Body Dysmorphic Disorder has been like for you?".* Participants were encouraged to consider their beliefs, explanations, and the meaning they attributed to each aspect of their BDD experience.

6.2.4 Procedure. Participants completed the battery of quantitative questionnaires prior to attending an interview with the student researcher. The interview was held at either St Vincent's Hospital or Swinburne University, depending on what was most convenient for the participant. Informed consent was obtained via the relevant PICFs (See Appendix L and M). All relevant structured clinical interviews were completed first prior to commencing the

qualitative interviews. BDD participants were then instructed that for this component of the study the researchers were interested in learning about their unique experiences and views regarding their experiences of BDD. Each of the qualitative interviews took between 60 to 90 minutes. The project has approval by both the Swinburne University and St Vincent's Hospitals' Human Research Ethics Committees (See Appendix J and K). Participants were reimbursed at a rate of $25 per session.

6.2.5 Data analysis.

6.2.5.1. Quantitative data analysis. One-way between-groups analysis of variance (ANOVA) were used to compare the BDD and control groups on basic demographics (age and years of education) to ensure appropriate matching of the groups. Further one-way between-groups ANOVA were conducted on each of the quantitative questionnaires to assess for any significant group differences. A more stringent p value of $P \leq 0.01$ was utilised to control for the number of analyses conducted and to minimise the chance of type 1 error. Where significant group differences existed Pearson's correlations were conducted to explore the relationships between the variable of interest with BDD symptom severity (BDD-YBOCS) to determine whether a relationship existed. A p value of $P \leq 0.01$ was also applied to the Persons correlations to adjust for multiplicity.

6.2.5.2. Qualitative data analysis All qualitative interviews were recorded, transcribed verbatim and analysed according to the qualitative methodology of IPA (Smith, 1996; Smith, & Osborn, 2008). Following Smith and Osborn's (2008) recommendations, a complete and detailed analysis of each participant's interview in its own right occurred before moving onto the next participant. This process involved the student researcher listening to and re-reading the interview transcript several times, while making written annotations regarding points of interest. The next step involved further developing the initial commentary into more concise phrases, which involved a move towards theoretical concepts and

psychological terminology (i.e., interpretation), which results in a chronological list of initial themes. Care was taken throughout each step of this process to check and ensure that the developing themes remained grounded in the source material. Next, themes were clustered through looking for connections and a sense of order, such that emerging superordinate (higher order) and subordinate (lower order) themes were created for the individual participant with reference to key quotes from the source material. This process was then repeated in full for each of the remaining participants. The student researcher then compared and contrasted the 12 participants' theme tables, searching for connection and relationships across the sample. Factors such as prevalence (to an extent), richness of passages and level of meaning held by the participants were used to guide the decisions about which final themes to include.

Following credibility guidelines for qualitative research (Elliott, Fischer, & Rennie, 1999), clean interview transcripts, and the table of superordinate and subordinate themes were supplied to a co-investigator and Psychologist, Dr Imogen Rehm, who has expertise in OCRD research and the qualitative methodology of IPA. This allowed for themes to be checked against the transcripts for their perceived relevance, importance, prevalence, and interpretation. Furthermore, several meetings were held between the research student and co-investigator during each step of the process and themes were discarded if they had low prevalence within transcripts, were not supported by rich evidence, or could be subsumed under other themes. Contrasting opinions were then resolved with the input of the primary supervisors, Clinical Psychologist, Dr Neil Thomas, and Researcher, Professor Susan Rossell. A copy of the final themes table was also supplied to co-investigator and BDD specialist, Professor David Castle, for validation in the clinical setting.

6.3. Results

6.3.1. Demographics and characteristics of the clinical sample. The 12 BDD

participants ranged from 19 to 64 years of age (*M*=38.17, *SD*= 13.37). Participants self-reported a duration of illness since onset ranging between 6 months to 48 years (*M*=16.23, *SD*= 14.08) and a duration of illness since professional diagnosis ranged from 6 months to 9 years (*M*=4.56 years, *SD*=3.14). The pooled background characteristics of these participants are summarised in Table 6.1.

Table 6.1.

Background characteristics of the BDD participants.

		Participants (n=12)
Gender		
	Female	7 (58%)
	Male	5 (42%)
Employment Status		
	Employed (fulltime)	7 (58%)
	Unemployed (due to disability)	3 (25%)
	Student (fulltime)	1 (8%)
	Retired	1 (8%)
Educational Attainment		
	Post Graduate Degree	4 (33%)
	Undergraduate Degree	3 (25%)
	Vocational Program	1 (8%)
	Secondary School	3 (25%)
	Primary School	1 (8%)
Relationship Status		
	Single (never married)	8 (67%)
	Defacto relationship	2 (17%)
	Married	1 (8%)
	Separated/Divorced	1 (8%)
Nationality		
(country of birth)	Australia	11 (92%)
	South Asia (Indian subcontinent)	1 (8%)

As summarised in Table 6.1, the majority of clinical participants were currently employed on a fulltime basis, with three participants (25%) currently unemployed due to the impact of BDD. Of note, most of the participants who were currently working described periods of unemployed, taking leave from their work duties or having lost employment in the past due to the impact of BDD. The participants in this study were highly educated with an average total number of years of education of 16.54 (*SD*=3.83) and the majority having attained higher education qualifications. The sample was predominantly single with 75% of participants currently single (never married or separated/divorced) as opposed to 25% who were currently married or in defacto relationships. While participants identified with a diverse range of ethnic backgrounds, 92% of the sample were born in Australia.

Consistent with other BDD samples (i.e. Oakes et al., 2016), the majority of the participants (9 out of 12) had at least one other psychiatric condition with the total number of comorbidies per participant ranging between 0 to 3. Comorbidities included; Major Depressive Disorder (7 participants; 58%), General Anxiety Disorder (7 participants; 58%), Obsessive Compulsive Disorder (2 participants; 17%) and Trichotillomania (1 participant; 8%). Four participants (33%) endorsed experiencing current suicidal ideation ranging from 'mild' to 'high risk' as measured by the MINI. While only one participant had a current diagnosis of Trichotillomania, a number of the participants (all female) described sub-threshold hair pulling and skin-picking behaviour. Three female participants reported past diagnoses of Anorexia Nervosa and/or Bulimia Nervosa but no longer met criteria for a current eating disorder. Personality Disorders were not assessed in this study. Four participants (33%) had undergone cosmetic surgery on their body part of concern/s, all of whom had completed more than one surgery and remained unsatisfied with their appearance. Seven participants (58%) were currently being treated with psychiatric medication, most commonly antidepressants. Finally, all participants in this study were currently or recently

engaged with a mental health professional (a psychiatrist or psychologist) and thus all participants were receiving some form of intervention in relation to their BDD. Detailed information regarding the nature and phase of treatments were not collected.

On average**,** the participants were preoccupied with 3 body parts of concern, with a range of 1 to 5. Consistent with the research, the most common concerns related to skin complexion (e.g., acne, scars, skin conditions, freckles, moles), hair (e.g., head hair loss, excessive or too dark body hair) and facial features (e.g., the shape or size of the nose, eyes, or lips). One of the 12 participants met criteria for the Muscle Dysmorphia form of BDD. Table 6.2 presents a summary of the BDD appearance concerns and how common each of these concerns were within this sample.

Table 6.2.

A Summary of BDD Appearance Concerns

Body Part of Concern	**Number of Participant's Endorsing**
Skin Complexion	5 (42%)
Hair	5 (42%)
Head	1 (8%)
Face	4 (33%)
Nose	3 (25%)
Eyes	2 (17%)
Eyebrows	1 (8%)
Teeth	2 (17%)
Mouth	1 (8%)
Cheeks	1 (8%)
Ears	1 (8%)
Lips	1 (8%)
Jaw	1 (8%)
Chin	3 (25%)
Neck	1 (8%)
Breasts	2 (17%)
Genitals	1 (8%)
Body Frame/Body Symmetry	1 (8%)
Body Weight/Body Shape[b]	3 (25%)

Note:

c. No subject was excessively concerned with body shape or weight alone.

d. As patients experienced multiple areas of concerns the total number of patients experiencing these concerns exceeds the total number of patients. All clinical participants with multiple areas of concern however were able to identify their most prominent one.

The BDD-YBOCS scores showed that on average the sample's BDD symptom severity was classed in the 'Moderate-Severe' range; total score (M=23.42, *SD*=6.64, Range= 14-36), obsession subscale (M=11.08, *SD*= 3.03, Range= 7-16), compulsion subscale (M= 9.08, *SD*= 1.68, Range= 1-15) and insight/avoidance subscale (M =3.08 *SD*=1.68, Range= 0-7). The average BABS score (M=11.27, *SD*=3.93, Range= 7-19) classified the sample as overall as having 'fair' insight into BDD beliefs. Only one participant met Eisen and colleagues' (1998) criteria for 'delusional' conviction associated with their BDD belief (a total score of ≥18 and a score of 4 on item 1, which relates to conviction). The remaining sample demonstrated either 'poor' or 'fair' insight, with one participant demonstrating 'good' insight according to the BABS categorical system. On average, BDD onset occurred at 21.75 years (*SD*=12.24), however, the majority of participants experienced much earlier onset, which is more accurately reflected by the median onset of 16 years of age.

6.3.2. Quantitative results. Table 6.3 presents the mean, standard deviations and ANOVA results comparing the BDD and control group on age, years of education and each of the quantitative questionnaire constructs.

The BDD group scored significantly higher than the control group on the DASS-21 total score and the subscale specifically measuring depression symptoms. While the BDD group also scored higher on the subscales of anxiety and stress these differences did not reach statistical significance.

The BDD group demonstrated higher rates of obsessional beliefs as measured by the OBQ-44. These differences were statistically significant on the OBQ-44 total score and the subscale of Perfectionism and Certainty (PC). However, the OBQ-44 did not demonstrate any correlational relationship with symptom severity as measured by the BDD-YBOCS.

Self-Ambivalence as measured by the SAM was also elevated in the BDD group as compared to the control group, however, while there was a trend towards significance

(P=0.017) this did not reach the applied alpha level of P≤0.01. Given this trend, Persons correlations were conducted revealing a strong positive correlation between self ambivalence and BDD compulsions as measured by the BDD-YBOCS Compulsions Subscale (*r*=. 859, p=. 001) suggesting a possible relationship between self-ambivalence and BDD symptomology, specifically engagement in BDD compulsions.

Shame as measured by the ESS was significantly greater in the BDD group compared to the controls. Of note, this applied not only to total ESS score and the bodily shame subscale but was also reflected on the characterlogical shame subscale, but did not reach significance on the subscale of behavioural shame. The ESS total score showed a moderately positive relationship with severity of BDD compulsions as measured by the BDD-YBOCS compulsions subscale (*r*=. 795, p=. 003) indicating a possible relationship between experiencing shame and engaging in BDD compulsions.

Finally, the BDD group showed higher levels of perfectionism as compared to the control group as measured by the FMPS. These differences however only occurred on the FMPS total score, and the subscales of 'Concern Over Mistakes' and 'Doubting of Actions' but not the other four subscales of perfection, suggesting that these specific elements of perfectionism may be especially pertinent to BDD. These perfectionism scores however did not show any significant correlations with BDD symptom severity.

Table 6.3.

Means, Standard Deviations and ANOVA result for Quantitative Measures of Body Dysmorphic and Related Symptoms.

Measure	BDD	Control	Group Comparisons			
	Mean (SD)	Mean (SD)	F	df	p	d
Age	38.17 (13.37)	33.69 (10.13)	.899	1,22	.353	0.38
Years of Education	16.54 (3.83)	17.04 (2.17)	.162	1,22	.691	-0.16
DASS-21 Total	15.58 (8.90)	6.15 (5.41)	10.44	1,22	.004*	1.28
DASS-21 Depression	6.17 (4.17)	2.38 (2.06)	8.46	1,22	.008*	1.15
DASS-21 Anxiety	3.17 (3.19)	1.08 (1.66)	4.34	1,22	.049	0.82
DASS-21 Stress	6.25 (4.61)	2.69 (3.04)	5.27	1,22	.031	0.91
SAM total	37.92 (17.10)	23.38 (10.47)	6.69	1,22	.017	1.03
OBQ-44 Total	154.75 (64.76)	93.85 (26.21)	9.22[a]	1,22	.009*	1.23
OBQ-44 Responsibility/Threat	57.00 (23.01)	35.85 (10.63)	8.47[a]	1,22	.011	1.18
OBQ-44 Perfectionism/Certainty	65.50 (28.35)	35.92 (11.38)	11.37[a]	1,22	.004*	1.37
OBQ-44 Import/Control Thoughts	32.25 (17.04)	22.08 (7.40)	3.65[a]	1,22	.076	0.77
ESS-Total	67.83 (20.77)	39.38 (11.28)	16.68[a]	1,22	.001**	1.70
ESS- Characterlogical Shame	31.42 (10.07)	17.46 (4.61)	19.32[a]	1,22	.001**	1.78
ESS- Behavioural Shame	23.42 (8.73)	15.85 (7.07)	5.72	1,22	.025	0.95
ESS- Bodily Shame	13.00 (3.05)	6.08 (1.66)	50.98	1,22	<.001**	2.82
FMPS-Total	110.67 (25.14)	86.62 (14.85)	8.65	1,22	.007*	1.16
FMPS-Concern Over Mistakes	27.92 (9.43)	17.85 (5.35)	17.12[a]	1,22	.005*	1.31
FMPS- Personal Standards	23.00 (6.34)	19.54 (4.94)	2.34	1,22	.140	0.61
FMPS- Parental Expectations	13.67 (6.23)	13.15 (4.16)	0.06	1,22	.809	0.10
FMPS- Parental Criticism	10.75 (5.05)	7.15 (3.53)	4.32	1,22	.050	0.83
FMSP-Doubting of Actions	13.92 (4.12)	7.46 (2.37)	17.25[a]	1,22	<.001**	1.92
FMPS-Organisation	21.42 (4.72)	21.46 (4.93)	0.00	1,22	.982	-0.01

Note: **= p≤ .001 (2-tailed), *=p≤. 01 (2-tailed), a = Welsh statistic used, d = Cohen's d effect size, DASS-21 = Depression, Anxiety and Stress Scale, SAM= Self Ambivalence Measure, OBQ-44= Obsessive Beliefs Questionnaire, ESS= Experiences Shame Scale, FMPS= Frost Multidimensional Perfection Scale.

6.3.3. Qualitative results. The IPA analysis identified three master themes, each reflecting core subjective experiences of living with BDD. The master (superordinate) and secondary (subordinate) themes are presented in Table 6.4. Each of the themes are further detailed in the text below and are exemplified using extracts from the original data. Pseudonyms have been used to protect the privacy of the participants. In the data extracts "…" signifies omitted data.

Table 6.4.

Superordinate and Subordinate Themes of the Interpretative Phenomenological Analysis

Superordinate Themes	Subordinate Themes
Consumed by the Disorder	▪ Controlled by One's Thoughts and Behaviours ▪ Trapped Within One's Body ▪ Hopelessness and Ruminating about Death as an Escape ▪ Lost Opportunities and Impact on Relationships
The Flawed Self	▪ External Flaw as a Symbol of One's Inner Flawed Self ▪ Self as Fundamentally Abnormal ▪ Objectified and Exposed Self
Intolerance of Uncertainty	▪ Not Just Right Experiences ▪ Focus on Detail Over the Whole ▪ Doubt and Uncertainty

- Seeking Certainty and Control Through Confirmation

6.3.3.1. Consumed by the disorder. Participants described the experience of living with BDD as all consuming and a constant struggle. Some reported that BDD had taken over their lives or that it had become a part of them. Overall, this first master theme highlights the all-consuming nature of BDD symptoms, the discomfort and distress associated with one's physical embodiment and the functional impact of these experiences, each explored further within the sub-themes below.

6.3.3.1.1. Controlled by one's thoughts and behaviours. Participants reported feeling controlled and tormented by obsessive thoughts and compulsive behaviours, and feeling unable to resist and escape these experiences. They reported being preoccupied with intrusive thoughts relating to their body part of concern for a significant proportion of the day. Compulsive behaviours were also a central part of the BDD experience for all participants in this study. In exploring the purpose of these behaviours the participants identified two core functions; one being an attempt to improve or hide the body part of concern, which could be conceptualised as safety behaviour. The other stemming from a strong desire "to know the truth" regarding their appearance; that is, to gather evidence to confirm or disprove their "deformed", "ugly" or "unacceptable" appearance. Participants reported that this latter *investigative* type behaviour was accompanied with much more distress and that these behaviours often felt disconnected from a rational logic. That is, they felt compelled to engaging in these mental processes and behavioural routines with little control over ceasing them despite knowing that they would most likely be unhelpful or lead to increased distress.

Many of the participants reported that while their general concern with appearance has remained relatively constant, the degree of obsessive thoughts, compulsions and associated distress has fluctuated significantly over the course of the disorder. Participants

for example, referred to the more challenging times as “episodes” or as periods of being “unwell” and also referenced times in which they felt their symptoms improved. Participants reflected a sense of helplessness relating to these more severe episodes of the disorder, with some referring to “the BDD” as a distinct entity that had the capacity to hijack or take a hold over them.

> *I don’t even know how they crept back in. But within one week it was back to googling procedures, taking time off work and just not being able to concentrate on anything else… When it was really bad I can’t drag myself away from the mirror. I would be standing there staring at it for hours, I couldn’t stop, I couldn’t drag myself away because I needed to be looking at it* (Rose).

Another participant, a young adult who only recently developed BDD, described how he very suddenly perceived a skin pigmentation on his face and the way in which this has consumed his life since:

> *It just came out of nowhere. I looked in the mirror and I saw it. I see it so clearly every time I look in the mirror. I don’t understand why other people can’t. I mean not one person has commented on it in 5 months… It was the only thought I could think about 24/7. I would go to the mirror 50 times per day. I couldn’t sit still and I just kept checking the mirror, taking videos of myself, photographs on my phone, inside the house, outside the house, in different rooms, different mirrors, different lighting, asking my family, asking my friends* (Julian).

Daniel, who has experienced a longer duration of BDD, described how he has felt anguished by BDD thoughts and behaviours over the years:

> *It was this obsessiveness of looking at others and then just these constant thoughts over and over, nearly all day long. It would never leave my mind, no matter what I tried to do, I just couldn't push it away, it was always there… I was constantly feeling it* (participant touches his nose with his fingers), *constantly going to the mirror and thinking 'does it look okay here?' and then trying to avoid the mirror. But then I am looking at other reflections or looking at photos close up and it was just, it was constant… Just over and over just like a nightmare. It was the thoughts, its what I did with it and everything else involved. It has dominated my life so much*. (Daniel).

The tone of the extracts above and the way in which the participants jumped from listing one behaviour to the next illustrates the lack of control and consuming nature of these sequences of behaviours. Participants reported finding themselves stuck in checking routines and feeling compelled to complete every possible option associated with the behaviour, such as changing the location, lighting, angle, or the mirror used. Participants repeatedly referenced being driven by the need to know exactly how they looked but were often felt feeing puzzled, not knowing which of the images they should trust, that is, which represented their 'true' appearance.

Notably, while the use of mirrors played a central role for many participants there were also a number of other visual and tactile methods used to perform checking behaviours. These included taking photographs and videos, with some participants storing files on computers and their mobile phones and using zoom and editing functions to evaluate the body part. A couple of participant's kept diaries where they documented information including pictures, writing, and measurements about the body part of concern over time. An alternative method used by one participant was creating a paper-cut-out, which she measured to match the diameter and shape of a scar and then kept the paper-cut-put in her pocket so

that she could check it from time to time. The participant reported that this was initially helpful as she could simply reach down and look or even just touch the paper-cut out with her fingers for reassurance, however, she would always eventually come to doubt to the accuracy of the substitute and would need to step-up the checking method (i.e. find a mirror and/or create a new cut-out).

6.3.3.1.2. Trapped within one's body. Another subtheme, which sits within the master theme of feeling consumed by disorder, was the sense of being trapped within one's body. Participant's described a sense of discomfort, or for many, an extreme distress associated with their physical embodiment. They felt their body was "not right" or even fundamentally wrong. For many participants they reported that one of the most difficult aspects of the BDD experience was the sense of fear and dread associated with a fear of being stuck within their body for the rest of their lives. Despite the specificity of their body concerns (e.g., the shape of a nostril), participants simultaneously expressed a broad sense of generalised distress associated with their physical embodiment. Tom explained the experience by likening it to Gender Dysphoria:

> *I feel* (pauses) *I don't know how else to describe this other than when you have a male that feels he is trapped in the wrong body because they feel female. I feel like I'm trapped in the wrong man's body, I still want to be a man but I'm trapped in the wrong man body because my body just won't change*. (Tom)

Abigail's account illustrates the sense of shame and disgust she experienced surrounding her physical embodiment:

> *I felt ashamed and anxious that I would have to live in my body for the rest of my life, that I wasn't good enough and that I wasn't lovable. Terror and panic that I can't remove those moles, trying to cut them out with nail clippers,*

> *picking them off, scratching them, and putting creams on them to get rid of them… this complete anxiety that I would have to live in this body for the rest of my life; disgusted by the way I look.* (Abigail).

6.3.3.1.3. Hopelessness and ruminating about death as an escape. All participants identified experiencing a strong sense of hopelessness and futility at some stage of their experience with BDD. Participants described an inability to experience any pleasure or happiness during these most challenging periods. More than half of the sample described periods where they contemplated suicide or had made a suicide attempt due to their experiences with BDD. The sense of hopelessness and the desire to escape came from different places depending on the person and the context. For example, some described this response when reaching a conclusion that they were unable to change their body or accept living with it. Whereas, others reported feeling so exhausted and depleted by relentless symptoms that they longed to escape to gain a sense of peace.

Julian described that after consulting numerous medical professionals who were unable to assist him he went from feeling panicked to deeply despondent. He reported:

> *I just couldn't enjoy anything. I just stopped enjoying the things I used to enjoy. I just couldn't concentrate on them because they felt insignificant compared to this. I came to look forward to sleeping because that would be the only time where I could actually forget about it…I sort of take comfort in knowing that it's not going to last forever. That I am going to die one day, so you know, even if it does last my entire life it's going to be over some day. That sort of gives me hope, but that is a bleak sort of attitude* (Julian).

The following statement from Daniel reflects both the previous subtheme of feeling trapped within one's body, and the current subtheme of hopelessness and a desire to escape himself and his experiences. He shared:

> *At its worst, I have not wanted to go on anymore, when feeling it is always going to be like this, it is exhausting. Feeling I can't deal with this, it is just too much. I just need to get rid of this. I have even thought I just wanted to cut it* (nose) *off completely and put something else on, like a prosthetic. Or that I'd rather not be alive and living with these emotions. I have thought I wish I could just go to bed and not get back up again. Or to get back up and all of a sudden I don't have this anymore*. (Daniel).

6.3.3.1.4. Lost opportunities and impact on relationships. Participants reported that BDD infiltrated most aspects of their lives including work, studies and relationships. Some expressed feeling held back as a consequence of BDD and unable to pursue their goals and dreams:

> *BDD is very debilitating; it holds you back from so many things. I feel I could have been and done so many things* (Mara).

> *I could have done things. I could have got married* (Ivan).

Participant's expressed guilt and shame associated with believing they were a burden to their partners, friends and family. Rose spoke of the impact on her marriage:

> *"It has really impacted on my relationship with my husband, he is really supportive, but it is just the fact when it is really bad everything is a struggle and no experience with him are enjoyable because everything is just so flat and sad… My husband once said there was an entire week, and I know he is*

> *not exaggerating, where the only conversations we had involved me talking about my scar. I mean for an entire week, it was the only conversation I had with him!* (Rose).

Nine of twelve participants were currently single and many associated their relationship status with BDD. A number of participants reported feeling they were unable to be in an intimate relationship; some felt too unattractive to be accepted by another, others feared that being in relationship would be exposing, that BDD symptoms would be exacerbated in an intimate relationship, while others recalled how past relationships had been significantly affected by their appearance concerns:

> *It has created a barrier between me and other people. It is particularly prominent in relation to romantic endeavours* (George).

> *In the past, I was in a relationship where I told my boyfriend that he wasn't allowed to look at my face at all and if he did look I would get really upset with him* (Stephanie).

> *I feel uncomfortable getting to know someone beyond a sexual relationship, it's because I wouldn't want them to know* (trails off). *I feel they would know* (pauses) *that I have nothing else to offer and I wouldn't want them to sort of get to know me and find out there is nothing there* (Tom).

Most participants reported feeling supported by key people in their lives, although many still expressed concerns that others didn't understand them and worried that they that they may be judged as vain or somehow inept due to their BDD.

> *My friends just can't get their head around it. Especially the fact that I am not working because of it. They must think I am slack! I have ruined a lot of*

friendships because of this. It's just the relentless thing that I am still talking about it. I mean it must just sound pathetic, you know they like have real life stress (Mara).

6.3.3.2. *The Flawed Self*. Participants invariably viewed themselves as being fundamentally flawed. They expressed a deep sense of shame and guilt, which was associated with not only their physical appearance but also pertained to the "self" more broadly. Participants felt acutely self-conscious, had a heightened awareness of their physical body, and were fearful of being seen by others, resulting in them feeling vulnerable, exposed and wanting to hide from the world.

6.3.3.2.1. External flaw as a symbol of one's inner flawed self. A clear yet implicit theme emerged throughout the interviews, which involved the external body flaw being a manifestation of an inner flawed person. This theme was so strongly embedded in the participant's experiences that they interchangeably spoke about the qualities of their physical body part and their inner self as if they were one and the same thing. Participants struggled to explain this intrinsic connection but suggested that people would somehow "know" or be able to "see" inner negative personal qualities such as weakness, inadequacy, inferiority or badness by simply viewing their body concern. It was as though the participants believed that if others were able to detect the physical flaw, this would somehow also be a confirmation of their inner flawed being. In accepting this experience it is not difficult to understand why individuals with BDD are therefore so concerned and distressed by these appearance concerns, which represent something far beyond the physical exterior.

Illustrating this subtheme, Evelyn reported that the belief that she was a bad person preceded her appearance preoccupation. She recalled that as an adolescent she experienced the intrusive thought that she was "bad person" and felt she was responsible for the suffering and death in the world. She explains

> *I had this bolt out of the blue that I was this bad person, like undeserving and bad and therefore ugly, you know. And for some reason it had to do with my mouth* (Evelyn).

Stephanie also believed her appearance somehow spoke to her personal morals;

> *I believe that if people were looking at me they would think I'm ugly, like, that's the first thing they would think 'UGLY', and that would somehow also correlate with me being a bad person* (Stephanie).

Julian similarly thought his physical appearance communicated something about him, which was indicated when the interviewer asked him what it would mean if others were to be able to detect the skin pigmentation that only he had so far been able to see. He replied, "*That I am everything they think I am. That, you know, I'll be lonely, alone forever, laughed at and stared at".*

6.3.3.2.2. Self as Fundamentally Abnormal. Participants viewed themselves as fundamentally abnormal and different. It was evident that participants did not simply view themselves as imperfect, less attractive than they aspired to be or as failing to reach a high beauty standard, but rather that they experienced themselves as inherently defective, abnormal and wrong. Many of the participants reflected that these feelings of abnormality predated their BDD onset.

> *I just feel different to others. Like I am maybe even an outcast. Just feeling there is something not right. I feel inferior to others in a sense, and that is what I have always felt. That sense of inferiority and intimidation and feeling less than* (Daniel).

I think who would want to be with someone like me, like a skinny guy. I wouldn't want to be with me like this, why would anyone else? Because I am just not (pauses) *I just don't feel like- normal* (Tom).

I think its loneliness. Not belonging. No one loves you. I think that has always been there. Yeah, I never felt like I belonged or wasn't really liked by other people, there was something wrong with me (Julian).

*I feel like, and I have been told that, I look like an alien. It is just not what a girl is supposed to be (*Mara).

I guess I just felt unworthy and un – like, unlovable based on my appearance. I honestly believe that every time someone would look at me they would be looking at my flaws. That was what they would focus on and I had many. (Stephanie).

These quotes speak to the strong sense of shame and guilt associated with the belief that one is abnormal. Some participants felt so ashamed about their appearance that they were concerned that exposing themselves to others was somehow offensive or harmful;

"I went out at night once and saw my reflection in a tram window. I just thought how could I do that to the world, the planet, how could I go out and inflict this on them? I am like this revolting thing and I should lock myself in a tower, and so I went back home (Lydia).

6.3.3.2.3. Objectified and Exposed Self. Participants described an acute hyper awareness of their physical body, which was especially prominent when they were out in public or in social settings. The participants appeared to experience themselves as objectified

beings, which were on display and being judged and evaluated by others. Participants reported visualising their body or body parts from an observer perspective. Participants expressed concerns they were being watched, judged, evaluated, and at times believed others were laughing or talking about them. This experience was described as extremely exhausting and uncomfortable on a mental but also a physiological level:

> *I felt completely on display to the public. I just felt that every customer that came in was criticising, like laughing at me and making comments. I would have nightmares about it. It was like being in front of a firing squad. Just constantly feeling people were looking at me. I couldn't escape it (Mara).*

Some participants responded to this sense of exposure by contorting or positioning their bodies as though they were trying to sculpt an object that would be perceived as acceptable to others. Mara, for example, described how she felt she had to constantly move her face while in public in order to control its appearance:

> *I just thought they thought I looked ridiculous. You know I just looked so strange. I would chew gum for 8 hours straight because my face was all droopy and hanging down. You just can't walk around like that. So I would chew the gum to make it animated, make sure it was moving all the time. It is so bloody exhausting* (Mara).

Again, the fear of exposure appeared to relate both to physical appearance but also extended to a concern that the inner self would be exposed.

> *I remember just driving for the first time, I felt so exposed, so aware of myself. Or when I first started working at a checkout, I was shaking. Just knowing that people could see me when I was out in public"* (Abigal).

Abigail emphasises the words “see me”, suggesting that her concern went beyond the possibility that others saw her body concern (freckles) to what she believed this conveyed about her that she was somehow bad or wrong. She explained, “*It’s mainly my freckles...I just felt I looked dirty, so very dirty and wrong and that I never looked clean”.*

For a number of participants their experience of intense physiological awareness was so strong that they reported being able to “feel” their body part on a sensory level;

> *When I am not happy with how I'm feeling or how my body is feeling, I literally can feel the clothes on me and how they feel against my body parts. I'm constantly aware of it* (Kiera).

> *Its not just what it looks like, I can also feel my eyes beings small* (Stephanie).

These accounts suggest that it may not just be the visual appearance of the body, but rather a broader collection of sensory experiences that are important to the BDD experience. Supporting this, one participant revealed that they were additionally concerned that their body had a repulsive odour and another identified the sound of their voice as a secondary body concern.

6.3.3.3. Intolerance of Uncertainty. The third theme and one of the strongest findings was that BDD participants experienced intense discomfort with and intolerance of uncertainty. The participants reported experiences of persistent doubt and ambivalence, and found themselves stuck, struggling to move forward with tasks or life more generally in the absence absolute clarity and certainty surrounding their appearance. It became apparent that the participants were much more distressed by the inherent uncertainty surrounding appearance than the actual existence of a physical flaw itself. Also reflected within this theme, participants expressed “not just right” experiences, had concerns with symmetry and evenness and had the tendency to become fixated and lost within minute details rather than

absorbing input more broadly. From these experiences, it was apparent that BDD behaviours were largely carried out in an attempt to investigate and gain a sense of certainty regarding ones' appearance and thus attempt to ease the distress associated with this uncertainty.

6.3.3.3.1. Doubt and Uncertainty. A strong experience, which emerged for all participants in this study, was a strong and persistent sense of doubt, uncertainty and ambiguity regarding their perceptions and the true nature of their body part of concern. This finding was on one hand surprising given the high conviction with which BDD beliefs were often held. Yet this finding also appeared fitting in the context of participants' need to repeatedly check their appearance and the desire to know the truth of their appearance. Participants described persistent intrusive thoughts, which drove this sense of doubt and uncertainty; "*How does it look right now?", "What if it has changed?", "Has it worsened/improved?"* and most frequently "*What if I missed something?".* Multiple participants expressed that the uncertainty about the reality or existence of their bodily flaw was more distressing than the generalised negative thoughts and beliefs about the flaw (e.g. my nose is hideous). Participants shared;

> *A thought would always come into my mind saying 'maybe you missed something'…That feeling of dread. That even if it hasn't changed for a month it's not guarantee that it won't change tomorrow. So I am always dreading it* (Julian).

> *It was awful. Thinking I have seen something and then going back and thinking 'hang on maybe I haven't'. Maybe I imagine it. Almost like trying to catch myself. Arranging my mouth in a way to think 'hang on yes there it is'* (Evelyn).

Participants experienced conflicting perceptual information and an inability to trust their perceptual experiences. Although only a few participants believed their body part actually "changed", many still struggled with the concept that it could change at any moment or struggled with not knowing exactly how it looked at any given point in time. Attached with this doubt and uncertainty was feeling out of control, that anything could happen and that uncertainty was not acceptable or something they felt they could cope with.

6.3.3.3.2. Not "just-right" experiences. Connected with the theme of intolerance of uncertainty were the phenomena of not "just-right" experiences, which involve discomfort associated with believing things were not right. This phenomena was coupled with a sense of unease and an urge to perform investigative compulsive acts or to engage in avoidance.

> *I might be putting on makeup and see something wrong, like not right with my appearance. Then the behaviours and hair pulling will start* (Lydia).

A number of participants also demonstrated a preoccupation with notions of symmetry, completeness, evenness and straightness. For example, participants expressed:

> *I became concerned my lip was asymmetrical. It has to do with symmetry. I think even when I was quite young I was concerned with symmetry* (Evelyn).

> *It is freckles, pimples, anything that is a blemish. Even the hair on my legs. So anything that isn't right, isn't smooth, isn't clean* (Abigail).

In addition to concern over things being not "just-right" the participants also expressed a craving and longing for a "just-right" feeling, which when accessible appeared to elevate their discomfort if only very fleetingly. These impressions of rightness or wrongness appeared to be fuelled by felt impressions or ambiguous sensory and perceptual feedback, which the participants relied upon to make decisions, such as whether one could leave their

home or when a checking behaviour was complete and could be ceased. This is evident in the following accounts;

> *Sometimes I can't go out because I've just been - it's just been ruined, I can't find that right feeling- that feeling I am after. I am not feeling good enough about myself to go out* (Amelia).

> *Sometimes I see the mirror and things are going good, but then I get to the gym and I will think how did I miss that. So then it's like how can I capture that feeling again? I'll capture it and then something will happen and it's completely the opposite* (Tom).

> *I'll look really up close at it and if I could just find the time where it doesn't look so bad then it can give me a bit of that feeling– maybe it's a bit of a false sense of feeling, but its 'oh hang on, it doesn't look too bad', and then you walk away with it. So it's trying to find that feeling.* (Daniel).

6.3.3.3.3. Focus on Detail over the Whole. As evidenced within the previous quote by Daniel, participants appeared to engage with their body and their visual reflection in a detailed and piecemeal manner. Participants repeatedly made reference to a practice of "zooming in" or "looking up close" at specific body areas, seeming skipping over or being unable to access a holistic sense of their entire body and the body part within its broader context.

> *I get close up to the mirror. Usually the first thing I start doing is picking my skin. I get up really close and I start scrutinising each area and then I'll pick or scratch it. I would scan everything for imperfections one bit at a time* (Rose).

This focus on detail over the whole was also evident in the way participants listed each specific body concern as if it were a fragmented object not integrated into a global body image. Indeed, participants' body concerns were very specific and detailed for example, a tooth deemed not to be straight, a nostril considered misshapen, or the unevenness of one's upper lip. It appeared that this detailed way of engaging with one's body drove the not "just right" experiences through a process of selective attention and hypersensitivity to ambiguous perceptual and sensory bodily feedback.

> *I can also feel parts of my body. So if I'm having an issue with my hips that day I'll zone into that area for some reason and I can just feel my hips or I can - when I think about like my thighs, I can actually like feel that part of my body. Then you almost zone into that area on your body and you can feel it just being. It's, it's weird. I guess it is a heightened sense of, you know, sensation and things* (Amelia).

6.3.3.3.4. Seeking Certainty and Control Through Confirmation. The experience of incessant doubt, uncertainty and not "just right" experiences were associated with high levels of discomfort, distress and intolerance among the participants. In response to these experiences participants engaged in compulsive checking with the purposing of establishing a sense of certainty and control. As previously noted such acts were rarely successful and could even lead to an exacerbated sense of doubt. A number of participants shared that at times they were actually hoping to find proof of the defect in these checks. They explained that they primarily wanted to establish evidence that they in fact looked "okay" but in not being able to reach this conclusion they would then turn to search for evidence of the existence and abnormality of their perceived flaw. Participants reported that finding such evidence could also provide a sense of relief and comfort. Evelyn described this as a "terrible bind" in which she found herself both desperately longing to find the flaw and dreading this confirmation at

the same time. She identified there being a difficulty accepting uncertainty at the core of this process.

> *On more than one occasion, I have actually tried to manufacture something so it can actually be seen, by biting my lip. I did this for weeks, thinking 'uh-huh' there is something there, it is not my imagination. I was actually trying to make it less symmetrical, actually trying to make something. It was weird. I was terrified that there was something visible but at the same time I wanted it to be. It sounds like madness but it was actually a relief. It was a bit like I wanted the confirmation but at the same time I dreaded it. I was torn between not wanting it to be and needing it to be there. It was a terrible bind …It gave me something definite rather than the uncertainty. It needed certainty. When I have been unwell what I couldn't cope with was the uncertainty* (Evelyn).

Another participant shared that finding evidence of the flaw could result not only provide a sense of relief but could at times also foster a sense of hope and eagerness, as to him this meant that something could be done to fix his problem;

> *I keep photos. It's like I want the evidence to say it is there, you're not making it up. There is a flaw there, even though it might be only be tiny, it's that reassurance…Sometimes I have to go check that it is there. I've got to put my finger over it to feel the unevenness or look at it in the mirror a little bit to make sure that it is there, to know it is there. And then I have felt this sense of, uh, like* (pauses) *like a bit of a release. I don't know why but it can give a sense of maybe something like excitement – I don't know whether excitement is the right word – thinking maybe I can get it improved or I can get it fixed up* (Daniel).

Rose delved further into this theme of wanting certainty and control, identifying that BDD itself, including her preoccupation with a body part and all the symptoms associated with it, presented an attempt to gain a sense of control in her life, and manage her broader anxiety related to the uncertainty of her future. In this sense she identified a sense of attachment to the condition which had overtime become a coping mechanism and provided a kind of containment and focus for her anxiety;

> *"I think the control part of BDD is similar to the eating disorder* (a past diagnosis), *where it was almost controlling the fact that nothing ever got really messy, to be able to live in my own little controlled world. It gave me a sense of control and a nice sense of isolation and there was no worry because I didn't have to think about the future or jobs or any really big scary things that were out of my control… It's the same with BDD because when it is not there I have to think about where I want to go with my career, do I want kids, family stuff, um really big scary things, parts about growing up, parts of being human like losing people. When I am obsessed with my BDD the control that I can get is I can live in my own little world where the only thing that matters is this scar and the only thing I need to do in order to have a successful fulfilling life is to get it fixed*" (Rose).

Another participant was also able to identify that BDD had become part of her identity, and that it provided a sense of protection against the unknown;

> *Who am I if I don't think I'm ugly. I don't know why but I always thought like I would lose my identity if I didn't – if I didn't think I was ugly. It's become part of my personality… If I didn't have BDD, I guess the scary part is the unknown, like just who am I?* (Stephanie).

6.4. Discussion

6.4.1. Theoretical reflections and clinical implications. The current study aimed to build upon existing qualitative research by using IPA to study the lived experience of BDD. It aimed to address the following research questions from the subjective perspective of those living with the condition; 1) What are the subjective experiences associated with living with BDD, including experiences of core clinical symptoms such as obsessions and compulsions; 2) What aspects of the condition are associated with the most distress and impairment; 3) How do these experiences impact upon relationships with others, self and with the world; 4) What do individuals with BDD attribute the development of this condition to and/or what function do they identify BDD symptoms having; and 5) To what extent, if any, do individuals living with BDD identify visual processing or cognitive control difficulties (as identified by the previous research) at a subjective level. This IPA analysis identified three superordinate themes; (1) consumed by the disorder, (2) the flawed self, and (3) intolerance of uncertainty. The discussion below will explore each of these superordinate themes in connection with the research literature, theoretical discourse and address how these themes inform the research questions.

The first master theme, *consumed by the disorder*, addressed a number of the research questions; it summarised the subjective experiences of BDD symptomology, reflected some of the most challenging aspects of the condition and how these experiences impact upon the individual. Participants identified feeling controlled by obsessions and compulsions, feeling trapped in their bodies and experiencing feelings of hopelessness and a desire to escape themselves. These experiences were reported to significantly impact upon daily living including employment, educational and social functioning. Furthermore, participants associated BDD with lost opportunities and reported that BDD most significantly impacted on their close friendships and intimate relationships. This study identified high levels of

depression, suicidal ideation and past suicidal behaviours, which corresponds with clinical descriptions in the literature and highlights the significance of suicidality as a major clinical concern for this population (Angelakis et al., 2016; Phillips et al., 2005a; Phillips & Menard, 2006).

Overall, the participant's personal accounts of intrusive appearance-related thoughts and repetitive behaviours captured the "obsessive and compulsive" nature of BDD. The participants described doubt-based intrusions (i.e., "have I missed something?"), preoccupations with symmetry, "not just right" experiences and use of compulsive checking behaviours as a means to manage experiences of uncertainty. Each of these symptoms are also common to OCD, thus supporting the reconceptualisation of BDD as an OCRD. The participants in this study additionally identified repetitive behaviours such as checking their body part of concern, comparing one-self to others and seeking reassurance from others as central BDD symptoms. Thus, supporting the inclusion of repetitive behaviours as a specific criterion of BDD in the latest DSM-5 (APA, 2013). As documented by others in the field, the diagnostic boundaries between OCD and BDD remain challenging to navigate (Assunção, Torresan, & Torres, 2009). For example, participant Daniel performed an array of additional repetitive behaviours such as compulsively writing down the names, details and location of people he encountered whose nose he admired and performed counting rituals associated with this documentation. He identified this behaviour as irrational, however, also struggled to resist the behaviour, as he thought doing so could result in a lost opportunity to have his nose improved or at least avoid any worsening of this feature. If examined in isolation, these behaviours may be interpreted as a manifestation of OCD, however, all of Daniel's compulsive behaviours were associated with his appearance concerns and thus his symptoms met criteria for a diagnosis of only BDD. Participant Evelyn reported that she first became convinced she was an immoral person and responsible for global starvation before the onset

of body-based concerns. She reported that her belief of being a "bad person" became fused with the belief that she must therefore also be ugly and that she came to locate this ugliness in her lip. This narrative suggests that obsessions regarding moral responsibility may not be limited to OCD but also extend to BDD. Evelyn's case also echoes a process known in OCD as *thought-action-fusion*, a cognitive distortion whereby an individual equates having a thought as equivalent to carrying out that action (Bailey, Wu, Valentiner, & McGrath, 2014). In Evelyn's case, this phenomenon may be better summarised as *thought-appearance-fusion*. Taken together, these parallels with OCD point to the dimensionality and transdiagnostic nature of these symptoms, which are not fully captured by current categorical diagnostic criteria. Thus, an interesting area for future research would be the exploration of the nature of obsessions and compulsions, via both quantitative and qualitative methods, across BDD and OCD samples. Such research could support a better understanding of what qualities these symptoms share across these disorders and address whether these symptoms could be better conceptualised, studied and treated using a more transdiagnostic approach (Waszczuk et al., 2017).

In the current study, the participants acknowledged a primary motivation for their checking behaviours as a strong urge, often referred to as a "need" to know exactly how they looked. Albeit, they often found this to be an impossible pursuit, with participants reporting that checking often did not make them feel better, could worsen their distress, or at best they were only briefly able to access a sense of relief associated with "knowing" how they looked, which was easily lost again. Numerous participants also reported being motivated to check their appearance to see if it had changed. Similarly, Veale and Riley (2001) in a retrospective forced-choice questionnaire, found that individuals with BDD were motivated to check mirrors for three primary reasons, which distinguished them from control participants; BDD participants, 1) hoped that they may look different 2) believed that they would feel worse if

they did not check, and 3) desired to know exactly how they looked. Veale and Riley (2001) also found that BDD participants compared to control participants invariably felt more distressed following mirror checking. In contrast, a study by Windheim et al. (2011) found that BDD participants tended to be equally distressed both before and after mirror-gazing sessions. They also discovered that both participants with BDD and without the condition experienced high levels of distress and self-focused attention following long mirror gazing sessions (10 minutes or more). What differentiated the groups, however, was that BDD participants reported being much less certain about their appearance, both before and after they engaged in mirror-gazing, and that they experienced stronger urges to continue the mirror gazing as well as the conflicting urge to avoid looking at their appearance. Thus, it appears that distress and self-focused attention may be a normal response to prolonged mirror gazing, and that other factors may be involved in why participants with BDD continue to pursue these behaviours despite the adverse consequences. Baldock, Anson, and Veale (2012) suggested that mirror-checking in BDD may persist despite distress, as individuals with BDD are more likely to use internal goals (e.g., needing to feel "right" about their appearance) compared to control participants who tended to using external goals (e.g., having finished applying makeup), and that in BDD these ambiguous internal goals were relied upon to inform their stop-criteria for mirror-use. Supporting this, the qualitative accounts from the current study provide confirmation of participants using internal goals, for example, pursuing the "just right" feeling. The participants also provided examples of using ambiguous internal feelings to guide decisions, such as whether they could disengage from compulsive behaviours or whether they felt acceptable enough to leave the house. Further research should endeavour to further understand the nature of distress and relief experiences associated with various BDD behaviours, as this could inform the current CBT model of BDD and in turn

support better treatment interventions to support individuals in managing these urges and behaviours.

The results of this study, also support assertions from previous qualitative research, which claimed that BDD behaviours might be best understood if differentiated and grouped into categories based on their function (Oakes et al., 2016; Veale & Neziroglu, 2010). The current diagnostic criteria for BDD refer to these behaviours as "repetitive behaviours", thus avoiding the term "compulsions" although they evidently do parallel compulsions as seen in OCD. In the OCD literature, compulsions are differentiated from safety behaviours based on the intention of the action. Safety behaviours are defined as those aimed at avoiding adverse experiences whereas compulsions are an attempt to undo or neutralise uncomfortable thoughts and/or feelings (Abramowitz & Deacon, 2006) The participants in this study described classic safety behaviours (e.g., camouflaging through makeup, or hiding under hair or clothing), although these behaviours were not accompanied with the same level of distress as those those which appeared to meet criteria for compulsive behaviours (i.e. checking behaviours including mirror checking, comparing oneself to others including internet searches and reassurance seeking); behaviours which had at their core an "investigative" nature. It may be that safety behaviours cause less distress because they are driven by a more explicit, external and thus attainable goal i.e. ensuring the body part is hidden. Also the individual who is performing a safety behaviour in that moment believes the flaw to exist and that their appearance is being improved or protected by their actions, thus resulting in anxiety reduction and the reinforcement of this behaviour. This is opposed to compulsive behaviours, which appear to be driven in investigation and search of finding an answer or accessing a particular feeling that will neutralise their distress. Based on the findings of this study, it is argued that this search is for a sense of certainty, resulting from a core intolerance of the unknown and ambiguity. Perhaps then, these checking behaviours persist despite their

apparent poor success rate, because this uncertainty is so insufferable that even a small opportunity to neutralise these feelings and gain a sense of control, even if only temporarily, is enough to reinforce this behaviour.

The second master theme, *the flawed self*, addresses the third research question as to how individuals with BDD experience themselves and how they engage with the world around them. Participants invariably viewed themselves as fundamentally flawed. These beliefs went beyond a concern of imperfection, but of viewing themselves as wholly defective, abnormal and wrong. Participants expressed a deep sense of shame not only regarding their appearance but also pertaining to the self more broadly. Participants described acute self-consciousness and a hyper-awareness of their physical body including strong sensory feedback, resulting in them feeling vulnerable, exposed and wanting to hide from the world. This master theme supports with previous qualitative research, including Brohede et al. (2016) who identified feelings of abnormality and a longing to be normal as their overarching thematic finding. Similar to Silver and Farrants (2015) the participants in this study also described themselves using non-human descriptions and characters. The subtheme, *objectified and exposed-self*, strongly resonates with Veale's (2004) cognitive-behavioural model of "self as an aesthetic model". The model proposes that BDD is marked by an extreme self-consciousness and self-focused attention, which leads the individual to focus on felt impressions of themselves and engage with mental imagery that possess strong sensory qualities, which in turn fuels a vicious selective-attention bias cycle (Veale, 2004). Supporting this, the participants in this study were highly attuned to sensory feedback and reported visualising their body and/or body parts from an observer perspective. This finding also supports previous quantitative research, showing that individuals with BDD relative to control participants experience more spontaneous mental imagery in which they view

themselves from an observer perspective, and that this imagery is more vivid, more detailed and more likely to rely on organic sensations (Osman et al., 2004).

The subtheme of *External Flaw as a Symbol of One's Inner Flawed Self* presents a novel research finding. While it is well accepted that self-esteem is poor in BDD, there has been limited discussion surrounding the idea that the perceived external appearance flaws may be a manifestation of a more global concern regarding one's core sense of self. Psychoanalytical theorists have theorised that in in BDD the body part perceived as defective is a symbol of another underlying conflict (e.g. a sexual or emotional conflict;(Lemma, 2009). This is argued to be a form of unconscious displacement, whereby an emotional struggle relating to feelings of inferiority, guilt or poor self-concept, are projected onto an external body part. This displacement is suggested to occur because the underlying problem is too emotionally threatening to be addressed directly, and thus it is placed onto the more psychologically acceptable aspect of appearance (Phillips, 2005a). Phillips (2005), however, notes that such perspectives have no empirical evidence and are difficult to test. It is acknowledged that in this study, the relationship between the external flaw and one's inner core self was a less overt finding than other themes presented, although the participants did acknowledge an awareness of this intrinsic connection and consistently referenced the fear that others could "see" or would "know" about inner characteristics of inferiority and "badness" just via the sight of the perceived flaw. Beyond psychoanalytic accounts, Veale (2002) asserted that a cognitive behavioural model of BDD must address the role of self-definition and overvalued ideas in order to support advancements in treatments for this population. Drawing on the work of (Beck, 1976) Veale claimed *"In BDD, appearance has become over-identified with the self and at the centre of a personal domain".* The findings of this study would go further to suggest that in BDD the self has become completely entwined with the perceived physical flaw. Rather than negative appearance beliefs informing and

influencing self-concept, it could also be the reverse, that intolerable negative beliefs about one's inner self might inform the physical body concern. Indeed, the participants expressed an intense hatred for and rejection of the body part/s of concern and appeared to distance themselves from it. Some labelled the body past as a separate entity to the self (i.e. "the hideous nose" or "the scar"), perhaps because this was more tolerable than experiencing this discomfort regarding one's whole being. BDD therefore may represent a protective mechanism where by the "flawed" physical feature becomes the object of difficult emotional experiences to protect against an insecure sense of self.

The role of shame has received very little empirical investigation in the BDD field. This is despite shame being viewed as central to the disorder since its earliest conception, where it was labeled "obsession del la honte du corps" translating to "obsession with shame of the body"(Janet & Raymond, 1903). The results of the ESS in the current study support the notion that shame in BDD is not limited to just bodily shame but also extends to a broader sense of shame regarding one's character. Furthermore, both bodily shame and characterlogical shame showed a strong positive relationship with BDD symptom severity, namely compulsions suggesting that shame may be fuelling these behaviours. The current sample however is small and thus these findings can only be considered preliminary. Of note, a recently published paper substantiates these findings, being the first to show that both body shame and general shame are elevated in BDD using an online BDD sample (N=184). Specifically, they found that body shame as measured by the Body-Focused Shame and Guilt Scale (BF-SG) was associated with BDD symptom severity, whereas general shame as measured by the Test of Self-Conscious Affect (TOSCA) was related to adverse psychosocial outcomes (Weingarden, Renshaw, Davidson, & Wilhelm, 2017). The authors suggested that when shame extends from a narrow focus on one's body part to a wider focus on the whole self as defective that the risk of negative outcomes such as depression, suicide and functional

impact increases. It however remains unknown whether a broad sense of shame regarding one's core self results from the impact of BDD or may be a vulnerability factor contributing to the development of BDD. Nonetheless, addressing shame through psychological treatments could be an avenue to improve the outcomes for this population. Currently available CBT programs for BDD do not explicitly addressed the role of shame (Veale & Neziroglu, 2010; Wilhelm et al., 2014; Wilhelm, Phillips, Fama, Greenberg, & Steketee, 2011). However, give the inherent role of body shame to BDD, it may be that aspects of shame are already being targeted through the cognitive strategies and core-belief work included in these programs. Broadening cognitive strategies to target negative beliefs, not only about appearance but also about the self more generally may better target underlying shame and lead to greater therapeutic outcomes. In support of this, recent research in CBT treatment for OCD has demonstrated that targeting underlying self-construals (in this case self-ambivalence) predicted lower post-treatment OCD symptoms (Bhar, Kyrios, & Hordern, 2015). Future RCT in BDD should incorporate shame assessment measures to assess whether shame is a mechanism of change in BDD and the extent to which existing treatments are targeting this construct. It may be that a narrow focus on appearance based symptoms and beliefs in the absence of broader considerations of self-concept, generalised shame and function of BDD could be masking some important understandings and treatment directions for this disorder. Furthermore, shame is a paramount area for further treatment exploration given it is a primary treatment barrier for this population and thus an area that clinicians must be sensitive during the engagement phase as well as being able to target this via their interventions.

The final master theme, *intolerance of uncertainty*, was a strong and anticipated finding of the current study. Intolerance of uncertainty was subjectively associated with the most distress, and participants identified its role in the development and function of their

BDD symptoms. Participants expressed high levels of doubt and uncertainty, distress about not "knowing" exactly how they looked and held beliefs that uncertainty was both unacceptable and intolerable. Their accounts suggested that BDD behaviors were employed as an attempt to regulate this experience by accessing a sense of certainty and control. As revealed via the qualitative extracts, numerous participants reported that "uncertainty" was the most challenging aspect of their experience with BDD, with some explicitly attributing the development of BDD to pre-existing difficulties with managing uncertainty.

Intolerance of Uncertainty (IU) has been defined in the literature as a set of beliefs about and reactions to situations and events that are experienced as uncertain (Carleton et al., 2012). People high in IU tend to view any uncertainty as negative, unacceptable and threatening, and engage in avoidance of this experience. It has been proposed that IU is a transdiagnostic construct playing a role in anxiety, depression, eating disorders and OCD (Einstein, 2014; Kesby, Maguire, Brownlow, & Grisham, 2017; Mahoney & McEvoy, 2012). The relationship between IU and OCD has been well established by the Obsessive Compulsive and Cognitions Working Group (OCCWG) identifying IU as one of the core 6 dysfunctional beliefs contributing to the development and maintenance of OCD (Tolin, Abramowitz, Brigidi, & Foa, 2003). IU tends to be particularly high in OCD patients with checking compulsions as compared to other compulsions such as washing. This is noteworthy given repetitive behaviours in BDD largely revolve around checking the body part of concern. In OCD, IU has also been found to predict compulsions above and beyond any of the other OCCWG's core beliefs of OCD which include perfectionism, overestimation of threat, inflated responsibility, over importance of thoughts and importance of controlling one's thoughts (Bottesi, Ghisi, Sica, & Freeston, 2017). It is therefore plausible that IU plays a similar role in driving repetitive behaviours in BDD as suggested by the participants' narratives presented in this study.

The notion that compulsive behaviors constitute an ineffective attempt to reduce distress associated with uncertainty has permeated the OCD literature for years, but it has scarcely received mention in the BDD literature (Beech & Liddell, 1974). Only one recently published study has addressed IU in BDD, showing that BDD participants have higher IU as compared to controls using the Intolerance of Uncertainty Scale (IUS-12) and that IU is associated with poorer functional impairment among BDD patients (Summers, Matheny, Sarawgi, & Cougle, 2016). Perhaps IU has been overlooked in BDD, as individuals with this condition may not immediately present as uncertain or ambivalent. By contrast, they often present with a strong conviction and rigidity surrounding a seemingly unwavering belief that they have a very real and noticeable flawed appearance. While participants in this study also presented with these beliefs, they simultaneously displayed an overwhelming sense of doubt and uncertainty regarding the "truth" of their appearance concern. In fact, the participant accounts in the current study revealed the fluctuating nature of beliefs in BDD and indicate that insight and conviction in BDD is unstable and osculates quickly. The pervasive sense of doubt and uncertainty suggests that the perceived bodily flaw is feared, but not yet known or decided upon. Indeed, if it were known the individual would not likely need to constantly check for its deformity. In the 1800s Morselli wrote "the dysmorphic patient in the middle of his daily routines is caught by the 'doubt of his deformity'" (Morselli, 1891). Combined with the current study's findings, it could be suggested that the core of the BDD experience is not merely a negative belief regarding one's body, but rather an innately unstable and oscillating sense of the body (and as earlier discussed, the self more broadly). Supporting this assertion, the quantitative results of the SAM in this study, showed that BDD participants compared to control participants had significantly higher levels of self-ambivalence, reflective of a changeable and dichotomous self-concept. Additionally, the SAM demonstrated a strong positive relationship with BDD severity, specifically compulsive behaviours, providing

support for the notion that uncertainty regarding the self plays a role in the performance of BDD behaviours. This finding aligns with a previous study that found self-ambivalence significantly predicted BDD symptoms in a large non-clinical sample (N=194: Phillips et al., 2011). Future research should explore the role of both self-ambivalence as well as uncertainty connected with situations and the future and investigate whether these constructs can predict BDD symptoms, namely compulsions within a clinical group. Further exploration of uncertainty in BDD could have important implications for treatment; CBT protocols in GAD that explicitly target IU have demonstrated the largest and most sustainable outcomes for these patients as compared with CBT interventions that do not focus on IU (Covin, Ouimet, Seeds, & Dozois, 2008).

Connected to experiences of uncertainty, the subtheme of *Not Just Right Experiences* (NJRE), revealed that participants experienced strong internal or body based sensations that things were not right. Italian researchers, Bottesi and colleagues (2017) showed that NJRE partially mediated the pathway from IU to checking behaviors in OCD. They proposed that IU was a transdiagnostic construct, whereas NJRE were an OCD-specific mechanism through which IU functioned to shape compulsions. The current study, however, provides qualitative accounts of NJRE in BDD, which suggests that these experiences are not specific to OCD. Of special relevance in the context of the previous neuropsychological studies conducted as part of this thesis, previous research has shown a relationship between the constructs of doubt, intolerance of uncertainty and NJRE and executive dysfunction (Kalanthroff, Avnit, Aslan, & Henik, 2014; Mushtaq, Bland, & Schaefer, 2011). It has been proposed that deregulated activity in the fronto-striatal system could impact on experiences of doubt, uncertainty and compulsive checking via persistent 'error' signals that result in the individual performing fruitless corrective actions, having difficulty ceasing behaviours due to inappropriate application of stop criteria and a tendency to become stuck in repetitive doubt

cycles and difficulty reasoning in this context. The research however is yet to determine whether executive dysfunction is a predisposing factor responsible for these development of these psychological phenomena or whether the experience of these symptoms in turn impacts on the functioning of the executive system. Further exploration of the relationship between uncertainty and the neuropsychological functioning of BDD is recommended to inform current conceptual models and to determine the developmental and maintenance factors involved in this condition. It further could provide opportunities to integrate the neuropsychological perspectives of BDD with more psychological (cognitive behavioural) based perspectives of BDD.

Regarding the fourth research question of developmental attributions and/or function of BDD, a number of participants connected their BDD with their challenges with uncertainty, including one participant (Rose) who explicitly reported that the disorder itself functioned to contain and regulate her broader uncertainty surrounding her life. The interviews with participants in this study contained considerable dialogue regarding the potential impact of adverse life experiences on the development of this condition. These etiological reflections were however diverse across the participants. Four participants strongly connected BDD with adverse early life experiences, which included traumatic childhood experiences such as sexual abuse, family violence, emotional neglect and bullying in the context of peer relationships. However, another third of the participants (n = 4) reported no such adverse events and did not link BDD with any specific life events. The remaining third of the participants (n=4) identified possible environmental experiences, but felt unsure about whether or not these events played a role in the development of their BDD. This breakdown, aligns with recent quantitative findings which showed that 37.6% of BDD patients attribute their development of the disorder to specific negative life experiences (Weingarden, Curley, Renshaw, & Wilhelm, 2017). Adverse experiences including trauma

are important to the aetiology of BDD, but as these only apply to a proportion of those affected by the disorder, other developmental factors are also involved.

To address the final research question, the subtheme, *focus on detail over the whole*, comprised of participants describing processes of "zooming in" and focusing on isolated aspects of their appearance over the holistic image. This finding provides some qualitative support to the notion that BDD involves a tendency towards detailed-oriented processing of information over more holistic right hemispheric processing (McCurdy-McKinnon & Feusner, 2017). Nonetheless, this finding of detailed-focused processing was not limited to visual processing, as participants described this same process with regard to felt impressions and body based sensory feedback. More broadly, this study also found other sensory input as possibly important in BDD including touch, smell and sound. Thus, it is recommended that future research explore sensory experiences in BDD more broadly. The tendency towards a detail-oriented focus in BDD may reflect a broader information processing bias that is not limited to aberrant visual mechanisms.

6.4.2. Contributions and limitations. Consistent with Silver et al. (2010) the qualitative methodology of this study was well received by the participants involved who expressed their appreciation for the opportunity to share their experiences and have their voices heard within the research context. To the author's knowledge, this is the first study to explore the lived experience of BDD using an IPA approach. This study has provided important insights into lived experiences and perspectives, which has facilitated comprehensive consideration of the clinical descriptions and theoretical discourse surrounding BDD. There are, however, several limitations to consider. The interviews were approached with procedures in place to facilitate openness and reduce researcher bias. Nonetheless, it is acknowledged that the student researcher's clinical foundations and training experiences, such as those of a cognitive behavioural framework undoubtedly created a lens

through which the data was viewed and analysed. To reduce this bias, this study relied on blind double coding of four of the twelve interview transcripts and regular consultation with the qualitative co-investigators and research supervisors. This involved discussions around possible bias and blind spots and appropriate modifications were made to the analysis in line with this feedback.

It is important to acknowledge that the results of this study represent the lived experienced of BDD as reflected by the 12 participants interviewed, and as such, may not necessarily represent the experiences of all individuals with BDD. This study attempted to include a diverse sample; inclusive of males and females from varying sexual orientations and across a broad age range (19-64 years). It included those who were medicated and unmediated, as well as those who have undergone cosmetic surgery and those with no such experiences. There are nevertheless some homogeneous sample characteristics. First, this sample was highly educated with the majority of participants having achieved a higher education qualification. It is unclear as to the extent to which this may deviate from the average BDD sample as education has not typically been reported by previous studies. It is also acknowledged that this treatment-seeking sample represents a group of individuals who were able to attend and engage with a face-to-face, in-depth interview of this nature. As such, the experiences reported by these individuals may differ to those with BDD who are undiagnosed, are not seeking treatment, who are housebound due to their symptoms or feel too vulnerable to speak about their experiences in this way. Indeed, two participants who were involved in the previous neuropsychological research studies of this thesis, elected not to be involved in the qualitative study due to feeling “too embarrassed” to be audio recorded. Thus, the current sample represents a particular group of individuals with BDD who were able to overcome barriers of shame, secrecy, and had a certain level of insight at the time of the interview. This study also excluded participants under 18 years of age and thus cannot be

generalised to children and adolescents living with BDD. Finally, all participants were recruited via two Melbourne-based specialised BDD clinics and thus were actively, recently or in the process of accessing treatment for BDD. Thus, a possible limitation is that the nature of these interventions could influence the participant's narrative surrounding their BDD experiences. While the BDD-YBOCS scores summarise this sample to fall in the moderately severe symptom severity range, nearly all participants reflected that they were currently in a more stable phase of their condition and this was evidenced by their tendency to shift and talk about various experiences in both past and present tense. It is therefore possible that individuals with BDD who were more significantly unwell may have shared different perspectives about their experiences.

Finally, while each of the participants were carefully assessed and BDD was determined as their primary diagnosis, several participants also meet criteria for other psychological disorders namely MDD, GAD, OCD and Trichotillomania. Of note, despite having participants in the previous studies with SAD diagnoses there were no participants with this comorbidity in the current study, suggesting the nature of this study may have presented unique challenges for these individuals. The inclusion of BDD participants with comorbidity invariably raises the question about the specificity of these findings to experiences of BDD. The rates and types of comorbid diagnoses in this sample replicate previous samples in the literature and were retained as symptoms of depression, anxiety, obsessions and compulsions and body-focused behaviours such as hair pulling are accepted as core characteristics for the average person with BDD. Furthermore, the decision to not exclude participants with these comorbidities was made in the context of a strong movement towards dimensional symptom-based research and treatment in clinical psychology over categorical boundaries that may prove to be arbitrary (Meidlinger & Hope, 2017). Some of the conceptual findings identified in this study such as the role of shame and IU, have also

been found in other psychological disorders, and as such, are being proposed as important transdiagnostic mechanisms (Einstein, 2014; Schoenleber & Gratz, 2017) Whether, these constructs are ultimately specific to BDD or are transdiagnositic and thus affect other OCRDs, they have the potential to inform conceptual models and clinical treatment approaches to those affected by BDD and related symptoms more broadly.

In summary, this study explored the lived experiences of BDD using the in-depth qualitative approach of IPA. These detailed qualitative accounts further validate the seriousness and debilitating nature of BDD with these individuals feeling consumed by intrusive thoughts and repetitive behaviours, feeling trapped within their bodies, experience a sense of hopelessness and a desire to escape, and significant functional impairment. These individuals experienced strong feelings of defectiveness and shame, which extended beyond just their appearance to their feelings about their core inner person. A key finding was that these individuals experience strong levels of doubt and uncertainty and this appears to be a possible developmental or maintenance factor fuelling compulsive checking behaviours. It is recommended that future research explore the role of shame and intolerance of uncertainty further as these factors may present unique avenues for innovative interventions for those living with BDD.

PART IV- GENERAL DISCUSSION

7. CHAPTER 7 – Integrative Discussion and Conclusion

BDD is a complex and distressing mental health condition associated with high levels of disability affecting interpersonal, occupational, general health and quality of life outcomes for those affected (Coles et al., 2006; Phillips & Menard, 2006; Phillips, 2000; Phillips et al., 2006a). Despite this, BDD has been subject to very limited research. Often misperceived as a rare or atypical condition, BDD has been shown to affect approximately 2% of the general population inclusive of males, females, children and adults and presents cross-culturally (Bartsch, 2007; Buhlmann et al., 2010; Rief et al., 2006). This is a comparable prevalence rate to other more well known and comprehensively studied disorders such as schizophrenia, bipolar disorder and OCD (Sanderson & Andrews, 2002). BDD typically onsets during adolescents although the limited awareness, knowledge and treatment options available to this population contributes to an average delay of 11 years between symptom onset and formal diagnosis (Phillips et al., 2006a). This is especially worrisome as longer durations of untreated BDD symptoms have been associated with greater adverse outcomes, poorer response to treatments and a lower likelihood of recovery (Phillips et al., 2013a). Thus, research into the developmental and maintenance factors involved in BDD is desperately needed to improve the understanding of this disorder, and to develop improved evidence based treatments for this population. This thesis, therefore, aimed to address this broad issue by conducting a mixed-method research project to explore the neurocognitive and psychological factors involved in BDD.

7.1. Summary of the Study Findings, Limitations, Conceptual Implications and Future Directions

7.1.1. Study One. Study one conducted a broad and comprehensive assessment of core neurocognitive functions in BDD. It aimed to build upon the small body of previous

neuropsychological research in this area by recruiting a moderate clinical BDD sample size, conducting comprehensive clinical assessment and diagnostic screening, and recruiting a broad and representative BDD sample. This study recruited 25 clinical BDD participants and 27 matched non-clinical controls who completed the MCCB. BDD participants showed a pattern of neurocognitive impairment marked by poor functioning on the domains of reasoning and problem solving, working memory, visual learning and speed of processing. Further, each of these significant findings showed large to very large effect sizes, which remained significant after controlling for the influence of IQ. Non-significant correlations with clinical variables such as anxiety, stress and depression suggest that these symptoms did not unduly impact upon the cognitive findings. Overall the results of this study were interpreted to reflect that BDD involves executive dysfunction and memory difficulties specifically pertaining to the online manipulation of visual based information and in planning and problem solving abilities. These findings largely support previous neuropsychological research (Deckersbach et al., 2000b; Dunai et al., 2009; Hanes, 1998; Toh et al., 2015) and are consistent with frontal lobe involvement in the pathophysiology of BDD (Buchanan et al., 2014; Feusner et al., 2009).

This research study aimed to build upon the literature by addressing limitations of the previous neuropsychological research. It successfully conducted a broad and comprehensive assessment of neurocognitive functioning in BDD, and is currently stands the largest neuropsychological study of this disorder. It also accomplished the goal of completing a systematic clinical assessment and diagnostic screening of all participants to ensure inclusion of only clinical participants with a current and primary BDD diagnosis along side carefully matched controls with no mental health history. This approach further allowed for a thorough description of the BDD sample and their symptom profiles within this study. In a variety of ways this BDD sample reflected a diverse and representative sample; inclusive of

approximately equal males and females from varying sexual orientations and across a broad age range (19-64 years).

This study was not successful in overcoming all of the aforementioned limitations in previous research, specifically it included BDD participants who were actively using psychotropic medications and had comorbid mental health diagnosis. Future neuropsychological research would benefit from a replication of this study using a non-medicated sample of clinical participants or comparing both medicated and unmediated participants to assess whether this explains or changes the results. The inclusion of BDD participants with comorbidities invariably raises the question about the specificity of these findings to experiences of BDD. However, the rates and types of comorbid diagnoses are typical of BDD samples, with symptoms of depression, anxiety, obsessions and compulsions and body-focused behaviours such as hair pulling all accepted as core characteristics for the average person with BDD. Furthermore, this recruitment approach was deemed appropriate in line with movements towards dimensional symptom-based research and treatment in clinical psychology over categorical boundaries that may prove to be arbitrary (Meidlinger & Hope, 2017). It, therefore, may not necessarily be helpful to attempt to replicate this research in a study with clinical participants with only a single diagnosis of BDD, as this is not representative of this population. It would, however, be helpful for future research to continue to conduct thorough clinical assessments so that these symptom profiles and other background characteristics can be better understood and factored into neuropsychological interpretations. Despite having extensively considered the impact of anxiety, stress and depression on cognitive performance, this thesis did not specifically consider the impact of the intrusive thoughts on cognitive performance. Future neuropsychological research in BDD should include a measure of intrusive thoughts, which can be administered to clinical and non-clinical participants to address this limitation by controlling for this variable (i.e. The

Intrusive Thoughts Questionnaire, Cognitive Intrusions Questionnaire or The Obsessional Intrusions Inventory). Finally, the clinical participants included in this study (and the other studies of this thesis) were referred by local BDD specialists and thus these individuals were previously, currently or in the process of engaging in psychiatric and/or psychological services. While this thesis presented information on the percentage of those participants receiving current psychotropic medication, it did not gather detailed information regarding which participants had received therapy, the type of interventions received and the phase of this treatment. This presents a limitation for this study and the thesis more broadly and the capacity to further analysis any possible differences in the presentation of those participants who have or have not received psychological interventions. Thus, it is recommended that future studies in this area address this limitation by gathering such information.

This study demonstrated that MCCB is a useful tool for the studying the neurocognitive profile in BDD. It has the advantage of covering a number of different types of cognitive functions, being relatively easy to administer and including tests/versions, which allow for repeat testing (Nuechterlein & Green, 2006). It is recognised that the cognitive impairments identified on the MCCB domains, while sizable, did not show a significant correlation with BDD symptoms as measured by the BDD-YOCS. Although contrary to expectations this is not an unusual finding, with previous neuropsychological studies of BDD and other mental health disorders also finding such outcomes (Dunai et al., 2009). There are a number of reasons why this may be the case. Firstly, the BDD-YBOCS reflects very specific symptoms of BDD, namely current degree of obsession, compulsions and insight, thus it is possible that this is not the best measure to capture BDD symptomology in the way in which relates to cognitive function. In hindsight, it would have been helpful to have also included a quantitative measure of general body image distress or satisfaction, such as the Body Esteem Scale (BES) or the Body Consciousness Questionnaire (BCQ), which both the BDD group

and controls groups could have completed (Franzoi & Shields, 1984). Secondly, it suggests that the cognitive deficits reported in this and other work in BDD are trait deficits, and not related to current symptom severity. Further, cognitive impairments in BDD, as with other mental health conditions, may be more correlated with other manifestations of the disorder such as functional outcomes. Thus, the inclusion of functional outcome measure and quality of life measure may have also been more beneficial for exploring the relationship between cognitive impairments and BDD impact.

The specific cognitive deficits that were reported: reasoning and problem solving, memory and visual learning, are of clinical relevance upon reflecting on the symptomatology of BDD. Firstly, BDD is a disorder marked by difficulty controlling one's cognitive processes, as evidenced by repetitive intrusive thoughts, compulsive performance of unhelpful ritualised behaviours, which are difficult to stop despite their ineffectiveness, and poor insight into one's thinking and beliefs (Phillips et al., 2005b). The findings of visuospatial memory dysfunction in BDD are of particular importance as BDD participants largely report their appearance concerns to stem from visual representations of themselves (i.e. mirror, photographs). It is, therefore, possible that underlying difficulties with visual perception or the ability to encode and retrieve visual stimuli from short-term memory could explain how individuals come to perceive or experience distortions in their appearance.

In summary this study found that neurocognitive impairments to the areas of executive functioning, memory and visual functions are important components of BDD. There is a debate as to whether these cognitive deficits present predisposing factors, which are involved in the development of BDD, or are an epiphenomenon caused by BDD symptomatology. Further neuropsychological testing using large BDD samples could endeavor to explore this question by studying these neurocognitive domains in light of factors such as duration of illness, symptom severity, functional outcomes and actively comparing

adolescents and/or young adults with early onset of symptoms of BDD to adults with longer BDD experiences. Nonetheless, whether neurocognitive impairments are a product of, or caused by, BDD, they remain a important component of the BDD profile, with the more important pursuit being to understand the relationship between neurocognitive functioning and functional outcomes for those with this condition, and exploring the potential for these neurocognitive impairments to respond and improve via treatment interventions. Some preliminary yet encouraging research comes via case studies in OCD showing improved neuropsychological function following pre-existing evidence based treatments (SSRI & CBT (Dittrich et al., 2010; Vandborg et al., 2012). See Section 7.3.2 below for a discussion surrounding treatment recommendations based on results of this study.

7.1.2. Study Two. Study two built upon the results of study one, by conducting a closer examination of the two core areas of cognitive impairment identified in BDD; executive functioning and visual processing. This study recruited a smaller sample of 11 clinical BDD participants and 13 age, sex and IQ matched non clinical- controls, who had previously participated in study one. They completed a specialised battery of executive and visual processing measures. Contrary to expectations the BDD group showed no significant difference to the controls on the executive measures reflecting response inhibition, set-shifting, auditory working memory, and phonemic verbal fluency. In conjunction with the results from study one pertaining to executive functions, this result was interpreted to indicate that BDD does not involve gross executive impairment across the board, but rather subtle differences affecting more complex top-down processes such as planning, problem solving, organisation and the ability to hold and manipulate information ‘on-line’ with particular respect to visual stimuli. Study two, however, did find that, BDD participants compared to age, sex and IQ matched controls, had impaired visual recall of the RCFT from short term memory. Further, the BDD patients demonstrated a significantly impaired organisational

approach, tending to recall visual information from memory via isolated and fragmented individual units, as opposed to controls who tended to recall the figure using its global organising features. This finding replicates the results of Deckersbach et al. (2000b) using the RCFT, and further supports previous neuroimaging research, which showed BDD participants to engage in irregular predominant left-hemispheric detailed-oriented visual processing even in situations where holistic right hemispheric processing mechanisms would be more effective (Feusner et al., 2011; Feusner et al., 2010b; Feusner et al., 2007). The RCFT results build upon the finding of impaired visual memory in the larger study one of this thesis, but goes further to support the proposed model that abberant visual processing in BDD includes a difficulty with global (holistic-oriented) visual processing mechanisms and a heightened, although misused tendency, to utilise local (detailed-oriented) visual processing (Deckersbach et al., 2000b; McCurdy-McKinnon & Feusner, 2017).

This finding, regarding an imbalance to global versus local visual processing and memory mechanisms in BDD, shows significant parallels with the clinical picture of BDD. This model could explain how individuals with BDD come to perceive, fixate and become so distressed regarding small aspects of their physical appearance, at the expense of viewing themselves more holistically. The difficulty with encoding and / or retrieving visual information may also contribute toward the BDD experience of distrusting and doubting ones memory of appearance, and concerns with not being able to "know" or grasp onto a certain image of themselves. This finding could provide insight into the phenomena reported by some individuals with BDD who experiences their appearance "flaw" as changing.

Study two was subject to a number of limitations. Firstly, the sample was small, particularly with respect to the Navon task results, which reflected a further reduced sample size due to lost data. Careful consideration of these preliminary results must, therefore, be undertaken; in particularly the findings of no differences on executive function measures,

which diverge from previous research findings (Dunai et al., 2009; Feusner et al., 2009; Hanes, 1998; Toh et al., 2015). The results on these executive measures did not display any trends towards significance, and the effect sizes were small. The executive functions measured in this study are different from the complex top-down executive processes used by previous research projects. Thus, it is possible that some executive functions remain unaffected in BDD whilst planning, reasoning and organization are impaired. However, given this small sample size, future research is recommended to compare a large BDD sample to control participants across a range of executive functioning processes. Study two, included two visual processing tasks with questionable suitability for the purpose of testing global verses local visual processing in BDD. It is concluded that the CIT is not suitable for this pursuit given its limitation within test variability. The Navon was also not successful in identifying group differences in local versus global visual processing mechanisms. It is possible that this task was also not appropriate for this goal, but in considering the mixed findings on this tasks within recent studies (Kerwin et al., 2014; Monzani et al., 2013), it may that the Navon paradigm employed requires further refinement to adequately tap into these processes in BDD. More broadly, it is recommended that future neuropsychological studies of BDD consider the use of tests which are of a more complex and challenging nature, and that visual processing tests consider the inclusion of conditions such as varied response times and the use of explicit versus implicit instructions regarding the global analysis of visual stimuli. Such adaptions are recommended as it remains unclear as to what exact stage of the visual system aberrant visually processing takes place (i.e. basic perceptual input, encoding, storage, and/or retrieval), and whether this anomaly constitutes a fundamental biological deficit (a bottom-up process) or a learnt approach and/or preference when processing visual stimuli (a top-down process). Exploring this possibility is an important next step in

understanding visual processing and memory deficits in BDD, and exploring whether these functions are amenable to modification.

Despite the small sample of study two it identified substantial differences in the BDD participants on visual recall and visual organisation on the RCFT. It is acknowledged that depression and anxiety scores showed a relationship with RCFT accuracy scores in this study, which could not be fully controlled for. This limitation allows for the questioning of the specificity of visual memory difficulties to BDD rather than these other psychological symptoms. Yet, it should be noted that BDD patients showed significant reduced visual recall and organisational abilities in the previous study of this thesis, and there was no relationship in study one between these cognitive deficits and depression and anxiety. Further, Deckersbach found the same pattern of results on the RCFT in their study, they included the presence of depression and use of medication in their regression analysis, and showed that these factors did not explain the results of poor visual recall in BDD.

Overall the RCFT has proven to be an advantageous tool for studying visual processing and memory in BDD. Given the notable differences between BDD and control participants on this measure, as reflected in the quantitative data and the qualitative depictions provided in chapter 5, it is recommended that future research use the RCFT to further study visual processing and memory functioning in a more substantial BDD sample. It is acknowledged that not all BDD participants demonstrated the profound visual recall and impaired organisational approach on the RCFT. It would, therefore, be useful within a sizable sample to explore the clinical characteristics associated with BDD participants who demonstrate these more profound visual recall and visual organisational challenges. For example, greater symptom, level of global cognitive impairment, duration of illness, and whether one has very specific body preoccupations versus more broad body complaints.

As highlighted, future research pertaining to the role of visual processing in BDD is warranted including identification of how and when these aberrant processes occur, whether these processes are emendable to modification and the specificity of this finding to BDD rather than other mental health diagnoses. Refer to section 7.3.2 for a discussion regarding treatment recommendations based on these findings.

7.1.3. Study Three. The third study adopted an alternative approach to studying putative developmental and maintenance factors involved in BDD, by conducting an in-depth qualitative interview to explore the subjective lived experience of the disorder. This study was undertaken as empirical quantitative research is fundamental to informing conceptual models and designing treatments, it is however, also paramount to study how these behavioural results fit with the individuals' personal experiences. 12 BDD participants, who had previously been involved in the previous neuropsychological studies of this thesis, underwent an in-depth qualitative interview pertaining to their lived experiences of BDD. The BDD participants, alongside 12 non-clinical matched controls, also completed a battery of quantitative questionnaires relating to putative constructs such as obsessional beliefs, perfectionism, shame and self-ambivalence. The qualitative data was analysed in accordance to IPA (Smith, 1996). The analysis identified three superordinate themes reflecting subjective experiences with BDD; (1) consumed by the disorder, (2) the flawed self, and (3) intolerance of uncertainty. The results of study three are complex, extensive and challenging to summarise outside of their thematic narrative. This final summary will therefore focus on providing a brief overview of each of qualitative master themes, focusing on those, which were the strongest, novel and which were supported by the quantitative data. For the full discussion relating to these results, refer to section 6.4 of this thesis.

The results of this qualitative study were consistent with clinical descriptions in the literature and provide support for the serious and debilitating nature of BDD. BDD

participants reported feeling consumed by the disorder. The described experiences of relentless intrusive thoughts, constant doubt, repetitive behaviours, feeling of hopelessness and many experienced past and current suicidal ideation (Angelakis et al., 2016; Phillips et al., 2005b). Overall, the nature of BDD symptoms captured in this study echoed the "obsessive and compulsive" nature of these symptoms and the parallels BDD shares with OCD, providing further support for the conceptualisation of BDD as an OCDR ((Frías, Palma, Farriols, & González, 2015). Of interest, the participants in this study consistently described NJRE, which are strong internal or body based sensations that things are not right, a phenomena which was previously thought to be specific to OCD (Bottesi et al., 2017).

The results of this study identified shame as an important factor to understanding BDD. The participants invariably viewed themselves as fundamentally flawed. Notably, this deep sense of shame pertained to not only their appearance but extended to the self more broadly. This finding was supported by the quantitative results on the shame measure (ESS) showing significantly higher rates of both body and character based shame among BDD participants compared to controls. The importance of shame in BDD was further evidenced by the strong positive relationship between shame (ESS) and BDD symptom severity (BDD-YBOCS), in particularly with compulsions suggesting that shame could play an important role in fuelling these behaviours. Consistent with Veale's (2004) cognitive-behavioural model of "self as an aesthetic model" the participants described an acute hyper awareness of their physical body, described themselves as though they were objectified beings with the purpose of being judges, and further reported visualising their body or body parts from an observer perspective. Thus, the qualitative findings provide support to Veale's CBT model from the subjective experience of those living with this condition. A strong yet novel finding within the *flawed self* theme was the finding that the external flaw acted as a symbol of one's perceived inner "flawed" self. The participant's narratives reflected an intrinsic connection

between the perceived body flaw and their inner core being including their self-worth as a person and their morality. Participants feared others would somehow "see" or would "know" about inner characteristics of "inferiority" and "badness" via the sight of the perceived flaw. Thus pointing to an entwining of the perceived physical flaw with self-identity. It remains unclear whether a broad sense of shame regarding one's self results from the impact of BDD or alternatively may be a vulnerability factor contributing to the development of BDD. Nonetheless, the results of this study show that shame and the enmeshment of one's identify with negative self-beliefs are important to understanding this condition.

Finally, the results from the third master theme of study three, found IU to be an important developmental and/or maintenance factor based on the subjective experiences of those living with BDD. The participant's identified that the most challenging and distressing aspect of the BDD experiences was their experience of uncertainty. Participants expressed high levels of doubt and uncertainty, distress about not "knowing" exactly how they looked and held beliefs that uncertainty was both unacceptable and intolerable. The results further suggested that BDD behaviors (i.e. mirror checking) were employed as an attempt to regulate this experience by accessing a sense of certainty and control. Remarkably, some of the participants found this uncertainty so intolerable that they reported being motivated to wanting to find the "defect so that they would at least be certain. In one account, a participant reported manufacturing and exaggerating the "defect" in order to capture a sense of certainty and reprieve from this constant uncertainty (see extract by Evelyn in section 6.3.3.3.4). Similar to shame the experiences of doubt, uncertainty and ambivalence tended to extend beyond just appearance to question the nature of the self. Supporting this assertion, the quantitative results of self-ambivalence (SAM) showed that BDD participants compared to control participants had significantly higher levels of self-ambivalence, reflective of a changeable and dichotomous self-concept. Additionally, the SAM demonstrated a strong

positive relationship with BDD severity, specifically compulsive behaviours, providing support for the notion that uncertainty regarding the self plays a role in the performance of BDD behaviours.

The notion that compulsive behaviors constitute an ineffective attempt to reduce distress associated with uncertainty has permeated the OCD literature for years, but it has scarcely received mention in the BDD literature (Beech & Liddell, 1974). IU is also identified as a core developmental and maintenance factor in anxiety disorders such as GAD and has shown to be a key mechanism for change via targeted CBT interventions. One recently published study, has addressed IU in BDD, showing that BDD participants have elevated IU, and that IU is associated with poorer functional impairment among BDD patients (Summers et al., 2016). It was therefore concluded that IU may be a key factor in the development and maintenance of BDD symptoms and is an important construct warranting further investigation in BDD.

The key limitations associated with study three are that results reflect the experiences and perspectives of 12 individuals with BDD, they thus might not represent the experiences of all individuals with BDD. It is noted that 12 is considered a very large qualitative study by IPA standards, with standard recommendation for a full doctoral thesis to include 4 to 10 participants (Hefferon & Gil-Rodriguez, 2011; Turpin et al., 1997). Furthermore the sample in this study reflected an especially educated and insightful group of individuals with BDD who were capable of engaging in an intensive face-to-face interview regarding their experiences. As such, the experiences reported by these individuals may differ to those with BDD who are undiagnosed, are not seeking treatment, who are housebound due to their symptoms or feel too vulnerable to speak about their experiences in this way.

7.2. Benefits and challenges associated with the integration of neuropsychological studies and a qualitative study drawing on cognitive-behavioural perspectives within this thesis.

This study used a mixed-method approach including both quantitative and qualitative methods to study the neurocognitive and psychological factors involved in the development and maintenance of BDD. The use of both quantitative and qualitative methods follows recommendations of triangulation to bolster creditability and validity of research findings (Elliott et al., 1999). In addition to conducting the primary neuropsychological investigation of BDD, as presented in study one and two, this study undertook an additional endeavour, which was to explore the lived subjective experiences of BDD. This approach was embarked upon in line with the student researchers interests as well as a prospect providing integration and links between the two primary perspectives permeating the BDD literature; neuropsychological and cognitive behavioural.

Historically, neuropsychological and cognitive behavioural perspectives have worked in isolation (Jokić-Begić, 2010). Treatments for various mental health disorders including BDD have been designed and implemented with little consideration to the neurobiological basis of the disorder. This included any relevant neurocognitive impairments, which undoubtedly play a role in the presentation of symptoms, the individual's engagement in therapy and their responsiveness to treatment. In recent years this separation between the perspectives is closing with attempts to integrate neuropsychological and cognitive behavioural models of clinical disorders. This remains a challenging goal for many in the field, and in introspecting on this thesis this broad and multi-faceted objectives of this student thesis this has been an ambitious undertaking.

Nevertheless, there have been some benefits of having included these two study parts. For example, while the BDD participants did not explicitly identify subjective awareness or

complaint of executive of visual dysfunction, their lived experiences with BDD spoke to a number of novel links to current conceptual models of BDD including neuropsychological perspectives. For example, the qualitative results of study three identified a strong superordinate theme of *focus on detail over the whole*. This developed in line with the participants repeatedly describing processes of "zooming in" and focusing on isolated aspects of their appearance over the holistic image (see extracts in section 6.3.3.3.3). This finding provides qualitative support to the notion that BDD involves a tendency towards detailed-oriented processing of information over more holistic right hemispheric processing (McCurdy-McKinnon & Feusner, 2017). Yet the qualitative study identified that this finding of detailed-focused processing was not limited to just visual processing, as participants described this same process with regard to felt impressions and body based sensory feedback. More broadly, the qualitative study also pointed to other aberrant sensory input indicating that the participants hold concerns about other minor sensory qualities such as felt touch, sense of smell and sound. It is, therefore, recommended that future research explore sensory experiences in BDD more broadly. The tendency towards a detail-oriented focus in BDD may reflect a broader information processing bias that is not limited to aberrant visual mechanisms.

Another connection between the neuropsychological and qualitative findings of this thesis exists in the identification of IU as important to BDD. Although IU is not currently identified within preliminary CBT models of BDD, the qualitative findings of this thesis suggest IU is an important construct especially with regard to the manifestation and maintenance of compulsive behaviours. This is further supported by the recent quantitative findings showing IU is associated with BDD functional impairment (Summers et al., 2016).While this finding requires further empirical support, it is not ungrounded in that IU is identified as one of the core dysfunctional beliefs contributing towards the development and

maintenance (Tolin et al., 2003). The connection exists in that uncertainty and executive dysfunction show a strong association with some arguing that cognitive control issues are at the heart of this uncertainty. Indeed the specific frontal regions involved in executive processes are also activated when individuals are placed in situations where uncertainty is high (Mushtaq et al., 2011). It has been proposed that the interaction between executive functions and uncertainty could be responsible for the development of disorders involving excessive doubt, uncertainty and checking behaviour (Kalanthroff et al., 2014), which were all identified as key experiences in study 3 of this thesis.

7.3. Treatment Implications

7.3.1. Implications for Cognitive Behavioural Therapy. Overall the results of this thesis support the use of CBT in the treatment of BDD, as is already being practiced. The neuropsychological results, specifically those pertaining to the identification of visual processing and visual memory difficulties in BDD are of special interest in light of recent trends towards inclusion of "perceptual training" techniques within current CBT programs (Wilhelm et al., 2011). Perceptual retraining in this context refers to therapeutic strategies, which support the person with BDD to perceive and memorise their physical image in a more holistic manner as opposed to their natural inclination to view themselves using a more fragmented system which promotes focus on the perceive defect/s above all else. Described techniques include practicing standing an appropriate distance from a mirror when viewing oneself, engaging in broader visual tracking processes when assessing one's appearance and the individual engaging in a holistic and balanced verbal description of what they are viewing in the mirror (Wilhelm et al., 2014). It remains unclear whether the identified visual processing and visual memory impairments in BDD are amenable to change and adaption in BDD through such techniques thus highlighting the importance of further CBT clinical trials using pre and post assessment including not only symptom evaluation but also select

neuropsychological tests and/or eye tracking assessments to provide feedback on the impact of such visual processing interventions in BDD.

The findings from study three of this thesis point to a justification for CBT therapies to target broader beliefs about self, shame pertaining not only to the body but also to the self more broadly, and intolerance of uncertainty. While recent research has highlighted the role of self in the symptomatology and treatment of mental health disorders including the OCRDs, there is still limited directions as to how the role of self should be addresses in treatment (Moulding, Mancuso, Rehm, & Nedeljkovic, 2016). While the constructs such as shame, self-ambivalence and intolerance of uncertainty are just starting to be addressed by the empirical literature, they are not yet explicitly targeted within the existing CBT protocols for BDD (Veale & Neziroglu, 2010; Wilhelm et al., 2014). Support for the targeting of IU comes from the use of CBT in GAD, where by the protocols which have explicitly target IU have demonstrated the largest and most sustainable outcomes for these patients as compared with CBT interventions that do not focus on IU (Covin et al., 2008). Other studies using CBT in GAD have demonstrated that reduction in IU predicts recovery from GAD at 12-month follow up. While IU is becoming accepted as transdiagnostic symptom and key mechanisms of change across a number of psychological disorders, at current there are no transdiagnostic programs targeting these areas to which can be applied to BDD. It would be valuable for current CBT protocols to be informed by GAD manuals, which explicitly address this mechanism. More broadly, awareness of clinicians working with clients regarding likely experiences of IU is paramount as individuals with this condition may not immediately present as uncertain or ambivalent. By contrast, they often present with a strong conviction and rigidity surrounding a seemingly unwavering belief that they have a very real and noticeable flawed appearance. Thus, working solely to address poor insight and negative beliefs about appearance may miss the root of this problem, which based on the results of

study three of this thesis suggests there is a strong experience and intolerance of uncertainty manifesting in a “need to know”.

Further, the results of the qualitative study of this thesis have highlight that for some individuals with BDD, their experiences with, and diagnosis of, BDD have become entwined with their sense of identity (see extracts from Stephanie and Rose in section 6.3.3.3.4). A number identified that their preoccupation with appearance and BDD behaviours more broadly had come to serve as a protective mechanism against their broader fears and experiences of uncertainty. Clinicians working with clients with BDD must be mindful of the meaning the individual attaches to their appearance concerns, their diagnosis and its position within the individuals life. As pursuing CBT without due consideration to the meaning it holds for the client may run the risk of prematurely removing protective mechanisms and leaving clients vulnerable to broader threats to the self which could result in disengagement or resistance to therapy, relapse, or the arrival of others unhelpful coping behaviours (see extract from Rose in section 6.3.3.3.4 regarding the interchangeability of BDD and eating disorder behaviour).

7.3.2. Implications for Cognitive Remediation Therapy. On the basis of the neuropsychological findings of this thesis, it is proposed that individuals with BDD could benefit from specialised treatment interventions tailored to address cognitive functioning such as Cognitive Remediation Therapy (CRT). CRT is a treatment approach that was designed to target and improve neurocognitive abilities such as attention, verbal and visual memory, working memory, cognitive flexibility, planning and other executive functions, with the ultimate goal of improving functional outcomes (Medalia, Herlands, Saperstein, & Revheim, 2017). CRT was originally developed to treat patients with neurological disorders and brain injuries yet is increasingly showing efficacy in reducing the neurocognitive impairments and overall improving long term functional outcomes for a range of mental

health disorders including schizophrenia, bipolar disorder and major depression (Bonnin et al., 2016; Lystad et al., 2017; Motter et al., 2016). More recently CRT, and other cognitive rehabilitation packages, have shown some preliminary positive outcomes for disorders such as AN and OCD; disorders with which it shares a close neurocognitive profile to BDD (Buhlmann et al., 2006a; Dingemans et al., 2014; Park et al., 2006). To the author's knowledge, there has been no research as yet to trial the utility of CRT in BDD. There remains much to learnt about the neurocognitive profile of BDD, including the extent to which executive functions are affected in BDD, whether abberant visual processes constitute bottom up basic perceptual difficulties or a top down mechanisms, and most importantly the relationship between these neurocognitive deficits and functional outcomes for individuals with BDD. Nonetheless, CRT could prove to be a fruitful treatment avenue to not only treat symptoms and outcomes in BDD but also provide further insights into the neurocognitive functioning of the disorder, and speak to whether these neurocognitive anomalies are remediable through CRT. Although, tailored CRT programs may prove to be more appropriate and time-efficient, studies investigating the outcomes of general CRT program versus tailored CRT programs in schizophrenia have shown to be equally effective, and a general program represents a viable option for an initial CRT trial for BDD. If CRT proves effective for the treatment of BDD, modifications to address the specific areas of executive functioning or visual processing and memory could be explored. Further it may be that individuals with certain neurocognitive profiles are more likely to benefit from this form of treatment. Ultimately, a movement towards thorough clinical and neuropsychological assessment of BDD patients may prove fruitful to design individually tailored treatment, inclusive of a combination of CBT and CRT where appropriate (Cuthbert, 2014)

7.4. Conclusion

Overall this thesis has demonstrated that BDD involves a pattern of specific cognitive deficits marked by executive dysfunction in the areas of planning, problem solving, working memory and organisation. It found that BDD participants did not show impairments on a series of more basic executive function measures reflecting response inhibition, set-shifting, auditory working memory, and phonemic verbal fluency. This result suggests that while BDD displays does not involve gross global executive impairment, but rather subtle differences affecting more complex top-down processes such as planning, problem solving, organisation and the ability to hold and manipulate information 'on-line' with particular respect to visual stimuli. The thesis further identified aberrant visual processing and visual memory, consistent with a model of BDD involving impaired global visual mechanisms and in turn an overuse and reliance on detailed. An imbalance in global verses local visual processing mechanisms could explain how individuals with BDD come to perceive defects in their appearance not perceived by others and their tendency to become distressed regarding very minor and specific body concerns. The qualitative component of this thesis highlighted the role of global shame, self-ambivalence and intolerance of uncertainty in BDD, areas which have not received very much attention in the BDD field. Although broadly, the qualitative accounts support for current conceptual models of BDD, including its conception as an OCRD, alignment with the CBT model of "self as an aesthetic model" and further support for the notion that individuals with BDD do tend to become concerned with detailed over global information processing. The results indicated that this detailed tendency was not limited to just visual processing but other sensory information processing, and thus, further research is warranted. In concluding, this thesis made recommendations for considerations in current CBT models and recommended that CRT be trialled in BDD to investigate the

potential for this therapy to address cognitive deficits in BDD in addition to BDD symptoms more broadly.

References

Abramowitz, J. S., & Deacon, B. J. (2006). Psychometric properties and construct validity of the Obsessive-Compulsive Inventory—Revised: Replication and extension with a clinical sample. *J Anxiety Disord, 20*.

Ahamed, S. S., Enani, J., Alfaraidi, L., Sannari, L., Algain, R., Alsawah, Z., & Al Hazmi, A. (2016). Prevalence of Body Dysmorphic Disorder and its Association With Body Features in Female Medical Students. *Iranian journal of psychiatry and behavioral sciences, 10*(2).

Allen, A., & Hollander, E. (2004). Similarities and differences between body dysmorphic disorder and other disorders. *Psychiatric Annals, 34*(12), 927-933.

Alvarez, J. A., & Emory, E. (2006). Executive Function and the Frontal Lobes: A Meta-Analytic Review. *Neuropsychology Review, 16*(1), 17-42. doi:10.1007/s11065-006-9002-x

Andrews, B., & Hunter, E. (1997). Shame, early abuse, and course of depression in a clinical sample: A preliminary study. *Cognition & emotion, 11*(4), 373-381.

Andrews, B., Qian, M., & Valentine, J. D. (2002). Predicting depressive symptoms with a new measure of shame: The Experience of Shame Scale. *British Journal of Clinical Psychology, 41*(1), 29-42.

Angelakis, I., Gooding, P. A., & Panagioti, M. (2016). Suicidality in body dysmorphic disorder (BDD): A systematic review with meta-analysis. *Clinical Psychology Review, 49*, 55-66.

Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychological assessment, 10*(2), 176.

Aouizerate, B., Pujol, H., Grabot, D., Faytout, M., Suire, K., Braud, C., . . . Tignol, J. (2003). Body dysmorphic disorder in a sample of cosmetic surgery applicants. *European Psychiatry, 18*(7), 365-368.

Army, U. S. (1944). Army Individual Test Battery: Manual of directions and scoring: Washington, DC: War Department, Adjutant General's Office.

Association, A. P. (1968). DSM-II. *Diagnostic and statistical manual of mental disorders, 2*.

Association, A. P. (1980). Diagnostic and statistical manual (DSM-III). *American Psychiatric Association, Washington, 3*.

Association, A. P. (1987). *Diagnostic and Statistical Manual of Mental Health Disorders (DSM-III-R)*: American psychiatric association.

Association, A. P. (1994). *Diagnostic and statistical manual of mental disorders: DSM-IV*: American Psychiatric Association.

Association, A. P. (2000). Diagnostic and statistical manual-text revision. *Washington, DC: American Psychiatric Association, 256*.

Association, A. P. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*: American Psychiatric Pub.

Association., A. P. (1952). *Mental disorders: Diagnostic and statistical manual* (Vol. 1): American Psychiatric Association, Mental Hospital Service.

Assunção, M. C., Torresan, R. C., & Torres, A. R. (2009). Body dysmorphic and/or obsessive-compulsive disorder: Where do the diagnostic boundaries lie? *Revista Brasileira de Psiquiatria, 31*(3), 282-283. doi:10.1590/S1516-44462009000300017

Atmaca, M., Bingol, I., Aydin, A., Yildirim, H., Okur, I., Yildirim, M. A., . . . Gurok, M. G. (2010). Brain morphology of patients with body dysmorphic disorder. *Journal of Affective Disorders, 123*(1), 258-263.

Baddeley, A. (1992). Is working memory working? The fifteenth Bartlett lecture. *The Quarterly Journal of Experimental Psychology, 44*(1), 1-31.

Bailey, B. E., Wu, K. D., Valentiner, D. P., & McGrath, P. B. (2014). Thought–action fusion: Structure and specificity to OCD. *Journal of Obsessive-Compulsive and Related Disorders, 3*(1), 39-45.

Baldock, E., Anson, M., & Veale, D. (2012). The stopping criteria for mirror-gazing in body dysmorphic disorder. *British Journal of Clinical Psychology, 51*(3), 323-344. doi:10.1111/j.2044-8260.2012.02032.x

Bartsch, D. (2007). Prevalence of body dysmorphic disorder symptoms and associated clinical features among Australian university students. *Clinical Psychologist, 11*(1), 16-23.

Beck, A. (1976). Meaning and emotions. *Cognitive therapy and the emotional disorders*, 47-75.

Beech, H., & Liddell, A. (1974). Decision-making, mood states and ritualistic behaviour among obsessional patients. *Obsessional states*, 143-160.

Beilharz, F., Castle, D., Grace, S., & Rossell, S. (2017). A systematic review of visual processing and associated treatments in body dysmorphic disorder. *Acta Psychiatrica Scandinavica*.

Benedict, R. H., Schretlen, D., Groninger, L., & Brandt, J. (1998). Hopkins Verbal Learning Test–Revised: Normative data and analysis of inter-form and test-retest reliability. *The Clinical Neuropsychologist, 12*(1), 43-55.

Benedict, R. H., Schretlen, D., Groninger, L., Dobraski, M., & Shpritz, B. (1996). Revision of the Brief Visuospatial Memory Test: Studies of normal performance, reliability, and validity. *Psychological assessment, 8*(2), 145-153.

Benton, A. (1969). Development of a multilingual aphasia battery: Progress and problems. *Journal of the neurological sciences, 9*(1), 39-48.

Berthier, M. L., Kulisevsky, J., Gironell, A., & Heras, J. A. (1996). Obsessive-compulsive disorder associated with brain lesions Clinical phenomenology, cognitive function, and anatomic correlates. *Neurology, 47*(2), 353-361.

Bhar, S. S., & Kyrios, M. (2007). An investigation of self-ambivalence in obsessive-compulsive disorder. *Behaviour Research and Therapy, 45*(8), 1845-1857.

Bhar, S. S., Kyrios, M., & Hordern, C. (2015). Self-Ambivalence in the Cognitive-Behavioural Treatment of Obsessive-Compulsive Disorder. *Psychopathology, 48*(5), 349-356.

Bienvenu, O. J., Samuels, J. F., Riddle, M. A., Hoehn-Saric, R., Liang, K. Y., Cullen, B. A., . . . Nestadt, G. (2000). The relationship of obsessive-compulsive disorder to possible spectrum disorders: results from a family study. *Biol Psychiatry, 48*. doi:10.1016/s0006-3223(00)00831-3

Binder, L. M. (1982). Constructional strategies on complex figure drawings after unilateral brain damage. *Journal of Clinical and Experimental Neuropsychology, 4*(1), 51-58.

Blatt, S. J., D'Afflitti, J. P., & Quinlan, D. P. (1976). *Depressive experiences questionnaire*: Yale University, school of medicine, Department't of psychiatry.

Bohne, A., Wilhelm, S., Keuthen, N. J., Florin, I., Baer, L., & Jenike, M. A. (2002). Prevalence of body dysmorphic disorder in a German college student sample. *Psychiatry Res, 109*. doi:10.1016/s0165-1781(01)00363-8

Bohon, C., Hembacher, E., Moller, H., Moody, T. D., & Feusner, J. D. (2012). Nonlinear relationships between anxiety and visual processing of own and others' faces in body dysmorphic disorder. *Psychiatry Research - Neuroimaging, 204*(2-3), 132-139. doi:10.1016/j.pscychresns.2012.09.003

Bonnin, C. M., Torrent, C., Arango, C., Amann, B. L., Solé, B., González-Pinto, A., . . . Martinez-Aran, A. (2016). Functional remediation in bipolar disorder: 1-year follow-up of neurocognitive and functional outcome. *The British Journal of Psychiatry, 208*(1), 87-93. doi:10.1192/bjp.bp.114.162123

Boone, K. B., Ananth, J., Philpott, L., Kaur, A., & Djenderedjian, A. (1991). Neuropsychological characteristics of nondepressed adults with obsessive-compulsive disorder. *Cognitive and Behavioral Neurology, 4*(2), 96-109.

Bottesi, G., Ghisi, M., Sica, C., & Freeston, M. H. (2017). Intolerance of uncertainty, not just right experiences, and compulsive checking: Test of a moderated mediation model on a non-clinical sample. *Comprehensive psychiatry, 73*, 111-119.

Brohede, S., Wijma, B., Wijma, K., & Blomberg, K. (2016). 'I will be at death's door and realize that I've wasted maybe half of my life on one body part': the experience of living with body dysmorphic disorder. *International Journal of Psychiatry in Clinical Practice, 20*(3), 191-198. doi:10.1080/13651501.2016.1197273

Buchanan, B., Rossell, S., Maller, J. J., Toh, W. L., Brennan, S., & Castle, D. (2014). Regional brain volumes in body dysmorphic disorder compared to controls. *Australian and New Zealand Journal of Psychiatry, 48*(7), 654-662. doi:10.1177/0004867413520253

Buhlmann, U., Cook, L. M., Fama, J. M., & Wilhelm, S. (2007). Perceived teasing experience in body dysmorphic disorder. *Body Image, 4*(4), 381-385.

Buhlmann, U., Deckersbach, T., Engelhard, I., Cook, L. M., Rauch, S. L., Kathmann, N., . . . Savage, C. R. (2006a). Cognitive retraining for organizational impairment in obsessive-compulsive disorder. *Psychiatry Res, 144*.

Buhlmann, U., Etcoff, N. L., & Wilhelm, S. (2006b). Emotion recognition bias for contempt and anger in body dysmorphic disorder. *Journal of Psychiatric Research, 40*(2), 105-111.

Buhlmann, U., Glaesmer, H., Mewes, R., Fama, J. M., Wilhelm, S., Brähler, E., & Rief, W. (2010). Updates on the prevalence of body dysmorphic disorder: A population-based survey. *Psychiatry Research, 178*(1), 171-175. doi:10.1016/j.psychres.2009.05.002

Buhlmann, U., Wilhelm, S., McNally, R. J., Tuschen-Caffier, B., Baer, L., & Jenike, M. A. (2002). Interpretive biases for ambiguous information in body dysmorphic disorder. *CNS Spectrums, 7*(6), 435-443.

Burns, D. (1983). The spouse who is a perfectionist. *Medical aspects of human sexuality, 17*(3), 219-230.

Campbell, M., Maynard, D., Roberti, J., & Emmanuel, M. (2012). A comparison of the psychometric strengths of the public-domain Zung Self-rating Depression Scale with the proprietary Beck Depression Inventory-II in Barbados. *West Indian Medical Journal, 61*(5), 483-488.

Cansever, A., Uzun, O., Donmez, E., & Ozsahin, A. (2003). The prevalence and clinical features of body dysmorphic disorder in college students: a study in a Turkish sample. *Compr Psychiatry, 44*. doi:10.1053/comp.2003.50010

Carleton, R. N., Mulvogue, M. K., Thibodeau, M. A., McCabe, R. E., Antony, M. M., & Asmundson, G. J. (2012). Increasingly certain about uncertainty: Intolerance of uncertainty across anxiety and depression. *Journal of Anxiety Disorders, 26*(3), 468-479.

Carroll, B. T., Yendrek, R., Degroot, C., & Fanin, H. (1994). Response of major depression with psychosis and body dysmorphic disorder to ECT. *The American Journal of Psychiatry, 151*(2), 288-289. doi:10.1176/ajp.151.2.288a

Castle, D. J., Rossell, S., & Kyrios, M. (2006). Body dysmorphic disorder. *Psychiatric Clinics, 29*(2), 521-538.

Chosak, A., Marques, L., Greenberg, J. L., Jenike, E., Dougherty, D. D., & Wilhelm, S. (2008). Body dysmorphic disorder and obsessive-compulsive disorder: Similarities, differences and the classification debate. *Expert Review of Neurotherapeutics, 8*(8), 1209-1218. doi:10.1586/14737175.8.8.1209

Coles, M. E., Phillips, K. A., Menard, W., Pagano, M. E., Fay, C., Weisberg, R. B., & Stout, R. L. (2006). Body dysmorphic disorder and social phobia: cross-sectional and prospective data. *Depression and Anxiety, 23*(1), 26-33.

Cororve, M. B., & Gleaves, D. H. (2001). Body dysmorphic disorder: a review of conceptualizations, assessment, and treatment strategies. *Clinical Psychology Review, 21*(6), 949-970. doi:http://dx.doi.org/10.1016/S0272-7358(00)00075-1

Covin, R., Ouimet, A. J., Seeds, P. M., & Dozois, D. J. A. (2008). A meta-analysis of CBT for pathological worry among clients with GAD. *Journal of Anxiety Disorders, 22*(1), 108-116. doi:https://doi.org/10.1016/j.janxdis.2007.01.002

Crowe, S. F. (2000). Does the letter number sequencing task measure anything more than digit span? *Assessment, 7*(2), 113-117.

Cummings, J. L., & Cunningham, K. (1992). Obsessive-compulsive disorder in Huntington's disease. *Biological psychiatry, 31*(3), 263-270.

Cuthbert, B. N. (2014). The RDoC framework: facilitating transition from ICD/DSM to dimensional approaches that integrate neuroscience and psychopathology. *World Psychiatry, 13*(1), 28-35.

De Wit, S. J., Alonso, P., Schweren, L., Mataix-Cols, D., Lochner, C., Menchón, J. M., . . . Sato, J. R. (2014). Multicenter voxel-based morphometry mega-analysis of structural

brain scans in obsessive-compulsive disorder. *American Journal of Psychiatry, 171*(3), 340-349.

Deckersbach, T., Otto, M. W., Savage, C. R., Baer, L., & Jenike, M. A. (2000a). The relationship between semantic organization and memory in obsessive-compulsive disorder. *Psychotherapy and psychosomatics, 69*(2), 101-107.

Deckersbach, T., Savage, C. R., Phillips, K. A., Wilhelm, S., Buhlmann, U., Rauch, S. L., . . . Jenike, M. A. (2000b). Characteristics of memory dysfunction in body dysmorphic disorder. *Journal of the International Neuropsychological Society, 6*(6), 673-681. doi:10.1017/S1355617700666055

Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *Delis-Kaplan Executive Function System: Examiners manual*: Psychological Corporation.

Demakis, G. J. (2004). Frontal Lobe Damage and Tests of Executive Processing: A Meta-Analysis of the Category Test, Stroop Test, and Trail-Making Test. *Journal of Clinical and Experimental Neuropsychology, 26*(3), 441-450. doi:10.1080/13803390490510149

DeMarco, L. M., Li, L. C., Phillips, K. A., & McElroy, S. L. (1998). Perceived stress in body dysmorphic disorder. *The Journal of nervous and mental disease, 186*(11), 724-726.

Didie, E. R., Kuniega-Pietrzak, T., & Phillips, K. A. (2010). Body image in patients with body dysmorphic disorder: evaluations of and investment in appearance, health/illness, and fitness. *Body Image, 7*(1), 66-69.

Didie, E. R., Tortolani, C. C., Pope, C, G., Menard, W., Fay, C., &Phillips, K. A. (2006) Childhood abuse and neglect in body dysmorphic disorder. *Child Abuse and Neglect, 30*(10), 1105-1115.

Dingemans, A. E., Danner, U. N., Donker, J. M., Aardoom, J. J., Meer, F., Tobias, K., . . . Furth, E. F. (2014). The effectiveness of cognitive remediation therapy in patients with a severe or enduring eating disorder: a randomized controlled trial. *Psychother Psychosom, 83*.

Dittrich, W. H., Johansen, T., Padhi, A. K., Smith, I. E., Chamberlain, S. R., & Fineberg, N. A. (2010). Clinical and neurocognitive changes with modafinil in obsessive–compulsive disorder: a case report. *Psychopharmacology, 212*(3), 449-451.

Dufresne, R. G., Phillips, K. A., Vittorio, C. C., & Wilkel, C. S. (2001). A screening questionnaire for body dysmorphic disorder in a cosmetic dermatologic surgery practice. *Dermatologic Surgery, 27*(5), 457-462.

Dunai, J., Labuschagne, I., Castle, D. J., Kyrios, M., & Rossell, S. L. (2009). Executive function in body dysmorphic disorder. *Psychological Medicine, 40*(9), 1541-1548. doi:10.1017/S003329170999198.

Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program.*Behavior Research Methods, Instruments, & Computers*, 28, 1–11.

Einstein, D. A. (2014). Extension of the transdiagnostic model to focus on intolerance of uncertainty: a review of the literature and implications for treatment. *Clinical Psychology: Science and Practice, 21*(3), 280-300.

Eisen, J. L., Phillips, K. A., Baer, L., Beer, D. A., Atala, K. D., & Rasmussen, S. A. (1998). The brown assessment of beliefs scale: reliability and validity. *American Journal of Psychiatry, 155*(1), 102-108.

Elliott, R., Fischer, C. T., & Rennie, D. L. (1999). Evolving guidelines for publication of qualitative research studies in psychology and related fields. *British Journal of Clinical Psychology, 38*(3), 215-229. doi:10.1348/014466599162782

Feusner, J. D., Hembacher, E., Moller, H., & Moody, T. D. (2011). Abnormalities of object visual processing in body dysmorphic disorder. *Psychological Medicine, 41*(11), 2385-2397. doi:10.1017/S0033291711000572

Feusner, J. D., Moller, H., Altstein, L., Sugar, C., Bookheimer, S., Yoon, J., & Hembacher, E. (2010a). Inverted face processing in body dysmorphic disorder. *Journal of Psychiatric Research, 44*(15), 1088-1094. doi:10.1016/j.jpsychires.2010.03.015

Feusner, J. D., Moody, T., Hembacher, E., Townsend, J., McKinley, M., Moller, H., & Bookheimer, S. (2010b). Abnormalities of visual processing and frontostriatal systems in body dysmorphic disorder. *Archives of General Psychiatry, 67*(2), 197-205. doi:10.1001/archgenpsychiatry.2009.190

Feusner, J. D., Townsend, J., Bystritsky, A., & Bookheimer, S. (2007). Visual information processing of faces in body dysmorphic disorder. *Archives of General Psychiatry, 64*(12), 1417-1426. doi:10.1001/archpsyc.64.12.1417

Feusner, J. D., Townsend, J., Bystritsky, A., McKinley, M., Moller, H., & Bookheimer, S. (2009). Regional brain volumes and symptom severity in body dysmorphic disorder. *Psychiatry Research: Neuroimaging, 172*(2), 161-167.

Fontenelle, L. F., Mendlowicz, M. V., Kalaf, J., & Versiani, M. (2006a). The problem of delusional ugliness: Is it really body dysmorphic disorder? *The World Journal of Biological Psychiatry, 7*(2), 110-115.

Fontenelle, L. F., Telles, L. L., Nazar, B. P., de Menezes, G. B., do Nascimento, A. L., Mendlowicz, M. V., & Versiani, M. (2006b). A sociodemographic, phenomenological, and long-term follow-up study of patients with body dysmorphic disorder in Brazil. *International journal of psychiatry in medicine, 36*. doi:10.2190/b6xm-hlhq-7x6c-8gc0

Franzoi, S. L., & Shields, S. A. (1984). The Body Esteem Scale: Multidimensional structure and sex differences in a college population. *Journal of personality assessment, 48*(2), 173-178.

Frare, F., Perugi, G., Ruffolo, G., & Toni, C. (2004). Obsessive–compulsive disorder and body dysmorphic disorder: a comparison of clinical features. *European Psychiatry, 19*(5), 292-298.

Frías, Á., Palma, C., Farriols, N., & González, L. (2015). Comorbidity between obsessive-compulsive disorder and body dysmorphic disorder: Prevalence, explanatory theories, and clinical characterization. *Neuropsychiatric Disease and Treatment, 11*, 2233-2244. doi:10.2147/NDT.S67636

Friedman, N. P., Miyake, A., Corley, R. P., Young, S. E., DeFries, J. C., & Hewitt, J. K. (2006). Not all executive functions are related to intelligence. *Psychological science, 17*(2), 172-179.

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive therapy and research, 14*(5), 449-468.

Gardiner, M. (1971). The Wolf-Man by the Wolf-Man: The Double Story of Freud's Most Famous Case: New York: Basic Books.

Garner, D. M., Olmstead, M. P., & Polivy, J. (1983). Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *International Journal of Eating Disorders, 2*(2), 15-34.

Goodman, W. K., Storch, E. A., Geffken, G. R., & Murphy, T. K. (2006). Obsessive-compulsive disorder in Tourette syndrome. *Journal of child neurology, 21*(8), 704-714.

Grace, S. A., Labuschagne, I., Kaplan, R. A., & Rossell, S. L. (2017). The neurobiology of body dysmorphic disorder: A systematic review and theoretical model. *Neuroscience & Biobehavioral Reviews, 83*(Supplement C), 83-96. doi:https://doi.org/10.1016/j.neubiorev.2017.10.003

Grant, J. E., Kim, S. W., & Eckert, E. D. (2002). Body dysmorphic disorder in patients with anorexia nervosa: prevalence, clinical features, and delusionality of body image. *International Journal of Eating Disorders, 32*(3), 291-300.

Grant, J. E., Menard, W., & Phillips, K. A. (2006). Pathological skin picking in individuals with body dysmorphic disorder. *General hospital psychiatry, 28*(6), 487-493.

Grant, J. E., & Phillips, K. A. (2005). Recognizing and treating body dysmorphic disorder. *Annals of Clinical Psychiatry, 17*(4), 205-210.

Grant, J. E., Redden, S. A., Leppink, E. W., & Odlaug, B. L. (2015). Skin picking disorder with co-occurring body dysmorphic disorder. *Body Image, 15*, 44-48. doi:http://dx.doi.org/10.1016/j.bodyim.2015.05.003

Greenberg, J. L., Limoncelli, K. E., & Wilhelm, S. (2017). Body Dysmorphic Disorder by Proxy. *Body Dysmorphic Disorder: Advances in Research and Clinical Practice*, 95.

Greisberg, S., & McKay, D. (2003). Neuropsychology of obsessive-compulsive disorder: a review and treatment implications. *Clinical Psychology Review, 23*(1), 95-117. doi:http://dx.doi.org/10.1016/S0272-7358(02)00232-5

Group, O. C. C. W. (2005). Psychometric validation of the obsessive belief questionnaire and interpretation of intrusions inventory—Part 2: Factor analyses and testing of a brief version. *Behaviour Research and Therapy, 43*(11), 1527-1542.

Guidano, V. F., & Liotti, G. (1983). *Cognitive processes and emotional disorders: A structural approach to psychotherapy*: Guilford Press.

Gunstad, J., & Phillips, K. A. (2003). Axis I comorbidity in body dysmorphic disorder. *Compr Psychiatry, 44*. doi:10.1016/s0010-440x(03)00088-9

Hanes, K. R. (1998). Neuropsychological performance in body dysmorphic disorder. *Journal of the International Neuropsychological Society, 4*(2), 167-171. doi:10.1017/S1355617798001672

Hanes, K. R., Andrewes, D. G., Smith, D. J., & Pantelis, C. (1996). A brief assessment of executive control dysfunction: Discriminant validity and homogeneity of planning, set shift, and fluency measures. *Archives of Clinical Neuropsychology, 11*(3), 185-191.

Hart, A. S., & Phillips, K. A. (2013). Symmetry concerns as a symptom of body dysmorphic disorder. *Journal of Obsessive-Compulsive and Related Disorders, 2*(3), 292-298. doi:10.1016/j.jocrd.2013.04.004

Hefferon, K., & Gil-Rodriguez, E. (2011). Interpretative phenomenological analysis. *Psychologist, 24*(10), 756-759.

Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology, 44*(2), 227-239.

Hollander, E., Allen, A., Kwon, J., Aronowitz, B., Schmeidler, J., Wong, C., & Simeon, D. (1999). Clomipramine vs desipramine crossover trial in body dysmorphic disorder: selective efficacy of a serotonin reuptake inhibitor in imagined ugliness. *Archives of General Psychiatry, 56*(11), 1033-1039.

Hollander, E., Cohen, L., & Simeon, D. (1993). Body dysmorphic disorder. *Psychiatr Annals, 23*. doi:10.3928/0048-5713-19930701-06

Hsu, S. H., & Vashi, N. A. (2015). Body Dysmorphic Disorder: Historical Aspects. In N. A. Vashi (Ed.), *Beauty and Body Dysmorphic Disorder: A Clinician's Guide* (pp. 95-102). Cham: Springer International Publishing.

Ipser, J. C., Sander, C., & Stein, D. J. (2009). Pharmacotherapy and psychotherapy for body dysmorphic disorder. *Cochrane Database of Systematic Reviews*(1). doi:10.1002/14651858.CD005332.pub2

Ishigooka, J., Iwao, M., Suzuki, M., Fukuyama, Y., Murasaki, M., & Miura, S. (1998). Demographic features of patients seeking cosmetic surgery. *Psychiatry and Clinical Neurosciences, 52*(3), 283-287.

Janet, P., & Raymond, F. (1903). *Les obsessions et la psychasthénie* (Vol. 2): Félix Alcan.

Jefferies, K., Laws, K. R., & Fineberg, N. A. (2012). Superior face recognition in Body Dysmorphic Disorder. *Journal of Obsessive-Compulsive and Related Disorders, 1*(3), 175-179. doi:10.1016/j.jocrd.2012.03.002

Jokić-Begić, N. (2010). Cognitive-behavioral therapy and neuroscience: Towards closer integration. *Psihologijske teme, 19*(2), 235-254.

Joy, S., Kaplan, E., & Fein, D. (2004). Speed and memory in the WAIS-III Digit Symbol—Coding subtest across the adult lifespan. *Archives of Clinical Neuropsychology, 19*(6), 759-767. doi:https://doi.org/10.1016/j.acn.2003.09.009

Kalanthroff, E., Avnit, A., Aslan, C., & Henik, A. (2014). Inhibiting Doubt and Uncertainty: Intergrating Behavioral and Cognitive Models in Obessesive-Compulsive Disorder. *Clinical Neuropsychiatry, 11*(6), 160-163.

Keefe, R. S., & Harvey, P. D. (2015). Understanding symbol coding in schizophrenia. *Biological psychiatry, 78*(11), 744-746.

Kellett, S., Greenhalgh, R., Beail, N., & Ridgway, N. (2010). Compulsive Hoarding: An Interpretative Phenomenological Analysis. *Behavioural and Cognitive Psychotherapy, 38*(2), 141-155. doi:10.1017/S1352465809990622

Kerwin, L., Hovav, S., Hellemann, G., & Feusner, J. D. (2014). Impairment in local and global processing and set-shifting in body dysmorphic disorder. *Journal of Psychiatric Research, 57*(1), 41-50. doi:10.1016/j.jpsychires.2014.06.003

Kesby, A., Maguire, S., Brownlow, R., & Grisham, J. R. (2017). Intolerance of Uncertainty in eating disorders: An update on the field. *Clinical Psychology Review*.

Koran, L. M., Abujaoude, E., Large, M. D., & Serpe, R. T. (2008). The prevalence of body dysmorphic disorder in the United States adult population. *CNS Spectrums, 13*(4), 316-322.

Kovács, I., Polat, U., Pennefather, P. M., Chandna, A., & Norcia, A. M. (2000). A new test of contour integration deficits in patients with a history of disrupted binocular experience during visual development. *Vision Research, 40*(13), 1775-1783. doi:http://dx.doi.org/10.1016/S0042-6989(00)00008-0

Kraepelin, E. (1915). Psychiatrie Barth. *Leipzig, Germany*.

Kuelz, A. K., Hohagen, F., & Voderholzer, U. (2004). Neuropsychological performance in obsessive-compulsive disorder: a critical review. *Biological Psychology, 65*(3), 185-236. doi:http://dx.doi.org/10.1016/j.biopsycho.2003.07.007

Labuschagne, I., Castle, D. J., Dunai, J., Kyrios, M., & Rossell, S. L. (2010). An Examination of Delusional Thinking and Cognitive Styles in Body Dysmorphic Disorder. *Australian & New Zealand Journal of Psychiatry, 44*(8), 706-712. doi:10.3109/00048671003671007

Labuschagne, I., Castle, D. J., & Rossell, S. L. (2011). What the cognitive deficits in body dysmorphic disorder tell us about the underlying neurobiology: An investigation of three cases. *International Journal of Cognitive Therapy, 4*(1), 21-33. doi:10.1521/ijct.2011.4.1.21

Labuschagne, I., Rossell, S. L., Dunai, J., Castle, D. J., & Kyrios, M. (2013). A comparison of executive function in Body Dysmorphic Disorder (BDD) and Obsessive-Compulsive Disorder (OCD). *Journal of Obsessive-Compulsive and Related Disorders, 2*(3), 257-262. doi:http://dx.doi.org/10.1016/j.jocrd.2013.05.003

Lambrou, C., Veale, D., & Wilson, G. (2011). The role of aesthetic sensitivity in body dysmorphic disorder. *Journal of Abnormal Psychology 120(2)*, 443-453.

Lecrubier, Y., Sheehan, D. V., Weiller, E., Amorim, P., Bonora, I., Sheehan, K. H., . . . Dunbar, G. C. (1997). The Mini International Neuropsychiatric Interview (MINI). A short diagnostic structured interview: reliability and validity according to the CIDI. *European Psychiatry, 12*(5), 224-231.

Lemma, A. (2009). Being seen or being watched? A psychoanalytic perspective on body dysmorphia. *The International Journal of Psychoanalysis, 90*(4), 753-771.

Li, W., Arienzo, D., & Feusner, J. D. (2013). Body dysmorphic disorder: Neurobiological features and an updated model. *Zeitschrift fur Klinische Psychologie und Psychotherapie, 42*(3), 184-191. doi:10.1026/1616-3443/a000213

Li, W., Lai, T. M., Bohon, C., Loo, S. K., McCurdy, D., Strober, M., . . . Feusner, J. (2015a). Anorexia nervosa and body dysmorphic disorder are associated with abnormalities in processing visual information. *Psychological Medicine, 45*(10), 2111-2122. doi:10.1017/S0033291715000045

Li, W., Lai, T. M., Loo, S. K., Strober, M., Mohammad-Rezazadeh, I., Khalsa, S., & Feusner, J. (2015b). Aberrant early visual neural activity and brain-behavior relationships in anorexia nervosa and body dysmorphic disorder. *Frontiers in Human Neuroscience, 9*(JUNE). doi:10.3389/fnhum.2015.00301

Lovibond, P., & Lovibond. (1995). Manual for the depression anxiety stress scales. *The Psychology Foundation of Australia Inc*.

Lystad, J., Falkum, E., Haaland, V. Ø., Bull, H. C., Evensen, S., McGurk, S. R., & Ueland, T. (2017). SU27. Cognitive Remediation, Cognitive Behavioral Therapy, and Occupational Outcome in Schizophrenia Spectrum Disorders: A 2-Year Follow-up Study. *Schizophrenia Bulletin, 43*(suppl_1), S170-S171.

Madsen, S. K., Zai, A., Pirnia, T., Arienzo, D., Zhan, L., Moody, T. D., . . . Feusner, J. D. (2015). Cortical thickness and brain volumetric analysis in body dysmorphic disorder. *Psychiatry Research: Neuroimaging, 232*(1), 115-122.

Mahoney, A. E., & McEvoy, P. M. (2012). A transdiagnostic examination of intolerance of uncertainty across anxiety and depressive disorders. *Cognitive Behaviour Therapy, 41*(3), 212-222.

Marques, L., Weingarden, H. M., LeBlanc, N. J., & Wilhelm, S. (2011). Treatment utilization and barriers to treatment engagement among people with body dysmorphic symptoms. *Journal of psychosomatic research, 70*(3), 286-293.

Mathias, J. L., Bowden, S. C., & Barrett Woodbridge, M. (2007). Accuracy of the Wechsler Test of Adult Reading (WTAR) and National Adult Reading Test (NART) when estimating IQ in a healthy Australian sample. *Australian Psychologist, 42*(1), 49-56.

McCurdy-McKinnon, D., & Feusner, J. D. (2017). Neurobiology of Body Dysmorphic Disorder: Heritability/Genetics, Brain Circuitry, and Visual Processing. *Body Dysmorphic Disorder: Advances in Research and Clinical Practice*, 253.

McKay, D., Neziroglu, F., & Yaryura-Tobias, J. A. (1997). Comparison of clinical characteristics in obsessive-compulsive disorder and body dysmorphic disorder. *Journal of Anxiety Disorders, 11*(4), 447-454.

Medalia, A., Herlands, T., Saperstein, A., & Revheim, N. (2017). *Cognitive remediation for psychological disorders: therapist guide*: Oxford University Press.

Meidlinger, P. C., & Hope, D. A. (2017). The new transdiagnostic cognitive behavioral treatments: Commentary for clinicians and clinical researchers. *Journal of Anxiety Disorders, 46*(Supplement C), 101-109. doi:https://doi.org/10.1016/j.janxdis.2016.11.002

Miller, G. A., & Chapman, J. P. (2001). Misunderstanding analysis of covariance. *Journal of Abnormal Psychology, 110*(1), 40.

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. *Cognitive Psychology, 41*(1), 49-100. doi:https://doi.org/10.1006/cogp.1999.0734

Mohn, C., Sundet, K., & Rund, B. R. (2014). The relationship between IQ and performance on the MATRICS consensus cognitive battery. *Schizophrenia Research: Cognition, 1*(2), 96-100. doi:https://doi.org/10.1016/j.scog.2014.06.003

Monzani, B., Krebs, G., Anson, M., Veale, D., & Mataix-Cols, D. (2013). Holistic versus detailed visual processing in body dysmorphic disorder: Testing the inversion, composite and global precedence effects. *Psychiatry Research, 210*(3), 994-999. doi:10.1016/j.psychres.2013.08.009

Morselli, E. (1891). Sulla dismorfofobia e sulla tafefobia: due forme non per anco descritte di Pizzia con idee fisse. *Boll R Accad Genova, 6*.

Morselli, E., & Jerome, L. (2001). Dysmorphophobia and taphephobia: two hitherto undescribed forms of Insanity with fixed ideas. *History of Psychiatry, 12*(45), 103-107. doi:10.1177/0957154X0101204505

Motter, J. N., Pimontel, M. A., Rindskopf, D., Devanand, D. P., Doraiswamy, P. M., & Sneed, J. R. (2016). Computerized cognitive training and functional recovery in major depressive disorder: A meta-analysis. *Journal of Affective Disorders, 189*, 184-191.

Moulding, R., Mancuso, S. G., Rehm, I., & Nedeljkovic, M. (2016). The self in the obsessive–compulsive-related disorders: hoarding disorder, body dysmorphic disorder, and trichotillomania. *The self in understanding and treating psychological disorders. Cambridge: CUP*, 123-133.

Mufaddel, A., Osma, O. T., Almugaddam, F., & Jafferany, M. (2013). A review of body dysmorphic disorder and its presentation in different clinical settings. *Primary Care Companion to the Journal of Clinical Psychiatry, 15*(4). doi:10.4088/PCC.12r01464

Mulkens, S., Kerzel, C., Merckelbach, H., & Jansen, A. (2006). Mooi, maar ontevreden, over psychische stoornissen en cosmetische chirurgie. *MGV, 61*, 34-47.

Murphy, H., & Perera-Delcourt, R. (2014). 'Learning to live with OCD is a little mantra I often repeat': Understanding the lived experience of obsessive-compulsive disorder (OCD) in the contemporary therapeutic context. *Psychology and Psychotherapy: Theory, Research and Practice, 87*(1), 111-125. doi:10.1111/j.2044-8341.2012.02076.x

Mushtaq, F., Bland, A. R., & Schaefer, A. (2011). Uncertainty and Cognitive Control. *Frontiers in Psychology, 2*, 249. doi:10.3389/fpsyg.2011.00249

Nakamae, T., Narumoto, J., Sakai, Y., Nishida, S., Yamada, K., Kubota, M., . . . Fukui, K. (2012). Reduced cortical thickness in non-medicated patients with obsessive-compulsive disorder. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 37*(1), 90-95. doi:http://dx.doi.org/10.1016/j.pnpbp.2012.01.001

Neziroglu, F., Khemlani-Patel, S., & Yaryura-Tobias, J. (2006) Rates of abuse in body dysmorphic disorder and obsessive-compulsive disorder. *Body Image, 3*(2), 189-193.

Neziroglu, F., Khemlani-Patel, S., & Veale, D. (2008). Social learning ad cognitive behavioural models of body dysmorphic disorder. *Body Image, 5(1)*, 28-38.

Nierenberg, A. A., Phillips, K. A., Petersen, T. J., Kelly, K. E., Alpert, J. E., Worthington, J. J., . . . Fava, M. (2002). Body dysmorphic disorder in outpatients with major depression. *Journal of Affective Disorders, 69*(1), 141-148.

Nuechterlein, K., & Green, M. (2006). MATRICS consensus cognitive battery manual. *Los Angeles, CA: MATRICS Assessment Inc*.

Nuechterlein, K. H., Green, M. F., Kern, R. S., Baade, L. E., Barch, D. M., Cohen, J. D., . . . Gold, J. M. (2008). The MATRICS Consensus Cognitive Battery, part 1: test selection, reliability, and validity. *American Journal of Psychiatry, 165*(2), 203-213.

Oakes, A., Collison, J., & Milne-Home, J. (2016). Repetitive, Safe, and Automatic: The Experience of Appearance-Related Behaviours in Body Dysmorphic Disorder. *Australian Psychologist*. doi:10.1111/ap.12247

Olley, A., Malhi, G., & Sachdev, P. (2007). Memory and executive functioning in obsessive–compulsive disorder: A selective review. *Journal of Affective Disorders, 104*(1), 15-23. doi:http://dx.doi.org/10.1016/j.jad.2007.02.023

Osman, S., Cooper, M., Hackmann, A., & Veale, D. (2004). Spontaneously occurring images and early memories in people with body dysmorphic disorder. *Memory, 12*(4), 428-436. doi:10.1080/09658210444000043

Osterrieth, P. A. (1944). Le test de copie d'une figure complexe; contribution a l'etude de la perception et de la memoire. *Archives de psychologie*.

Otto, M. W., Wilhelm, S., Cohen, L. S., & Harlow, B. L. (2001). Prevalence of body dysmorphic disorder in a community sample of women. *Am J Psychiatry, 158*. doi:10.1176/appi.ajp.158.12.2061

Pankejeff, S., Brunswick, R. M., Gardiner, M., & Freud, S. (1971). *The Wolf-Man: With The Case of the Wolf-Man*: Basic Books.

Park, H. S., Shin, Y. W., Ha, T. H., Shin, M. S., Kim, Y. Y., Lee, Y. H., & Kwon, J. S. (2006). Effect of cognitive training focusing on organizational strategies in patients with obsessive-compulsive disorder. *Psychiatry Clin Neurosci, 60*.

Pavan, C., Simonato, P., Marini, M., Mazzoleni, F., Pavan, L., & Vindigni, V. (2008). Psychopathologic Aspects of Body Dysmorphic Disorder: A Literature Review. *Aesthetic Plastic Surgery, 32*(3), 473-484. doi:10.1007/s00266-008-9113-2

Perugi, G., Akiskal, H. S., Giannotti, D., Frare, F., Di Vaio, S., & Cassano, G. B. (1997). Gender-related differences in body dysmorphic disorder (dysmorphophobia). *J Nerv Ment Dis, 185*. doi:10.1097/00005053-199709000-00007

Phillipou, A., Rossell, S. L., Wilding, H. E., & Castle, D. J. (2016). Randomised controlled trials of psychological & pharmacological treatments for body dysmorphic disorder:

A systematic review. *Psychiatry Research, 245*, 179-185. doi:10.1016/j.psychres.2016.05.062

Phillips, B., Moulding, R., Kyrios, M., Nedeljkovic, M., & Mancuso, S. (2011). The relationship between body dysmorphic disorder symptoms and self-construals. *Clinical Psychologist, 15*(1), 10-16.

Phillips, K. (1994). *Body Dysmorphic Disorder Diagnostic Module*: McLean Hospital, Belmont, MA.

Phillips, K. (2015). Body Dysmorphic Disorder. In K. Phillips & D. Stein (Eds.), *Handbook on Obsesisve-Compulsive and Related Disorders* American Psychiatric Publishing.

Phillips, K., Coles, M. E., Menard, W., Yen, S., Fay, C., & Weisberg, R. B. (2005a). Suicidal ideation and suicide attempts in body dysmorphic disorder. *The journal of clinical psychiatry, 66*(6), 717-725.

Phillips, K., Hart, A. S., Simpson, H. B., & Stein, D. J. (2014). Delusional versus nondelusional body dysmorphic disorder: Recommendations for DSM-5. *CNS Spectrums, 19*(1), 10-20. doi:10.1017/S1092852913000266

Phillips, K., & Menard, W. (2006). Suicidality in Body Dysmorphic Disorder: A Prospective Study. *American Journal of Psychiatry, 163*(7), 1280-1282. doi:10.1176/ajp.2006.163.7.1280

Phillips, K., Menard, W., Fay, C., & Weisberg, R. (2005b). Demographic Characteristics, Phenomenology, Comorbidity, and Family History in 200 Individuals With Body Dysmorphic Disorder. *Psychosomatics, 46*(4), 317-325. doi:http://dx.doi.org/10.1176/appi.psy.46.4.317

Phillips, K., Menard, W., Quinn, E., Didie, E., & Stout, R. (2013a). A 4-year prospective observational follow-up study of course and predictors of course in body dysmorphic disorder. *Psychological Medicine, 43*(05), 1109-1117.

Phillips, K., Pinto, A., Hart, A. S., Coles, M. E., Eisen, J. L., Menard, W., & Rasmussen, S. A. (2012). A comparison of insight in body dysmorphic disorder and obsessive-compulsive disorder. *Journal of Psychiatric Research, 46*(10), 1293-1299. doi:10.1016/j.jpsychires.2012.05.016

Phillips, K., & Stein, D. (2015). *Handbook on Obsesisve-Compulsive and Related Disorders* American Psychiatric Publishing

Phillips, K. A. (2000). Quality of life for patients with body dysmorphic disorder. *The Journal of nervous and mental disease, 188*(3), 170-175.

Phillips, K. A. (2004). Psychosis in body dysmorphic disorder. *Journal of Psychiatric Research, 38*(1), 63-72. doi:http://dx.doi.org/10.1016/S0022-3956(03)00098-0

Phillips, K. A. (2005a). *The broken mirror: understanding and treating body dysmorphic disorder*: Oxford University Press, USA.

Phillips, K. A. (2005b). Placebo-controlled study of pimozide augmentation of fluoxetine in body dysmorphic disorder. *American Journal of Psychiatry, 162*(2), 377-379.

Phillips, K. A. (2009). *Understanding body dysmorphic disorder*: Oxford University Press.

Phillips, K. A., Albertini, R. S., & Rasmussen, S. A. (2002). A randomized placebo-controlled trial of fluoxetine in body dysmorphic disorder. *Archives of General Psychiatry, 59*(4), 381-388.

Phillips, K. A., & Diaz, S. F. (1997). Gender differences in body dysmorphic disorder. *J Nerv Ment Dis, 185*. doi:10.1097/00005053-199709000-00006

Phillips, K. A., Didie, E. R., Menard, W., Pagano, M. E., Fay, C., & Weisberg, R. B. (2006a). Clinical features of body dysmorphic disorder in adolescents and adults. *Psychiatry Res, 141*. doi:10.1016/j.psychres.2005.09.014

Phillips, K. A., Dufresne, R. G., Wilkel, C. S., & Vittorio, C. C. (2000). Rate of body dysmorphic disorder in dermatology patients. *Journal of the American Academy of Dermatology, 42*(3), 436-441.

Phillips, K. A., Grant, J., Siniscalchi, J., & Albertini, R. S. (2001). Surgical and nonpsychiatric medical treatment of patients with body dysmorphic disorder. *Psychosomatics, 42*(6), 504-510.

Phillips, K. A., Hart, A. S., Menard, W., & Eisen, J. L. (2013b). Psychometric evaluation of the Brown Assessment of Beliefs Scale in body dysmorphic disorder. *The Journal of nervous and mental disease, 201*(7), 640.

Phillips, K. A., & Hollander, E. (2008). Treating body dysmorphic disorder with medication: evidence, misconceptions, and a suggested approach. *Body Image, 5*(1), 13-27.

Phillips, K. A., Hollander, E., Rasmussen, S. A., & Aronowitz, B. R. (1997). A severity rating scale for body dysmorphic disorder: development, reliability, and validity of a modified version of the Yale-Brown Obsessive Compulsive Scale. *Psychopharmacology bulletin, 33*(1), 17.

Phillips, K. A., & Kaye, W. H. (2007). The relationship of body dysmorphic disorder and eating disorders to obsessive-compulsive disorder. *CNS Spectrums, 12*(5), 347-358.

Phillips, K. A., McElroy, S. L., Keck, P. E., Hudson, J. I., & Pope, H. (1994). A comparison of delusional and nondelusional body dysmorphic disorder in 100 cases. *Psychopharmacology bulletin*.

Phillips, K. A., McElroy, S. L., Keck, P. E., Pope, H. G., & Hudson, J. I. (1993). Body dysmorphic disorder: 30 cases of imagined ugliness. *Am J Psychiatry, 150*. doi:10.1176/ajp.150.2.302

Phillips, K. A., Menard, W., & Fay, C. (2006b). Gender similarities and differences in 200 individuals with body dysmorphic disorder. *Compr Psychiatry, 47*. doi:10.1016/j.comppsych.2005.07.002

Phillips, K. A., Quinn, G., & Stout, R. L. (2008). Functional Impairment in Body Dysmorphic Disorder: A Prospective, Follow-up Study. *Journal of Psychiatric Research, 42*(9), 701-707. doi:10.1016/j.jpsychires.2007.07.010

Phillips, K. A., Wilhelm, S., Koran, L. M., Didie, E. R., Fallon, B. A., Feusner, J., & Stein, D. J. (2010). Body dysmorphic disorder: some key issues for DSM-V. *Depression and Anxiety, 27*(6), 573-591.

Pope, C. G., Pope, H. G., Menard, W., Fay, C., Olivardia, R., & Phillips, K. A. (2005). Clinical features of muscle dysmorphia among males with body dysmorphic disorder. *Body Image, 2*(4), 395-400.

Purcell, R., Maruff, P., Kyrios, M., & Pantelis, C. (1998). Cognitive Deficits in Obsessive–Compulsive Disorder on Tests of Frontal–Striatal Function. *Biological psychiatry, 43*(5), 348-357. doi:http://dx.doi.org/10.1016/S0006-3223(97)00201-1

Rauch, S. L., Phillips, K. A., Segal, E., Makris, N., Shin, L. M., Whalen, P. J., . . . Kennedy, D. N. (2003). A preliminary morphometric magnetic resonance imaging study of regional brain volumes in body dysmorphic disorder. *Psychiatry Research: Neuroimaging, 122*(1), 13-19.

Reese, H. E., McNally, R. J., & Wilhelm, S. (2010). Facial asymmetry detection in patients with body dysmorphic disorder. *Behaviour Research and Therapy, 48*(9), 936-940. doi:10.1016/j.brat.2010.05.021

Rehm, I. C., Nedeljkovic, M., Thomas, A., & Moulding, R. (2015). The role of cognitions and beliefs in trichotillomania: A qualitative study using interpretative phenomenological analysis. *Behaviour Change, 32*(4), 209-230.

Reitan, R. M. (1986). *Trail Making Test: Manual for administration and scoring*: Reitan Neuropsychology Laboratory.

Rief, W., Buhlmann, U., Wilhelm, S., Borkenhagen, A., & Brähler, E. (2006). The prevalence of body dysmorphic disorder: A population-based survey. *Psychological Medicine, 36*(6), 877-885. doi:10.1017/S0033291706007264

Rosen, J. C., Reiter, J., & Orosan, P. (1995). Cognitive-behavioral body image therapy for body dysmorphic disorder. *Journal of consulting and clinical psychology, 63*, 263.

Rossell, S. L., Labuschagne, I., Dunai, J., Kyrios, M., & Castle, D. J. (2014). Using theories of delusion formation to explain abnormal beliefs in Body Dysmorphic Disorder (BDD). *Psychiatry Research, 215*(3), 599-605. doi:10.1016/j.psychres.2013.12.030

Ruff, R., Light, R., Parker, S., & Levin, H. (1996). Benton controlled oral word association test: Reliability and updated norms. *Archives of Clinical Neuropsychology, 11*(4), 329-338.

S Ruffolo, J., Phillips, K. A., Menard, W., Fay, C., & Weisberg, R. B. (2006). Comorbidity of body dysmorphic disorder and eating disorders: severity of psychopathology and body image disturbance. *International Journal of Eating Disorders, 39*(1), 11-19.

Sanderson, K., & Andrews, G. (2002). Prevalence and severity of mental health-related disability and relationship to diagnosis. *Psychiatric services, 53*(1), 80-86.

Sarwer, D. B., Wadden, T. A., Pertschuk, M. J., & Whitaker, L. A. (1998). Body image dissatisfaction and body dysmorphic disorder in 100 cosmetic surgery patients. *Plastic and Reconstructive Surgery, 101*(6), 1644-1649.

Savage, C. R., Baer, L., Keuthen, N. J., Brown, H. D., Rauch, S. L., & Jenike, M. A. (1999). Organizational strategies mediate nonverbal memory impairment in obsessive–compulsive disorder. *Biological psychiatry, 45*(7), 905-916.

Savage, C. R., Deckersbach, T., Wilhelm, S., Rauch, S. L., Baer, L., Reid, T., & Jenike, M. A. (2000). Strategic processing and episodic memory impairment in obsessive compulsive disorder. *Neuropsychology, 14*(1), 141.

Saxena, S., & Rauch, S. L. (2000). Functional neuroimaging and the neuroanatomy of obsessive-compulsive disorder. *Psychiatric Clinics of North America, 23*(3), 563-586.

Saxena, S., Winograd, A., Dunkin, J. J., Maidment, K., Rosen, R., Vapnik, T., . . . Bystritsky, A. (2001). A retrospective review of clinical characteristics and treatment response in

body dysmorphic disorder versus obsessive-compulsive disorder. *The journal of clinical psychiatry, 62*(1), 67-72.

Schieber, K., Kollei, I., de Zwann, M., Muller, A., & Martin, A. (2013). Personality traitds as vulnerability factors in body dysmorphic disorder. Psychiatry Research, *210 (1),* 242-246.

Schoenleber, M., & Gratz, K. L. (2017). Self-Acceptance Group Therapy: A Transdiagnostic, Cognitive-Behavioral Treatment for Shame. *Cognitive and Behavioral Practice*.

Shao, Z., Janse, E., Visser, K., & Meyer, A. S. (2014). What do verbal fluency tasks measure? Predictors of verbal fluency performance in older adults. *Frontiers in Psychology, 5*, 772. doi:10.3389/fpsyg.2014.00772

Sheehan, D., Lecrubier, Y., Sheehan, K. H., Janavs, J., Weiller, E., Keskiner, A., . . . Dunbar, G. (1997). The validity of the Mini International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. *European Psychiatry, 12*(5), 232-241.

Shenhav, A., Cohen, J. D., & Botvinick, M. M. (2016). Dorsal anterior cingulate cortex and the value of control. *Nat Neurosci, 19*(10), 1286-1291. doi:10.1038/nn.4384

Sherman, B. J., Savage, C. R., Eddy, K. T., Blais, M. A., Deckersbach, T., Jackson, S. C., . . . Herzog, D. B. (2006). Strategic memory in adults with anorexia nervosa: Are there similarities to obsessive compulsive spectrum disorders? *International Journal of Eating Disorders, 39*(6), 468-476.

Silver, J., & Farrants, J. (2015). 'I Once Stared at Myself in the Mirror for Eleven Hours.' Exploring mirror gazing in participants with body dysmorphic disorder. *Journal of Health Psychology*. doi:10.1177/1359105315581516

Silver, J., & Reavey, P. (2010). " He's a good-looking chap aint he?": Narrative and visualisations of self in body dysmorphic disorder. *Social Science and Medicine, 70*(10), 1641-1647. doi:10.1016/j.socscimed.2009.11.042

Silver, J., Reavey, P., & Fineberg, N. (2010). How do people with body dysmorphic disorder view themselves? A thematic analysis. *International Journal of Psychiatry in Clinical Practice, 14*(3), 190-197. doi:10.3109/13651501003735492

Silverstein, S. M., Elliott, C. M., Feusner, J. D., Keane, B. P., Mikkilineni, D., Hansen, N., . . . Wilhelm, S. (2015). Comparison of visual perceptual organization in schizophrenia and body dysmorphic disorder. *Psychiatry Research, 229*(1-2), 426-433. doi:10.1016/j.psychres.2015.05.107

Smith, J., & Osborn, M. (2008). Interpretative phenomenological analysis. Dans JA Smith (Éd.), Qualitative psychology: a practical guide to research methods (2 e éd., pp. 53-80): Los Angeles, CA: Sage.

Smith, J. A. (1996). Beyond the divide between cognition and discourse: Using interpretative phenomenological analysis in health psychology. *Psychology and health, 11*(2), 261-271.

Smith, J. A. (2011). Evaluating the contribution of interpretative phenomenological analysis. *Health psychology review, 5*(1), 9-27.

Snyder, H. R., Kaiser, R. H., Warren, S. L., & Heller, W. (2014). Obsessive-Compulsive Disorder Is Associated With Broad Impairments in Executive Function. *Clinical Psychological Science, 3*(2), 301-330. doi:10.1177/2167702614534210

Sobanski, E., & Schmidt, M. H. (2000). Body dysmorphic disorder: A review of the current knowledge. *Child Psychology and Psychiatry Review, 5*(1), 17-24.

Stangier, U., Adam-Schwebe, S., Müller, T., & Wolter, M. (2008). Discrimination of facial appearance stimuli in body dysmorphic disorder. *Journal of Abnormal Psychology, 117*(2), 435.

Stewart, S. E., Stack, D. E., & Wilhelm, S. (2008). Severe obsessive-compulsive disorder with and without body dysmorphic disorder: Clinical correlates and implications. *Annals of Clinical Psychiatry, 20*(1), 33-38. doi:10.1080/10401230701844463

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of experimental psychology, 18*(6), 643.

Stuss, D. T., & Alexander, M. P. (2000). Executive functions and the frontal lobes: a conceptual view. *Psychological research, 63*(3), 289-298.

Summers, B. J., Matheny, N. L., Sarawgi, S., & Cougle, J. R. (2016). Intolerance of uncertainty in body dysmorphic disorder. *Body Image, 16*, 45-53. doi:http://dx.doi.org/10.1016/j.bodyim.2015.11.002

Suzuki, K., Takei, N., Kawai, M., Minabe, Y., & Mori, N. (2003). Is taijin kyofusho a culture-bound syndrome? *American Journal of Psychiatry, 160*(7), 1358-1358.

Taylor, E. (1959). *The appraisal of children with cerebral deficits*: Harvard Univ. Press, Cambridge, MA.

Tisher, R., Allen, J. S., & Crouch, W. (2014). The Self Ambivalence Measure: A psychometric investigation. *Australian Journal of Psychology, 66*(3), 197-206.

Toh, W. L., Castle, D. J., & Rossell, S. L. (2015). Examining neurocognition in body dysmorphic disorder using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): A comparison with obsessive-compulsive disorder. *Psychiatry Research, 228*(3), 318-324. doi:10.1016/j.psychres.2015.05.094

Toh, W. L., Castle, D. J., & Rossell, S. L. (2017). Characterisation of body dysmorphic disorder (BDD) versus obsessive-compulsive disorder (OCD): In light of current DSM-5 nosology. *Journal of Obsessive-Compulsive and Related Disorders, 12*, 117-126.

Toh, W. L., Rossell, S. L., & Castle, D. J. (2009). Body dysmorphic disorder: a review of current nosological issues and associated cognitive deficits. *Current Psychiatry Reviews, 5*(4), 261-270.

Tolin, D. F., Abramowitz, J. S., Brigidi, B. D., & Foa, E. B. (2003). Intolerance of uncertainty in obsessive-compulsive disorder. *Journal of Anxiety Disorders, 17*(2), 233-242.

Tolin, D. F., Worhunsky, P., & Maltby, N. (2006). Are "obsessive" beliefs specific to OCD?: A comparison across anxiety disorders. *Behaviour Research and Therapy, 44*(4), 469-480.

Turpin, G., Barley, V., Beail, N., Seaire, J., Slade, P., Smith, J., & Walsh, S. (1997). *Standards for research projects and theses involving qualitative methods: Suggested guidelines for trainees and courses.* Paper presented at the Clinical Psychology Forum.

Vandborg, S. K., Hartmann, T. B., Bennedsen, B. E., Pedersen, A. D., Eskildsen, A., Videbech, P. B. H., & Thomsen, P. h. (2012). Do cognitive functions in obsessive–

compulsive disorder change after treatment? A systematic review and a double case report. *Nordic journal of psychiatry, 66*(1), 60-67.

Veale, D. (2002). Over-valued ideas: a conceptual analysis. *Behaviour Research and Therapy, 40*(4), 383-400.

Veale, D. (2004). Advances in a cognitive behavioural model of body dysmorphic disorder. *Body Image, 1*(1), 113-125.

Veale, D., Anson, M., Miles, S., Pieta, M., Costa, A., & Ellison, N. (2014). Efficacy of cognitive behaviour therapy versus anxiety management for body dysmorphic disorder: a randomised controlled trial. *Psychotherapy and psychosomatics, 83*(6), 341-353.

Veale, D., Gournay, K., Dryden, W., Boocock, A., Shah, F., Willson, R., & Walburn, J. (1996). Body dysmorphic disorder: a cognitive behavioural model and pilot randomised controlled trial. *Behaviour Research and Therapy, 34*(9), 717-729.

Veale, D., & Neziroglu, F. (2010). *Body dysmorphic disorder: A treatment manual*: John Wiley & Sons.

Veale, D., & Riley, S. (2001). Mirror, mirror on the wall, who is the ugliest of them all? The psychopathology of mirror gazing in body dysmorphic disorder. *Behaviour Research and Therapy, 39*(12), 1381-1393. doi:http://dx.doi.org/10.1016/S0005-7967(00)00102-9

Villareal, G., Johnson, M., & Ballenger, J. C. (1995). Body dysmorphic disorder in patients with anxiety disorders and major depression: a comorbidity study. *Am J Psychiatry, 152*(1), 1665-1667.

Waszczuk, M. A., Zimmerman, M., Ruggero, C., Li, K., MacNamara, A., Weinberg, A., . . . Kotov, R. (2017). What do clinicians treat: Diagnoses or symptoms? The incremental validity of a symptom-based, dimensional characterization of emotional disorders in predicting medication prescription patterns. *Comprehensive psychiatry*.

Wechsler, D. (1997). *WMS-III: Wechsler memory scale administration and scoring manual*: Psychological Corporation.

Wechsler, D. (2001). *Wechsler Test of Adult Reading: WTAR*: Psychological Corporation.

Weingarden, H., Curley, E. E., Renshaw, K. D., & Wilhelm, S. (2017). Patient-identified events implicated in the development of body dysmorphic disorder. *Body Image, 21*, 19-25. doi:http://dx.doi.org/10.1016/j.bodyim.2017.02.003

Weingarden, H., & Renshaw, K. D. (2015). Shame in the obsessive compulsive related disorders: A conceptual review. *Journal of Affective Disorders, 0*, 74-84. doi:10.1016/j.jad.2014.09.010

Weingarden, H., Renshaw, K. D., Davidson, E., & Wilhelm, S. (2017). Relative relationships of general shame and body shame with body dysmorphic phenomenology and psychosocial outcomes. *Journal of Obsessive-Compulsive and Related Disorders, 14*, 1-6. doi:https://doi.org/10.1016/j.jocrd.2017.04.003

Wilhelm, S., & Neziroglu, F. (2002) Cognitive theory of body dysmorphic disorder. In R, Frost & G, Steketee (Ed.) *Cognitive approaches to obsessions and compulsions* (pp. 203-214). Elsevier Science, Oxford, United Kingdom.

Wilhelm, S., Otto, M. W., Zucker, B. G., & Pollack, M. H. (1997). Prevalence of body dysmorphic disorder in patients with anxiety disorders. *Journal of Anxiety Disorders, 11*(5), 499-502.

Wilhelm, S., Phillips, K. A., Didie, E., Buhlmann, U., Greenberg, J. L., Fama, J. M., . . . Steketee, G. (2014). Modular Cognitive-Behavioral Therapy for Body Dysmorphic Disorder: A Randomized Controlled Trial. *Behavior Therapy, 45*(3), 314-327. doi:https://doi.org/10.1016/j.beth.2013.12.007

Wilhelm, S., Phillips, K. A., Fama, J. M., Greenberg, J. L., & Steketee, G. (2011). Modular cognitive–behavioral therapy for body dysmorphic disorder. *Behavior Therapy, 42*(4), 624-633.

Windheim, K., Veale, D., & Anson, M. (2011). Mirror gazing in body dysmorphic disorder and healthy controls: Effects of duration of gazing. *Behaviour Research and Therapy, 49*(9), 555-564. doi:10.1016/j.brat.2011.05.003

Yaryura-Tobias, J. A., Neziroglu, F., Chang, R., Lee, S., Pinto, A., & Donohue, L. (2002). Computerized perceptual analysis of patients with body dysmorphic disorder: a pilot study. *CNS Spectrums, 7*(6), 444-446.

Zung, W. W. (1965). A self-rating depression scale. *Archives of General Psychiatry, 12*(1), 63-70.

Appendix A

Advertisement -Body Dysmorphic Disorder (BDD) Participants

Body Dysmorphic Disorder (BDD) Research Project

Seeking volunteers to participate in a research study looking at beliefs, life experiences and cognition in individuals with Body Dysmorphic Disorder .

Eligibility Criteria

- Aged 18-65
- Current diagnosis of Body Dysmorphic Disorder
- Speak English fluently

What does research involve?

- Attending two testing sessions.
- Session one will involve a clinical interview and questionnaires.
- Session two will involve completing a number of non-invasive cognitive tasks (e.g. verbal, paper & pen and computer)

You will be reimbursed for your time and participation at $25 per assessment session

Sarah Brennan:
M:
E: snbrennan@swin.edu.au

Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au
Sarah Brennan:
M:
E: snbrennan@swin.edu.au

Appendix B

Advertisement -Control Participants

Seeking Control Participants

Seeking **control** volunteers to participate in a research study looking at beliefs, life experiences and cognition in Body Dysmorphic Disorder

Eligibility Criteria

- Aged 18-65
- No past or current diagnosis of Body Dysmorphic Disorder or other psychiatric disorder
- Speak English fluently

What does research involve?

- Attending two testing sessions.
- Session one will involve a clinical interview and questionnaires.
- Session two will involve completing a number of non-invasive cognitive tasks (e.g. verbal, paper & pen and computer)

You will be reimbursed for your time and participation at $25 per assessment session

Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au	Sarah Brennan: M: E: snbrennan@swin.edu.au

Appendix C

Clinical Demographic Form

Protocol Number: HREC-A 102/13

Protocol Version: 1

Protocol Date: 19/8/2013

(This page to be filed separately to the CRF)

Participant Information

Full name: _____
Participant ID number: _____
Address: _____
Phone number: _____
Mobile number: _____

Participant ID number:_____ **Date:** _____

Protocol Number: HREC-A 102/13

DEMOGRAPHIC INFORMATION

1. Date of Birth: __ __-__ __-__ __ __ __
Day Month Year

2. Age at start of Study: ___ ___

3. Sex:
- ❑ Male$_1$
- ❑ Female$_2$

4. Handedness
- ❑ Right$_1$
- ❑ Left$_2$

5. Country of Birth:
- ❑ Australia$_1$
- ❑ UK and Ireland$_2$
- ❑ Europe (including former USSR) 3
- ❑ North America$_4$
- ❑ Central and South America$_5$
- ❑ NZ, Pacific islands, PNG$_6$
- ❑ East Asia (China, Japan, Korea, Taiwan, Hong Kong) 7
- ❑ South East Asia$_8$
- ❑ Indian subcontinent and other Asia$_9$
- ❑ Middle East$_{10}$
- ❑ North Africa$_{11}$
- ❑ Central and Southern Africa$_{12}$
- ❑ Other$_{13}$_____

6. Ethnicity:
- ❑ Caucasian$_1$
- ❑ African Desent$_2$
- ❑ Asian$_3$
- ❑ Hispanic$_4$
- ❑ Aboriginal or Torres Strait Islander$_5$
- ❑ Other$_6$_____

Participant ID number:_____ **Date:** _____

Protocol Number: HREC-A 102/13

7. Primary Language

- ❑ English$_1$
- ❑ Other$_2$_____

8. Marital Status:

- ❑ Single$_1$ (Never married)
- ❑ Defacto$_2$
- ❑ Married$_3$
- ❑ Divorced$_4$
- ❑ Separated$_5$
- ❑ Widowed$_6$
- ❑ Other$_7$_____

9. Education:

- ❑ Primary School qualification$_1$
- ❑ Secondary School Qualification$_2$
- ❑ Trade Certificate/apprenticeship$_3$
- ❑ Tafe/Diploma$_4$
- ❑ Undergraduate university degree$_5$
- ❑ Post graduate Degree$_6$
- ❑ Masters/Doctorate/PhD$_7$
- ❑ Other$_8$_____

Total years of Education_____

10. Employment:

- ❑ Unemployed$_1$
- ❑ Employed Full-time$_2$
- ❑ Employed Part-time$_3$
- ❑ Employed Casual$_4$
- ❑ Self Employed$_5$
- ❑ House duties$_6$
- ❑ Student$_7$
- ❑ Retired$_8$

Participant ID number:_____ **Date:** _____

Protocol Number: HREC-A 102/13

MEDICAL AND PSYCHIATRIC INFORMATION

1. Have you ever suffered from a head injury accompanied by a loss of consciousness that lasted for longer than 5 minutes or required hospitalisation?

- ❑ Yes$_1$
- ❑ No$_2$
- ❑ Do not know$_3$

2. Do you have a neurological or seizure disorder?

- ❑ Yes$_1$
- ❑ No$_2$

If so, please specify:

_____
_____
_____

3. Please list all medications you are currently taking:

Name	***Dosage (per day)***	***Purpose***

4. Do you have a psychiatric diagnosis?

- ❑ Yes$_1$
- ❑ No$_2$

If so, please specify:

_____
_____
_____

5. Age of diagnosis: _____

6. Duration of condition to this point (*years / months*):_____

Participant ID number:_____ **Date:** _____

Protocol Number: HREC-A 102/13

7. Does anyone in your family have a psychiatric illness?

- ❑ Yes$_1$
- ❑ No$_2$

If so, please specify:

_____
_____
_____
_____

Appendix D

Body Dysmorphic Disorder Diagnostic Module (BDD-DM; Phillips, 1994)

BODY DYSMORPHIC DISORDER DIAGNOSTIC MODULE – ADULT VERSION
DIAGNOSING BDD ACCORDING TO DSM-5 DIAGNOSTIC CRITERIA

CRITERION A

"Are you very worried about your appearance in any way?" *OR,* "Are you unhappy with how you look?"	A. Preoccupation with one or more perceived defects or flaws in physical appearance that are not observable or appear slight to others.	1 2 3
If yes, "What is your concern? Do you think *(fill in body area)* is especially unattractive?"	*NOTE: Give some examples of body areas even if patient answers no to these questions.*	
"Are you unhappy with any other aspects of your appearance, such as your face, skin, hair, nose, or the shape, size, or any other aspect of your body?"	Examples include: skin concerns (e.g., acne, scars, wrinkles, paleness), hair concerns (e.g. thinning), or the shape/size of the nose, jaw, lips, etc. Also consider perceived "defects" of hands, genitals, or any other body part.	
If yes, "Do these concerns preoccupy you? How much time would you estimate that you spend each day thinking about your appearance, if you add up all the time you spend?"	*NOTE: List all body parts of concern.*	

CRITERION B

"Is there anything that you do over and over in response to your appearance concerns?"	B. At some point during the course of the disorder, the individual has performed repetitive behaviors (for example, mirror checking, excessive grooming, skin picking, reassurance seeking) or mental acts (for example, comparing his or her appearance with that of others) in response to the appearance concerns.	1 2 3
"Do you do anything else to try to check, fix, hide, or be reassured about your *(fill in disliked body areas)*?"	*NOTE: Specifically ask about these examples and any other repetitive behaviors done in response to the appearance concerns.*	

CRITERION C

"How much distress do these concerns cause you?"	C. The preoccupation causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.	1 2 3
"Do these concerns interfere with your life or cause problems for you in any way?"	*NOTE: Ask about resulting anxiety, social anxiety, depression, panic, shame, hopelessness, guilt, and suicidal thinking.*	
	NOTE: Ask about effects on work, school, and various aspects of role and social functioning (for example, caring for family, relationships, intimacy, social activities,	

household tasks, and other types of interference).

CRITERION D

If concern is secondary to Anorexia Nervosa or Bulimia Nervosa, score "1."	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.	1 2 3

SPECIFIERS

Muscle Dysmorphia Specifier

"Are you preoccupied with the idea that your body build is too small or that you're not muscular enough?"	**Specify if: with muscle dysmorphia:** The individual is preoccupied with the idea that his or her body build is too small or insufficiently muscular. This specifier is used even if the individual is preoccupied with other body areas, which is often the case.	1 2 3

Insight Specifier

"What word would you use to describe how bad these body areas -- (*fill in all disliked areas)* -- look?"	Indicate degree of insight regarding BDD beliefs:	
Elicit a global belief about the perceived defects rather than asking about specific body areas.	- **Good/fair insight:** The individual recognizes that BDD beliefs are definitely or probably not true	1 2 3
"How convinced are you that these body areas look (*fill in patient's global descriptor*)?"	- **Poor insight:** The individual thinks that BDD beliefs are probably true.	1 2 3
If patient has difficulty choosing a word, "Some people use words like ugly, deformed, hideous, unattractive…. do you think any of these apply to you?"	- **Absent insight/delusional beliefs:** The individual is completely convinced that BDD beliefs are true.	1 2 3

1 = absent	2 = sub-threshold	3 = threshold or true

The format and scoring of this diagnostic measure are similar to those used by the Structured Diagnostic Interview for DSM. Questions to be asked are on the left; diagnostic criteria are on the right. All items must be coded 3 to meet diagnostic criteria for BDD. Italics indicate instructions to the interviewer.

These questions can also be asked for past concerns (by using past tense)

Katharine Phillips, M.D. 3/20/95; updated 2016
KatharinePhillipsMD.com

Appendix E

Wechsler Adult Reading Test (WTAR; Wechsler, 2001)

WTAR Word List

Say, **I will show you some words that I will ask you to pronounce.** Place the WTAR Word Card in front of the examinee. As you point to the card, say, **Beginning with the first word on the list, pronounce each word aloud. Start with this word** (point to Item 1), **and go down this column, one right after the other, without skipping any. When you finish this column, go to the next column** (point to the second column). **Pronounce each word even if you are unsure. Do you understand?** When you are sure that the examinee understands the task, say, **Ready? Begin.**

	Item	Pronunciation	Score (0, 1)		Item	Pronunciation	Score (0, 1)
1.	again	uh-GEHN *or* uh-GAIN		26.	conscientious	kon-chee-EN-shus *or* kon-chee-INCH-us	
2.	address	uh-DRESS *or* AD-dress		27.	homily	HAHM-uh-lee	
3.	cough	kawf *or* kof		28.	malady	MAL-uh-dee	
4.	preview	PREE-vyue		29.	subtle	SUH-tl	
5.	although	awl-THO		30.	fecund	FE-cund *or* FEE-cund	
6.	most	mohst		31.	palatable	PAL-uh-tuh-bul	
7.	excitement	eck-SITE-munt *or* ik-SITE-munt		32.	menagerie	muh-NAJ-uh-ree	
8.	know	noh *or* no		33.	obfuscate	OB-fuh-skate *or* ob-FUH-skate	
9.	plumb	plum		34.	liaison	lee-A-zahn *or* LAY-a-zahn *or* LEE-ah-zahn	
10.	decorate	DEK-uh-rate		35.	exigency	EKS-eh-jen-see *or* ek-ZEE-jen-see	
11.	fierce	firhrss		36.	xenophobia	zen-uh-FO-bee-uh *or* zeen-uh-FO-bee-uh	
12.	knead	need		37.	ogre	OH-gur	
13.	aisle	EYE-l		38.	scurrilous	SKUR-uh-ius *or* SKUH-ruh-lus	
14.	vengeance	VEN-junts *or* VIN-junts		39.	ethereal	ih-THEER-ee-uhl *or* ih-THIR-ee-uhl	
15.	prestigious	pre-STIJ-us *or* pre-STEEJ-us		40.	paradigm	PAIR-uh-dime *or* PAIR-uh-dim	
16.	wreathe	reeTH		41.	perspicuity	pur-spuh-KYEW-uh-tee	
17.	gnat	nat		42.	plethora	PLETH-er-aah	
18.	amphitheater	AM(p)-fuh-the-uh-ter		43.	lugubrious	loo-GOO-bree-us *or* luh-GOO-bree-us *or* loo-GYEW-bree-us	
19.	lieu	loo		44.	treatise	TREET-us	
20.	grotesque	gro-TESK		45.	dilettante	DILL-uh-tahnt	
21.	iridescent	ihr-uh-DESS-unt		46.	vertiginous	vur-TI-jin-us *or* vur-TIJ-uh-nus	
22.	ballet	BA-lay *or* ba-LAY		47.	ubiquitous	you-BIC-wuh-tus *or* you-BIH-kwah-tus	
23.	equestrian	ih-KWESS-tree-un		48.	hyperbole	hi-PUR-buh-lee	
24.	porpoise	POR-pus		49.	insouciant	in-SOO-see-yunt	
25.	aesthetic	ess-THET-ik *or* ees-THET-ik		50.	hegemony	heh-JEM-o-nee *or* he-je-MO-nee	
						WTAR Raw Score	
						WTAR Standard Score	

Again	Conscientious
Address	Homily
Cough	Malady
Preview	Subtle
Although	Fecund
Most	Palatable
Excitement	Menagerie
Know	Obfuscate
Plumb	Liaison
Decorate	Exigency
Fierce	Xenophobia
Knead	Ogre
Aisle	Scurrilous
Vengeance	Ethereal
Prestigious	Paradigm
Wreathe	Perspicuity
Gnat	Plethora
Amphitheatre	Lugubrious
Lieu	Treatise
Grotesque	Dilettante
Iridescent	Vertiginous
Ballet	Ubiquitous
Equestrian	Hyperbole
Porpoise	Insouciant
Aesthetic	Hegemony

Appendix F

The Zung Self-Rated Depression Measure (ZDS; Zung, 1965)

ZUNG SELF-RATING DEPRESSION SCALE

Patient's Initials

Date of Assessment

Please read each statement and decide how much of the time the statement describes how you have been feeling during the past several days.

Make check mark (✓) in appropriate column.	A little of the time	Some of the time	Good part of the time	Most of the time
1. I feel down-hearted and blue				
2. Morning is when I feel the best				
3. I have crying spells or feel like it				
4. I have trouble sleeping at night				
5. I eat as much as I used to				
6. I still enjoy sex				
7. I notice that I am losing weight				
8. I have trouble with constipation				
9. My heart beats faster than usual				
10. I get tired for no reason				
11. My mind is as clear as it used to be				
12. I find it easy to do the things I used to				
13. I am restless and can't keep still				
14. I feel hopeful about the future				
15. I am more irritable than usual				
16. I find it easy to make decisions				
17. I feel that I am useful and needed				
18. My life is pretty full				
19. I feel that others would be better off if I were dead				
20. I still enjoy the things I used to do				

Adapted from Zung, A self-rating depression scale, *Arch Gen Psychiatry*, 1965;12:63-70.

Presented as a service by

GlaxoWellcome
Glaxo Wellcome Inc.
Research Triangle Park, NC 27709
Web site: www.glaxowellcome.com

 Printed in USA. WEL056R0 February 1997

Appendix G

Depression, Anxiety, and Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995)

DASS21 *Name:* *Date:*

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

Appendix H

Yale-Brown Obsessive Compulsive Scale Modified for Body Dysmorphic Disorder

(BDD-YBOCS; Phillips et al, 1997)

BODY DYSMORPHIC DISORDER MODIFICATION OF THE Y-BOCS (BDD-YBOCS)©
(Adult version)

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

1. **TIME OCCUPIED BY THOUGHTS ABOUT BODY DEFECT**

How much of your time is occupied by THOUGHTS about a defect or flaw in your appearance [list body parts of concern]?

0 = None
1 = Mild (less than 1 hr/day)
2 = Moderate (1-3 hrs/day)
3 = Severe (greater than 3 and up to 8 hrs/day)
4 = Extreme (greater than 8 hrs/day)

---

2. **INTERFERENCE DUE TO THOUGHTS ABOUT BODY DEFECT**

How much do your THOUGHTS about your body defect(s) interfere with your social or work (role) functioning? (Is there anything you aren't doing or can't do because of them?)

Y/N Spending time with friends
Y/N Dating
Y/N Attending social functions
Y/N Doing things w/family in and outside of home
Y/N Going to school/work each day
Y/N Being on time for or missing school/work
Y/N Focusing at school/work
Y/N Productivity at school/work
Y/N Doing homework or maintaining grades
Y/N Daily activities

0 = None
1 = Mild, slight interference with social, occupational, or role activities, but overall performance not impaired.
2 = Moderate, definite interference with social, occupational, or role performance, but still manageable.
3 = Severe, causes substantial impairment in social, occupational, or role performance
4 = Extreme, incapacitating.

---

3. **DISTRESS ASSOCIATED WITH THOUGHTS ABOUT BODY DEFECT**

How much distress do your THOUGHTS about your body defect(s) cause you?

Rate "disturbing" feelings or anxiety that seem to be triggered by these thoughts, not general anxiety or anxiety associated with other symptoms.

0 = None
1 = Mild, not too disturbing.
2 = Moderate, disturbing.
3 = Severe, very disturbing.
4 = Extreme, disabling distress.

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

4. **<u>RESISTANCE</u> AGAINST THOUGHTS OF BODY DEFECT**

How much of an effort do you make to resist these THOUGHTS?
How often do you try to disregard them or turn your attention away from these thoughts as they enter your mind?

Only rate effort made to resist, NOT success or failure in actually controlling the thoughts. How much patient resists the thoughts may or may not correlate with ability to control them.

0 = Makes an effort to always resist, or symptoms so minimal doesn't need to actively resist.
1 = Tries to resist most of time.
2 = Makes some effort to resist.
3 = Yields to all such thoughts without attempting to control them but yields with some reluctance.
4 = Completely and willingly yields to all such thoughts.

---

5. **<u>DEGREE OF CONTROL</u> OVER THOUGHTS ABOUT BODY DEFECT**

How much control do you have over your THOUGHTS about your body defect(s)?
How successful are you in stopping or diverting these thoughts?

0 = Complete control, or no need for control because thoughts are so minimal.
1 = Much control, usually able to stop or divert these thoughts with some effort and concentration.
2 = Moderate control, sometimes able to stop or divert these thoughts.
3 = Little control, rarely successful in stopping thoughts, can only divert attention with difficulty.
4 = No control, experienced as completely involuntary, rarely able to even momentarily divert attention.

---

6. **<u>TIME SPENT</u> IN ACTIVITIES RELATED TO BODY DEFECT**

The next several questions are about the activities/ behaviors you do in relation to your body defects.

Read list of activities below to determine which ones the patient engages in.

How much time do you spend in ACTIVITIES related to your concern over your appearance [read activities patient engages in]?

0 = None
1 = Mild (spends less than 1 hr/day)
2 = Moderate (1-3 hrs/day)
3 = Severe (spends more than 3 and up to 8 hours/day)
4 = Extreme (spends more than 8 hrs/day in these activities)

Read list of activities (check all that apply)

___Checking mirrors/other surfaces
___Grooming activities
___Applying makeup
___Excessive Exercise (time beyond 1 hr. a day)
___Camouflaging with clothing/other cover (rate time spent selecting/changing clothes, not time wearing them)
___Scrutinizing others' appearance (comparing)
___Questioning others about/discussing your appearance
___Picking at skin
___Other _____

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

7. **<u>INTERFERENCE</u> DUE TO ACTIVITIES RELATED TO BODY DEFECT**

overall
How much do these ACTIVITIES interfere with your social or work (role) functioning? (Is there any-performance,
thing you don't do because of them?)

0 = None
1 = Mild, slight interference with social, occupational, or role activities, but performance not impaired.
2 = Moderate, definite interference with social, occupational, or role but still manageable.
3 = Severe, causes substantial impairment in social, occupational, or role performance.
4 = Extreme, incapacitating.

---

8. **<u>DISTRESS</u> ASSOCIATED WITH ACTIVITIES RELATED TO BODY DEFECT**

How would you feel if you were prevented from performing these ACTIVITIES?
How anxious would you become?

Rate degree of distress/frustration patient would experience if performance of the activities were suddenly interrupted.

0 = None
1 = Mild, only slightly anxious if behavior prevented.
2 = Moderate, reports that anxiety would mount but remain manageable if behavior is prevented.
3 = Severe, prominent and very disturbing increase in anxiety if behavior is interrupted.
4 = Extreme, incapacitating anxiety from any intervention aimed at modifying activity.

---

9. **<u>RESISTANCE</u> AGAINST COMPULSIONS**

How much of an effort do you make to resist these ACTIVITIES?

Only rate effort made to resist, NOT success

0 = Makes an effort to always resist, or symptoms so minimal doesn't need to actively resist.
1 = Tries to resist most of the time.
2 = Makes some effort to resist.
3 = Yields to almost all of these behaviors without attempting to control them, but does so with

or failure in actually controlling the activities.
How much the patient resists these behaviors may or may not correlate with his/her ability to control them.

some reluctance.
4 = Completely and willingly yields to all behaviors related to body defect.

---

10. **<u>DEGREE OF CONTROL</u> OVER COMPULSIVE BEHAVIOR**

How strong is the drive to perform these behaviors?
How much control do you have over them?

0 = Complete control, or control is unnecessary because symptoms are mild.
1 = Much control, experiences pressure to perform the behavior, but usually able to exercise voluntary control over it.
2 = Moderate control, strong pressure to perform behavior, can control it only with difficulty.
3 = Little control, very strong drive to perform behavior, must be carried to completion, can delay only with difficulty.
4 = No control, drive to perform behavior experienced as completely involuntary and overpowering, rarely able to even momentarily delay activity.

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

11. **INSIGHT**

Is it possible that your defect might be less noticeable or less unattractive than you think it is?

How convinced are you that [fill in body part] is as unattractive as you think it is?

Can anyone convince you that it doesn't look so bad?

0 = Excellent insight, fully rational.
1 = Good insight. Readily acknowledges absurdity of thoughts (but doesn't seem completely convinced that there isn't something besides anxiety to be concerned about).
2 = Fair insight. Reluctantly admits that thoughts seem unreasonable but wavers.
3 = Poor insight. Maintains that thoughts are not unreasonable.
4 = Lacks insight, delusional. Definitely convinced that concerns are reasonable, unresponsive to contrary evidence.

---

12. **AVOIDANCE**

Have you been avoiding doing anything, going any place, or being with anyone because of your thoughts or behaviors related to your body defects?
If YES, then ask: What do you avoid?

Rate degree to which patient deliberately tries to avoid things such as social interactions or work-related activities. Do not include avoidance of mirrors or avoidance of compulsive behaviors.

0 = No deliberate avoidance.
1 = Mild, minimal avoidance.
2 = Moderate, some avoidance clearly present.
3 = Severe, much avoidance; avoidance prominent.
4 = Extreme, very extensive avoidance; patient avoids almost all activities.

Brackets [ ] indicate material that should be read. Brackets are also used to indicate a pause.
Parentheses ( ) indicate optional material that may be read.
Italicized items are instructions to the interviewer.

Phillips KA, Hollander E, Rasmussen SA, Aronowitz BR, DeCaria C, Goodman WK. A severity rating scale for body dysmorphic disorder: development, reliability, and validity of a modified version of the Yale-Brown Obsessive Compulsive Scale. Psychopharmacol Bull 1997;33:17-22.

Appendix I

Brown Assessment of Beliefs Scale (BABS: Eisen et al., 1998)

Brown Assessment of Beliefs Scale - (Adult Version)

ID#:_____ Date_____

Belief (describe principal belief(s) during the past week):_____

_____

For each item circle the number identifying the response which best characterizes the patient **over the past week**. The patient's specific belief can be incorporated into the question--for example, "How convinced are you of this belief--that you are really ugly and deformed?" Optional questions are indicated in parentheses; instructions to the interviewer are italicized.

---

1. Conviction

How convinced are you of these ideas/beliefs?
Are you certain your ideas/beliefs are accurate?
(What do you base your certainty on?)

0- Completely convinced beliefs are false (0% certainty).
1- Beliefs are probably not true, or substantial doubt exists.
2- Beliefs may or may not be true, or unable to decide whether beliefs are true or not.
3- Fairly convinced that beliefs are true but an element of doubt exists.
4- Completely convinced about the reality of held beliefs (100% certainty).

---

2. Perception of others' views of beliefs

What do you think other people (would) think of your beliefs? How certain are you that most people think your beliefs make sense?

(Interviewer should clarify if necessary that the patient answers this question assuming that others are giving their honest opinion.)

0- Completely certain that most people think these beliefs are unrealistic.
1- Fairly certain that most people think these beliefs are unrealistic.
2- Others may or may not think beliefs are unrealistic, or uncertain about others' views concerning these beliefs.
3- Fairly certain that most people think these beliefs are realistic.
4- Completely certain that most people think these beliefs are realistic.

(Interviewer should not ask this item if responses on item 1 and 2 are the same. In that case, give the same score as items 1 and 2.)

3. Explanation of differing views

You said that (*fill in response to item 1*), but that (*fill in response to item 2*).
How do you explain the difference between what you think and what others think about the accuracy of your beliefs?
(Who's more likely to be right?)

0- Completely certain that beliefs are unrealistic or absurd (e.g., "my mind is playing tricks on me.")
1- Fairly certain that beliefs are unrealistic.
2- Uncertain about why others don't agree-- beliefs may be unrealistic or others may be wrong.
3- Fairly certain that beliefs are true; view of others is less accurate.
4- Completely certain that beliefs are true; view of others is not accurate.

4. Fixity of ideas

If I were to question (or challenge) the accuracy of your beliefs, what would your reaction be? Could I convince you that you're wrong? (Would you consider the possibility?)

(If necessary, supply a non-confrontational example.)

(Rate on the basis of whether the patient could be convinced, not whether s/he wishes s/he could be convinced.)

0- Eager to consider the possibility that beliefs may be false; demonstrates no reluctance to entertain this possibility.
1- Easily willing to consider the possibility that beliefs may be false; reluctance to do so is minimal.
2- Somewhat willing to consider the possibility that beliefs may be false, but moderate resistance is present.
3- Clearly reluctant to consider the possibility that beliefs may be false; reluctance is significant.
4- Absolutely refuses to consider the possibility that beliefs may be false--i.e., beliefs are fixed.

---

5. Attempt to disprove ideas

How actively do you try to disprove or reject your ideas/beliefs? How much of an effort do you make to convince yourself that your beliefs are inaccurate?

(Interviewer should rate attempts patient makes to talk himself/herself out of the belief, not attempts to push the thoughts/ideas out of his/her mind or think about something else.)

0- Always involved in trying to disprove beliefs, or not necessary to disprove because beliefs are not true.
1- Usually tries to disprove beliefs.
2- Sometimes tries to disprove beliefs.
3- Occasionally attempts to disprove beliefs.
4- Makes no attempt to disprove beliefs.

---

6. Insight

What do you think has caused you to have these beliefs? Do they have a psychiatric or psychological cause, or are they actually true?

(Interviewer should determine what the patient actually believes, not what s/he has been told or hopes is true.)

(Recognition that the thoughts are excessive (i.e., take up too much time) or cause problems for the patient should not be considered equivalent to psychiatric/psychological etiology. Instead rate patient's awareness that the source/cause of the beliefs is psychiatric/psychological.)

0- Beliefs definitely have a psychiatric/psychological cause.
1- Beliefs probably have a psychiatric/psychological cause.
2- Beliefs possibly have a psychiatric/psychological cause.
3- Beliefs probably do not have a psychiatric/psychological cause.
4- Beliefs definitely do not have a psychiatric/psychological cause.

7. TOTAL BABS SCORE: _____ = SUM OF QUESTIONS 1 THROUGH 6

ADDITIONAL ITEM: *(Do not include in total score)*

8. Ideas/delusions of reference

Does it ever seem that people are talking about you or taking special notice of you because of *(fill in belief)*?
OPTIONAL: What about receiving special messages from your environment because of *(fill in belief)*?
(How certain are you of this?)

(This question pertains only to the belief(s) being assessed by the BABS interviewer– not if patient thinks s/he is noticed for a reason unrelated to the beliefs being assessed. Interviewer should NOT base answer on observable actions or compulsions; instead, rate core belief.)

0- No; others definitely do not take special notice of me.
1- Others probably do not take special notice of me.
2- Others may or may not take special notice of me.
3- Others probably do take special notice of me.
4- Others definitely do take special notice of me.

Appendix J

St Vincent's Human Research Ethics Committee (HREC) Project Approval

ST VINCENT'S HOSPITAL
MELBOURNE
A FACILITY OF ST VINCENT'S HEALTH AUSTRALIA

St Vincent's Hospital
(Melbourne) Limited
ABN 22 052 110 755

41 Victoria Parade Fitzroy VIC 3065
PO Box 2900 Fitzroy VIC 3065

Telephone 03 9288 2211
Facsimile 03 9288 3399
www.svhm.org.au

29 October 2013 (re-issued 9 December 2013)

Prof Susan Rossell
Monash Alfred Psychiatry Research Centre (MAPRc)
Level 4, 607 St Kilda Road
Melbourne VIC 3004

Dear Prof Rossell,

HREC-A Protocol number: HREC-A 102/13

'An Exploration of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder.'

The St Vincent's Hospital (Melbourne) Human Research Ethics Committee-A has reviewed and approved the aforementioned study.

Approval Status: FINAL

Period of Approval: 29 October 2013 – 29 October 2017

Ethical approval is given in accordance with the research conforming to the *National Health and Medical Research Council Act 1992* and the *National Statement on Ethical Conduct in Human Research (2007)*.

Ethical approval is given for this research project to be conducted at the following sites:

- St Vincent's Hospital (Melbourne)

Approved documents

The following documents have been reviewed and approved:

Document	Version	Date
National Ethics Application Form (NEAF)	2	08/10/2013
Victorian Specific Module (VSM)	1	21/08/2013
Research Protocol	3	28/10/2013
Participant Information and Consent Form (PICF) – BDD Group	1	21/08/2013
Participant Information and Consent Form (PICF) – Control Group	1	21/08/2013

Letter of Invitation – BDD Group	2	08/10/2013
Advertisement Poster – BDD Participants	1	21/08/2013
Advertisement Poster – Controls	2	08/10/2013
Demographic Measure	1	21/08/2013
Mini International Neuropsychiatric (MINI)	1	21/08/2013
Body Dysmorphic Disorder Module (BDD DM)	1	21/08/2013
Weschler Test of Adult Reading (WTAR)	1	21/08/2013
BDD Yale Brown Obsessive Compulsive Scale (BDD YBOCS)	1	21/08/2013
Browns Assessment of Beliefs Scale (BABS)	1	21/08/2013
Body Image Questionnaire (BIQ)	1	21/08/2013
The Depression Anxiety Stress Scale (DASS-21)	1	21/08/2013
Brief Fear of Negative Evaluation (BFNE)	1	21/08/2013
Social Interaction Anxiety Scale (SIAS)	1	21/08/2013
Qualitative Semi Structured Interview (Question Prompts)	1	21/08/2013
Appearance Schemas Inventory Revised (ASI-R)	1	21/08/2013
Experience of Shame Scale (ESS)	1	21/08/2013
Frosts Multidimensional Perfectionism Scale (FMPS)	1	21/08/2013
Self-Ambivalence Measure (SAM-19)	1	21/08/2013
Perseverance of Thinking Questionnaire (PTQ)	1	21/08/2013
Rosenberg Self-Esteem Scale (RSES)	1	21/08/2013
Obsessive Beliefs Questionnaire (OBQ)	1	21/08/2013
Childhood Trauma Questionnaire (CTQ SF)	1	21/08/2013
The Perception of Teasing Scale (POTS)	1	21/08/2013
Parental Bonding Instrument (PBI)	1	21/08/2013
Family Concern/Pressures about Appearance Scale (FCACS)	1	21/08/2013

St Vincent's HREC-A Protocol number: HREC-A 102/13
Please quote these numbers on all Correspondence

Approval is subject to:

- The Principal Researcher is to ensure that all associate researchers are aware of the terms of approval and to ensure the project is conducted as specified in the application and in accordance with the National Statement on Ethical Conduct in Human Research (2007).
- Immediate notification to the Research Governance Unit of any serious adverse events on participants.
- Immediate notification of any unforeseen events that may affect the continuing ethical acceptability of the project;
- Notification and reasons for ceasing the project prior to its expected date of completion;
- Notification of proposed amendments to the study;
- Submission of an annual report, due on the anniversary date of approval, for the duration of the study.

- Submission of reviewing HREC approval for any proposed modifications to the project;
- Submission of a final report and papers published on completion of project;
- Projects may be subject to an audit or any other form of monitoring by the Research Governance Unit at any time.

The HREC wishes you and your colleagues every success in your research.

Yours sincerely,

Ms Anita Arndt
Senior Administrative Officer and HREC-A Secretary
Research Governance Unit
St Vincent's Hospital (Melbourne)

Appendix K

Swinburne University Human Research Ethics Committee (HREC) Project Approval

2014

To: Prof S Rossell, Ms S Brennan

Dear Susan and Sarah,

SUHREC Project 2014/018 An Exploration of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder (SVH HREC-A 102-13)
Prof S Rossell, Ms S Brennan (student) et al
Approved duration: 04/02/2014 to 29/10/2017

I refer to your application for Swinburne ethics clearance for a supervised Swinburne student project given ethics clearance by the St Vincent's Hospital Human Research Ethics Committee (SVH HREC-A 102-13).

Relevant documentation pertaining to your application was emailed on 20 January 2014 with attachments. The documentation was given expedited ethical review on behalf of Swinburne's Human Research Ethics Committee (SUHREC) by a SUHREC delegate, significantly on the basis of the ethical review conducted by St Vincent's Hospital's HREC.

I am pleased to advise that, as submitted to date, Swinburne ethics clearance has been given for the project to proceed in line with standard on-going ethics clearance conditions (as applicable) and on the understanding that appropriate insurance arrangements are in place to cover the Swinburne-sanctioned research activity. (Nb SVH HREC may need to be apprised of the Swinburne ethics clearance.)

Standard conditions:

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the current National Statement on Ethical Conduct in Human Research and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/ clearance. SUHREC must be notified immediately or as soon as possible

thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project. (A copy of any progress, annual or final report submitted to Alfred HREC also being submitted to the Research Ethics office should meet this requirement; similarly with any request to modify the approved protocol.)

- A duly authorised external or internal audit of the project may be undertaken at any time.

The approved documentation includes:

- NEAF 09/10/2013
- VSM Version 1, 28/10/2013
- Research Protocol Version 3, 28/10/2013
- PICF Control Group Version 2, 8.1.2014
- PICF BDD Group Version 2, 8.1.2014

Please contact me if you have any queries about Swinburne on-going ethics clearance and if you need a signed Swinburne ethics clearance certificate, citing the SUHREC project number. Copies of clearance emails should be retained as part of project record-keeping.

Best wishes for the project.

Yours sincerely

Ann

_____

Dr Ann Gaeth
Executive Officer (Research)
Swinburne Research (H68)
Swinburne University of Technology
P O Box 218
HAWTHORN VIC 3122
Ph +61 3 9214 8356

Appendix L

Participant Information and Consent Form (PICF) - Body Dysmorphic Disorder (BDD) Participants

Participant Information Sheet/Consent Form: BDD Group

St Vincent's Hospital and Swinburne University of Technology

Title:	An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder (BDD)
Short Title:	Cognition in BDD
Protocol Number:	HREC-A 102/13
Version Number:	1
Date:	21/8/2013
Principal Investigator:	Prof Susan Rossell
Associated Investigators:	Dr Neil Thomas
	Prof David Castle
Student Researcher:	Sarah Brennan
Location:	St Vincent's Mental Health, St Vincent's Hospital & Swinburne University of Technology, Hawthorn

1 Introduction

You are invited to take part in the research project, '*An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder*'. You are being invited because you have expressed an interest in this project and your details have been forwarded to us by your clinician, or alternatively you responded to one of our advertisements. This could be because you have been diagnosed with Body Dysmorphic Disorder (BDD). This research project aims to further our understanding of BDD. It aims to do this by gathering information from individuals with BDD about their symptoms, thoughts about self and life experiences. It will also compare the neurocognitive profile of people with a diagnosis of BDD compared to those without.

This Participant Information Sheet/Consent Form tells you about the research project. It explains the tests and research involved. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or local doctor.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. You will receive the best possible care whether or not you take part.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read
- Consent to take part in the research project
- Consent to the tests and research that are described
- Consent to the use of your personal and health information as described.

You will be given a copy of this Participant Information and Consent Form to keep.

2 What is the purpose of this research?

Despite a growing awareness of BDD, the developmental and maintaining factors involved in this condition are still poorly understood. This study aims to examine cognitive processes which may underlie BDD symptoms. This information will assist in understanding how BDD symptoms develop, what keeps them going and how BDD is experienced by the individual. Such knowledge has the potential to inform and improve treatments for people with this condition.

A total of 80 participants will be recruited to participate in this study; 40 individuals with BDD and 40 individuals without a mental health condition.

The results of this research will be used by the researcher Sarah Brennan to obtain a Doctor of Clinical Psychology degree. This study has been initiated by the study principal investigator Prof Susan Rossell. This research is being jointly conducted by Swinburne University and St Vincent's Hospital.

3 What does participation in this research involve?

If you decide to participate in this research study you will be invited to attend two testing sessions. Each session will be approximately 2 hours in length. These sessions will be held at either St Vincent's Hospital (Fitzroy) or Swinburne University (Hawthorn), whichever is most convenient.

<u>Session 1. Clinical assessment session</u>

At the first session you will meet the researcher and discuss your participation again before proceeding to the written informed consent process. A structured clinical interview will be conducted to assess symptoms associated with a range of mental health conditions. A second, less formal interview will then be conducted; you will be asked about your BDD symptoms, thoughts about yourself and your life experiences including adverse life events. This section only will be audio recorded. Finally, you will be provided with a number of brief questionnaires to complete. If not already arranged you will be asked to schedule a second appointment.

Session 2. Cognitive assessment session

At this session you will be asked to complete a number of cognitive tasks that examine processes like perception, memory, attention, planning and reading. Examples of such tasks include completing a pencil and paper maze, repeating a string of numbers and drawing symbols from memory.

You will be reimbursed a total of $50 dollars for you time and any costs you may have incurred as a result of participating in this study. You will be provided this reimbursement to the amount of $25 dollars at the end of each testing session.

4 Do I have to take part in this research project?

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage.

If you do decide to take part, you will be given this Participant Information and Consent Form to sign and you will be given a copy to keep.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your routine treatment or your relationship with the researchers, members of your treating team if any or St Vincent's Hospital (Melbourne).

5 What are the possible benefits of taking part?

There will be no clear benefits to you from your participation in this research project; however possible future benefits include early identification, intervention and advances in therapeutic treatments for Body Dysmorphic Disorder.

6 What are the possible risks and disadvantages of taking part?

There are no physical risks associated with taking part in this study. However, the interviews will involve questions about your experiences of BDD and your personal history. There is a possibility that you might find some of these questions uncomfortable, and there is a small risk that this questioning may lead to you becoming upset of distressed. You do not have to answer any question you are concerned about, and are free to discontinue the interview if you become upset or distress. Additionally, if you were to become distressed as a result of taking part in this study, the research team members can talk with you about the kinds of support that might be helpful to you, and assist in helping you contact someone involved in your treatment or other appropriate support. If you become distressed, please talk to the researcher, or contact the Principal Investigator, Professor Susan Rossell on (03) 9214 8173. Alternatively you may contact Lifeline on 13 11 14.

7 What if I withdraw from this research project?

If you decide to withdraw from this research project, please notify a member of the research team before you withdraw. A member of the research team will inform you if there are any special requirements linked to withdrawing. Please note that if you withdraw

a copy of the data collected to date will be kept on file. If you would also like to withdraw your data, please let the researcher know at the time of study withdrawal. Please note that it is not possible to withdraw your data after the study conclusion (end of 2015) as all data will be permanently de-identified to protect privacy and confidentiality.

8 What will happen to information about me?

Any information obtained in connection with this research project that can identify you will remain confidential and only be used for the purpose of this study. It will only be disclosed with your permission, except as required by law.

In the handling of data, all references to personal information will be removed and replaced by a code, so that participants will not be able to be individually identified. All data will be stored securely, under lock-and-key, or via password protection, at the research venue. The audio recording will not contain personal identifying information such as your name. It will be securely stored electronically using the unique code and under password protection, at the research venue. Access to the data will only be available to the principal and associate researchers responsible for this study.

In any publication and/or presentation, information will be provided in such a way that you cannot be identified, except with your permission. All participants will remain anonymous, with results being primarily presented as group pooled data. In the event results are presented as a case series, only minimal demographic information (e.g. age and gender) will be used in order to protect your privacy and confidentiality.

If you agree for your data to be stored for this project, the collected data will be destroyed under the direction of the principal investigator after seven years.

9 Can I access research information kept about me?

In accordance with relevant Australian and/or Victorian privacy and other relevant laws, you have the right to access the information collected and stored by the researchers about you. You also have the right to request that any information, with which you disagree, be corrected. Please contact the principal researcher if you would like to access your information.

10 Is this research project approved?

All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this research project have been approved by the HREC at St Vincent's Hospital.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect the interests of people who agree to participate in human research studies.

11. Who can I contact?

The person you may need to contact will depend on the nature of your query. Therefore, please note the following:

For further information or appointments:
If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project (for example, feelings of distress), you can contact the principal investigator, Prof Susan Rossell on (03) 9214 8173 or any of the following people:

Name: Dr Neil Thomas
Role: Associate Researcher
Telephone: (03) 9214 8742

Name: Ms Sarah Brennan
Role: Associate Student Researcher
Telephone: XXXX XXX XXX

For complaints:

If you have any complaints about any aspect of the study or the way in which it is being conducted you may contact the Patient Liaison Officer at St Vincent's Hospital (Melbourne) on Telephone: (03) 9288 3108. You will need to tell the Patient Liaison Officer the name of the person who is noted above as principal investigator.

Research Participant Rights:
If you have any questions about your rights as a research participant, then you may contact the Executive Officer Research at St Vincent's Hospital (Melbourne) on Telephone: (03) 9288 3930.

Consent Form- BDD Group

Title:	An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder (BDD)
Short Title:	Cognition in BDD
Protocol Number:	HREC-A 102/13
Principal Investigator:	Prof Susan Rossell
Associated Investigators:	Dr Neil Thomas Prof David Castle
Student Researcher:	Sarah Brennan
Location:	St Vincent's Mental Health, St Vincent's Hospital & Swinburne University of Technology, Hawthorn

Declaration by Participant

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research described in the project.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time during the project without affecting my future health care.

I understand that I will be given a signed copy of this document to keep.

Name of Participant (please print) _____

Signature _____ Date _____

☐ I would like to receive a summary of the general research findings upon completion of this study (2015). Please provide a postal or email address

_____

Name of Witness* to Participant's Signature (please print) _____

Signature _____ Date _____

Declaration by Researcher

I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Name of Researcher (please print) _____

Signature _____ Date _____

Note: All parties signing the consent section must date their own signature

.

Form for Withdrawal of Participation- BDD Group

Title:	An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder (BDD)
Short Title:	Cognition in BDD
Protocol Number:	HREC-A 102/13
Principal Investigator:	Prof Susan Rossell
Associated Investigators:	Dr Neil Thomas Prof David Castle
Student Researcher:	Sarah Brennan
Location:	St Vincent's Mental Health, St Vincent's Hospital & Swinburne University of Technology, Hawthorn

Declaration by Participant

I wish to withdraw from participation in the above research project and understand that such withdrawal will not affect my routine treatment, my relationship with those treating me or my relationship with St Vincent's Hospital or Swinburne University.

Name of Participant (please _____

Signature _____ Date _____

Declaration by Researcher

I have given a verbal explanation of the implications of withdrawal from the research project and I believe that the participant has understood that explanation.

Name of Study Doctor/
Senior Researcher† (please print) _____

Signature _____ Date _____

Note: All parties signing the consent section must date their own signature.

Appendix M

Participant Information and Consent Form (PICF)- Control Participants

Participant Information Sheet/Consent Form: Control Group

St Vincent's Hospital and Swinburne University of Technology

Title:	An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder (BDD)
Short Title:	Cognition in BDD
Protocol Number:	HREC-A 102/13
Version Number:	1
Date:	21/8/2013
Principal Investigator:	Prof Susan Rossell
Associated Investigators:	Dr Neil Thomas
	Prof David Castle
Student Researcher:	Sarah Brennan
Location:	St Vincent's Mental Health, St Vincent's Hospital & Swinburne University of Technology, Hawthorn

1 Introduction

You are invited to take part in the research project, '*An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder*'. You are being invited because you have responded to an advertisement to participate as a control participant. This research project aims to further our understanding of BDD.

This Participant Information Sheet/Consent Form tells you about the research project. It explains the tests and research involved. Knowing what is involved will help you decide if you want to take part in the research.

Please read this information carefully. Ask questions about anything that you don't understand or want to know more about. Before deciding whether or not to take part, you might want to talk about it with a relative, friend or local doctor.

Participation in this research is voluntary. If you don't wish to take part, you don't have to. You will receive the best possible care whether or not you take part.

If you decide you want to take part in the research project, you will be asked to sign the consent section. By signing it you are telling us that you:

- Understand what you have read
- Consent to take part in the research project
- Consent to the tests and research that are described
- Consent to the use of your personal and health information as described.

You will be given a copy of this Participant Information and Consent Form to keep.

2 What is the purpose of this research?

Despite a growing awareness of BDD, the developmental and maintaining factors involved in this condition are still poorly understood. This study aims to examine cognitive processes which may underlie BDD symptoms. This information will assist in understanding how BDD symptoms develop, what keeps them going and how BDD is experienced by the individual. Such knowledge has the potential to inform and improve treatments for people with this condition.

A total of 80 participants will be recruited to participate in this study; 40 individuals with BDD and 40 individuals without a mental health condition.

The results of this research will be used by the researcher Sarah Brennan to obtain a Doctor of Clinical Psychology degree. This study has been initiated by the study principal investigator Prof Susan Rossell. This research is being jointly conducted by Swinburne University and St Vincent's Hospital.

3 What does participation in this research involve?

If you decide to participate in this research study you will be invited to attend two testing sessions. Each session will be approximately 2 hours in length. These sessions will be held at either St Vincent's Hospital (Fitzroy) or Swinburne University (Hawthorn), whichever is most convenient.

<u>Session 1. Clinical assessment session</u>
At the first session you will met the researcher and discuss your participation again before proceeding to the written informed consent process. This session will involve a structured clinical interview to assess symptoms associated with a range of mental health conditions. You will then be asked to complete a number of brief questionnaires which will ask you about your experiences including adverse life events. If not already arranged you will be asked to schedule a second appointment.

<u>Session 2. Cognitive assessment session</u>
At this session you will be asked to complete a number of cognitive tasks that examine processes like perception, memory, attention, planning and reading. Examples of such tasks include completing a pencil and paper maze, repeating a string of numbers and drawing symbols from memory.

You will be reimbursed a total of $50 dollars for you time and any costs you may have incurred as a result of participating in this study. You will be provided this reimbursement to the amount of $25 dollars at the end of each testing session.

4 Do I have to take part in this research project?

Participation in any research project is voluntary. If you do not wish to take part, you do not have to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage.

If you do decide to take part, you will be given this Participant Information and Consent Form to sign and you will be given a copy to keep.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your routine treatment or your relationship with the researchers or St Vincent's Hospital (Melbourne).

5 What are the possible benefits of taking part?

There will be no clear benefits to you from your participation in this research project; however possible future benefits include early identification, intervention and advances in therapeutic treatments for Body Dysmorphic Disorder.

6 What are the possible risks and disadvantages of taking part?

There are no physical risks associated with taking part in this study. However, the interviews will involve questions about your experiences and your personal history. There is a possibility that you might find some of these questions uncomfortable, and there is a small risk that this questioning may lead to you becoming upset of distressed. You do not have to answer any question you are concerned about, and are free to discontinue the interview if you become upset or distressed. Additionally, if you were to become distressed as a result of taking part in this study, the research team members can talk with you about the kinds of support that might be helpful to you, and assist in making contact if required. If you become distressed, please talk to the researcher, or contact the Principal Investigator, Professor Susan Rossell on (03) 9214 8173. Alternatively you may contact Lifeline on 13 11 14.

7 What if I withdraw from this research project?

If you decide to withdraw from this research project, please notify a member of the research team before you withdraw. A member of the research team will inform you if there are any special requirements linked to withdrawing. Please note that if you withdraw a copy of the data collected to date will be kept on file. If you would also like to withdraw your data, please let the researcher know at the time of study withdrawal. Please note that it is not possible to withdraw your data after the study conclusion (end of 2015) as all data will be permanently de-identified to protect privacy and confidentiality.

8 What will happen to information about me?

Any information obtained in connection with this research project that can identify you will remain confidential and only be used for the purpose of this study. It will only be disclosed with your permission, except as required by law.

In the handling of data, all references to personal information will be removed and replaced by a code, so that participants will not be able to be individually identified. All data will be stored securely, under lock-and-key, or via password protection, at the research venue. Access to the data will only be available to the principal and associate researchers responsible for this study.

In any publication and/or presentation, information will be provided in such a way that you cannot be identified, except with your permission. All participants will remain anonymous, with results being primarily presented as group pooled data. In the event results are presented as a case series, only minimal demographic information (e.g. age and gender) will be used in order to protect your privacy and confidentiality.

If you agree for your data to be stored for this project, the collected data will be destroyed under the direction of the principal investigator after seven years.

9 Can I access research information kept about me?

In accordance with relevant Australian and/or Victorian privacy and other relevant laws, you have the right to access the information collected and stored by the researchers about you. You also have the right to request that any information, with which you disagree, be corrected. Please contact the principal researcher if you would like to access your information.

10 Is this research project approved?

All research in Australia involving humans is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this research project have been approved by the HREC at St Vincent's Hospital.

This project will be carried out according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect the interests of people who agree to participate in human research studies.

11. Who can I contact?

The person you may need to contact will depend on the nature of your query. Therefore, please note the following:

For further information or appointments:
If you want any further information concerning this project or if you have any problems which may be related to your involvement in the project (for example, feelings of distress), you can contact the principal investigator, Prof Susan Rossell on (03) 9214 8173 or any of the following people:

Name: Dr Neil Thomas
Role: Associate Researcher
Telephone: (03) 9214 8742

Name: Ms Sarah Brennan
Role: Associate Student Researcher
Telephone: XXXX XXX XXX

For complaints:

If you have any complaints about any aspect of the study or the way in which it is being conducted you may contact the Patient Liaison Officer at St Vincent's Hospital (Melbourne) on Telephone: (03) 9288 3108. You will need to tell the Patient Liaison Officer the name of the person who is noted above as principal investigator.

Research Participant Rights:
If you have any questions about your rights as a research participant, then you may contact the Executive Officer Research at St Vincent's Hospital (Melbourne) on Telephone: (03) 9288 3930.

Consent Form- Control Group

Title:	An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder (BDD)
Short Title:	Cognition in BDD
Protocol Number:	HREC-A 102/13
Principal Investigator:	Prof Susan Rossell
Associated Investigators:	Dr Neil Thomas Prof David Castle
Student Researcher:	Sarah Brennan
Location:	St Vincent's Mental Health, St Vincent's Hospital & Swinburne University of Technology, Hawthorn

Declaration by Participant

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research described in the project.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time during the project without affecting my future health care.

I understand that I will be given a signed copy of this document to keep.

Name of Participant (please print) _____

Signature _____ Date _____

☐ I would like to receive a summary of the general research findings upon completion of this study (2015). Please provide a postal or email address

_____

Name of Witness* to Participant's Signature (please print) _____

Signature _____ Date _____

Declaration by Researcher

I have given a verbal explanation of the research project, its procedures and risks and I believe that the participant has understood that explanation.

Name of Researcher (please print) _____

Signature _____ Date _____

Note: All parties signing the consent section must date their own signature

.

Form for Withdrawal of Participation- Control group

Title:	An Examination of Cognition and Adverse Early Life Experiences in Body Dysmorphic Disorder (BDD)
Short Title:	Cognition in BDD
Protocol Number:	HREC-A 102/13
Principal Investigator:	Prof Susan Rossell
Associated Investigators:	Dr Neil Thomas Prof David Castle
Student Researcher:	Sarah Brennan
Location:	St Vincent's Mental Health, St Vincent's Hospital & Swinburne University of Technology, Hawthorn

Declaration by Participant

I wish to withdraw from participation in the above research project and understand that such withdrawal will not affect my routine treatment, my relationship with those treating me or my relationship with St Vincent's Hospital or Swinburne University.

Name of Participant (please _____

Signature _____ Date _____

Declaration by Researcher

I have given a verbal explanation of the implications of withdrawal from the research project and I believe that the participant has understood that explanation.

Name of Study Doctor/
Senior Researcher† (please print) _____

Signature _____ Date _____

Note: All parties signing the consent section must date their own signature.

Appendix N

Obsessive Beliefs Questionnaire (OBQ-44; OCCWG, 2005)

This inventory lists different attitudes or beliefs that people sometimes hold. Read each statement carefully and decide how much you agree or disagree with it. For each statement, choose the number matching the answer that best describes how you think. Because people are different, there are no right or wrong answers. To decide whether a given statement is typical of your way of looking at things, simple keep in mind what you are like most of the time. Use the following scale.

Rate your replies as follows:

1	2	3	4	5	6	7
Disagree Very Much	Disagree Moderately	Disagree a Little	Neither agree nor disagree	Agree a little	Agree moderately	Agree very much

1.	I think things around me are unsafe.	1	2	3	4	5	6	7
2.	If I'm not absolutely sure, I'm bound to make a mistake.	1	2	3	4	5	6	7
3.	Things should be perfect according to my own standards.	1	2	3	4	5	6	7
4.	To be a worthwhile person, I must be perfect at everything I do.	1	2	3	4	5	6	7
5.	When I see the opportunity to do so, I must prevent bad things from happening.	1	2	3	4	5	6	7
6.	Even if harm is very unlikely, I should try to prevent it at any cost.	1	2	3	4	5	6	7
7.	For me, having bad urges is as bad as actually carrying them out.	1	2	3	4	5	6	7
8.	If I don't act when I foresee danger, then I am to blame for consequences.	1	2	3	4	5	6	7

9. If I can't do something perfectly, I shouldn't do it at all	1	2	3	4	5	6	7
10. I must work to my full potential at all times.	1	2	3	4	5	6	7
11. It's essential for me to consider all possible outcomes of a situation.	1	2	3	4	5	6	7
12. Even minor mistakes mean a job is not complete.	1	2	3	4	5	6	7
13. If I have aggressive thoughts or impulses about my loved ones, this means I may secretly want to hurt them.	1	2	3	4	5	6	7
14. I must be certain of my decisions.	1	2	3	4	5	6	7
15. In all kinds of daily situations, failing to prevent harm is just as bad as deliberately causing it.	1	2	3	4	5	6	7
16. Avoiding serious problems (for example, illness or accidents) requires constant effort on my part.	1	2	3	4	5	6	7
17. For me, not preventing harm is as bad as causing harm.	1	2	3	4	5	6	7
18. I should be upset if I make a mistake.	1	2	3	4	5	6	7
19. I should make sure others are protected from negative consequences of my decisions or actions.	1	2	3	4	5	6	7
20. For me, things are not right if they are not perfect.	1	2	3	4	5	6	7
21. Having nasty thoughts means I'm a terrible person.	1	2	3	4	5	6	7
22. If I do not take extra precautions, I am more likely than others to have or cause a serious disaster.	1	2	3	4	5	6	7
23. In order to feel safe, I have to be prepared as possible for anything that could go wrong.	1	2	3	4	5	6	7
24. I should not have bizarre or disgusting thoughts.	1	2	3	4	5	6	7
25. For me, making a mistake is as bad as failing completely.	1	2	3	4	5	6	7
26. It is essential for everything to be clear cut, even minor matters.	1	2	3	4	5	6	7
27. Having a blasphemous thought is a sinful as committing a sacrilegious act.	1	2	3	4	5	6	7
28. I should be able to rid my mind of unwanted	1	2	3	4	5	6	7

thoughts.							
29. I am more likely than other people to accidentally cause harm to myself or to others.	1	2	3	4	5	6	7
30. Having bad thoughts means I am weird or abnormal.	1	2	3	4	5	6	7
31. I must be the best at things that are important to me.	1	2	3	4	5	6	7
32. Having an unwanted sexual thought or image means I really want to do it.	1	2	3	4	5	6	7
33. If my actions could have even a small effect on a potential misfortune, I am responsible for the outcome.	1	2	3	4	5	6	7
34. Even when I am careful, I often think bad things will happen	1	2	3	4	5	6	7
35. Having intrusive thoughts means I'm out of control.	1	2	3	4	5	6	7
36. Harmful events will happen unless I'm careful.	1	2	3	4	5	6	7
37. I must keep working until it's done exactly right.	1	2	3	4	5	6	7
38. Having violent thoughts means I will lose control and become violent.	1	2	3	4	5	6	7
39. To me, failing to prevent disaster is as bad as causing it.	1	2	3	4	5	6	7
40. If I don't do a job perfectly, people won't respect me.	1	2	3	4	5	6	7
41. Even ordinary experiences in my life are full of risk.	1	2	3	4	5	6	7
42. Having a bad thought is morally no different than doing a bad deed.	1	2	3	4	5	6	7
43. No matter what I do, it won't be good enough.	1	2	3	4	5	6	7
44. If I don't control my thoughts, I'll be punished.	1	2	3	4	5	6	7

Appendix O

The Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990)

Multidimensional Perfectionism Scale

Please circle the number that best corresponds to your agreement with each statement below. Use this rating system

Strongly disagree 1 2 3 4 5 Strongly agree

	Strongly Disagree				Strongly Agree
1. My parents set very high standards for me.	1	2	3	4	5
2. Organization is very important to me.	1	2	3	4	5
3. As a child, I was punished for doing thing less than perfectly.	1	2	3	4	5
4. If I do not set the highest standards for myself, I am likely to end up a second rate person.	1	2	3	4	5
5. My parents never tried to understand my mistakes.	1	2	3	4	5
6. It is important to me that I be thoroughly competent in everything I do.	1	2	3	4	5
7. I am a neat person.	1	2	3	4	5
8. I try to be an organized person.	1	2	3	4	5
9. If I fail at work/school, I am a failure as a person.	1	2	3	4	5
10. I should be upset if I make a mistake.	1	2	3	4	5
11. My parents wanted me to be the best at everything.	1	2	3	4	5
12. I set higher goals for myself than most people.	1	2	3	4	5
13. If someone does a task at work/school better than me, then I feel like I failed the whole task.	1	2	3	4	5
14. If I fail partly, it is as bad as being a complete failure.	1	2	3	4	5
15. Only outstanding performance is good enough in my family.	1	2	3	4	5
16. I am very good at focusing my efforts on attaining a goal.	1	2	3	4	5
17. Even when I do something very carefully, I often feel that it is not quite done right.	1	2	3	4	5
18. I hate being less than the best at things.	1	2	3	4	5
19. I have extremely high goals.	1	2	3	4	5
20. My parents have expected excellence from me.	1	2	3	4	5

21. People will probably thing less of me if I make a mistake.	1	2	3	4	5
22. I never felt like I could meet my parents' expectations.	1	2	3	4	5
23. If I do not do as well as other people, it means I am an inferior human being.	1	2	3	4	5
24. Other people seem to accept lower standards from themselves than I do.	1	2	3	4	5
25. If I do not do well all the time, people will not respect me.	1	2	3	4	5
26. My parents have always had higher expectations for my future than I have.	1	2	3	4	5
27. I try to be a neat person.	1	2	3	4	5
28. I usually have doubts about the simple everyday things I do.	1	2	3	4	5
29. Neatness is very important to me.	1	2	3	4	5
30. I expect higher performance in my daily tasks than most people.	1	2	3	4	5
31. I am an organized person.	1	2	3	4	5
32. I tend to get behind in my work because I repeat things over and over.	1	2	3	4	5
33. It takes me a long time to do something "right".	1	2	3	4	5
34. The fewer mistakes I make, the more people will like me.	1	2	3	4	5
35. I never felt like I could meet my parents' standards.	1	2	3	4	5

Appendix P

Experience of Shame Scale (ESS; Andrews & Hunter, 1997)

Experiences of Shame Scale(ESS)

Everybody at times can feel embarrassed, self-conscious or ashamed. These questions are about such feelings if they have occurred **at any time in the past year**. There are no 'right' or 'wrong' answers. Please indicate the response which applies to you with a tick.

1= not at all 2= a little 3=moderately 4=very much

1	Have you felt ashamed of any of your personal habits?	1	2	3	4
2	Have you worried about what other people think of any of your personal habits?	1	2	3	4
3	Have you tried to cover up or conceal any of your personal habits?	1	2	3	4
4	Have you felt ashamed of your manner with others?	1	2	3	4
5	Have you worried about what other people think of your manner with others?	1	2	3	4
6	Have you avoided people because of your manner?	1	2	3	4
7	Have you felt ashamed of the sort of person you are?	1	2	3	4
8	Have you worried about what other people think of the sort of person you are?	1	2	3	4
9	Have you tried to conceal from others the sort of person you are?	1	2	3	4
10	Have you felt ashamed of your ability to do things?	1	2	3	4
11	Have you worried about what other people think of your ability to do things?	1	2	3	4
12	Have you avoided people because of your inability to do things?	1	2	3	4
13	Do you feel ashamed when you do something wrong?	1	2	3	4
14	Have you worried about what other people think of you when you do something wrong?	1	2	3	4
15	Have you tried to cover up or conceal things you felt ashamed of having done?	1	2	3	4
16	Have you felt ashamed when you said something stupid?	1	2	3	4
17	Have you worried about what other people think of you when you said something stupid?	1	2	3	4
18	Have you avoided contact with anyone who knew you said something stupid?	1	2	3	4
19	Have you felt ashamed when you failed in a competitive situation?	1	2	3	4
20	Have you worried about what other people think of you when you failed in a competitive situation?	1	2	3	4
21	Have you avoided people who have seen you fail?	1	2	3	4
22	Have you felt ashamed of your body or any part of it?	1	2	3	4
23	Have you worried about what other people think of your appearance?	1	2	3	4
24	Have you avoided looking at yourself in the mirror?	1	2	3	4
25	Have you wanted to hide or conceal your body or any part of it?	1	2	3	4

Appendix Q

The Self-Ambivalence Measure (SAM; Bhar & Kyrios; 2007)

The Self-Ambivalence Measure

Please rate the **extent to which you agree** with the following statements. Indicate your answer by circling the appropriate number on the scale beside each statement.

Not at all	Agree a little	Agree moderately	Agree a lot	Agree totally
0	1	2	3	4

1. I doubt whether others really like me	0 1 2 3 4
2. I am secure in my sense of self-worth	0 1 2 3 4
3. I feel torn between different parts of my personality	0 1 2 3 4
4. I fear I am capable of doing something terrible	0 1 2 3 4
5. I think about my worth as a person	0 1 2 3 4
6. I am constantly aware of how others perceive me	0 1 2 3 4
7. I feel that I am full of contradictions	0 1 2 3 4
8. I question the extent to which others want to be close to me	0 1 2 3 4
9. I tend to think of myself in terms of categories such as "good" or "bad"	0 1 2 3 4
10. I have mixed feelings about my self-worth	0 1 2 3 4
11. I question whether I am a moral person	0 1 2 3 4
12. I think about how I can improve myself	0 1 2 3 4
13. If I inadvertently allow harm to come to others, this proves I am untrustworthy	0 1 2 3 4
14. I tend to move from one extreme to the other in how I think about myself	0 1 2 3 4
15. I am mindful about how I come across to others	0 1 2 3 4
16. I am constantly concerned about whether I am a "decent' human being	0 1 2 3 4
17. I am constantly worried about whether I am a good or bad person	0 1 2 3 4
18. I question whether I am morally a good or bad person	0 1 2 3 4
19. I constantly worry about whether I will make anything of my life	0 1 2 3 4

Appendix R

Qualitative Semi-Structured Interview

'An Examination of Cognition and Early Adverse Life Experiences in Body Dysmorphic Disorder'

Qualitative Semi-Structured Interview

(Question prompts)

A semi structured interview will be conducted to illicit information about experiences and cognitions. Example prompt questions are given below.

NB: Detailed symptom interviews have already been conducted and the examiner will be aware of BDD concern and will use participant's language to discuss the body part/s.

1. BDD development and early course

- When do you first remember becoming concerned about your appearance (body part)?
  - What age were you?
  - What was happening in your life at that time?
- Are there any particular memories that you link with your appearance concerns?
  - How do you think about these now?
- How did your concerns develop over time?
- What are your thoughts about how you developed BDD?

2. The attitudes of family and close others towards appearance

I would like you to think about what things were like in your family when you were growing up.

- How was physical appearance talked about in your family?
  - How important was physical appearance in your family?
  - How did your family talk about your physical appearance?

3. Experiences of abuse, bullying, neglect

- Were you teased or bullied when you were younger?
  - What age were you?
  - Can you tell me more about that?
  - Can you recall what was said?
  - How often do you think about this now?

- Did you experience trauma or abuse when you were younger?
  - What age were you?
  - Can you tell me more about that?
  - How often do you think about this now?
  -
- Is there a particular memory that you link with your thoughts and beliefs about your (body part/appearance)?

4. Cognitions and beliefs about body image in relation to self

NB: Use downward arrow technique

Now I would like to think about your _____(body part/appearance concern).

- What is it specifically that concerns you about _____(body part/appearance)?

- When you think about _____(body part/appearance) what thoughts or images come to mind?
  - Can you tell me more about that?

- What is the most distressing aspect about_____(thought, image)
  - How much do you believe that is true (0-100)?
  - If it were true, what would be so distressing about it?
  - What would that mean about you?
  - So, If _____ then _____. How much do you believe that is true (0-100)?

- To what extent does your feature define who you are in your identity?

4. Phenomenology

- How often do you think about your_____ (body part/appearance)?

- When do you typically think about _____(body part/appearance)?

- What triggers you to think about _____(body part/appearance)?

- Have there been periods when you have been more or less worried about _____ (body part/appearance)?

- Have your body image concerns changed over time?
  - Same body part, but change in concern about it
  - Different body parts

- Other than the physical appearance of _____ (body part/appearance) are there any other aspects of _____ (body part/appearance) that concern you?
  - The way it feels to touch
  - The way it feels sensation
  - The way it smells
  - The way it sounds
  - The way it tastes

- What do you do (behaviours) when you think about _____ (body part/appearance)?
  - How does this impact upon how you feel?

- How does BDD impact upon your life?