

DELUSIONAL IDEATION ASSOCIATED WITH OBSESSIVE-COMPULSIVE SYMPTOMS

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Declaration

This thesis is submitted in fulfilment of the requirement of the degree Doctor of Philosophy.

This is to certify that this thesis is all my own work and all my own writing. No part of this thesis has been submitted for a higher degree to any other institution or university. All of the work reported in this thesis was undertaken during the time I was enrolled as a PhD student at Macquarie University. The studies reported in this thesis were all conducted within the ARC Centre of Excellence in Cognition and its Disorders (CCD), Department of Cognitive Science, Macquarie University, under the supervision of my principle supervisor Robyn Langdon and my associate supervisor Max Coltheart.

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Signed:

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General Abstract

This PhD thesis explores the extent and nature of delusional thinking associated with obsessive-compulsive (OC) symptoms across different diagnostic categories, in particular, obsessive-compulsive disorder (OCD) and schizophrenia.

In **Paper 1** we aim to gain preliminary insights concerning how an intrusive thought in OC cases may become delusional using an on-line survey. Relationships between different measures of proneness to delusional ideation and severity of OC symptoms were assessed, across a variety of self-reported diagnoses. The possible mediating role of metacognitive biases is also considered. Given the reported high prevalence of comorbid OC symptoms in schizophrenia outside Australia, **Paper 2** aims to establish the prevalence of any OC symptoms in an Australian sample of people with schizophrenia recruited with the assistance of the Australian Schizophrenia Research Bank (ASRB) Volunteer Register. The ASRB also provided lifetime severity ratings of different delusions, and data for neuropsychological performance, which allowed us to examine relations with self-reported severity of OC symptoms. **Paper 3** then focuses on four unusual and more bizarre OCD cases to help identify and quantify the distinction between ‘unusual’ delusion-like and ‘normal’ OCD cases. The case histories of these four single cases are presented and a range of clinical instruments for assessing insight and conviction associated with the primary OC related beliefs are administered. To discover common or possibly distinguishing features of delusion-like thinking in people with OC symptoms with or without a comorbid Schizophrenia diagnosis, **Paper 4** reports a preliminary investigation involving in-depth interviews to administer a range of clinical tools for assessing characteristics of belief and insight, as well as self-report inventories to 29 individuals with OC symptoms. In accord with previous research, which proposes that high conviction in an implausible OC belief indicates

the presence of delusional thinking, **Paper 5** compares a 'high conviction' and a 'low conviction' OC subgroup on tasks that have revealed impairments in delusional psychotic disorders (i.e., tasks assessing probabilistic reasoning, theory of mind and attributional biases). The whole sample of 29 patients with OC symptoms are also compared to previously reported normative data.

A summary chapter then provides an overview of the results showing that: (1) measures of a proneness to general delusional ideation associate with severity of OC symptoms independent of the effects of metacognitive biases; (2) OC symptoms are prevalent in a high proportion of Australian schizophrenia patients (roughly 30%) and associate with some psychotic delusions and poor neuropsychological performance; (3) unusual OCD cases with bizarre beliefs according to their case histories do not show consistently poor insight into their disorder or express consistently high conviction in their primary OC-related belief; (4) while patients with schizophrenia and comorbid OC symptoms are less insightful about their OC symptoms than a 'primary OC' sample without schizophrenia, there is substantial overlap in ratings of conviction, strength of belief and insight related to the primary OC-related beliefs, supporting a symptom-focused approach to study the factors that underlie delusional thinking across disorders; and (5) neither high conviction nor poor insight concerning the primary OC-related beliefs nominated by OC cases as causing them most distress associated with poor performances on the same tasks that have revealed impairments in delusional schizophrenia patients. Implications for future research are then discussed.

General Introduction

The primary focus of this thesis is the extent and nature of delusional thinking associated with obsessive-compulsive (OC) symptoms across different diagnostic categories, in particular, obsessive-compulsive disorder (OCD) and schizophrenia. The characteristic symptoms of OCD include the obsessions that arise as ideas or images and/or the compelling impulses, which run repeatedly through a person's mind and are difficult to resist, resulting in compulsive actions (Diagnostic and Statistical Manual of Mental Disorders, DSM-5; American Psychiatric Association, 2013). Commonly, obsessive thoughts involve worries about the need for a specific order or exactness in one's activities or a symmetrical positioning of items in the closer environment, typically at home. However, there are many different obsessive thoughts that can arise, including anticipatory worries of harming a family member or friend by not being careful enough, both with regard to the contents of one's own thoughts and one's actions throughout the day. Other people who experience OC symptoms might feel unable to resist thinking evil or sinful thoughts (Kobori, Salkovskis, Read, Lounes, & Wong, 2012). They may repetitively seek reassurance that they are not doing 'wrong' things (Starcevic et al., 2012). Often, but not in all cases, these intrusive obsessive thoughts and impulses will lead to compulsive reactions, that cause the person to repeatedly engage in the same "protective" behaviour or routine. These compulsive rituals are, however, not limited to observable behaviours, such as cleaning (e.g., washing hands or showering), checking, ordering, and arranging or counting items out loud up to a certain number. Instead, the compulsive rituals can involve mental acts, such as mentally repeating phrases or list-making behaviour. Rituals of this kind are also repetitively performed until the individual feels less tense and the compulsion eases (Abramowitz, Franklin, Schwartz, & Furr,

2003). All of these OC symptoms can come to determine and finally control a person's entire daily life.

These distinctive obsessive and compulsive symptoms are found to be present in 8.3% of the general population over a 12 months period of time (Adam, Meinschmidt, Gloster, & Lieb, 2012) and in as many as 13% of the general population at some point in their life (Fullana et al., 2010). However, only 1.6% will show levels of severity over a lifetime that are sufficient for a clinical diagnosis of OCD (Swets et al., 2014). This is because the diagnostic criteria for OCD require that the obsessions and related compulsive behaviours are excessive, time consuming, significantly distressing and with functional consequences, that is, negatively affecting the person's social or work life (DSM-5; American Psychiatric Association American Psychiatric Association, 2013).

The previous DSM diagnostic criteria for OCD from the Fourth Edition (DSM-IV; American Psychiatric Association, 1994) had also required the affected persons to show at least fair insight into the unreasonableness and excessiveness of their obsessional thoughts and/or compulsions. In fact, intact insight has traditionally been conceived as distinguishing between the beliefs associated with OC symptoms and the unreasonable delusional beliefs that are characteristic of people with psychotic mental illnesses, such as schizophrenia. Although, this additional diagnostic requirement for insight in DSM-IV was considered justified in previous years to distinguish between obsessive thoughts in OCD and other aberrant thoughts, in particular delusions, in psychotic mental illness, research (e.g., Fear, Sharp, & Healy, 2000) has shown that not all persons with OCD have full insight and that some more severe OCD cases show particularly bizarre and unusual OC beliefs that appear delusion-like (Jaafari et al., 2011; Jakubovski et al., 2011). These particular OCD patients with

bizarre, delusion-like obsessional thoughts do not consider their ideas to be unreasonable and experience the contents of their OC thoughts and their compulsive actions to be justified, for example, to prevent the feared future consequences (Stanley, Turner, & Borden, 1990).

An example of such a case is an initially insightful 25-year-old male, who worked as a childcare worker, and who has been described in detail by Insel and Akiskal (1986). This case was reported to be initially obsessed with the thought that he had poisoned the juice of the children he was looking after, and he was constantly checking by tasting the juice that it was not. Although he never found evidence that he had actually poisoned the juice, and was aware of the unreasonableness of his intrusive thought about the fear of poisoning, doubts persisted and completely took over his life. While his subsequent hospitalisation and treatment helped him to eventually reject this particular obsessive thought, he then became convinced that the hospital staff and his therapist thought that he was guilty of poisoning the juice and wanted him to be jailed, even though he was innocent. Insel and Akiskal (1986) interpreted this change in the content of this case's obsessive thoughts as a switch from a 'contamination' fear (i.e., fearing that his touch could cause poisoning) to the development of delusional guilt that he might cause harm, and then to a paranoid delusion of being persecuted by others who thought that he was a poisoner. Another way to think about this transition is that the thematic content of his obsessive thoughts (i.e., that he might poison others) remained throughout, but the 'mental attitude' towards that content shifted from a fear of what might happen (with insight) to a delusional guilt and then to a paranoid delusional belief about others' thinking he was guilty of poisoning. More recently, Fontenelle et al. (2008) reported another obsessional young man, who also appeared delusional. This case insisted that several parts of his body consistently exhaled smelly odour and so he had

to engage in compulsive washing rituals. Another example is a case of a woman who believed that an external supernatural power was responsible for the insertion of thoughts into her mind to ritualistically count, hand-wash and check (O'Dwyer & Marks, 2000). She admitted that it was unreasonable to perform these rituals and so presented with some insight by acknowledging that her rituals might not actually prevent any harm to her family and friends. However, she was convinced that a supernatural power put the thoughts into her mind and that she had to obey even though the compulsive actions might not be successful. These researchers also described a woman who persistently complained about black dots on her hand that she believed to be her own feces, despite doctors and family reassuring her that there were no such black dots and further reported another case of OCD - a man who believed that "spirits" made him engage in compulsive rituals. While O'Dwyer and Marks (2000) acknowledge that the thoughts and subsequent behaviours of these cases were particularly bizarre, they argued that the link between the belief and the behaviour suggested that the core nature of the disorder was obsessive-compulsive rather than psychotic.

The aforementioned examples and the interpretation of O'Dwyer and Marks (2000) thus illustrate that OCD cases can be diverse and complex with a phenomenology that sometimes extends well beyond the characteristic obsessions and compulsions, in particular, also comprising a range of beliefs and explanations for the OC symptoms that can become delusional.

Delusion-like thinking in OCD has sometimes been discussed in relation to the presence of "magical thinking". That is, often, those OC-related beliefs are unusually delusion-like and can contain more magical content. OCD patients sometimes experience obsessive thoughts as somehow magical in nature (Yorulmaz, Inozu, & Gultepe, 2011) and capable of changing

the state of the world or future events (McNicol & Wells, 2012; Shafran, Thordarson, & Rachman, 1996). It has been shown that those more bizarre thoughts impact negatively on the force of related compulsions and general prognosis for OCD (Yorulmaz et al., 2011). More generally, it has been reported that people with magical thoughts are also more likely to show more psychotic or psychotic-like experiences so that thoughts of a magical nature are suggested to predispose towards psychoses (Eckblad & Chapman, 1983), further suggesting links between magical thinking and delusion-like ideation in OCD.

The aforementioned cases also suggest different relationships between the associated beliefs and the OC symptoms that develop and can change over time (e.g., recall the patient who shifted from obsessional fear with insight to obsessional paranoid delusions). One possible factor that may be implicated in such changes over time is “metacognitions”.

In particular, metacognitive biases in OCD patients have been reported on several occasions as being a key influence on distress levels and the reason for maintenance of OC symptoms and the inability to cope with OC symptoms. Metacognitive beliefs are thought to be responsible for the interpretation, evaluation and regulation of cognitive activities (McNicol, 2012). Hence, a disturbed metacognitive belief system, with thoughts such as “I can’t have peace of mind unless I perform my rituals” (McNicol & Wells, 2012, p.33) are associated with increased distress in OCD patients. Therefore, it has been proposed by Laroi and Van der Linden (2005) that bizarre thoughts, as mentioned above, are maintained by false metacognitive beliefs in patients with OC symptoms and are hence good predictors of delusions in OCD as proposed by Abramowitz, Khandker, Nelson, Deacon, and Rygwall (2006). However, biased metacognitive beliefs have not only been identified as risk factors for the development and continuation of specific OC symptoms (Abramowitz et al., 2006), they are also found to indirectly mediate the daily functioning of schizophrenia patients,

often suffering from delusions (Lysaker et al., 2010).

Reports of delusion-like cases as mentioned above and general clinical observations have led to changes in the recent DSM-5 diagnostic criteria for OCD, which now allows for a continuum of insight (good or fair insight, to poor insight, to absence of insight/delusional belief) that associates with obsessions and/or compulsions (American Psychiatric Association, 2013). The existence of these more extreme OCD cases that lack insight can sometimes make it difficult to distinguish between the thinking processes that are associated with what is essentially an OC disorder and the symptoms, in particular, delusional beliefs, that are typically associated with other disorders (Adam et al., 2012). This “grey area” may help to explain why it is that one of the mental disorders that is known to show particular high comorbidity with OC symptoms, that are similar to the OC symptoms seen in OCD cases, is schizophrenia. The reverse is also the case, although not to such an extent. To explain in more detail, psychotic symptoms have been reported in 16% of people with a primary OCD diagnosis at some point in their lives (Ingram, Mueller, Pollitt, and Rosenberg as cited in Kruger et al., 2000, p.1), although De Haan, Dudek-Hodge, Verhoeven, and Denys (2009) found a much lower risk with only 1.7% of OCD patients developing comorbid psychotic symptoms later in their life. In contrast, it has been reported that schizophrenia patients show a relatively high lifetime risk of at least 25% for the development of any OC symptoms although these symptoms may not necessarily be of sufficient severity for a diagnosis of OCD (Swets et al., 2014). This inequality with regard to prevalence rates may reflect the traditional assumption that OCD patients are insightful about their OC symptoms and, if a patient is found to show delusional thinking, even if related to OC symptoms, that patient might be given a diagnosis of schizophrenia rather than OCD.

The evidence for comorbidity of OC symptoms and psychotic symptoms is interpreted in different ways. For example, some researchers consider OCD cases that show signs of delusion-like thinking to be “atypical cases of OCD” (Fontenelle et al., 2008). In other words, typical thinking associated with OC symptoms is conceived of as non-delusional, and, indeed, this is the case in the majority of OCD cases. But, if one allows for delusion-like OCD cases, questions then arise concerning how one can best identify those more delusion-like OCD cases. For example, assumptions seem to exist that it is a patient’s absence of insight into the unreasonableness and excessiveness of their OC symptoms and the subsequent failure to attribute those symptoms to a disorder that distinguishes delusional from non-delusional OC cases, with the beliefs of the former being closer to the delusional beliefs of schizophrenia patients (Faragian, Kurs, & Poyurovsky, 2008; Nicolau, Fortuny, Ruiz, & Pedraza, 2003; Ongur & Goff, 2005; Poyurovsky et al., 2007). Thus poor insight is understood to be the key indicator for delusionality being present in some more severe cases of OCD (Catapano et al., 2010; Kozak & Foa, 1994).

But insight concerning one’s belief about the origin of OC symptoms may differ from one’s insight concerning other beliefs that associate with one’s OC symptoms (e.g., the beliefs in a supernatural power in one of the cases described above). What exactly distinguishes a bizarre thought in some extreme cases of OCD, as mentioned above, from a delusion in schizophrenia, or are both of these types of aberrant thoughts equally delusion-like? One can see some similarities between a lack of insight into the unreasonableness of one’s OC thoughts and aspects of the accepted definition of a delusion in psychotic disorders. Delusions are defined in DSM-5 as “...fixed beliefs that are not amenable to change in light of conflicting evidence. Their content may include a variety of themes (e.g., persecutory, referential, somatic, religious, grandiose) [...]. Delusions are deemed bizarre if they are

clearly implausible and not understandable to same-culture peers and do not derive from ordinary life experiences.” (American Psychiatric Association, 2013, p.87). Thus, whereas earlier versions of DSM focused on ‘falsity’ in their definition of delusions, DSM-5 focuses more on implausibility and fixity and resistance to counter-evidence in their new definition of delusions. The lack of insight into the implausibility or unreasonableness of an OC related belief (which often associates with lack of insight concerning the origin of such beliefs being a disorder) might hence be of primary importance for identifying the presence of delusional thinking in OC cases. But, then again, other aspects of the DSM-5 definition of delusions concerning the conviction of the strongly held delusional beliefs may be more important to consider when attempting to identify the presence of delusional thinking in OC cases. That is, the definition also goes on to say: “...the distinction between a delusion and a strongly held idea is sometimes difficult to make and depends in part on the degree of conviction with which the belief is held despite clear or reasonable contradictory evidence regarding its veracity.” (American Psychiatric Association, 2013 p.87). Accordingly, it could be argued that it is the strength of the unreasonable OC related belief(s), rather than insight into the implausibility of the OC related belief(s) and their attribution to a disorder, that is the key element for judging presence of delusionality in OCD (see Catapano, Sperandeo, Perris, Lanzaro, and Maj (2001), Jacobsen, Freeman, and Salkovskis (2012), van der Zwaard, de Leeuw, van Dael, and Knook (2006)). In other words, a person with OCD and high conviction in an implausible unjustified belief will be strongly convinced that his/her OC related belief is true, even though he or she might acknowledge that it may seem implausible to others, resulting in their compliance with regard to consequent actions, for example, to prevent harm or other bad outcomes for either oneself or others. Therefore it is this conviction, seen in some OCD cases and that associates with delusional beliefs in psychosis, rather than insight, which other researchers have focused upon as the key marker of delusional ideation

in OCD. Jacobsen et al. (2012) and Poyurovsky et al. (2007) have also suggested that strong belief conviction, as suggested in the severe OCD cases with bizarre delusion-like thoughts described above, predicts a worse prognosis.

Consistent with this view, it is known that psychological treatment for OCD is more difficult when delusion-like thinking is present (Fear et al., 2000). In general, the possible links between delusional thinking in schizophrenia and unwarranted delusion-like conviction in some extreme OCD cases may have implications for treatment options. For example, if the same factors that contribute towards delusions in psychotic disorders like schizophrenia also underpin the unwarranted belief conviction seen in some OCD cases with bizarre or magical OC related beliefs, psychological treatments that have been developed to help reduce delusional severity in psychotic patients may also help to reduce delusion-like thinking in these more extreme OCD cases. Likewise, the psychological treatments to reduce psychotic symptoms (e.g. Cognitive Behavioural Therapy: CBT) in schizophrenia patients might be more effective if adapted to incorporate psychological approaches to treating OC symptoms in patients with schizophrenia and comorbid OC symptoms.

Against this background, and with the general aim of better understanding the extent and nature of delusion-like thinking associated with OC symptoms across cases with OCD and cases with schizophrenia and comorbid OC symptoms, the following studies were undertaken. A thesis by publication format has been adopted in this PhD thesis, in which each chapter of the thesis is formatted as a separate paper, which must stand alone.

Paper 1

This paper reports results of an on-line survey that was conducted to gain some initial insights concerning how an intrusive thought might become a delusional obsession with or without associated compulsive behaviours. This survey examined the relationships between severity of self-reported OC symptoms (irrespective of diagnosis in accordance with current dimensional approaches), meta-cognitive capacities (in particular, negative metacognitive biases such as thinking it is important to worry), difficulty with adopting other people's perspectives (or poor 'theory of mind'), and various indices of general delusional ideation and magical thinking. There is some evidence of impairments in meta-cognitive capacities and perspective taking in both OCD and schizophrenia, and it was predicted that both higher levels of delusional ideation and severity of metacognitive difficulties would associate with severity of self-reported OC symptoms. We were particularly interested in whether the delusional ideation might predict severity of OC symptoms by way of the mediating influence of metacognitive difficulties or whether the severity of OC symptoms might predict delusional ideation by way of the mediating influence of metacognitive difficulties. It was hoped that findings would inform understanding of whether a pre-existing proneness to delusional ideation promotes the development of increasingly severe OC symptoms or whether delusional ideation is a secondary consequence of trying to explain and justify increasingly severe obsessions.

Paper 2

Paper 2 was motivated in part by the views of Lysaker and Whitney (2009), who suggest that a comorbidity of schizophrenia and OC symptoms will have important implications for prognosis and treatment of such cases, in particular, contributing to a decreased quality of life and greater social impairments in these individuals. The first aim was to establish the

prevalence of (any) OC symptoms in an Australian schizophrenia sample and the prevalence of OC symptoms of sufficient severity to qualify for diagnosis of OCD. Our second aim was to examine the nature of the OC symptoms in this Australian schizophrenia sample, in particular, by comparing the profile across subtypes of OC symptoms in this schizophrenia sample to the profile seen in an OC sample without schizophrenia (sample accessed from paper 1). We also examined relations between severity of self-reported OC symptoms and lifetime presence of different types of delusions in this Australian schizophrenia sample.

Paper 3

In this paper, we report four single cases of OCD with more unusual obsessive-compulsive beliefs and bizarre magical features. These cases were drawn from a larger group of 21 OCD patients, and were interviewed in depth. The general aim is to illustrate the existence, diverse nature and complexity of these unusual bizarre cases. Demographic and clinical characteristics and case histories are reported. Participant's underlying primary OC related belief was evaluated through a range of instruments to assess insight into the belief, conviction, and strength of belief. Moreover, delusional ideation and magical thinking were also evaluated. Overall, we expected that it would be difficult to place or locate each of these unusual bizarre cases somewhere along a single continuum of insight and hence delusionality.

Paper 4

High comorbidity of OC symptoms in schizophrenia opens up questions about possible commonalities and differences between delusion-like thinking associated with OC symptoms in OCD and in people with schizophrenia and comorbid OC symptoms. We therefore interviewed and compared 21 cases with primary OC symptoms and 8 patients with a

primary diagnosis of schizophrenia or schizoaffective disorder and comorbid OC symptoms. The latter group of 8 did not comprise any who had taken part in the Paper 2 survey, all of whom were unable to attend a face-to-face interview session. This group of 8 comprised participants who had been recruited to take part in previous schizophrenia studies and who had either spontaneously reported OC symptoms as being a concern or evidenced compulsive behaviours. It was hoped that this group, albeit small in number, would show similar levels of severity of their OC symptoms to that seen in the cases with primary OC symptoms. This way, any differences between groups on various measures of general delusional ideation/magical thinking and facets of OC related belief (i.e., insight, conviction) would not be confounded by differential severity of OC symptoms.

Paper 5

The overall aim in this Paper was to examine whether the same factors that associate with delusions in psychotic mental illness also associate with bizarre delusion-like thinking about OC symptoms. Based on previous findings from related schizophrenia research (e.g., Langdon, Ward, & Coltheart, 2010), we examined “jumping to conclusions” (JTC) and over-adjustment of hypotheses based on immediate experience using two versions of a probabilistic reasoning task (the ‘Beads’ task) and theory of mind ability (i.e., the capacity to adopt the mental perspective of others to understand a situation rather than focusing on the apparent objective facts), as well as attributional biases, in particular extent of an externalising bias (i.e., a self-serving tendency to externalise the cause of negative events) and a personalising bias (i.e., a tendency to externalise blame to others rather than circumstances). The sample comprised 29 cases (the same 21 OCD patients and eight schizophrenia patients with comorbid OC symptoms compared in Paper 4.) who were sub-grouped into a ‘high conviction’ group if they had a conviction score on the Brown

Assessment of Belief Scale (BABS; Eisen et al., 1998) of '4' (the highest score on the scale and taken to index delusional thinking) or else a 'low conviction' group. It is predicted that the 'high conviction' OC group will perform significantly differently to the 'low conviction' group on these tasks assessing probabilistic reasoning, theory of mind and attributional styles that have previously been used in schizophrenia research on delusions.

Following these five Papers, the final chapter of this thesis, summarises the main findings and discusses future directions.

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PAPER 1

Obsessive-compulsive symptoms and their associations with metacognitions, magical thinking and delusional ideation

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Abstract

Introduction: Patients with obsessive-compulsive disorder (OCD) typically recognize that their obsessions and/or compulsions are unrealistic. However, there is increasing awareness that degree of insight varies greatly with instances of delusional thinking in some OCD cases. Recent research indicates associations between elements of “schizotypal personality”, including “magical thinking”, and severity of obsessive-compulsive (OC) symptoms. There is also evidence that delusions in psychotic mental illnesses such as schizophrenia are associated with metacognitive biases. Psychological treatment for OCD is more difficult when delusions and/or lack of insight are present. Hence, we aimed to gain insights concerning how an intrusive thought becomes a delusional obsession by conducting an online survey to investigate relationships between OC symptoms, metacognitive biases, and delusional ideation. We predicted that severity of OC symptoms would associate with both metacognitive biases and delusional ideation, and that metacognitive biases would mediate the relationships between delusional ideation and OCD severity.

Method: Data was collected over an 18-month period. Ninety respondents (70 male, 20 female) completed online questionnaires that assessed: severity of OC symptoms using the Obsessive Compulsive Inventory (OCI); lack of insight and delusional ideation using Beck’s Cognitive Insight Scale (BCIS), the Magical Ideation Scale (MIS), and Peters’ Delusions Inventory (PDI); metacognitive biases concerning one’s own thinking using the Metacognition Questionnaire (MCQ-30); and metacognitive deficits concerning inferences of others’ thoughts using the Interpersonal Reactivity Index (IRI) Perspective-taking items.

Results: Significant correlations were found between OC symptom severity, measures of magical thinking and delusional ideation, but not cognitive insight. Similar relations were seen with metacognitive biases assessed using the MCQ-30 but not metacognitive deficits assessed using the IRI. These relations were stronger for the thought-oriented OC symptoms. Counter to our hypothesis, metacognitive biases did not fully mediate the links between delusional ideation and OC symptom severity.

Conclusion: Our findings show that delusional ideation is associated directly with OC symptom severity, independent of metacognitive biases. Cognitive treatments developed to reduce delusional severity in psychotic mental illnesses such as schizophrenia may therefore benefit OCD patients with delusional ideation, but not OCD patients without delusional ideation. However, other potential influencing factors need to be explored further.

INTRODUCTION

Obsessive-compulsive disorder (OCD) is characterised by obsessions that arise as ideas, images and/or impulses, which run repeatedly through the persons mind and are difficult to resist (DSM-5; Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, American Psychiatric Association, 2013). There are a number of different OC symptoms, but common symptoms include contamination obsessions and checking compulsions. Other people with OC symptoms will find their thoughts interrupted by worries about the need for a specific order or exactness of their work or symmetrical positioning of items at home. People with obsessive-compulsive (OC) symptoms can also seek reassurance repetitively (Starcevic et al., 2012), since they might not be able to resist thinking evil or sinful thoughts. These intrusive thoughts often, but not in all cases, lead to compulsive actions, which are not limited to observable behaviours, like cleaning (e.g., washing hands or showering), checking, ordering, arranging or counting items up to a certain number, but can also involve mental rituals, performed repetitively until one feels less compelled and tense. These compulsive mental acts can involve mentally repeating phrases or mental list making behaviour (DSM-5; American Psychiatric Association, 2013).

Diagnostic criteria for OCD require that obsessions and related behaviours are excessive, time consuming and significantly distressing, detrimentally affecting the person's social or work life (DSM-5; American Psychiatric Association, 2013). Previous DSM-IV diagnostic criteria had also required persons diagnosed with OCD to show at least fair insight into the unreasonableness and excessiveness of their obsessional thoughts and/or compulsions. Although, this additional requirement for insight was justified in previous years to distinguish symptoms of OCD from other thought related psychotic symptoms such as

delusions, research (Abramowitz, Franklin, Schwartz, & Furr, 2003) has shown that not all persons with OCD have insight. Findings of this type and clinical observation has led to changes in the recent DSM-5 diagnostic criteria for OCD, which allow for three different states of insight (good or fair insight, poor insight, absent insight/delusional belief) associated with obsessions and/or compulsions. Hence, there is no longer a clear distinction between delusional obsessions in OCD and delusional thinking in schizophrenia, for example. This is consistent with the observation that lack of insight into the unreasonableness of one's obsessions fits with the definition of a delusion. For example, The DSM-5 defines a delusion, in part, as "[...] The distinction between a delusion and a strongly held idea is sometimes difficult to make and depends in part on the degree of conviction with which the belief is held despite clear or reasonable contradictory evidence regarding its veracity." (American Psychiatric Association, 2013, p. 87)

Delusional thinking in OCD may be present from the beginning and integrally involved in the initial development of OC symptoms. As an example of a case where delusional thinking may have been present very early, Fear, Sharp, and Healy (2000) described a case study of a woman with ritualised counting, hand-washing and checking behaviours who concurrently believed that a supernatural power was responsible for the injection of intrusive thoughts related to these behaviours. While she also acknowledged that performing rituals to prevent any harm coming to family members and friends was unreasonable (suggesting some insight), she strongly believed in the supernatural power who was putting thoughts into her mind and which must be obeyed, without being able to explain how and why. O'Dwyer and Marks (2000) acknowledge that this thought and subsequent behaviour was particularly bizarre, but mention the key criteria in this case being the link between the central belief and the behaviour that suggests obsessive-compulsive rather than a psychotic disorder.

However, more often, the obsessional thoughts may just develop over time into delusions. For example, another case reported by Insel and Akiskal (1986) describes an initially insightful 25-year childcare worker, who was obsessed with the thought that he had poisoned the children's juice and was constantly checking by tasting the juice. Although he never found evidence that he actual did poison the juice, and was aware of the unreasonableness of his intrusive thought, doubts remained. While his subsequent hospitalisation and treatment helped him to eventually reject this particular thought, he then became convinced that the hospital staff and his therapist thought that he was guilty of poisoning the juice and wanted him to be jailed. Insel and Akiskal (1986) interpreted this change as a switch from a contamination fear that his touch could cause poisoning developing into a delusional guilt that then shifted towards a paranoid delusion of being persecuted by others for the same action of being a poisoner.

Despite the differences in a longitudinal course of the delusional thinking, both cases show that obsessional thoughts might be difficult to distinguish from delusional phenomena. This seems particularly so in some extremely severe OCD cases (Jaafari et al., 2011). It therefore suggests that factors that have been implicated in delusions in psychotic disorders such as schizophrenia may also play a role in exacerbating the severity of OC symptoms in OCD patients who lack insight. Such a view is supported by recent research that indicates associations between elements of "schizotypal personality", including "magical thinking", and severity of OC symptoms (O'Dwyer & Marks, 2000), particularly in patients who are delusional about their obsessions (Yorulmaz, Inozu, & Gultepe, 2011).

Of related interest, it is known that psychological treatment for OCD is more difficult when delusions and/or lack of insight are present (Fear et al., 2000). As such, if factors that

contribute to delusions in psychotic disorders like schizophrenia also contribute to increased severity of OC symptoms in people with OCD who lack insight, this may have implications for psychological OCD treatments. For example, treatments such as “Metacognitive Training” (Moritz & Grp, 2012), which have been developed to treat delusions in psychotic mental illnesses, may also be of benefit to some sufferers of OCD. However, this effect of Metacognitive training might not be direct but indirect, in particular, mediated by biased metacognitive beliefs. Metacognitive beliefs, such as “I can’t have peace of mind unless I perform my rituals” (McNicol & Wells, 2012, p.33) were proposed as a key influence on distress levels and the reason for maintenance and the inability to cope with OC symptoms. In addition, Well’s metacognitive model suggests that beliefs about rituals, as often seen in OCD patients, are associated with increased distress and therefore a heightened severity of OCD.

Also of interest, it has been shown by Laroi and Van der Linden (2005) that metacognitive beliefs, whether negative or positive, are good predictors of delusions and as proposed by Abramowitz, Khandker, Nelson, Deacon, and Rygwall (2006) are risk factors for the development of specific types of OCD. It is also suggested by Lysaker et al. (2010) that certain forms of metacognitions mediate indirectly the functioning of schizophrenia patients, often suffering from delusions.

Against this background, the current study aims to shed some light on OCD and its co-occurring delusion-like phenomena, such as magical thinking, and lack of insight in a clinical online sample. Further, we also consider the potential role of metacognitive deficits and biases in mediating any observed relations between severity of OC symptoms and delusional

ideation. Metacognition refers generally to thinking about thinking. The construct has been applied to study the capacity to put oneself into the “mental shoes” of another person to think as they do (also referred to as “Theory of Mind”). It has also been applied to studies that examine the nature of reflecting upon one’s own thinking, as typically assessed using questionnaires such as the Metacognitive Questionnaire (Wells & Cartwright-Hatton, 2004) which indexes negative self-reflective biases (e.g., greater tendencies to think that worrying is helpful, ruminate on negative thoughts, or brood about not being able to control one’s thoughts).

With regard to the former, there is evidence that metacognitive or Theory of Mind deficits are associated with delusional ideation in psychotic mental illnesses such as schizophrenia (Langdon, Ward, & Coltheart, 2010). Of more interest to us, however, is the possibility that metacognitive biases, as assessed using the MCQ for example, mediate the development of delusional ideation in OCD, as suggested in the second example described above. In more detail, evidence reported by Wells and Cartwright-Hatton (2004) implies that metacognition, conceived as distorted biases in reflecting upon one’s own thinking, may play a vital role in the development of OCD and specific OC subtypes, such as obsessive checking. Another illustrative example related to the role of metacognitive biases in hallucinations comes from Laroi and Van der Linden (2005). They suggest that the intrusive thought “I have to worry all the time in order to perform well” could be exacerbated into an even more severe delusional obsession by a person’s metacognitive belief “It is a sign of weakness, that I cannot control my worrying thoughts”. Morrison, Haddock, and Tarrier (1995) claim that a person’s aim to overcome this conflict between the intrusive thought about needing to worry and their metacognitive belief that one ought to be able to control one’s thoughts

could even result in their externalising of the intrusive thought, thus leading to hallucinatory experiences and related delusions.

Hence, this clinical study aimed to conduct an online survey to gain insights concerning how an intrusive thought might become a delusional obsession with or without associated compulsive behaviours by investigating relationships between severity of self-reported OC symptoms, metacognitive capacities and biases, and various indices of delusional ideation. Self reported OC symptoms were considered, irrespective of diagnosis, in accordance with current dimensional approaches. It was predicted that self-reported severity of OC symptoms would be associated with magical thinking, delusional conviction and preoccupation as well as lack of insight. The strength of these relations was also expected to differ between OC subtypes; specifically, it was predicted that these relationships would be strongest for the thought-oriented OC subtypes, such as obsessions and doubting, which generally precede ritualistic behaviours, and for which their thought content can be unusual. Behavioural OC subtypes, such as washing, on the other hand, are actions that provide relief to the patient's urge when finished. In contrast, it is expected that we will fail to find evidence to support an association between severity of OC symptoms and strength of traditional religious beliefs. Furthermore, consistent with previous research on metacognitions in OCD (Morrison et al., 1995), it was also anticipated that metacognitive biases related to distorted reflections on one's own thinking and deficits in Theory of Mind (or taking other people's perspectives) will likewise be associated with severity of OC symptoms, once again, more strongly for the thought-oriented OC subtypes. Finally, if, as predicted, metacognitive deficits and/or biases and delusional ideation are both associated with OC severity, additional analyses will examine whether those metacognitive biases

and/or deficits mediate any relationships observed between severity of OC symptoms and delusional ideation and/or lack of insight.

METHOD

Participants

Over approximately 18 months, 162 individuals, in total, participated in the online survey, completing at least some of the self-report questionnaires listed below. As the primary focus of this study is severity of OC symptoms, only the data of those respondents who completed all 42 questions of the Obsessive Compulsive Inventory (OCI: see below) were considered further. Data from two of these individuals were excluded due to the participants being younger than 16 years of age, since this was an exclusion criterion. While English did not need to be the first language, participants were also excluded if they self-reported that they were non-English speaking. Final survey results are therefore based on 90 respondents (70 female, 20 male), with a mean age of 33 years ($SD = 12.74$).

Materials

The online survey incorporated the questionnaires and inventories outlined in the following section.

Demographics

Supplementary information about respondents' socio-demographics (e.g., age, gender) and clinical background (e.g., if they have ever been given a diagnosis of OCD) was collected as listed in Table 1.

Obsessive-compulsive (OC) Symptoms

Respondents were asked to self-report their current OC symptoms using the Obsessive Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998). The original version of the OCI requests respondents to rate 42 items (e.g., “I repeatedly check doors, windows, drawers etc.”; “After I have done things, I have persistent doubts about whether I really did them” or “I sometimes have to wash or clean myself simply because I feel contaminated.”) according to the degree of associated distress using a 5-point Likert scale (‘not at all’, ‘a little’, ‘moderately’, ‘a lot’, ‘extremely’). These distress ratings were totalled for each of seven dimensions, washing and obsessions (8 items per subscale; scores ranging from 0 to 32), ordering (5 items; scores ranging from 0 to 20), doubting and hoarding, (3 items per subscale; ranging from 0 to 12), neutralising (6 items; ranging from 0 to 24), and checking (9 items; ranging from 0 to 36) and then added for an overall OCI total score. Further, an overall clinical OCI cut-off score of 21 has been proposed later by Foa et al. (2002). Based on research conducted by Foa et al. (1998) respondents were also asked to rate the frequency of those OC symptoms that were reported as causing any distress (i.e., rated as ‘a little’ or more on the distress ratings) on a 4-point rating scale (‘less than 1 hour each day’, ‘between 1 and 3 hours a day’, ‘between 3 and 8 hours a day’, ‘more than 8 hours a day’). This also allowed us to also assess participants' preoccupation, that is, time spent acting on their compulsions and thinking about their obsessions, as well as their associated distress. Frequency scores were also calculated for each dimension of OC symptoms, with similar generally similar possible ranges. In general, higher scores for distress and frequency indicate greater severity of OC symptoms.

Previous research (Foa et al., 1998) has reported good test-retest reliability for the OCI distress ratings ($r = .89$ in a control sample and $.87$ in an OCD sample) as well as for the OCI

frequency ratings ($r = .90$ in a control sample and $.84$ in OCD sample). The OCI shows good convergent and divergent validity (Foa et al., 1998).

Delusional Ideation

Schizophrenia-like Delusional Ideation

Delusional thinking of the type typically seen in Schizophrenia was measured using the 2004 version of the Peters' Delusions Inventory (PDI; Peters, Joseph, Day, & Garety, 2004; Peters, Joseph, & Garety, 1999). This version of the PDI comprises 21 items that probe presence of unusual beliefs (e.g., "Do you ever feel as if your own thoughts were being echoed back to you?" or "Do you ever feel as if there is a mysterious power working for the good of the world?"). For each item, the respondent answers 'yes' or 'no'. If the response is yes, the respondent then rates associated distress, preoccupation and conviction on a 5-point rating scale (1 = indicating 'not at all distressing/hardly ever think about it/ don't believe it's true' and 5 = 'very distressing/think about it all the time/believe it to be absolutely true'). Separate scores are obtained for a PDI total yes score (range 0 to 21), and total distress, preoccupation, and conviction scores, all ranging from 0 to 105. A grand total PDI score (summing the three dimension scores and the PDI total yes score) can also be obtained (range 0 to 336).

The PDI has adequate inter-item reliability with a reported Cronbach's $\alpha = .82$; good test-retest reliability of $r = .80$; and confirmed validity (Peters et al., 2004).

Magical Thinking

General magical ideation was assessed using the Magical Ideation Scale (MIS; Eckblad & Chapman, 1983). Respondents were asked to rate 30 statements about their magical

thinking and behaviour as being TRUE or FALSE (e.g., “Things sometimes seem to be in different places when I get home, even though no one has been there.” or “I sometimes have a feeling of gaining or losing energy when certain people look at me or touch me.”). A total score out of 30 is then calculated, after reverse-coding where required. Higher scores indicate more extreme magical thinking.

Reliability has been reported between $\alpha = .81$ and $\alpha = .79$ in a clinical sample with evidence of good construct validity (Eckblad & Chapman, 1983).

Traditional Religious Belief

In order to distinguish between strength of delusional/magical thinking and traditional religious beliefs, respondents also completed the Religious Belief Subscale of the Paranormal Belief Scale (PBS; Tobacyk & Milford, 1983). This subscale comprises four items (e.g., “The soul continues to exist though the body may die.” or “I believe in God”) that are rated using a 5-point scale (from 1 = ‘strongly disagree’ to 5 = ‘strongly agree’). The total score ranges from 4 to 20, with higher scores indicating stronger traditional religious beliefs.

Reliability for this subscale has been reported as good, $\alpha = .75$. Strong construct validity for the entire PBS, and discriminant validity of the various PBS subscales, including the Traditional Religious Belief subscale, have also been reported in a nonclinical sample (Tobacyk & Milford, 1983).

Cognitive Insight

Participants’ capacity to self-reflect and accept that one’s beliefs might be mistaken was assessed using Beck’s Cognitive Insight Scale (BCIS; Beck, Baruch, Balter, Steer, & Warman,

2004). The BCIS comprises 15 items rated using a 4-point scale (0 = 'do not agree at all', 1 = 'agree slightly', 2 = 'agree a lot' and 3 = 'agree completely', used for the current study), and includes two subscales. The self-reflectiveness (or objectivity) subscale comprises nine items and assesses participants' reflectiveness and openness to feedback (e.g., "Some of the ideas I was certain were true turned out to be false." or "There is often more than one possible explanation for why people act the way they do."), with scores ranging from 0 to 27. Higher scores are thought to index better introspection and willingness to acknowledge being wrong. The self-certainty subscale comprises six items (e.g., "If something feels right, it means that it is right." or "I cannot trust other people's opinion about my experiences.") and assesses confidence and conviction in one's own beliefs (e.g., "I know better than anyone else what my problems are."), with scores ranging from 0 to 18. Higher scores reflect overconfidence in decision-making. An overall score can also be calculated by subtracting the self-certainty score from the self-reflectiveness score (range -18 to 27), with higher scores purported to index better overall insight. However, since previous studies of non-clinical delusional ideation have found that both higher self-reflection and higher self-certainty associate with higher levels of delusional ideation (Carse & Langdon, 2013), the current study did not use this composite score.

Reliability has been reported as Cronbach's alpha = .68 for the self-reflectiveness subscale and .60 for the self-certainty subscale in a clinical sample (Beck et al., 2004) with similar internal consistencies reported in a nonclinical sample (Warman & Martin, 2006).

Metacognition

We distinguished between self-focused metacognition, that is, the control of, and thinking about, one's own thinking, and a capacity to think about and take the perspective of others, as follows:

Metacognition Questionnaire

Aspects of metacognition, as conceived by Wells, were assessed using a short form of the Metacognition Questionnaire-30 (Wells & Cartwright-Hatton, 2004). The MCQ-30 was developed to assess the control and modification of one's own thinking in relation to psychological disorder (Cartwright-Hatton & Wells, 1997). Participants rate their level of agreement on a 4-point scale (1 = 'do not agree', 2 = 'agree slightly', 3 = 'agree moderately' and 4 = 'agree very much') for 30 statements comprising six statements for each of five subscales: Cognitive confidence (e.g., "My memory can mislead me at times."), Positive beliefs (e.g., "Worrying helps me to avoid problems in the future."), Cognitive self-consciousness (e.g., "I am constantly aware of my thinking."), Uncontrollability and danger (e.g., "My worrying could make me go mad") and Need to control thoughts (e.g., "It is bad to think certain thoughts."). Higher scores on Cognitive confidence indicate lack of confidence in one's own memory ability and attention, while high scores on Positive beliefs indicate belief in the value of worrying thoughts. Scoring high on Cognitive self-consciousness indicates paying undue attention to one's own thought processes. Finally, high scores on Uncontrollability and danger and Need to control thoughts indicate negative beliefs about worrying thoughts and not being able to control thoughts and their consequences.

Scores for each subscale are totalled (range from 6 to 24). Subsequently a total MCQ-30 score across the five dimensions is summed (range from 30 to 120) to give a global picture of

participants' thinking about their thinking, with higher scores indicating generally more maladaptive metacognitive thinking.

Reliability has been reported as Cronbach's alpha = .93 for Cognitive confidence, = .92 for Positive beliefs alpha, = .92 for Cognitive self-consciousness, = .91 for Uncontrollability and danger, = .72 for Need to control thoughts, with an overall MCQ-30 Cronbach's alpha = .93 in a healthy sample (Wells & Cartwright-Hatton, 2004). The convergent validity of the MCQ-30 items is also supported (Wells & Cartwright-Hatton, 2004).

Perspective taking

To assess participants' capacity to reflect on other people's thinking and imagine other people's subjective perspectives, a subscale from the Interpersonal Reactivity Scale (IRI; Davis, 1983), the Perspective Taking Scale, was administered. These seven items (e.g., "I sometimes find it difficult to see things from the "other guy's" point of view." or "I believe that there are two sides to every question and try to look at them both.") are rated on a Likert scale (from 0 = 'not at all' to 5 = 'very much') and a total score computed, after reverse coding, as needed (range 0 to 35). The higher the score, the better the capacity to reflect upon and to take the perspective of others.

A satisfactory internal reliability (Cronbach's alpha ranging from .71 to .77) and test-retest reliability (ranging from .62 to .71) has been reported by (Davis, 1983). Also, Hoffman had earlier in 1977 confirmed a relationship between perspective taking and two other IRI subscales, empathic concern and personal distress, supporting construct validity (Davis, 1983).

Socially Desirable Responding

To examine possible effects of socially desirable responding in participants' self-report, the short form of the Social Desirable Scale (SDS; Reynolds, 1982) was included in the online survey. This 13-item form requires 'yes' or 'no' responses. All 'yes' responses are totalled after reverse-coding as needed (range 0 to 13). The SDS is reported to be a reliable assessment of participants' tendencies for socially desirable responding and validated according to other measures of personality traits and general behaviours (see e.g., Loo & Loewen, 2004).

Comparisons of the original longer form of the Marlowe-Crowne Social Desirability Scale (see e.g., Loo & Loewen, 2004), with its known strong psychometric properties (Crowne & Marlowe, 1960), and the 13-item short form version C, used here, has revealed a strong association (Ballard, 1992).

General Procedure

The online survey was brought to the attention of people with OC symptoms via the websites of OCD support groups (e.g., the OCD Foundation in the US). The online survey was advertised on these websites, which also provided a link to the survey. Notices were also placed in support groups' newsletters.

At the start of the survey, participants were informed about the purpose and content of the survey and asked to give consent to have their data included in outcome reports. Following their agreement, socio-demographic information (e.g., age, gender, diagnosis of OCD or other) was collected and respondents were asked to complete the OCI and then the other

questionnaires as listed above. Ethics approval was granted from Concord Repatriation Hospital (CH62/6/2012-081) (see Appendix 4) and Macquarie University (5201200243) (see Appendix 5).

Data analysis

All statistical analyses were performed using Pearson's r correlation coefficient tests were used to examine the strength of relationships. Possible mediation effects of metacognitive biases/deficits for any established significant correlations between severity of OC symptoms and measures of delusional ideation, magical thinking and lack of insight were tested by carrying out Mediation Analyses utilising Linear Regression. Scatterplots and histograms as well as power calculations for a moderate effect size were examined to ensure that the assumptions of normality and linearity were met and that power was acceptable.

RESULTS

Preliminary Results and Demographics

Results for the Social Desirability Scale (SDS) were considered first. The SDS mean of 7.48 with a SD of 3.02 for the current study sample was similar to that described in (IBM, Released 2011) norms; mean = 5.67 (SD = 3.20). No relations between SDS scores and other questionnaire measures were found to be significant. As such, no participants were excluded based on their SDS scores.

The demographic data (summarised in Table 1 below) revealed that the 78% ($n = 70$) respondents who were female had a mean age of 32.6 (SD = 13.32), while the 22% ($n = 20$) who were male had a mean age of 32.6 (SD = 10.79). Most respondents (90%) confirmed their first language was English, with the majority being USA citizens (61.11%). Seventy five

percent of respondents mentioned at least one diagnosis, with OCD being the major one, although multiple diagnoses were common. No respondents reported a diagnosis of schizophrenia or schizoaffective disorder. Roughly two thirds reported taking medications. Most respondents had completed some college (24.44%) or a Bachelor degree (23.33%) and only a minority had finished with less than a Highschool degree (4.44%).

Table 1

Socio demographic data: Frequencies mean scores (standard deviations) of respondents

		N	Mean (SD)	Range
Age		90	32.6 (12.74)	16-65
	Male	20	32.6 (10.79)	16-65
	Female	70	32.6 (13.32)	16-65
		N	Percentage	
Gender	Male	20	22.00	
	Female	70	78.00	
English as first language	Yes	81	90.00	
	No	9	10.00	
Country	Africa	3	3.33	
	USA	55	61.11	
	Australia	14	15.56	
	India	5	5.56	
	GB	4	4.44	
	Other	9	10.00	
Diagnoses	Yes	68	75.56	
	No	22	24.44	
Type of Diagnosis^{a)}	OCD	50	55.56	
	Other Anxiety Disorders	23	25.56	
	Mood Disorders	22	24.44	
	Other	12	13.33	
Medication	Yes	58	64.44	
	No	32	35.56	
Other treatments	Yes	33	36.67	
	No	57	63.33	
Highest level of education	Less than Highschool	4	4.44	
	Highschool/GED	13	14.44	
	Some College	22	24.44	
	College Degree (2 years)	10	11.11	
	Bachelor Degree (4 years)	21	23.33	
	Doctoral Degree	10	11.11	
	Professional Degree (Medical or Juris Doctor)	2	2.22	
	Other	4	4.44	

^{a)} Several participants reported more than one diagnosis. In total, 12 different diagnoses were self-reported with OCD being the most common. Anxiety diagnoses included General Anxiety Disorder, Social Anxiety Disorder, Post Traumatic Stress Disorder and Panic Disorder. Mood disorder diagnoses included Depression and Bipolar Disorder. Other disorders included ADHD, Anorexia Nervosa, Borderline Personality Disorder, Trichotillomania and Excoriation Disorder.

Description of Obsessive Compulsive Symptoms

Descriptive data for the OCI ratings of distress and frequency for the different subtypes, and overall, as well as Cronbach's alphas, which were all high, are summarised in Table 2 below.

Table 2

Mean total scores, standard deviations (SDs), actual ranges, and Cronbach's alphas for the distress and frequency ratings of the seven OCI dimensions, and overall, for the 90 participants. Mean ratings of subscales are also expressed as the average per item - in brackets after mean total scores - to allow for comparisons across subscales, which differed in numbers of items per scale.

		Mean total (per item)	SD	Actual range of scores	Cronbach's alpha
OCI					
<i>Washing</i>					
	Distress ratings	12.01 (1.50)	9.99	0 – 32	.935
	Frequency ratings	9.13 (1.14)	9.05	0 – 32	.954
<i>Checking</i>					
	Distress ratings	14.33 (1.59)	8.98	0 – 35	.882
	Frequency ratings	10.46 (1.16)	7.54	0 – 33	.897
<i>Doubting</i>					
	Distress ratings	6.40 (2.13)	3.67	0 – 12	.837
	Frequency ratings	4.81 (1.60)	3.64	0 – 12	.928
<i>Ordering</i>					
	Distress ratings	9.62 (1.92)	6.55	0 – 20	.909
	Frequency ratings	6.67 (1.33)	5.34	0 – 20	.915
<i>Obsessions</i>					
	Distress ratings	16.91 (2.11)	7.58	0 – 32	.843
	Frequency ratings	13.29 (1.66)	7.71	0 – 31	.891
<i>Hoarding</i>					
	Distress ratings	3.77 (1.26)	3.67	0 – 12	.862
	Frequency ratings	2.47 (0.82)	2.77	0 – 12	.901
<i>Neutralising</i>					
	Distress ratings	9.46 (1.58)	5.90	0 – 24	.745
	Frequency ratings	6.71 (1.12)	4.89	0 – 21	.774
<i>TOTAL</i>					
	Distress ratings	72.50 (1.73)	32.41	3 – 153	.939
	Frequency ratings	53.53 (1.28)	30.35	0 – 124	.955

Overall, distress ratings were mild to moderate and were relatively higher (per item) for the thought-oriented subtypes (doubting and obsessions) than the behavioural subtypes, in particular hoarding. Frequency ratings were also highest for obsessions, whether one considered the cumulative total or the mean per item. Since the OCI distress and frequency ratings were very strongly inter-correlated (e.g., $r = .967$ for the overall ratings), subsequent

analyses focus on the distress ratings, which are more commonly used in the literature to identify and distinguish OC symptoms.

Table 3 below provides descriptive data and Cronbach's alphas, which were all acceptable to good, for the other questionnaire measures. In brief, ratings spanned nearly the full range for all measures.

Table 3

Mean ratings, standard deviations (SDs), actual ranges, and Cronbach's alphas for the Peters' Delusions Inventory (PDI), Magical Ideation Scale (MIS), Traditional Religious Belief subscale of the Paranormal Beliefs Scale (PBS), Becks Cognitive Insight Scale (BCIS), Metacognitive Questionnaire 30 (MCQ-30) and the Interpersonal Reactivity Scale's (IRI) Perspective Taking Items. The number (N) completing each questionnaire is also provided.

	N	Mean	SD	Actual range	Cronbach's alpha
PDI ^{a)}					
<i>Total 'yes' score</i>	80	7.39	4.22	0 – 19	.809
<i>Distress</i>	75	21.61	14.55	1 – 64	.856
<i>Preoccupation</i>	74	19.07	12.72	1 – 65	.850
<i>Conviction</i>	74	21.32	13.84	2 – 76	.854
<i>Overall score</i>	80	65.01	43.23	0 – 224	.910
MIS					
<i>Total</i>	85	12.59	3.85	0 – 23	.585
Traditional Religious Belief Scale of PBS					
<i>Total</i>	57	13.95	4.32	4 – 20	.841
BCIS					
<i>Self-reflectiveness</i>	85	14.61	19.63	5 – 26	.663
<i>Self-certainty</i>	85	7.89	3.78	0 – 16	.740
MCQ-30					
<i>Cognitive confidence</i>	77	13.09	4.89	6 – 23	.857
<i>Positive beliefs</i>	77	12.51	5.42	6 – 24	.902
<i>Cognitive self-consciousness</i>	77	18.16	4.40	7 – 24	.846
<i>Uncontrollability and danger</i>	77	18.66	4.93	6 – 24	.882
<i>Need to control thoughts</i>	77	15.19	4.76	6 – 24	.776
<i>Total</i>	77	77.58	18.02	32 – 114	.925
Perspective Taking (IRI)					
<i>Total</i>	81	21.94	7.11	0 – 35	.796

^{a)} Only participants who answered a PDI yes/no question with 'yes' were then asked to rate the related items on distress, preoccupation and conviction, which explains the different N-values.

Hypothesis 1: Severity of OC symptoms and levels of magical thinking, delusional ideation and lack of insight

First, we hypothesised that levels of magical thinking, delusional ideation and lack of insight would correlate with self-reported severity of OC symptoms. We also anticipated that these relationships would be stronger for the thought-oriented OC subtypes, such as obsessions and doubting, rather than the behavioural OC subtypes, such as washing or hoarding. In contrast, we expected the Traditional Religious Belief subscale ratings from the PBS would not correlate with severity of any OC symptoms. The latter was supported with all p-values's > .05. Correlation findings for the other measures of magical thinking, delusional ideation and cognitive insight, as assessed using the self-certainty and self-reflectiveness subscales of the BCIS, are presented in Table 4 below.

Table 4

Correlations of severity of OCI subtypes with BCIS scores of self-reflectiveness and self-certainty, MIS scores of magical thinking and PDI scores of delusional ideation.

	BCIS self- reflectiveness		BCIS self-certainty		MIS Total		PDI Total 'yes' score		PDI Distress		PDI Preoccupation		PDI Conviction		PDI Overall score	
	(r)	p	(r)	p	(r)	p	(r)	p	(r)	p	(r)	p	(r)	p	(r)	p
N	85		85		85		80		75		74		74		80	
OCI distress subgroups																
Washing	-.029 (ns)	.794	.232*	.033	.222*	.041	.114 (ns)	.315	.196 (ns)	.091	.249*	.032	.252*	.031	.155 (ns)	.169
Checking	.124 (ns)	.260	.093 (ns)	.399	.166 (ns)	.129	.092 (ns)	.418	.176 (ns)	.131	.187 (ns)	.110	.124 (ns)	.291	.118 (ns)	.299
Doubting	.211 (ns)	.053	-.006 (ns)	.956	.213 (ns)	.051	.186 (ns)	.098	.285*	.013	.276*	.017	.178 (ns)	.129	.225*	.045
Ordering	.077 (ns)	.485	.339***	.001	.316***	.003	.178 (ns)	.113	.277*	.016	.292*	.011	.290*	.012	.242*	.030
Obsessions	.304**	.005	-.015 (ns)	.895	.289**	.007	.266*	.017	.305**	.008	.341***	.003	.201 (ns)	.086	.273*	.014
Hoarding	.206 (ns)	.058	.082 (ns)	.456	.260*	.016	.242*	.030	.180 (ns)	.123	.092 (ns)	.438	.075 (ns)	.527	.198 (ns)	.078
Neutralising	.304**	.005	.175 (ns)	.110	.325***	.002	.321**	.004	.290*	.012	.317**	.006	.265*	.022	.276*	.013
OCI Total score	.214*	.050	.201 (ns)	.065	.357***	.001	.270*	.015	.365***	.001	.393***	.001	.315**	.006	.297**	.007

* p < .05; ** p < .01; *** p < 0.005

Given the number of correlations, we only consider results with $p < .01$ and interpret effect sizes according to Cohen's convention (Cohen, 1988). Focusing first on relations with the BCIS measures of cognitive insight, the only association to reach significance with a medium effect size at $\alpha = .01$ for BCIS self-certainty was with the severity of OCI Ordering ($r(85)=0.34$, $p=.001$). That is, respondents with higher levels of self-reported self-certainty also self-reported more extreme ordering compulsions. In contrast, higher levels of self-reflectiveness associated moderately with more extreme OCI Obsessions and Neutralising (in both cases with $r(85)=0.30$, $p=.005$). That is, respondents who were more self-reflective also engaged in more obsessive and neutralising behaviours and thoughts.

Three OCI subtypes were strongly associated with the MIS magical thinking score: ordering ($r(85)=0.32$, $p=.003$), obsessions ($r(85)=0.29$, $p=.007$) and neutralising ($r(85)=0.33$, $p=.002$). There was also a highly significant relationship between higher levels of magical thinking and overall severity of OC symptoms indexed by the OCI Total score ($r(85)=0.357$, $p=.001$), all showing a medium effect size.

In a similar way, the association between the PDI Overall score of delusional ideation and the OCI Total score was equally highly significant at $\alpha = .01$, ($r(76)=.350$, $p=.001$). More specifically, the associations with the three PDI subscales of distress, preoccupation and conviction were all significant at $\alpha = .01$ (see Table 4). That is, more severe OC symptoms associated with higher levels of conviction, distress and preoccupation about delusional ideas. In particular obsessions were highly associated with PDI distress ($r(75)=0.305$, $p=.008$) and preoccupation ($r(74)=0.341$, $p=.003$) and more severe neutralising associated with a higher level of PDI preoccupation ($r(74)=0.317$, $p=.006$). That is, respondents with a stronger engagement in obsessions or neutralising were more distressed and/or preoccupied with

delusion-like beliefs indexed by the PDI. According to Cohen's convention (1988) all correlations were of medium effect size.

In sum, and as predicted, overall severity of OC symptoms was not associated with strength of traditional religious beliefs but was associated significantly with magical thinking, as indexed by the MIS, and higher levels of distress, preoccupation and conviction associated with delusional ideation, as indexed by the PDI. Results for cognitive insight, as assessed using the BCIS, were overall not as strong. The general pattern across OCI subtypes was such that these relations were stronger for the thought-oriented subtypes, in particular, OCI obsessions and neutralising, although higher levels of magical thinking did correlate significantly with more severe OCI ordering compulsions.

Hypothesis 2: Correlations between levels of metacognitive biases and metacognitive deficits of Theory of Mind (or taking other people's perspectives) with severity of OC symptoms

Participants' Theory of Mind or the capacity to reflect on other people's thinking was assessed using the Perspective Taking subscale of the Interpersonal Reactivity Scale (IRI). Results showed that respondents self-reported, on average, a satisfactory ability to reflect upon and take other peoples' perspective. Moreover, no significant negative relations with OC severity were found; indeed, the only significant relationship was a positive one such that better ability to reflect upon oneself associated moderately with more severe levels of the OCI subtype, obsessions ($r(81)=0.230$, $p=.039$).

In contrast, correlations were found to be generally highly significant between severity of OCI symptoms and more extreme metacognitive thinking biases, as assessed using the Metacognitive Questionnaire-30 (MCQ-30: see Table 5). In particular, this relation was strong for the MCQ-30 Total score and the OCI Overall severity score. A strong relation with the overall MCQ-30 score was seen for all OCI subtypes with overall moderate effect sizes, except for the behavioural compulsions washing and hoarding.

Table 5

Correlations of OCI subgroups and MCQ-30 dimensions

(Cognitive confidence, Positive beliefs, Cognitive self-consciousness, Uncontrollability and danger, Need to control thoughts)

	MCQ-30 Total		MCQ-30 Cognitive confidence		MCQ-30 Positive beliefs		MCQ-30 Cognitive self-consciousness		MCQ-30 Uncontrollability and danger		MCQ-30 Need to control thoughts	
	(r)	p	(r)	p	(r)	p	(r)	p	(r)	p	(r)	p
N	77		77		77		77		77		77	
OCI distress subgroups												
Washing	.162 (ns)	.158	-.041 (ns)	.724	.094 (ns)	.415	.063 (ns)	.415	.272 (ns)	.017	.209 (ns)	.068
Checking	.437**	<.001	.262 (ns)	.021	.309**	.006	.189 (ns)	.101	.391**	<.001	.455**	<.001
Doubting	.559**	<.001	.416**	.006	.300**	.008	.352**	.002	.541**	<.001	.459**	<.001
Ordering	.369**	.001	.193 (ns)	.093	.335**	.003	.270 (ns)	.017	.223 (ns)	.051	.335**	.003
Obsessions	.556**	<.001	.343**	.002	.225 (ns)	.049	.407**	<.001	.583**	<.001	.516**	<.001
Hoarding	.226 (ns)	.049	.369**	.001	.048 (ns)	.678	.048 (ns)	.678	.189 (ns)	.100	.232 (ns)	.042
Neutralising	.381**	.001	.104 (ns)	.367	.306**	.007	.234 (ns)	.041	.275 (ns)	.015	.484**	<.001
OCI Total Score	.570**	<.001	.303**	.007	.352**	.002	.324**	.004	.544**	<.001	.583**	<.001

** Correlation is significant at the 0.01 level (2-tailed).

The influence of metacognitive biases on the relationship between severity of OC symptoms and delusional ideation

Given the above significant relations, we went on to consider whether those previously established relationships between severity of OC symptoms and levels of delusional ideation (indexed by the PDI scores of schizophrenia-like delusional ideation and the MIS scores of magical thinking) are mediated by metacognitive biases. We focused on the total scores for all measures (PDI, MIS, OCI and MCQ-30). Since these mediation analyses were exploratory we considered two possibilities. The first was that delusional ideation might exacerbate OC severity by way of the mediating effects of metacognitive biases. If this was not the case, there be implications for new treatment options based on cognitive remediations to reduce delusional severity in other conditions (e.g., schizophrenia) for those more delusional OCD patients. The second was that developing OC symptoms lead to the formation of associated delusional beliefs by way of the mediating effects of metacognitive biases in thinking style.

Three conditions needed to be established prior to performance of mediation analyses; those are: 1) The IV (delusional ideation (PDI Overall or MIS magical ideation)) is significantly related to the DV (OC severity), 2) The IV (PDI Overall or MIS magical ideation)) is significantly related to the mediator (MCQ-30 Total) and 3) the mediator (MCQ-30 Total) also predicts the DV (OC symptom severity). As reported above, positive relationships were established between OC symptom severity and schizophrenia-like delusional ideation represented by the overall PDI score as well as MIS total score for magical ideation, thus satisfying criterion 1). There were also significant relationships between the MCQ-30 total and the PDI scores (e.g., MCQ-30 with PDI Overall: $r = .347$, $p = .002$), thus satisfying criterion 2). Metacognition (MCQ-30 total) was a significant predictor for OC symptom severity, thus

satisfying criterion 3). Three different linear regression analyses revealed raw regression coefficients and their standard errors for associations between the IV (PDI Overall or MIS total) and the mediator (MCQ-30 Total), and the association between the IV (PDI Overall or MIS total) and the OC symptom severity across the mediator (MCQ-30 total). It was found that the effect of delusional ideation (PDI Overall) on OC symptom severity (OCI Total) was not fully mediated by metacognitive biases (MCQ-30 Total). In the same way, the previously established effect of magical ideation (MIS Total) on OC symptom severity was not fully mediated by metacognitive biases. The following Figure 1 illustrates the significant relationships between delusional ideation, indexed by the PDI overall score, and OC symptom severity, having accounted for the hypothesised mediator metacognitive biases (MCQ-30 Total). Figure 2 examines the same relationships between magical ideation and OC severity.

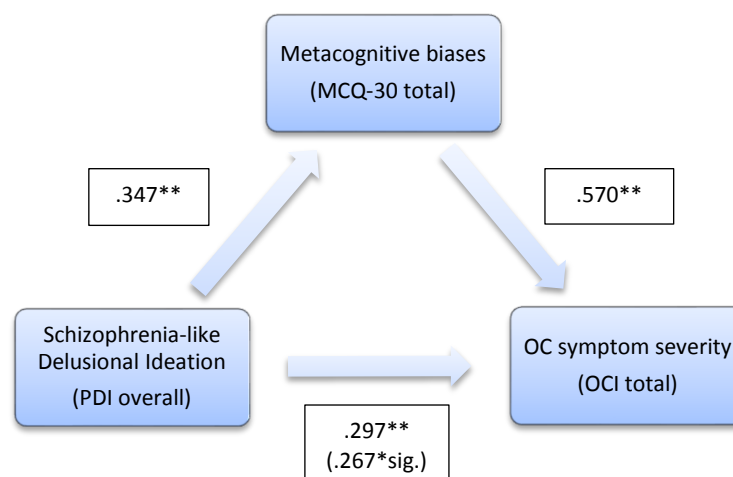


Figure 1. Relationships between schizophrenia like delusional ideation (PDI overall) and the OC symptom severity (OCI total) via the hypothesised mediator, degree of metacognitive biases (MCQ-30 Total). The value in brackets (.267) shows the strength of the relationship having accounted for the mediator.

Note: Correlation is significant at the level * $p < .05$; ** $p < .01$

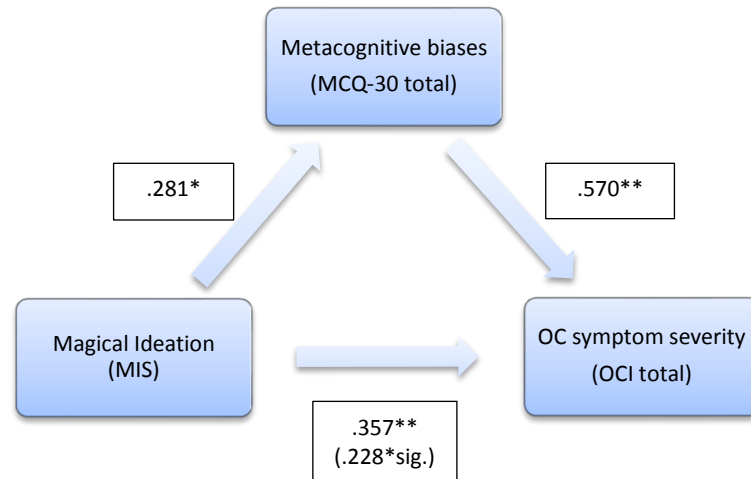


Figure 2. Relationships between magical thinking indexed by the Magical Ideation Scale (MIS) and the OC symptom severity (OCI Total) via the hypothesised mediator degree of metacognitive biases (MCQ-30 Total). The value in brackets (.228) shows the strength of the relationship having accounted for the mediator. Note: Correlation is significant at the level * $p < .05$; ** $p < .01$

Results concerning the second set of mediation analyses were similar; that is, the mediating influence of metacognitive biases did not completely account for the effects of OC severity on levels of magical thinking/delusional ideation.

Hence, the hypothesis that metacognitive biases would mediate the relationships between delusional ideation/magical thinking and severity of OC symptoms was not fully supported. While the relations above show partial mediation by metacognitive biases, the findings suggest an independent effect of delusional ideation, whether represented by the PDI Overall score or the Magical Ideation Scale score, on the severity of OC symptom severity having accounted for the effects of metacognitive biases.

DISCUSSION

The aim of this study was to gain insights concerning how OC intrusive thoughts may become a delusional obsession with possible related compulsive behaviours by conducting an online survey to investigate the interactions between severity of self-reported OC symptoms, meta-cognitive capacities and biases, and potential delusional ideation. It was predicted that there would be associations between the severity of OC symptoms and indices of delusional ideation, magical thinking and lack of insight, as well as measures of metacognitive deficits and biases, and that these relationships would be stronger for the thought oriented OC subtypes. Mediation analyses were then planned if the above relationships held to determine whether metacognitive biases or deficits mediated any observed relationships between OC symptom severity and the measures of delusional ideation and/or lack of insight.

Commenting first on the overall levels of OC symptoms, delusional ideation and metacognitive deficits/biases, the distress ratings of OC symptoms were generally mild to moderate with the thought-oriented OCD subtype, Obsessions, being reported to be the most distressing and the most frequent OCI symptom. In line with Reynolds (1982) who suggested a possible relation between severity of OC symptoms and schizotypal features, such as magical thinking, this study found a marked range of delusional ideation in this study with levels of delusional ideation indexed by the Peters' Delusions Inventory (PDI) and magical thinking indexed by the Magical Ideation Scale (MIS), for example, ranging from zero to near maximum scores. Levels of metacognitive biases, as indexed by the MCQ-30, also showed near the full range of possible scores.

Results concerning the first two hypotheses (related to delusional ideation/magical thinking and metacognitive biases, respectively) were significant. There were significant relationships

between severity of OC symptoms and the measures of delusional ideation indexed by the PDI and magical thinking indexed by the MIS but not cognitive insight as assessed using Beck's Cognitive Insight Scale. Focusing first on the specific results for magical thinking, as predicted, magical thinking was more closely associated with severity of the thought-oriented subtypes, such as obsessions and neutralising. However, significant associations were also seen for the subtype ordering. Since ordering compulsions are often accompanied by thoughts about symmetry or a particular meaning of order, such thoughts behind the ordering compulsions can be seen as being magical thinking in nature, consistent with Yorulmaz et al. (2011). Hence, it is perhaps not so surprising that the ordering subtype of OC, as well as the thought-oriented subtypes, were found to be significantly related to magical thinking.

Specific results related to the PDI measures of delusional ideation and OC symptom severity showed that OC symptom severity was strongly linked with the PDI measures of delusional ideation, whether related to distress, preoccupation or conviction, or overall. Hence, it can be assumed that participants' preoccupation and fixation with delusion-like ideas, which may also include the primary focus of their OC symptoms, is closely related to their OC symptom severity, possibly compounding the urge to act on their obsessions or compulsions. Moreover, as further predicted, the associations between the PDI scores and OC symptom severity were strongest for thought oriented subtypes, for example Obsessions and Neutralising. These findings are consistent with previous research suggesting a strong connection between delusional ideation and severity of OC symptoms (Yorulmaz et al., 2011).

While delusional ideation and magical thinking were associated with the severity of respondents' OC symptoms, the results for cognitive insight were less convincing, showing

only weak relations between overall OC severity and BCIS self-reflectiveness and self-certainty. Some relations with certain OC subtypes were apparent, however, for example, between BCIS self-reflectiveness and the OC subtypes, obsessions and neutralising, but not for BCIS self-certainty. The one exception here with regard to self-certainty was a somewhat unexpected relation between greater self-certainty and more severe OC ordering. Contrary to previous findings from Coles, Heimberg, Frost & Steketee (2005), who had found a strong relationship between self-certainty and OC severity, the majority of previous results do not show this relationship. Overall, there was little evidence to be found for an association between people's self-certainty and OC severity, thus the possibility that lack of cognitive insight might affect OC severity was not strongly supported by the data, despite the strong evidence found for associations with magical thinking, as well as with multiple features of delusional ideation. Fear et al. (2000) suggest it is important to define the concept of insight more precisely and it may be that the BCIS was not the best tool to assess insight related to OC symptoms.

Finally, this study's results show that, as expected, strength of traditional religious beliefs did not associate with severity of any OC symptoms. In line with earlier suggestions (Markova, Jaafari, and Berrios, 2009) we can thus infer that respondents' traditional religious background does not play an important role in the development of intrusive thoughts and related compulsive behaviours.

We turn now to consider results concerning the hypothesis that metacognitive biases and/or deficits would associate with OC symptom severity, as found by multiple studies (Hoffnung, Aizenberg, Hermesh, & Munitz, 1989). As expected, current results also supported these previous findings. Not only did metacognitive biases assessed using the MCQ-30 associate with severity of OC symptoms overall, highly significant relations were also apparent for six

out of the seven OC subtypes. The only exception was for the hoarding subtype, where evidence of an association was not found. Given that the DSM-5 criteria to diagnose hoarding differs substantially from criteria for other OC subtypes, it is perhaps not so surprising that the hoarding subtype did not show similar relations to metacognitive biases as seen for other OC subtypes.

In contrast to metacognitive biases related to reflection on one's own thinking, it was also of interest to assess participants' metacognitive capacity to reflect on other people's thinking. Therefore, Theory of Mind capacity or ability to take other people's perspectives was also considered in relation to the severity of participants' OC symptoms. Respondents self-reported, on average, a satisfactory ability to take other peoples' perspective with no significant relations seen between perspective-taking ability, assessed using the IRI, and OC symptom severity. This is generally consistent with the previous results of McNicol & Wells, (2012) and Moritz, Peters, Laroj, & Lincoln (2010) who suggest that OCD patients' basic Theory of Mind abilities are satisfactory and any deficits may relate to reduced memory capacities. However, it should be noted that our null results concerning metacognitive deficits of Theory of Mind and OC symptom severity might be a result of our using a self-report measure. Assessing Theory of Mind abilities using objective measures may produce different results.

To further shed light on the role of delusional ideation in exacerbating OC symptom severity, we considered the possible mediating role of metacognitive biases. Consistent with earlier research from Moritz et al. (2010), this study also found strong associations between delusional ideation assessed using the PDI and metacognitive biases. Similar relations were seen with magical thinking, as assessed using the MIS. However, further analyses showed that neither the strong relationships between OC symptom severity and magical thinking nor

with delusional ideation were fully accounted for by metacognitive biases. Therefore, our results suggest that delusional ideation and magical thinking is having a significant direct effect on participants' OC symptom severity, independent of any effects of metacognitive biases. This is consistent with the possibility that delusional thinking is present from the beginning in some OC cases and contributes to the initial development of OC symptoms. Nevertheless, that metacognitive biases partially mediated the relations between delusional ideation/magical thinking and OC symptom severity would also be consistent with the possibility that obsessional thoughts just develop over time into delusions in some OCD patients, through the effects of metacognitive thinking styles.

Lastly, even though online surveys have the advantage of being easily administered and having wide accessibility, this method is also limited. An online survey always bears the risk of only reaching out to respondents who are literate with the computer and having access to the internet. Therefore, it might be possible that our sample does not generalise to all OCD patients.

In conclusion, delusional ideation and magical thinking seem to be associated with severity of OC symptoms, independently of metacognitive biases, and, as expected, especially so for thought oriented OC symptoms. This suggests implications for best treatment options for OCD patients. Since delusional ideation/magical thinking is a factor influencing how severely people are suffering from OC symptoms, such thinking processes could also be taken into consideration when OC symptoms are targeted by psychological treatments. In other words, it might be worthwhile to also take delusional ideation/magical thinking into account as an additional influential factor, besides already known targets, when planning individual OCD treatment options. Thus, in general accord, with previous propositions by Laroi and Van der Linden (2005) and Himle, Van Etten, Janeck, and Fischer (2006) that patients' insight into their OC symptoms should be taken into consideration as a predictor of treatment outcome

for OCD, it would probably also be useful to target the potential delusionality of OCD patients' intrusive thoughts to maximise treatment outcomes on severity of their OC symptoms. In support of this view, treatments that have been developed to reduce severity of delusional ideation in psychotic mental illnesses, such as schizophrenia (Kishore, Samar, Janardhan Reddy, Chandrasekhar, & Thennarasu, 2004), have also been proven to be of benefit to people who experience OC symptoms, as seen in research from Moritz, S., & Grp, M. S. (e.g., Metacognitive Training: Moritz & Grp, 2012). Future research to examine the benefits of other such delusion targeted treatments for more severe cases of OCD with reduced insight would be warranted.

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PAPER 2

Obsessive-compulsive symptoms: exploring their prevalence and profile in Australian patients with schizophrenia and related psychotic disorders

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Abstract

Introduction: While obsessive-compulsive (OC) symptoms are the hallmark of obsessive-compulsive disorder (OCD), with patients typically insightful about their obsessions and/or compulsions, OC symptoms can also be seen in schizophrenia. Delusions related to OC symptoms in schizophrenia may be a consequence of explaining the obsessions and/or compulsions or underpin their development. In either case, OC symptoms in schizophrenia complicate treatment and may require targeted interventions. A better understanding of the profile of OC symptoms in schizophrenia may inform the focus of such interventions. Hence, we conducted a mail-out survey to 340 schizophrenia patients registered with the Australian Schizophrenia Research Bank (ASRB) on the East Coast of Australia, to investigate the prevalence and profile of OC symptoms. The Obsessive Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998) was used to assess current distress and preoccupation associated with any OC symptoms.

Method: 321 had valid addresses and received the mail-out. 98 volunteers responded, two of whom reported no OC symptoms. The ASRB provided information on neuropsychological status and lifetime delusion ratings for those that responded to the mail-out.

Results: Assuming all those with valid addresses who did not respond experienced no OC symptoms, we conservatively estimate prevalence of current OC symptoms in this ASRB sample as 29%. Prevalence of OC symptoms severe enough to meet the criteria for OCD was estimated at 7.5%. Distress and frequency ratings were lower than typically seen in OCD, however. Ratings differed across subtypes, with most distress for obsessions. Severity of OC symptoms was associated with poorer neuropsychological performance and severity of

delusions of influence, although significant results regarding the latter were only seen for the OCI subtypes of ordering and doubting, once neuropsychological performance had been taken into account.

Conclusion: Approximately one-third of this Australian schizophrenia and related psychotic diagnosis sample reported current OC symptoms. The profile of severity across OC subtypes was similar to that seen in OCD, albeit less marked. Questions remain about why OC symptoms may associate with delusions in schizophrenia, while OCD patients can show the same profile of OC subtype severity but are typically insightful about their obsessions/compulsions.

INTRODUCTION

Obsessive-compulsive disorder (OCD) is a very diverse disorder characterized by obsessions and compulsions within various contexts. Obsessive thoughts are known to occur as images, impulses or ideas that repeatedly run through a person's mind, and which the person cannot, or has great difficulty resisting. People showing obsessions are mostly disturbed by constant thoughts about dirt and germs, becoming contaminated, or the persistent anticipation of harming a family member or friend by not being careful enough in their thoughts and actions throughout the day. Obsessive thoughts can also involve concerns with order, symmetry and/or exactness. Other frequent themes include the fear of thinking evil or sinful thoughts and a recurrent need for reassurance (Kobori, Salkovskis, Read, Lounes, & Wong, 2012). These obsessions are often, but not always, accompanied by acts (including mental acts), of engaging in the same "protective" behaviour or routine repeatedly. These, mostly unwanted, recurring behaviours, which sometimes accord with a person's own specific rules, evolve into the compulsive rituals or actions that often represent the most obvious part of the disorder. These compulsive rituals can involve repetitive cleaning (e.g., washing hands or showering), checking, ordering, arranging and/or counting items. Repetitive list-making behaviour can also occur, or even repeating phrases mentally (Abramowitz, Franklin, Schwartz, & Furr, 2003). Compulsive rituals of this type often come to determine and control a person's entire daily life.

An epidemiological study of the presence of these distinctive obsessive and compulsive symptoms in the general population over a 12-month period of time revealed a period prevalence of 8.3% (Adam, Meinschmidt, Gloster, & Lieb, 2012). Other epidemiological research on lifetime prevalence has shown that as many as 13% of the general population will show obsessions and/or compulsions at some point over a lifetime (Fullana et al., 2010),

however only 1.6% will show clinical levels of severity for a diagnosis of OCD (Swets et al., 2014).

Prevalence rates are higher, however, in people with mental disorders, with evidence that the presence of OC symptoms is related to an increased risk to develop mental disorders other than OCD (Fullana et al., 2010). Thus, it might come as no surprise that obsessions and/or compulsions are often comorbid with several other mental disorders, including depression, social phobia and eating disorder (Fineberg et al., 2013). Whether obsessions and/or compulsions are a precursor to the development of these other mental illnesses or a secondary response is still under debate. Indeed, in some cases it can be difficult to distinguish between OC symptoms and the symptoms typically associated with other disorders, which may be why certain disorders are more likely to be accompanied by OC symptoms (Adam et al., 2012). One of those mental disorders known to show high comorbidity with OC symptoms and to be characterised by symptoms that are sometimes difficult to distinguish from features of severe cases of OCD is schizophrenia. In particular, we refer here to the yet undefined area between lack of insight and delusional thinking in OCD, in comparison to the presence of OC symptoms and delusional psychosis in schizophrenia.

Although schizophrenia is not among the most common comorbid mental illnesses in people with OCD – these are depression and anxiety – people with schizophrenia show a high comorbidity with other mental disorders (Buckley, Miller, Lehrer, & Castle, 2009), with prevalence rates of OC symptoms in schizophrenia especially high (Achim et al., 2011; Bijl, Ravelli, & van Zessen, 1998). In more detail, the rates of comorbidity vary according to the primary or the first diagnosis, schizophrenia or OCD. For example, the maximum lifetime

prevalence rate of psychotic symptoms appearing at any time in people with a primary OCD diagnosis has been reported as 16% by Ingram, Mueller, Pollitt, and Rosenberg (as cited in Kruger et al., 2000, p.1). De Haan, Dudek-Hodge, Verhoeven, and Denys (2009) also report a comparatively low risk of 1.7% for patients with an OCD diagnosis going on to develop comorbid psychotic symptoms later in their life. In contrast, it has been reported that schizophrenia patients show a high lifetime risk of at least 25% for the development of OC symptoms, albeit not necessarily meeting diagnostic criteria for OCD (Swets et al., 2014). This disparity may reflect the traditional diagnostic criterion that OCD patients are insightful about their OC symptoms; if not, and delusional thinking is present, even if related to OC symptoms, a patient may have been given a diagnosis of schizophrenia.

Several factors are thought to influence the high co-occurrence of OC symptoms in people with schizophrenia and may need to be taken into consideration when distinguishing between delusional psychotic symptoms that characterise schizophrenia and “look-a-like” obsessions and/or compulsions accompanied by magical thinking so as to establish the primary diagnosis. These factors can be of methodological nature, such as involving reliable clinical measurement issues and the diagnostic tools being used. Using different thresholds to identify presence of symptoms can also impact on the primary diagnosis. Other factors that can be taken into account include patient characteristics such as age or cultural background of the patient; for example, people with OCD will often adopt cultural themes, such as a fear of AIDS. As a general point, it has been advocated that a subdivision into homogenous OCD subgroups with similar properties (i.e., with certain comorbidities or coming from a specific cultural background) will aid classification of specific core clinical criteria and inform understanding of underlying causes (Zink, 2014; Zink et al., 2014).

With regard to the possible overlap between OC symptoms associated with delusional or magical thinking and psychotic symptoms that characterise schizophrenia and the difficulty with differentiating between these in some cases it may be useful to begin with the definition of delusions as used by DSM-5 as a main criterion for diagnosis of schizophrenia. Delusions are defined as “fixed beliefs that are not amenable to change in light of conflicting evidence” (American Psychiatric Association, 2013, p.87). Delusions may be implausible or bizarre, however it is the certainty and fixity of the beliefs, which characterise delusional thinking. Patients experiencing established delusions are absolutely convinced that their belief is true despite contradicting evidence. They are also resistant to counter-argument. The contents of their delusional thoughts are generally externally attributed as facts of the world and are not recognized as the product of one’s own thinking. Obsessive thoughts in OCD, in contrast, are commonly recognised by patients as originating internally. Traditionally, insight into the unreasonableness of an intrusive thought’s content and attempts to resist those obsessive thoughts has been considered the main distinction between delusional thinking in schizophrenic patients and obsessions in OC patients (Zink, 2014; Zink et al., 2014). However, DSM-5 now recognises that obsessions can be delusional with lack of insight seen in some severe OCD cases, thus blurring the traditional distinction between delusions in schizophrenia and obsessions in OCD. Understanding of the nature of delusional thinking associated with OC symptoms might thus be gained by investigating the types of OC symptoms seen in schizophrenia, and the delusional themes of people with schizophrenia and comorbid OC symptoms.

Lysaker and Whitney (2009) identified that comorbidity of schizophrenia and OC symptoms will have implications for patients’ lives. In line with this, evidence suggests that comorbid OC symptoms associate with greater dysfunction in life and more severe symptoms, thereby

contributing to a decreased quality of life and greater social impairments. For example, the presence of OC symptoms, even below the level for diagnosis of OCD, is believed to increase the severity of positive, negative and depressive symptoms in schizophrenia patients (Cunill, Castells, & Simeon, 2009), and therefore has severe clinical implications. There is also evidence that presence of OC symptoms predicts more severe progression of the illness and worse outcome for schizophrenia patients as well as associating with greater cognitive impairments (Berman et al., 1998). Delusions related to OC symptoms in schizophrenia may be a consequence of explaining obsessions and/or compulsions or underpin their development. In either case, OC symptoms in schizophrenia complicate treatment and may require targeted interventions. A better understanding of the profile of OC symptoms in schizophrenia may inform the focus of such interventions. The current study will focus on the entire spectrum of current OC symptoms in an Australian schizophrenia sample, without restricting investigations to those above a cut-off point for OCD diagnosis.

Our first aim was to establish the prevalence of OC symptoms in an Australian sample. This is because the prevalence of OC symptoms in schizophrenia has been reported to vary noticeably. According to Achim et al. (2011) and Swets et al. (2014) not less than 12% and up to 60% (Berman et al., 1998) and even 64% (Kayahan, Ozturk, Veznedaroglu, & Eraslan, 2005) of schizophrenia patients have been found to show some OC symptoms throughout their life. A comorbid diagnosis of OCD in schizophrenia patients has also been previously reported throughout several studies to range from as low as 0% to as high as 59% (Bland et al.; Fabisch et al. as cited in Swets, 2013, p.1). More recent meta-analyses have found prevalence rates of OCD in schizophrenia patients, over a lifetime ranging from 0.6% (Niehaus et al., 2005) to 29% (Cassano, Pini, Saettoni, Rucci, & Dell'Osso, 1998).

Our second aim was to examine the nature of OC symptoms in this Australian schizophrenia sample. We were interested to determine whether the nature of OC symptoms, present in people with a diagnosis characterised by delusional thinking, that is schizophrenia, resembles the characteristics of OC symptoms in a sample of people with OC symptoms, as reported in paper 1. Presence of different obsessions and/or compulsions, as well as the associated distress and frequency of those current obsessive-compulsive experiences, will be assessed using the Obsessive Compulsive Inventory (OCI; Foa et al., 1998), a self-report screening instrument for current OC symptoms, including seven subscales: washing; checking; doubting; ordering; obsessions; hoarding and neutralising.

Finally, it is also of interest if sample features, like neuropsychological performance and clinical characteristics (e.g., history of certain types of delusions) impact on respondents' OC symptom severity ratings. For example, it is specifically predicted, that there will be no differences between OC subtypes with regard to strength of correlations with neuropsychological abilities in accord with previous research findings from Nedeljkovic et al. (2009), although we expect overall severity of OC symptoms to correlate with neuropsychology ability. It is further expected that certain delusions, as seen in schizophrenia, will be more strongly related to OC severity, and more so for the thought oriented OC symptom subtypes rather than the behavioural OC symptom subtypes.

METHOD

Participants

A total of 340 Australian Schizophrenia Research Bank (ASRB) volunteers were approached to take part in this study. 321 had valid addresses and received the mail-out. 98 volunteers responded and returned the completed Obsessive Compulsive Inventory (OCI: see below for details) to indicate the level of severity of their current OC symptoms. All but two of these self-reported experiencing some level of current distress associated with OC symptoms (see later). To be a volunteer on the ASRB register you must be an adult, therefore all 98 respondents who returned the completed OCI survey were 18 years of age or older. The ASRB was approached to provide available demographic and clinical data for these 98 respondents, as well as available neuropsychological data (see below). The 98 respondents (43 female, 55 male) had a mean age of 48 years ($SD = 10.19$).

General Procedure

The most comprehensive register of Australian volunteers with schizophrenia or related psychotic disorders is held by the Australian Schizophrenia Research Bank ("ASRB,"). The ASRB sent a mail-out to the volunteers on the Register, which included a brief information letter, along with the assessing instrument, the "Obsessive Compulsive Inventory (OCI)" (see below for details). This was mailed to all registered 340 ASRB volunteers on the East Coast of Australia who were asked to complete the survey and mail back their responses to Macquarie University for assessment. By sending back their completed survey, they indicated their agreement to participate in this study and were reimbursed for their participation when completed surveys were received.

Approval for this study was obtained independently from the Australian Schizophrenia Research Bank (ASRB) (see Appendix 6) and Macquarie University Human Research Ethics Committee (see Appendix 5).

Survey Instrument: Obsessive Compulsive Inventory (OCI)

Respondents were asked to self-report their current OC symptoms using the Obsessive Compulsive Inventory (OCI; Foa et al., 1998). The original version of the OCI requests respondents to rate 42 items (e. g, “I repeatedly check doors, windows, drawers etc.”; “After I have done things, I have persistent doubts about whether I really did them” or “I sometimes have to wash or clean myself simply because I feel contaminated.”) according to the degree of associated distress using a 5-point Likert scale (‘not at all’, ‘a little’, ‘moderately’, ‘a lot’, ‘extremely’). These distress ratings were totalled for each of seven dimensions, washing and obsessions (8 items per subscale; scores ranging from 0 to 32), ordering (5 items; scores ranging from 0 to 20), doubting and hoarding, (3 items per subscale; ranging from 0 to 12), neutralising (6 items; ranging from 0 to 24), and checking (9 items; ranging from 0 to 36) and then added for an overall OCI total score (ranging from 0 to 168). Based on Foa et al.’s (1998) procedure, respondents were also asked to rate the frequency of those OC symptoms that were reported as causing any distress (i.e., rated as ‘a little’ or more on the distress ratings) on a 4-point rating scale (‘less than 1 hour each day’, ‘between 1 and 3 hours a day’, ‘between 3 and 8 hours a day’, ‘more than 8 hours a day’). This allowed us to also assess participants' preoccupation, that is, time spent acting on their compulsions and thinking about their obsessions, as well as their associated distress. Frequency scores were also calculated for each dimension of OC symptoms, with similar possible ranges. In general, higher scores for distress and frequency indicate greater severity of OC symptoms.

Previous research (Foa et al., 1998) has reported good test-retest reliability for the OCI distress ratings ($r = .89$ in a control sample and $.87$ in an OCD sample) as well as for the OCI frequency ratings ($r = .90$ in a control sample and $.84$ in OCD sample). Also, the OCI shows good convergent and divergent validity (Foa et al., 1998).

Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)

The ASRB keeps a database of scores from the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Green et al., 2008; RBANS; Randolph, 1998) which was used to assess participants' general neuropsychological performance in five cognitive domains: Immediate memory (List Learning and Story Memory); Delayed memory (i.e., list recall, list recognition, story recall, figure recall); Visuospatial/Constructional (i.e., figure copy, line orientation); Language (i.e., picture naming, semantic fluency) and Attention (i.e., digit span, coding) (RBANS; Randolph, 1998). With an approximate administration time of 30 minutes, this instrument has become popular in clinical settings and for different patient populations, despite being designed originally for dementia research (Green et al., 2008).

The reliability for the RBANS Total score has been found to be high across all age groups with a reliability coefficient between $.80$ and $.94$. An overall good test-retest reliability across age groups has also been determined for each cognitive domain with Immediate Memory ($.84$ to $.90$), Visuospatial/Constructional ($.77$ to $.84$), Attention ($.83$ to $.88$), Language ($.75$ to $.87$) and Delayed Memory ($.92$ to $.95$). Good convergent validity with other cognitive measures is also confirmed. (Gold, Queern, Iannone, & Buchanan, 1999; Hobart, Goldberg, Bartko, & Gold, 1999)

In this study we used the RBANS scores provided to us by the ASRB for the participants included in the study.

Diagnostic Interview for Psychoses (DIP)

The ASRB establishes diagnosis using the Diagnostic Interview for Psychoses (DIP; Castle et al., 2006) which is a semi-structured easy to use comprehensive clinical interview for psychotic disorders and comprises questions about demographic information, social performance and disability, diagnostic ratings of symptoms, markers and past history as well as the patient's perceived patterns of use and need for service of the interviewee. While it is a diagnostic tool, with inbuilt-skips between and within sections to avoid redundancy, ICD-10 and DSM-III-R diagnoses are generated according to particular sets of criteria. The DIP can be administered either on-screen or in paper format.

For both, the ICD-10 and DSM-III-R diagnoses, good inter-rater reliability ($r = .80$ to 1.00) was confirmed, a good or excellent test-retest-reliability received ($r = .80$ to 1.00) and an acceptable diagnostic validity found. (Castle et al., 2006)

Data analysis

All statistical analyses were performed using SPSS, version 20 (IBM, Released 2011). Data was analysed using descriptives and frequencies to examine the prevalence of different OC symptoms. Correlational analyses were used to assess the relationships between severity of OC symptoms and participants' neuropsychological and clinical data; parametric and non-parametric statistics are reported where appropriate. A subsequent mixed-design ANOVA was carried out to compare the Paper 1 group of 90 people with OC symptoms only and the Paper 2 group of 98 people with OC symptoms and a schizophrenia diagnosis with regard to their profiles of distress ratings across the different OC symptoms. Scatterplots and histograms as well as power calculations for a moderate effect size were examined to ensure

that the assumptions of normality and linearity were met and sufficient power was established.

RESULTS

First we specify details on the background information provided by the ASRB on the 98 respondents.

Basic and Clinical Demographics

Respondents' socio-demographics, neuropsychological performances (e.g., memory abilities assessed on the Repeatable Battery for the Assessment of Neuropsychological Status, RBANS; Randolph, Tierney, Mohr, & Chase, 1998) and their clinical background (e.g., diagnosis according to the Diagnostic Interview for Psychosis – DIP; Castle et al., 2006) were provided by the ASRB and are summarised in Table 1.

Table 1

Socio demographic data: frequencies, mean-scores (standard deviations) of 98 respondents in comparison to an Australian normative sample (Green et al., 2008)

				Australian Normative sample		
		N	Mean (SD)	Actual Range	N	Mean (SD)
Age						
		98	48 (10.19)	27-66	172	
	Male	55	46 (9.55)	28-63	73	
	Female	43	50 (10.75)	27-66	99	
		N	Percentage		N	Percentage
Gender						
	Male	55	56		73	42
	Female	43	44		99	58
				Australian normative sample Means		
		N	Mean (SD)	Actual Range		
Neuropsychological Status (according to RBANS)						
Total Sum of Index Scores		98	437.1 (57.23)	279-551	108	
Immediate Memory Index (list learning and story memory)		98	82.16 (18.36)	44-126	105	

Constructional Index (figure copy & line orientation)	98	88.51 (16.67)	53-126	100.9
Language Index (picture naming & semantic fluency)	98	93.41 (12.72)	54-122	114
Attention Index (digit span & coding)	98	87.23 (16.26)	53-135	106
Delayed Memory Index (list, story & figure recall)	98	85.79 (15.91)	44-119	102
DIP Diagnoses (according to DSM-IV)				
Schizophrenia	67	68.4		
Schizoaffective disorder, depressed type	10	10.2		
Schizoaffective disorder, bipolar type	6	6.1		
Delusional disorder	4	4.1		
Psychotic disorder not otherwise specified (atypical psychosis)	11	11.2		

In sum, there were roughly equal numbers of males and females, with an average age of 48 years. All respondents had a confirmed diagnosis of schizophrenia or a related psychotic disorder.

To further understand the clinical features present in the survey sample, data from lifetime presence of six different subtypes of delusions, as assessed using the DIP was considered (see Table 2). The recorded clinical assessment data, provided by the ASRB, showed that in three quarters of the 98 respondents there were no primary delusions, no bizarre delusions, no delusions of perception and no delusions of passivity (e.g. respondents believing their will was steered from an outside force). However, two thirds were assessed to have had persecutory delusions and about half of the respondents had experienced referential delusions. The predominance of persecutory and referential delusions is in keeping with a general sample of schizophrenia and related psychotic diagnoses.

Table 2

Subtypes of delusions as assessed using the Diagnostic Interview for Psychosis (DIP) of 98 respondents

		N	Percentage (%)
DIP Delusions (58,59,60,61,62,64,63)			
Primary (e.g., Have you ever had the feeling that something odd is going on that you can't explain?)	not present	75	76.5
	present for less than one month or duration unspecified	12	12.2
	present for at least a significant portion of time in a one month period	11	11.2
Passivity (e.g., Have you ever felt your will was replaced by some force or power outside yourself?)	not present	82	83.7
	present for less than one month or duration unspecified	8	8.2
	present for at least a significant portion of time in a one month period	8	8.2
Persecutory* (e.g., Have you ever felt that people were deliberately acting to harm you?)	not present	29	29.6
	present for less than one month or duration unspecified	8	8.2
	present for at least a significant portion of time in a one month period	60	61.2
Influence (e.g., Have people ever seemed to drop hints meant for you, or say things with double meaning?)	not present	35	35.7
	present for less than one month or duration unspecified	10	10.2
	present for at least a significant portion of time in a one month period	53	54.1
Perception (e.g., When you saw...how did you know what it meant?)	not present	72	73.5
	present for less than one month or duration unspecified	6	6.1
	present for at least a significant portion of time in a one month period	20	20.4
Bizarre (e.g., Has there ever been anything unusual going on, that is hard to believe?)	not present	71	72.4
	present for less than one month or duration unspecified	10	10.2
	present for at least a significant portion of time in a one month period	17	17.3
Grandiose* (e.g., Have you thought that you were actually a special person because you have unusual abilities or talents or that you are famous, rich or related to prominent people?)	not present	41	41.8
	present for at least four days	28	28.6
	present for at least one week	2	2
	present at least two weeks	26	26.5

*based on 97 respondents

Of particular interest were DIP items indexing “Lack of Insight” and “Subjective Thought Disorder” (see Table 3). The distribution shows that the majority of survey respondents

showed insight into a psychological cause for their mental illness, and did not think that thoughts have been inserted into their head or made public and sent to others.

Table 3

Insight and subjective thought disorder as assessed using the Diagnostic Interview for Psychosis (DIP) of 98 respondents

		N	Percentage (%)
DIP Lack of Insight (65)			
<i>(Do you feel you are / have been psychiatrically unwell?)</i>	<i>insight present</i>	83	84.7
	<i>lack of insight</i>	15	15.3
DIP Subjective Thought Disorder (54,55,56)			
Insertion			
<i>(Respondent lacks the normal sense of ownership of the thoughts in his/her mind. The thoughts are experienced as clearly alien and are described as not his/her own, probably or definitely being put into their head by some clearly external agency.)</i>	<i>not present</i>	84	85.7
	<i>present for less than one month or duration unspecified</i>	11	11.2
	<i>present for at least a significant portion of time in a one month period</i>	84	85.7
Broadcast			
<i>(Do your thoughts seem to be somehow public; not private to yourself, so that others can know what you are thinking?)</i>	<i>not present</i>	72	73.5
	<i>present for less than one month or duration unspecified</i>	9	9.2
	<i>present for at least a significant portion of time in a one month period</i>	17	17.3
Withdrawal			
<i>(Are your thoughts actually taken out or sent out of your mind?)</i>	<i>not present</i>	92	93.9
	<i>present for less than one month or duration unspecified</i>	2	2
	<i>present for at least a significant portion of time in a one month period</i>	4	4.1

Description of types of OC symptoms

Here we provide descriptive data for the OCI ratings of distress and frequency of the different OCI subtypes as well as Cronbach's alphas, which were all high, for the 96 respondents who reported distress associated with current OC symptoms (see Table 4 below). Corresponding means from the OC sample reported in paper 1 are also included in Table 4. This sample was recruited primarily from OCD support groups, and included no respondents with a diagnosis of schizophrenia or related psychotic disorders.

Table 4

Mean total scores, standard deviations (SD), actual ranges, and Cronbach's alphas for the distress and frequency ratings of the seven OCI dimensions, and overall, for the 96 schizophrenia respondents reporting current OC symptoms. (Mean ratings of subscales are also expressed per item (in brackets after mean scores) for comparisons across subscales. Paper 1 data allows for comparison to an OC sample without schizophrenia.

	Mean total (per item)	SD	Range of actual ratings	Cronba ch's alpha	Comparative Mean total (per item) from Paper 1 OC sample	Independent samples t-test results (assuming non-equal variance where appropriate-Levene's test)
OCI						
<i>Washing</i>						
Distress ratings	4.44 (.76)	5.40	0 – 30	.828	12.01 (1.50)	t(133.98)=6.46, p<.001***
Frequency ratings	6.45(.89)	4.31	0 – 26	.862	9.13 (1.14)	t(125.13)=2.60, p=.010*
<i>Checking</i>						
Distress ratings	5.59(.55)	6.45	0 – 33	.889	14.33 (1.59)	t(160.07)=7.71, p<.001***
Frequency ratings	7.44(.81)	5.21	0 – 23	.929	10.46 (1.16)	t(156.59)=3.22, p<.002**
<i>Doubting</i>						
Distress ratings	2.29 (.62)	2.40	0 – 12	.917	6.40 (2.13)	t(151.15)=9.10, p<.001***
Frequency ratings	2.65(.83)	1.91	0 – 11	.943	4.81 (1.60)	t(131.89)=5.08, p<.001***
<i>Ordering</i>						
Distress ratings	3.79 (.76)	4.21	0 – 19	.883	9.62 (1.92)	t(149.43)=7.29, p<.001***
Frequency ratings	4.39(.88)	2.99	0 – 16	.900	6.67 (1.33)	t(137.19)=3.62, p<.001***
<i>Obsessions</i>						
Distress ratings	7.46 (.93)	5.71	0 – 27	.860	16.91 (2.11)	t(165.51)=9.72, p<.001***
Frequency ratings	8.50(1.06)	4.72	0 – 25	.875	13.29 (1.66)	t(145.64)=5.17, p<.001***
<i>Hoarding</i>						
Distress ratings	2.60 (.87)	2.63	0 – 12	.839	3.77 (1.26)	t(160.28)=2.59, p=.010*
Frequency ratings	2.77(.92)	2.82	0 – 9	.839	2.47 (0.82)	t(151.48)=-0.81, p=.422
<i>Neutralising</i>						
Distress ratings	4.66 (.78)	4.55	0 – 24	.793	9.46 (1.58)	t(167.03)=6.33, p<.001***
Frequency ratings	5.47(.91)	3.57	0 – 21	.866	6.71 (1.12)	t(162.17)=2.04, p=.043*
<i>TOTAL</i>						
Distress ratings	30.83 (.72)	26.23	0 – 152	.965	72.50 (1.73)	t(171.69)=9.77, p<.001***
Frequency ratings	37.37 (.90)	22.38	0 – 129	.979	53.53 (1.28)	t(162.82)=4.13, p<.001***

* p < .05; ** p < .01; *** p < .001

Comparison between the OC symptom profile of the current schizophrenia or related psychotic diagnoses sample with comorbid OC symptoms and the paper 1 sample with primary OC symptoms

A posthoc mixed-design ANOVA was carried out with OCI distress ratings as the dependent variable and a between-subjects factor of group (90 people with OC symptoms, 98 schizophrenia diagnosis and OC symptoms) and OCI subtype (washing, checking, doubting, ordering, obsessions, hoarding and neutralising) as the within-subjects factor to explore any

possible group differences. Mauchly's test indicated that the assumption of sphericity had been violated ($\chi^2(20)=271.02, p<.001$), therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\epsilon = 0.72$).

There were significant main effects of group, $F(1,186)=97.12, p<.001$ with a mean effect-size of $\mu^2_{\text{partial}} = .343$, and OCI subtype, $F(4.29,797.49)=88.67, p<.001$ with a mean effect-size of $\mu^2_{\text{partial}} = .323$, which were incorporated into an interaction between group and OCI subtype, $F(4.29,797.49)=19.94, p<.001$ with a mean effect-size of $\mu^2_{\text{partial}} = .097$. In more detail, our sample with primary OC symptoms (paper 1) reported significantly higher levels of distress for all OCI subtypes, with the exception of hoarding once alpha was corrected for multiple comparisons (see Table 4).

Subsequent similar analysis with OCI frequency ratings as the dependent variable revealed the same general pattern of results, with the exception that the difference between the paper 1 OC group and the group with schizophrenia and related psychotic diagnoses and OC symptoms was not significant for the subtype hoarding. In other words, the two groups reported spending the same number of hours per day on hoarding ($t(151.48)=-.81, p=.422$).

Estimate of Point Prevalence of OC Symptoms

Overall, of the 340 ASRB volunteers who were contacted to participate, only 321 had a valid address and received the mail-out invitation to participate. 98 volunteers responded by sending back the completed OCI questionnaire. From among those respondents, two reported not experiencing any current distress caused by obsessive or compulsive symptoms. Assuming all non-respondents experienced no OC symptoms, which is the most conservative approach, we estimate the point prevalence of any OC symptoms in this

schizophrenia and related psychotic diagnoses sample as 96/321 or 29.9% (95% CI = 24.90% to 34.90%). Of the 96 respondents reporting current OC symptoms, 24 self-reported OCI ratings that met criteria for diagnosis of OCD (i.e., exceeding the OCI symptom severity threshold of 40). Hence the point prevalence for diagnosable OCD was 24/321 or 7.5%.

We also examined the point prevalence of different types of OC symptoms (see Table 5). 28% of the respondents mentioned being distressed by obsessions, with the next most prevalent OC symptom subtype being neutralising at 27%. Further, 24% reported being occupied with checking and with ordering. Washing, as well as doubting and hoarding, were least prevalent, reported by 22% for each of these subtypes.

Table 5

Prevalence rates (%) of the seven OCI dimensions and related 95% Confidence Intervals (%)

OCI Distress Subgroups	Prevalence rates (out of 100%)	Specific Confidence Interval
<i>Washing</i>	22%	3.34% to 5.53%
<i>Checking</i>	24%	4.29% to 6.90%
<i>Doubting</i>	22%	1.81% to 2.78%
<i>Ordering</i>	24%	2.94% to 4.64%
<i>Obsession</i>	28%	6.30% to 8.61%
<i>Hoarding</i>	22%	2.07% to 3.13%
<i>Neutralising</i>	27%	3.73% to 5.57%

Distributions of Distress and Frequency Ratings for the different OCI Symptom Subtypes

The distributions of distress ratings for OCI subtypes for the 96 respondents who reported distress associated with at least one current OC symptom are displayed in Figure 1 below. These distributions reveal that respondents experience washing compulsions least severely, with 64% reporting being ‘not at all being distressed’. Highest severity ratings (calculated by cumulating ‘a lot’ and ‘extremely’) were reported for neutralising (10%) and obsessions (11%).

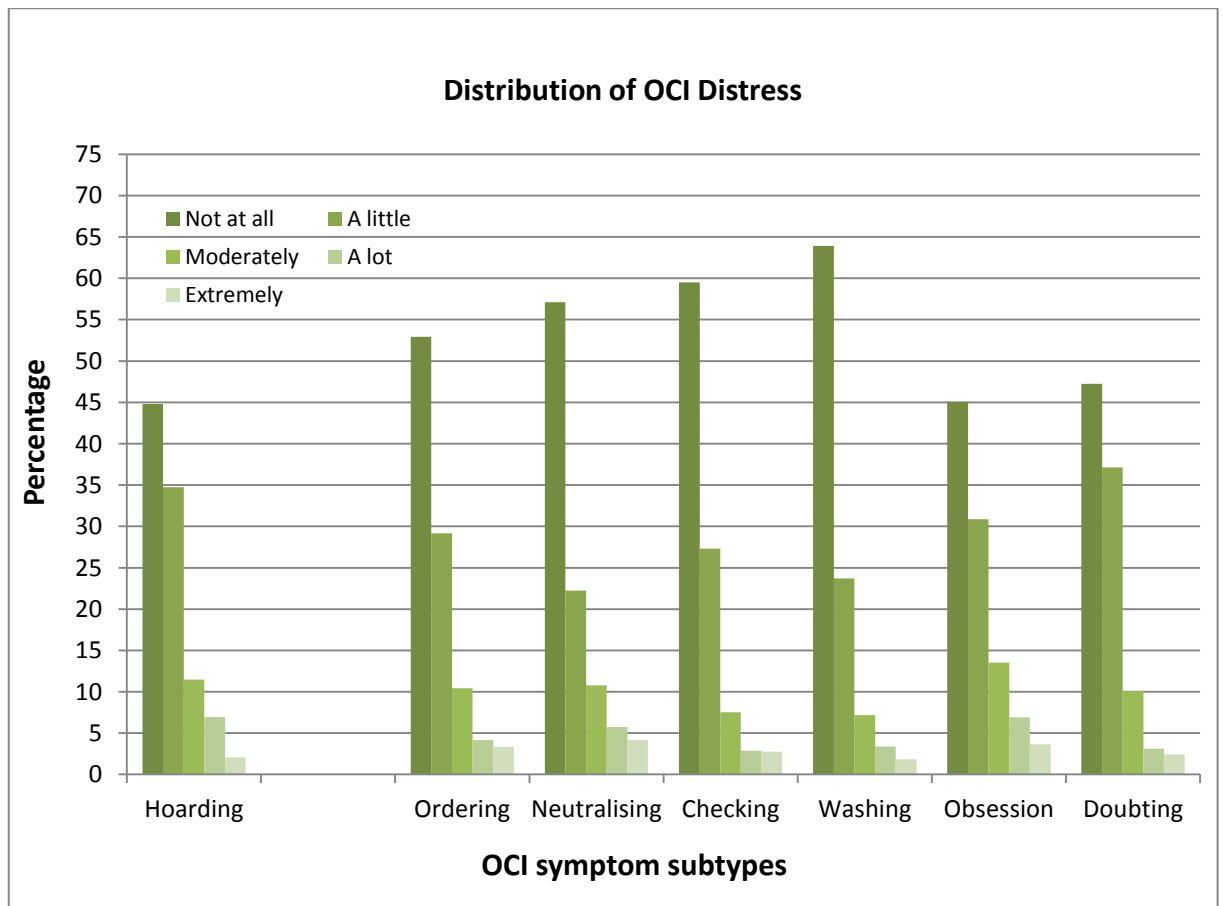


Figure 1. Distress (%) of the seven OCI dimensions

The corresponding distributions of frequency ratings for the 96 participants who reported distress associated with at least one OCI symptom are reported in Figure 2 below. Figure 2 shows that most people (approximately 30%) engaged in their obsessions and/or compulsions less than 1 hour during the day. However, respondents with obsessions, more than in any other subgroup, reported that they are spending 1 to 3 hours (14%), 3 to 8 hours (7%) and even more than 8 hours (4%) each day dealing with their obsession(s). In contrast, only 3% of respondents reported to be engaged 3 to 8 hours during the day in washing compulsions and not more than 2% reported being occupied more than 8 hours a day with washing rituals. In fact, respondents who reported being distressed by doubting were those who spent the least time overall (i.e., 37% reported spending less than 1 hour per day), doubting their actions. As previously mentioned, 24 patients had OCI ratings that met

criteria for a diagnosis of OCD (i.e., exceeding the OCI symptom severity threshold of 40). Those who met criteria for a comorbid OCD diagnosis showed a similar pattern of frequency distribution across the OCI subtypes.

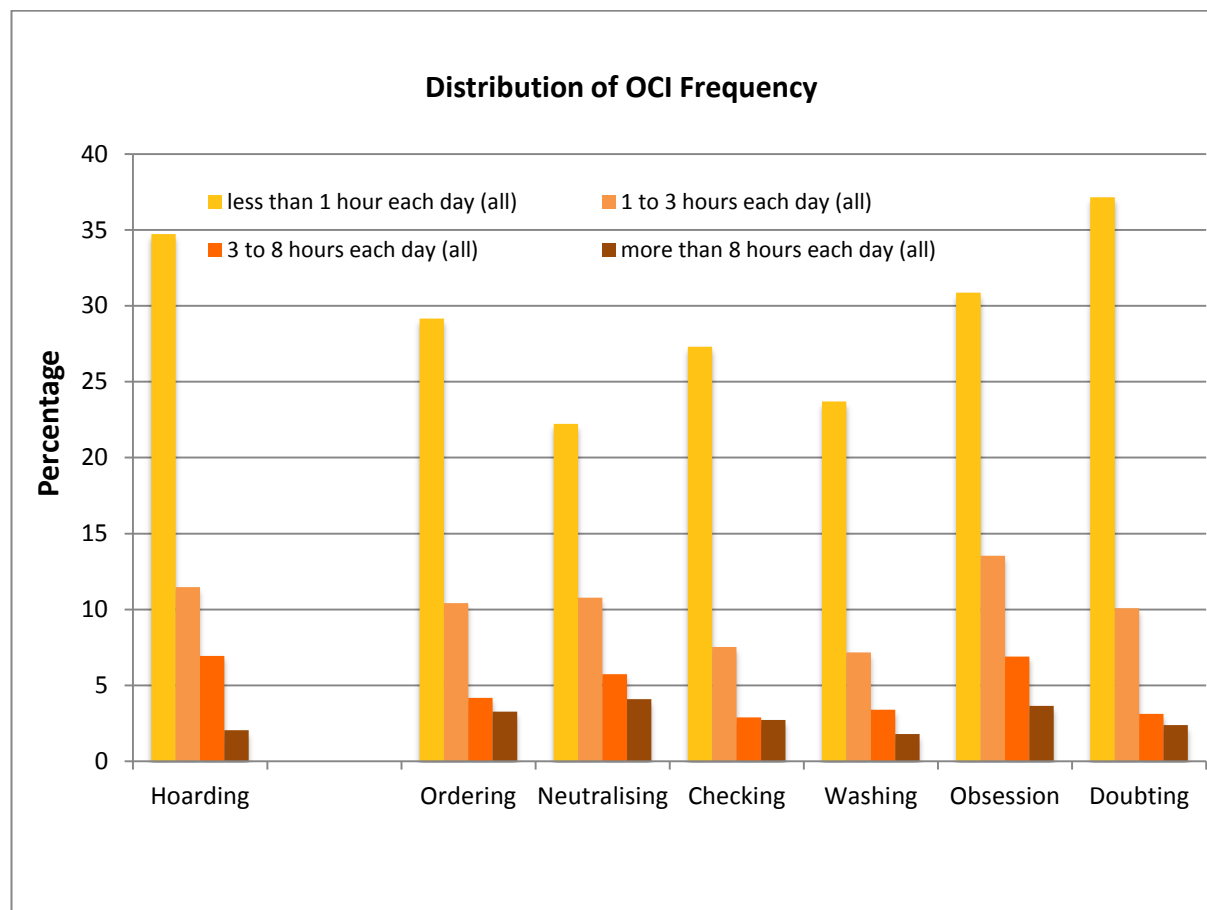


Figure 2. Frequency ratings (%) for the seven OCI dimensions for participants who previously reported distress associated with at least one OCI symptom subtype. *Note:* Participants only rated frequency for an OCI symptom subtype if they had previously endorsed distress for this OCI symptom subtype.

Correlational analyses

First we consider relations with neuropsychological performance. Pearson correlational analyses revealed significant negative relations between the participants' neuropsychological performance assessed using the RBANS total index score and the overall OCI severity score, indexed by the distress ratings ($r = -.24$, $p = .02$), as well as for the distress scores for the OCI subtypes neutralising ($r = -.23$, $p = .024$), washing ($r = -.25$, $p = .014$), and doubting ($r = -.21$, $p = .04$). Of particular note, relations were highly significant for the

subtypes checking ($r = -.26$, $p = .009$) and ordering ($r = -.26$, $p = .009$). In contrast, there were no significant relations found with the ratings for obsessions or hoarding. The pattern of correlational results with the OCI frequency ratings was very similar. In sum, results show that the worse a participants' neuropsychological abilities the more severe are their OC symptoms.

Additionally, Spearman correlational analyses using the lifetime ratings of different delusion items on the DIP as an index of delusion severity revealed negative, although non-significant, relations with the total OCI distress score (all p 's $> .05$). More detailed analysis of OCI symptom subtypes revealed that severity of the OCI subtype ordering was significantly positively correlated with severity of delusions of influence ($r_s = .27$, $p = .007$). There was also a significant positive relationship between severity of OCI doubting and severity of delusions of influence ($r_s = .25$, $p = .013$). In sum, the more severe the levels of delusions of influence (as indexed by the DIP) the more severe were some OC subtypes, in particular doubting and ordering. There was also a significant relationship between severity of OCI Ordering and severity of thought insertion; however, regression analysis revealed that this relation was no longer significant once neuropsychological performance was taken into account. In contrast, the relations between severity of delusions of influence and severity of OCI Ordering and Doubting remained significant, having accounted for neuropsychological impairments in the schizophrenia and related psychotic diagnoses patients (p 's $< .05$).

When analysis was limited to the 24 respondents who reached criteria for an OCD diagnosis due to severity ratings exceeding the threshold of 40 scale points on the OCI, the only correlation found to be significant and not influenced by participants' neuropsychological performances was a positive relation between severity of the subtype ordering and

delusions of influence ($r_s = .48$, $p = .018$). Accordingly, the more severe participants' delusions of influence the more severe were their ordering symptoms in this sub-sample of 24 participants.

DISCUSSION

Obsessive and compulsive (OC) symptoms are the core symptoms of obsessive-compulsive disorder (OCD) and yet are diverse in nature and known to co-occur with several other severe mental disorders. Prevalence rates of OC symptoms in schizophrenia have been found to be particularly high. This may be because a traditional requirement for diagnosis of OCD was that patients are insightful about their OC symptoms and yet people with OC symptoms can be delusional, in which case these individuals may have been diagnosed with a psychotic illness like schizophrenia. However, DSM-5 now recognises that people with OCD can have varying degrees of insight. Indeed there is increasing interest in better understanding the nature of delusional thinking associated with OC symptoms. Hence, it was this current study's general aim to advance understanding of the occurrence and, subsequently, the nature of OC symptoms in people with schizophrenia. To address this general aim we were able to access the Australian Schizophrenia Research Bank (ASRB) Volunteer Register, which also allowed us to examine relations between OC symptoms in schizophrenia and neuropsychological performance, as well as types of delusions associated with OC symptoms in schizophrenia.

Our first aim was to determine the prevalence of OC symptoms in this Australian sample of schizophrenia and related psychotic diagnoses patients. Prevalence rates of OC symptoms in schizophrenia have been reported to vary tremendously. Reasons for the varying results are considered to include the diversity of assessment methods used to identify presence of OC

symptoms and sample demographics. Many other prevalence studies have used the Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman et al., 1989), which is a semi structured clinical interview to assess severity of obsessions and compulsions in OCD, often for the purpose of diagnosis. Instead, the current study focused on the presence of any OC symptoms and used an established self-report instrument, the Obsessive Compulsive Inventory (OCI; Foa et al., 1998), within the mailed-out survey, as opposed to conducting face-to-face evaluations. In this way more schizophrenia patients could be reached and the use of a self-report survey, distributed by the ASRB, helped to minimise the reticence that some patients experience when required to openly discuss symptoms that many perceive as bizarre in face to face interviews

As expected, OC symptoms were self-reported by this Australian sample with schizophrenia and related psychotic diagnoses, and hence, provide further evidence of comorbidity of OC symptoms in schizophrenia, as established by previous research studies (Achim et al., 2011; Berman et al., 1998; Bijl et al., 1998; Cassano et al., 1998; Kayahan et al., 2005; Kruger et al., 2000; Niehaus et al., 2005; Swets et al., 2014). It was estimated that approximately one third of the schizophrenia patients currently experience some OC symptoms. Our findings of 29.9% point prevalence in this Australian sample with schizophrenia and related psychotic diagnoses are in general accordance with previous estimates of prevalence rates of any obsessions and/or compulsions in schizophrenia at a minimum of 25% over a lifetime (Swets et al., 2014). Our estimate of comorbid diagnosable OCD was much lower, at 7.5%, which was also generally consistent with meta-analyses that suggest prevalence rates of OCD in schizophrenia patients, over a lifetime, ranging from 0.6% (Niehaus et al., 2005) to 29% (Cassano et al., 1998). However, one limitation must here be acknowledged. The volunteers of the ASRB register that has been approached may not be representative of other populations (e.g. an inpatient sample) with schizophrenia and related psychotic diagnoses.

Hence, assumptions of comparable OC symptom prevalence rates in other samples should be treated carefully.

Our second aim was to examine the nature of OC symptoms in this Australian sample with schizophrenia and related psychotic diagnoses. We were interested to determine whether the nature of OC symptoms, present in people with a diagnosis characterised by delusional thinking (i.e., schizophrenia) resembles that seen in a general sample of people with OC symptoms, as reported in paper 1. We found that the sample with schizophrenia and related psychotic diagnoses and OC symptom group reported being most distressed by OC symptoms of obsessions and neutralizing. These are symptoms which generally involve mental processes and thought distortions. In contrast, compulsive behaviours, like washing, checking, ordering and hoarding were reported to be less distressing. It was also obsessions and neutralising that were reported to take up more time during the day, rather than behaviour-oriented OC symptoms – that is, checking, ordering and washing compulsions. This pattern was also seen in respondents whose severity of OC symptoms would have met diagnostic criteria for a comorbid OCD diagnosis, however the severity was more pronounced. These results are in line with previous findings revealing that thought-oriented OC symptoms, like obsessions, predominately affect schizophrenia patients (Guillem, Satterthwaite, Pampoulova, & Stip, 2009). It should, however, be acknowledged that the profile of OC symptoms in this sample with schizophrenia and related psychotic diagnoses was similar to that seen in a general OC sample without schizophrenia (see Paper 1) although of reduced severity.

Finally, our access to the ASRB Volunteer Register also allowed us to conduct further investigations to establish relationships between OC symptom severity and other features of the current sample with schizophrenia and related psychotic diagnoses. Firstly, our findings clearly demonstrated a relationship with participants' neuropsychological abilities. Hence,

respondents show similar pattern as participants in Abramovitch, Abramowitz and Mittelman's (2015) recent meta-analysis of 115 studies comparing the neuropsychological performance of adult OCD patients with a healthy sample. In that meta-analysis, OCD patients also showed a worse neuropsychological performance, across all studies, compared to healthy participants. As for this study's results, poorer neuropsychological performance as assessed using the RBANS related also to greater severity of OC symptoms, overall, and across all of the OCI subtypes with the exception of OCI obsessions and hoarding. As for why obsessions and hoarding might be different, according to the new DSM-5 criteria hoarding is now understood to be an independent disorder due to features that differ from all other OC subtypes. This might help contribute to explaining why the subtype hoarding was not associated with a lower neuropsychological performance as were other OC symptom subtypes in schizophrenia patients (Mataix-Cols et al., 2011; Rachman, Elliott, Shafran, & Radomsky, 2009).

However, it remains surprising that the current sample's neuropsychological functioning, as assessed using the RBANS, did not associate with severity of the subtype obsessions. In contrast to our findings, Nedeljkovic et al. (2009) demonstrated that patients' neuropsychological performance did associate with severity of obsessions. A critical consideration here may be that this research group had used the Cambridge Neuropsychological Test Automated Battery (CANTAB; Levaux et al., 2007; Sahakian & Owen, 1992) an alternative instrument to assess neuropsychological abilities, whereas we used the RBANS. The CANTAB includes measures of executive functioning, whereas the RBANS does not. Hence it may be that executive abilities, including inhibitory control, are more critical with regard to reducing severity of obsessions. Another critical consideration is that Nedeljkovic et al. (2009) investigated subtypes of OCD whereas our sample comprised schizophrenia patients with comorbid OC symptoms. It is therefore also possible that other

clinical features of schizophrenia, rather than neuropsychological impairment, associates with increased severity of obsessions in schizophrenia. Future research with a similar sample should therefore focus on assessing neuropsychological abilities using a battery that also assesses executive function, like the CANTAB, to better determine whether executive dysfunction associated with obsessional experiences across disorders.

The involvement of different types of delusions was also considered. Delusions, as assessed using the DIP, have previously been found to influence the treatment outcome of diverse presentations in schizophrenia (Harrow & Jobe, 2007; Jobe & Harrow, 2005). Our interest was, instead, associations with severity of different OC symptoms. Findings showed ordering and doubting symptoms to be greatest in those with a more severe past history of delusions of influence and thought insertion. While the relationships with thought insertion were no longer significant, once neuropsychological abilities were taken into account, the relationships of ordering and doubting with delusions of influence remained significant. A similar relation between severity of ordering and delusions of influence was also seen in the subsample of 24 participants with OC symptoms of sufficient severity to meet criteria for comorbid OCD. This is somewhat surprising since we would have expected that, of any of the OC subtypes, obsessions might have been the subtype to show the strongest connections with delusions, as demonstrated by previous schizophrenia research from Guillem et al. (2009). Nevertheless, our findings do demonstrate relations between severity of some OC symptom subtypes and delusions of influence in this sample with schizophrenia and related psychotic diagnoses.

In conclusion, previous investigations suggest, obsessions and compulsions do co-occur with psychotic symptoms in quite a high percentage (approximately 30%) of schizophrenia patients. However, it has to be acknowledged that the higher ratings of obsessions occurring in the schizophrenia patients could also be due to the misinterpretation of their psychotic

ideas and symptoms as obsessions. For example, a vivid psychotic symptom of thought insertion that is experienced repetitively could be misunderstood by the patients as a bizarre obsessive idea, and then self-reported as an obsession when asked about their OC symptoms. While the advantages of using an online survey to assess self-reported OC symptoms are apparent, in particular, with regard to reducing respondents' reticence, it is important to also accept this as a possible limitation and to follow up on the current findings in future research to more extensively probe the nature of the self-reported obsessions and ideas in a second step. Our findings also support to some extent the existence of relationships between schizophrenia patients' severity of certain OC symptoms and some types of delusions, in particular, delusions of influence. A limitation of our findings in this regard is that the ASRB ratings of delusions, to which we had access, were lifetime ratings of greatest severity rather than current ratings. With this in mind it might be of interest for future research to investigate the time-course of the development of delusions, in particular delusions of influence, and the development of OC symptoms in people with schizophrenia and indeed in OCD patients who are delusional about their obsessions and/or compulsions. Perhaps the delusional thinking precedes the development of the OC symptoms or, alternately, the earlier development of OC symptoms may lead towards a delusional preoccupation with the particular OC symptoms and delusional explanations of their origin. Better understanding of the longitudinal course of these relations in particular patients, either diagnosed with OCD or schizophrenia, may help inform whether it is better to target the delusionality or the OC symptoms to improve treatment outcomes.

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PAPER 3

Four single cases of obsessive-compulsive disorder with unusual associated beliefs: A comparison of different instruments to assess delusional thinking and insight

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Abstract

Introduction: While patients with obsessive-compulsive disorder (OCD) have traditionally been conceived as insightful about the origin of their reoccurring obsessive beliefs as being due to a disorder, delusion-like cases have been reported. Questions remain about how best to identify and characterise the delusional nature of such cases. We conducted in-depth phenomenological investigations of four cases of OCD with bizarre magical features to examine the varying spectrum of patients' attempts to reason about their obsessive-compulsive (OC) symptoms and related beliefs and to compare a range of instruments for assessing severity of OC related beliefs and poor insight.

Method: Four cases (two females and two males) with a diagnosis of OCD, confirmed using the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) and the Obsessive Compulsive Inventory (OCI), and presenting with more unusual OC beliefs were interviewed in depth. Detailed demographic data and case histories are reported, as well as ratings of: (a) general ideation/magical thinking associated with psychosis-proneness using the Peters' et al. Delusions Inventory (PDI), Magical Ideation Scale (MIS) and the Illusory Beliefs Inventory (IBI); (b) aberrant thought processes implicated in the development of OCD using the Thought Action Fusion Scale (TAF); and (c) belief conviction and insight related to the OC symptoms and beliefs using the Y-BOCS, Brown Assessment of Beliefs Scale (BABS), Overvalued Ideas Scale (OVIS), and Nepean Belief Scale(NBS).

Results: OC symptoms were rated as mild to moderate in all four cases. Levels of general delusional ideation/magical thinking were also mild. No case presented with particularly

poor insight and ratings of conviction/strength of primary OC-related belief showed the full range of scores.

Conclusion: Current tools for quantifying severity of delusion-like thinking in OCD appeared limited with regard to identifying these unusual OCD cases. Implications are discussed with regard to possible adaptations of such instruments and the need for future related empirical research to complement phenomenological studies of the type reported here.

INTRODUCTION

A diagnosis of obsessive-compulsive disorder (OCD) requires a patient to show the obsessions and/or compulsions that characterise the illness. While obsessions are experienced as ideas or images that run repetitively through a person's mind, compulsions result in repetitive acts that are often thematically related to the obsessional thoughts. However, this diagnostic focus on obsessions and compulsions does not always do justice to the diversity and complexity of obsessive-compulsive (OC) phenomenology, including the variety of beliefs, explanations and thinking biases that accompany the OC symptoms, as well as differences in the developmental course of the disorder. Research into factors that contribute towards the development of OCD has suggested that obsessions and compulsions are often accompanied by metacognitive biases such as excessive doubting and worrying, especially in situations where the individual feels responsible (Boschen & Vuksanovic, 2007; MacDonald & Davey, 2005; Moritz, Peters, Laroi, & Lincoln, 2010). It has been shown by Laroi and Van der Linden (2005) that metacognitive beliefs, whether negative or positive in content, are good predictors of delusions and, as proposed by Abramowitz, Khandker, Nelson, Deacon, and Rygwall (2006), are risk factors for the development of specific types of OCD.

The obsessive thoughts of OCD patients can also be experienced as somehow magical in nature (Yorulmaz, Inozu, & Gultepe, 2011) and capable of changing the state of the world or future events (McNicol & Wells, 2012; Shafran, Thordarson, & Rachman, 1996), which then has an impact on the force of related compulsions and general prognosis. In paper 1, we found that both negative metacognitive biases and magical thinking or delusional ideation associate with severity of OC symptoms, with both factors making independent

contributions to predicting the severity of OC symptoms. The primary focus in the present paper is on the presence of delusion-like thoughts in some more unusual cases of OCD.

A related clinical feature of OCD that is relevant to this paper is the patient's level of insight into the reasonableness of the contents of their obsessive thoughts and compulsive behaviours, and their insightful attribution of their OC symptoms as reflecting the presence of a clinical disorder. Intact insight has traditionally been conceived as distinguishing between the beliefs associated with obsessions and compulsions in OCD and the delusional ideation that is characteristic of psychotic mental illnesses such as schizophrenia. It is acknowledged here, however, that there is now increasing awareness of a continuum of insight in OCD, as seen in the latest version of the Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5; American Psychiatric Association, 2013). Clinical observation of bizarre or unusual beliefs associated with obsessions and/or compulsions in some cases has led to changes in the recent DSM-5 diagnostic criteria for OCD: the definition now allows that insight may vary in those with OCD, and the diagnostic criteria now specifies different levels of insight which may be seen in OCD (e.g., from good or fair insight, to poor insight, to absent insight/delusional belief). With these changes there is also acknowledgement that in some cases it can be difficult to distinguish between the phenomenology associated with OC symptoms and the symptoms, in particular delusional beliefs, typically associated with other psychotic disorders, such as schizophrenia (Adam, Meinschmidt, Gloster, & Lieb, 2012).

Nevertheless, the traditional distinction between delusional thought processes in psychotic mental illnesses and the nature of the beliefs that are typically associated with OC symptoms in OCD is understandable when one considers the characteristic features of delusions and

compares these to the thought processes of the majority of OCD patients. Delusions are defined in DSM-5 as

“... fixed beliefs that are not amenable to change in light of conflicting evidence. Their content may include a variety of themes [...] Delusions are deemed bizarre if they are clearly implausible and not understandable to same-culture peers and do not derive from ordinary life experiences. [...] The distinction between a delusion and a strongly held idea is sometimes difficult to make and depends in part on the degree of conviction with which the belief is held despite clear or reasonable contradictory evidence regarding its veracity” (American Psychiatric Association, 2013, p. 87).

Since the time of Jaspers (1913), who has pioneered research in psychiatry and more specifically in psychosis, and in accord with the DSM-5 definition, acute delusional beliefs are thus conceived as characterized by their implausibility (or unreasonableness), with delusional patients unwilling to contemplate the possibility of rejecting the belief. They express unwarranted conviction in their unjustified beliefs and maintain them with fixity despite rational counter-argument and counter-evidence (Langdon & Bayne, 2010).

These characteristic features of delusions, such as seen in psychotic mental illnesses, are in contrast to the style of thinking that is most typically seen in OCD patients. For example, while delusions are not challenged by patients with psychotic mental illnesses such as schizophrenia, at least when in acute delusional states, OCD patients will typically try to resist their thoughts. Nevertheless, doubts about the possibility that the obsessive thoughts might be true remain for these OCD patients. Hence, one could argue that the outcome of these continuing doubts with regard to associated preoccupation, distress and resultant

actions are the same in the OCD patient and the delusional psychotic patient. The person with OCD yields towards their doubts and compulsively repeats the associated actions. Thus it is the degree of insight into the unreasonableness of a particular obsessive thought that is traditionally thought to be a critical differentiation between delusional ideation and typical obsessions in OCD (Markova, Jaafari, & Berrios, 2009).

Despite this traditional distinction, however, there is increasing awareness of a continuum of insight and delusional thinking in OCD, as noted earlier. As such, a number of questions remain about the causal role of delusional thinking and lack of insight when present in OCD. For example, no consensus exists as to whether delusional thinking increases the severity of OC symptoms and worsens the outcomes for patients or, alternatively, whether the experience of more severe obsessions and compulsions alters a patient's view towards life and the world to cause the emergence of delusional ideation. Research aimed at unravelling the nature of the relationship between delusional thinking and severity of obsessions and compulsions in OCD has examined how the entwining of one's thoughts and their meaning with the impact of these thoughts upon the world and events is often corrupted in OCD (McNicol & Wells, 2012; Shafran et al., 1996). Studies have, for example, investigated the importance of "thought action fusion" in determining the severity of outcome in OCD (Amir, Freshman, Ramsey, Neary, & Brigidi, 2001; Berle & Starcevic, 2005; Rassin, Diepstraten, Merckelbach, & Muris, 2001; Rassin, Merckelbach, Muris, & Spaan, 1999). However, less is known about the patient's actual interpretation of the underlying belief in such cases (Brakoulias & Starcevic, 2011). Magical explanations for a patient's need to maintain an intrusive thought/belief have also been found to play a role in exacerbating severity of OCD in some patients (Yorulmaz et al., 2011). However, little attention has been paid to the strength of the magical belief, or the degree of conviction despite contradictory evidence. However, as Sanders, Whitty, Murray, and Devitt (2006) has mentioned, there still remain

severe cases of OCD without such extreme magical explanations, and where the reasoning simply becomes vague.

Nevertheless, with the current modification of the DSM-5 guidelines to include assessment of degree of insight in OCD, and consistent with the assessment of insight in the Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b) – the most commonly used instrument to assess severity of OCD – the impression is given that a patient's insight into the reoccurring obsessive thoughts has an impact on the interpretation of the thought content and, in turn, on the severity of the symptoms. Hence, through assessing insight in OCD, a distinction between a delusional and a non-delusional OCD patient is considered possible, although some researchers still question whether those severe cases, where a lack of insight has been established, are best seen as only “atypical cases of OCD” (Fontenelle et al., 2008).

Against this background, the aim of this paper was to conduct an exploratory investigation of variation in the ways that delusion-like thinking and poor insight can associate with OC symptoms in some more unusual cases. This exploratory investigation will involve in-depth phenomenological investigation of four OCD patients presenting with unusual belief content. The four patients will be described in detail to illustrate the existence of these more unusual OCD cases and also to illustrate the complexity of such cases. Demographic and clinical characteristics of each case will be presented. It is expected that these cases will demonstrate that it can often be difficult to place, or locate, such cases somewhere along a single continuum of insight. In accord with Insel and Akiskal (1986), we also aim to illustrate the varying spectrum of attempts to reason about and justify the conviction of a patient's OC related belief(s). We will therefore probe each patient's primary underlying OC related belief, in particular, the related insight, conviction and strength of belief using a range of

clinical measures. In addition, scales to assess more general delusional ideation and magical thinking (i.e., not specific to the OC related belief) will be administered. It is hoped that this in-depth investigation will provide a better understanding of any underlying core characteristics and commonalities that may consistently identify such unusual cases and provide insights concerning the nature of delusion-like thought processes in OCD patients with unusual belief content.

METHOD

Participants

The four cases presented below were drawn from a larger group of 21 participants with OC symptoms (14 females and 7 males) who were referred from Nepean Hospital, Sydney, Australia, or recruited via word-of-mouth and advertisement through OCD support groups in New South Wales with diagnosis of OCD according to treating psychiatrist/clinician. All participants were approached originally to participate in face-to-face interviews and experimental testing (the latter will be reported in Paper 5). Minimum age for inclusion in this larger study was 16 years of age and all participants had an English-speaking background, although English did not need to be the first language. Ethics approval was granted from Concord Repatriation Hospital (CH62/6/2012-081) (see Appendix 4) and Macquarie University (5201200243) (see Appendix 5).

All participants were initially interviewed using the semi-structured Y-BOCS to confirm the presence of OC symptoms, prior to an in-depth interview of insight and belief conviction related to the current primary OC related belief, as well as general delusional ideation, using the assessment tools described below.

Four cases of the larger sample of 21 cases were selected on the basis of their presenting with bizarre thought content with magical features, as compared to the other cases and to those more traditional OCD cases, conceived as being insightful. Thus, as per the focus of this current paper, all four cases presented with more unusual and magical OC related beliefs, when asked about their primary belief currently related to their OC symptoms (that is, as being of most concern in the BABS, OVIS and NBS interviews).

Materials and Instruments

General OC Symptomatology

The four selected cases were drawn from the larger group of 21 participants for whom OC symptoms had been rated in a face-to-face interview. Clinician rated (Y-BOCS) and self-report tools (OCI) were used to assess severity of OC symptoms in all 21 participants. An OC severity score for each participant was assessed according to the Y-BOCS and evaluated against the OCD diagnosis of the treating psychiatrist/clinician. The self-report questionnaire, the OCI, also provided self-reported ratings of participants' OC severity.

Yale-Brown Obsessive Compulsive Scale (Y-BOCS)

The Yale-Brown Obsessive-Compulsive Scale (Y-BOCS; Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b) is a semi-structured clinician rated instrument to assess obsessions and compulsions, and was originally developed specifically for OCD patients. The scale consists of 10 items rated for severity on a 5-point Likert scale (0 = 'no symptom', 1 = 'mild', 2 = 'moderate', 3 = 'severe', 4 = 'extreme'). Patients' current OC symptoms are identified prior to ratings using the Y-BOCS Symptom Checklist. The most prominent symptoms are identified and focused on in

the following severity evaluation. Separate subtotals for each subscale of obsessions (Item 1 to 5; range 0 to 20) and of compulsions (Item 6 to 10, range 0 to 20) can be generated and combined for a total severity score (range of 0 to 40). The higher the overall score the greater the severity. According to Loretz (2005), the total score can be interpreted to index overall severity (e.g., 0 to 7 = 'subclinical', 8 to 15 = 'mild', 16 to 23 = 'moderate', 24 to 31 = 'severe' and 32 to 40 = 'extreme'). An additional six items can be added to provide a more complete picture of OCD including items assessing insight, doubting, indecisiveness or avoidance (these items were included in our investigation: see later for more detailed information).

Previous research from Goodman, Price, Rasmussen, Mazure, Fleischmann, et al. (1989b) has reported good reliability with an overall Cronbach's alpha = .89 for total Y-BOCS scores in a sample of OCD patients. Data also suggest good construct validity and highly convergent validity (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a).

Obsessive Compulsive Inventory (OCI)

Participants also self-reported their current OC symptoms using the Obsessive Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998). The original version of the OCI requests respondents to rate 42 items (e.g., I repeatedly check doors, windows, drawers etc."; "After I have done things, I have persistent doubts about whether I really did them") according to the degree of associated distress using a 5-point Likert scale ('not at all', 'a little', 'moderately', 'a lot', 'extremely'). These distress ratings were totalled for each of seven dimensions, washing and obsessions (8 items per subscale; scores ranging from 0 to 32), ordering (5 items; scores ranging from 0 to 20), doubting and hoarding, (3 items per subscale; ranging from 0 to 12), neutralising (6 items; ranging from 0 to 24), and checking (9

items; ranging from 0 to 36) and then added for an overall OCI total score (ranging from 0 to 168).

Previous research (Foa et al., 1998) has reported good test-retest reliability for the OCI distress ratings ($r = .89$ in a control sample and $.87$ in an OCD sample). Also, the OCI shows good convergent and divergent validity (Foa et al., 1998).

General Delusional Ideation

The following instruments were included to assess more general delusional ideation/magical thinking, as seen across different clinical conditions and to varying degree in the general non-clinical community.

Schizophrenia-like Delusional Ideation – Peters’ Delusions Inventory (PDI)

Delusional thinking of the kind typically seen in schizophrenia was measured using the 2004 version of the Peters’ Delusions Inventory (PDI; Peters, Joseph, Day, & Garety, 2004). This version of the PDI comprises 21 items that probe presence of unusual beliefs (e.g., “Do you ever feel as if your own thoughts were being echoed back to you?” or “Do you ever feel as if there is a mysterious power working for the good of the world?”). For each item, the respondent answers ‘yes’ or ‘no’. If the response is yes, the respondent then rates associated distress, preoccupation and conviction on a 5-point rating scale (1 = indicating ‘not at all distressing/ hardly ever think about it/ don’t believe it’s true’ and 5 = ‘very distressing/think about it all the time/believe it to be absolutely true’). Separate scores are obtained for a PDI total yes -score (range 0 to 21), and total distress, preoccupation, and conviction scores, all ranging from 0 to 105. A grand total PDI score (summing the three dimension scores and the PDI total yes score) can also be obtained (range 0 to 336).

The PDI has adequate inter-item reliability with a reported Cronbach's alpha = .82; good test-retest reliability of $r = .80$; and confirmed validity using the 2004 version of the Peters' Delusions Inventory (PDI; Peters et al., 2004).

Magical Thinking

Magical Ideation Scale (MIS)

General magical ideation was assessed using the Magical Ideation Scale (MIS; Eckblad & Chapman, 1983). Respondents rate 30 statements about their magical thinking and behaviour as being TRUE or FALSE (e.g., "Things sometimes seem to be in different places when I get home, even though no one has been there." or "I sometimes have a feeling of gaining or losing energy when certain people look at me or touch me."). A total score out of 30 is then calculated, after reverse-coding where required. Higher scores indicate more extreme magical thinking.

Reliability has been reported between alpha = .81 and alpha = .79 in a clinical sample with evidence of good construct validity (Eckblad & Chapman, 1983).

Illusory Beliefs Inventory (IBI)

The Illusory Belief Inventory (IBI; Kingdon, Egan, & Rees, 2012) has been included as a newly developed measure of magical thinking that can be assessed in the general population and also relates to the characteristic beliefs, superstitions and thought action fusion that are seen in OCD. Four dimensions are assessed by the inventory: Three dimensions are assessed with the inventory: (1) the idea that some events happen due to a magical cause and cannot be explained scientifically (10 items, e.g., "I sometimes perform special rituals for protection"), (2) the belief in a special force or directing nature, a greater power (9 items, e.g., "I believe guardian angels or other spiritual forces protect me") and (3) the belief that

events can be predicted by having special feelings or dreams about it and that thoughts have a certain power (5 items, e.g., “My thoughts alone can alter reality”). All 24 IBI items are rated on a 5-point scale from 1 = ‘strongly disagree’ to 5 = ‘strongly agree’. The three subscale scores can be calculated as well as an overall score, ranging from 24 to 120, with higher scores reflecting a stronger illusory belief system.

In addition to the total IBI score, the first IBI subscale about magical beliefs is of particular interest here as it consists of items such as: “I do something special to prevent bad luck”, “I avoid unlucky numbers”, and “Magic causes miracles to happen”. The intention of this subscale is to assess a person’s belief that there is a universal order to everything.

Thought Action Fusion

This construct is considered very relevant to OCD. “Thought action fusion” is said to occur when intrusive thoughts of OCD patients are interpreted as having a specific significance (see below).

Thought Action Fusion Scale (TAF Scale)

The TAF Scale (Shafran et al., 1996) in revised form contains 19 items: 12 “Moral” items (e.g., “Thinking about swearing at someone else is almost as unacceptable to me as actually swearing.”), 4 items for “Likelihood-for-Others” (e.g., “If I think of a relative/friend falling ill this increases the risk that he/she will fall ill.”) and 3 items for “Likelihood-for-Self” (e.g., “If I think of myself being injured in a fall, this increases the risk that I will have a fall and be injured.”). Participants rate each item on a scale from 0 = ‘disagree strongly’ to 4 = ‘agree strongly’ (Shafran et al., 1996). Ratings are totalled and range from 0 to 76.

A satisfactory internal reliability has been reported (Rassin, Merckelbach, Muris, & Schmidt, 2001), with all Cronbach’s alphas ranging above .75, and construct validity of the scale has

been confirmed, for example, higher scores associate with more cognitive disabilities (Rassin, Merckelbach, et al., 2001).

IBI- Internal state and thought action

This third subscale of the IBI, mentioned in more detail above, is also used to assess TAF. This subscale is rated on a 5-point scale and includes statements such as: “If I think too much about something bad, it will happen.” and “My thoughts alone can alter reality.”

Insight and Belief Ratings Specific to OC symptoms

The main focus of this paper concerns the assessment of participants’ belief conviction, insight and strength of belief related specifically to the OC symptoms. Hence the following instruments and particular items (see below) were administered and investigated in detail.

Y-BOCS Insight (Y-BOCS Item 11)

The Y-BOCS insight item is of particular interest since participants are probed about the reasonableness of their actions and what would happen if they did not perform the compulsion(s) (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b). Participants were asked: “Do you think your concerns or behaviors are reasonable? [Pause] What do you think would happen if you did not perform the compulsion(s)? Are you convinced something would really happen?...” (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b). The interviewer then rates participants’ insight on a 5-point Likert scale (0 = ‘excellent insight, fully rational’, 1 = ‘good insight. Readily acknowledges absurdity or excessiveness of thoughts or behaviours but does not seem completely convinced that there isn’t something besides anxiety to be concerned

about (i.e., has lingering doubts).’, 2 = ‘fair insight’. Reluctantly admits thoughts or behaviour seem unreasonable or excessive, but wavers. May have some unrealistic fears, but no fixed convictions.’, 3 = ‘poor insight. Maintains that thoughts or behaviours are not unreasonable or excessive, but acknowledges validity of contrary evidence (i.e. overvalued ideas present).’, 4 = ‘lacks insight, delusional. Definitely convinced that concerns and behaviour are reasonable, unresponsive to contrary evidence’)

Brown Assessment of Belief Scale (BABS)

The Brown Assessment of Beliefs Scale (BABS; Eisen et al., 1998) assesses beliefs and related facets of insight, including the degree of conviction and features of delusional thinking, as seen in a range of psychiatric disorders. The semi-structured scale was developed to evaluate the particular belief a patient reports as causing most distress (in this case, the primary belief currently associated with the participant’s OC symptoms) on 7 items each rated on a 5-point Likert scale (generally ranging from 0 = ‘non-delusional or least severe’ to 4 = ‘delusional or most severe’). A total score combines the ratings of the first 6 items (for “Conviction”, “Perception of others’ views”, “Explanation of differing views”, “Fixity of ideas”, “Attempt to disprove beliefs” and “Insight”) and ranges between 0 and 24. An additional item, “Ideas/delusions of reference”, complements the global picture of the patient’s BABS overall insight score.

Cronbach’s alpha has been reported as .83 and the BABS shows good inter-item reliability as well as good to excellent inter-rater reliability. Test-retest reliability varies from .79 to .98 (median = .95). Good validity was established through high correlation with measures of delusional ideation and low correlation with general measures of symptom severity (Eisen et al., 1998).

BABS Conviction (Item 1)

Of specific interest is the BABS conviction item – item 1. Conviction has been suggested previously to be the key aspect to index presence of delusional ideation in OCD cases (Jacobsen, Freeman, & Salkovskis, 2012; Poyurovsky et al., 2007). This item is scored based on the interviewee's responses to the following questions: "How convinced are you of these ideas/beliefs? Are you certain your ideas/beliefs are accurate? What do you base your certainty on?" The interviewer then rates the respondent's conviction on a 5-point Likert scale (0 = 'completely convinced beliefs are false', 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').

BABS Insight (Item 6)

The BABS insight item – item 6 - is also of particular relevance to this study. The interviewees here are required to give information about the associated reason for their beliefs: "What do you think has caused you to have these beliefs?" and "Do they have a psychiatric (or psychological) cause, or are they actually true?". The interviewee's insight is again rated by the interviewer on a 5-point Likert scale (from 0 = 'beliefs definitely have a psychiatric/psychological cause' to 4 = 'beliefs definitely do not have a psychiatric/psychological cause') (Eisen et al., 1998a).

Overvalued Ideas Scale (OVIS)

The Overvalued Ideas Scale (OVIS; Neziroglu, McKay, Yaryura-Tobias, Stevens, & Todaro, 1999) was developed to examine different domains of thought processes associated with belief stability for up to three separate beliefs. So as to be consistent in administration across instruments, only the primary current belief associated with the OC symptoms was

rated using the OVIS. The 10-item scale assesses, for example, interviewees' strength of beliefs, reasonableness and accuracy of their beliefs, as well asking about the perspective of others and insight into a disorder causing the beliefs. Each item is rated by the interviewer on a 10-point scale and the 10 ratings are then combined for a total score from 1 to 10, with 1 being the weakest and 10 the strongest. An additional 11th item assesses the duration of the belief but is not included in an overall score.

Psychometric properties of the OVIS have been established as good with a test-retest reliability of $r = 0.93$ overall and confirmed medium to large convergent validity (Neziroglu et al., 1999).

Overvalued Ideas Scale (OVIS) Strength of belief (1)

Item 1 is of particular interest since it assesses the strength of a belief (or conviction). Interviewees are asked: "How strongly do you believe that [belief] is true? How certain/convinced are you this belief is true?" and "Can your belief be "shaken" if it is challenged by you or someone else?". The interviewer then rates the interviewees conviction using a 10-point scale, ranging from 1 = 'belief is very weak' to 5 = 'belief is weaker than stronger' to 10 = 'belief is very strong'.

Overvalued Ideas Scale (OVIS) Insight (9)

Item 9 is also of relevance and is evaluated according to the questions: "To what extent do you think that your disorder has caused you to have this belief?; How probable is it that your beliefs are due to psychological or psychiatric reasons?"; and "Do you think that your belief is due to a disorder?" This item is also rated by the interviewer on a 10-point scale ranging from 1 = 'totally probable' to 5 = 'more probable than improbable' to 10 = 'totally improbable'.

Nepean Belief Scale (NBS)

The Nepean Belief Scale (NBS; Brakoulis, 2012) was developed to evaluate specific OC related beliefs on six dimensions: conviction, fixity, fluctuation, resistance, awareness of unreasonableness of the belief, and attribution to an illness or disorder. All items are rated by the interviewer on a 5-point scale (e.g., 1 = 'not at all' to 5 = 'definitely') and summed for a total score. The higher the total the more extreme is the belief. The NBS's psychometric properties are still to be fully tested and initial findings show a better application when reducing the NBS to 5 instead of 6 items, with the last ("insight") item removed (Brakoulis & Starcevic, 2011). The latest revised version thus assesses the OC-related belief on 5 items. Due to the focus on insight in the present study, the original 6-item NBS was administered.

Nepean Belief Scale (NBS) Conviction (1)

Item 1 is about belief conviction and is of particular importance. It is assessed by asking the interviewee to report "How much do you think that your belief is true?" with responses scored by the interviewer on a 5-point Likert Scale (1 = 'not true at all', 2 = 'probably not true', 3 = 'is possible, but remains uncertain/unsure', 4 = 'probably true' and 5 = 'definitely true').

Nepean Belief Scale (NBS) Insight (6)

Given the interests of the current study, the Insight Item of the NBS was not omitted, as noted above. For this item, the interviewer asks: "Do you think that your belief may be due to an illness, disorder or psychological cause?" and responses are rated using a 5-point Likert scale: 1 = 'yes: completely certain about this', 2 = 'thinks it likely', 3 = 'is uncertain/unsure', 4 = 'thinks it unlikely' and 5 = 'no: completely unconvinced (does not think that is the case)'.

The instruments were all administered in the following order: self-report inventories were generally completed at home before attendance at the face-to-face interview during which participants responded to the Y-BOCS, BABS, OVIS and then NBS.

RESULTS

General Background

Table 1 below summarises basic demographics of the four unusual OCD cases (from the full sample of OCD1 to OCD21) and provides background data on overall OC severity assessed using the Y-BOCS and OCI and general delusional ideation/magical thinking and thought action fusion.

Overall severity OC symptoms as indexed by the Y-BOCS Checklist was categorized following the criterion of (Loretz, 2005) with subclinical “1” (0 to 7), mild “2” (8 to15), moderate “3” (16 to 23), severe “4” (24 to 31) and extreme “5” (32 to 40) cases. OC symptoms assessed using the Y-BOCS were thus rated as being mild with little impairment for three of the participants with one case being moderately severe and with poor functioning (YBOCS; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b). In two cases, compulsions were more prominent than obsessions. There was little difference in distress scores according to the OCI with all four cases self-reporting mid-range distress (OCI; Foa et al., 1998). However, all four cases self-reported severity of OC symptoms was above threshold for diagnosis of OCD on the OCI.

General delusional ideation was not notable, with generally low overall scores on the PDI (0 to 145) and MIS (6 to 12). Magical ideation, as indexed by the IBI (IBI; Kingdon et al., 2012), was also mild. As for the tendency to interpret intrusive thoughts as having a specific

significance and the presumption that just thinking of an event makes it more likely to occur, the thought action fusion scores of all four cases were only moderate, as reflected by the TAF scale (Rassin, Merckelbach, et al., 2001) and the IBI Internal state thought action subscale (IBI; Kingdon et al., 2012).

Table 1

Socio demographic data: age, gender, education, age of onset; Y-BOCS (Total, Global Severity, Obsessions, Compulsions); OCI scores; Peters' Delusions Inventory (PDI-21 Overall Total), Magical Ideation Scale (MIS Total); Thought-action-Fusion Scale (TAF Total); Illusory Beliefs Inventory (IBI Total and Magical Ideation, Internal state and Thought Action) for the four unusual OCD cases

Cases	OCD 1	OCD 10	OCD 15	OCD 17
Age (years)	22	32	41	23
Gender (Male/ Female)	Male	Male	Female	Female
Education	Bachelor Degree (4 years)	Bachelor Degree (4 years)	Master's Degree	Highschool /GED
Age of Onset (years)	15	15	9	18
Y-BOCS				
Total (0 to 40)	19	20	22	22
Global Severity (0 to 4)	2	2	2	3
Obsessions (0-20)	8	10	12	12
Compulsions (0-20)	11	10	10	10
OCI TOTAL (0 to 168)	57	63	53	48
PDI-21 Overall Total (0 to 336)	145	114	0	83
IBI Total (24 to 120)	71	78	85	48
MIS (0 to 30)	6	9	7	12
IBI magical beliefs (10 to 50)	29	28	34	14
TAF (0 to 76)	28	39	33	29
IBI Internal state thought action (5 to 25)	11	16	18	15

In sum thus far, neither general proneness to delusional ideation/magical thinking nor general ideas of thought action fusion were notable across these four unusual cases. Next we present the detailed case descriptions to illustrate the unusual associated thoughts, ratings of belief conviction (with a primary focus on the BABS conviction item given that it

has been suggested in previous studies to index presence of delusional ideation in OCD; Poyurovsky et al. (2007), and insight across a range of instruments that allow for a more specific focus on the belief content associated with the OC symptoms.

Single Case Presentations

Case: OCD 1

OCD 1 was a 22-year-old male student, who developed obsessions at the age of 15, and, although he has never been formally diagnosed with OCD, meets criteria according to the Y-BOCS and OCI. There is no known family history of obsessive or compulsive symptoms or any other mental disorders.

In his early adolescence, the participant developed the concern he might harm himself or act on impulses. At one point he was suffering from intrusive violent and horrific images. He also became concerned that he would say something inappropriate and be insulting towards other people. As he grew older those particular thoughts were not as common and a need for symmetry and exactness took over. At the time of interviewing, he reported the compelling feeling that things have to be equal to make them “good or right”. He therefore started ordering his clothes following a specific colour code, keeping in mind the specific significance of each colour (e.g., grey is neutral and believing that clothes have to be arranged on specific hangers). He also reports urges to sort and arrange dishes, bowls, switches and even plugs so that there is an equal number for everything. He tries to balance all things out, so that every item has the chance to be used equally. Asked to provide an example, he explained that, when he is taking a plate out of the shelf, he tries to use the plate that hasn’t been used the last time, as this would bring imbalance to the world and would be “unfair”.

When asked the primary belief currently related to his OC symptoms that was of most concern, OCD 1 nominated:

I have to arrange and order things in a specific order so that I can make sure that everything gets the equal opportunity to be worn or used, and so make things equal and right.

Case OCD 1: Insight and Delusional Ideation

The general assessment and evaluation of the particular OC related belief according to the three independent belief-rating instruments (BABS, OVIS, NBS: see Table 2) revealed relatively high overall scores: 15/24 on the BABS, 6.9/10 on the OVIS and 25/30 on the NBS. A more detailed consideration of insight in this case revealed that this individual personally believes that his OC symptoms are not unreasonable or excessive but acknowledges that other people might see this differently (as probed for the Y-BOCS insight score). Further, he remains uncertain/unsure about the cause of his belief (as probed for the NBS insight score) and says that it is “somewhat probable” (OVIS) and “possible” (as probed on the BABS) that his belief is related/caused by a psychological/psychiatric disorder. He is convinced, however, that his belief is true according to the BABS and OVIS probes but, then again, he later became inconsistent and allowed that his belief might probably not be true on the NBS. The strength and conviction in his belief therefore seemed to waver towards the end of the interviewing. Even though his overall rating for general delusional ideation on the PDI indicates a very low, subclinical score (see Table 1), the PDI conviction total appeared somewhat higher with 44/105.

Case: OCD 10

OCD 10 was a male participant, 32 years of age, with a Bachelor Degree in Physiotherapy. The OC symptoms began at 15 years of age. He has been diagnosed with OCD since 16 years of age and has had a previous comorbid diagnosis of depression. He has been receiving psychotherapy for the past 15 years and sees a counsellor once a month. There is a family history of mental disorders (for example, he reports his sister as depressive and his mother as having cleaning compulsions, although neither has been diagnosed). He also reports his father as having been diagnosed with Obsessive Compulsive Personality Disorder by the family's general practitioner.

At the age of 16, the participant developed obsessions and fear about harming other people by not being careful enough. In particular, he started to believe that he would blurt out insults about other people and developed the fear of saying something inappropriate. He also became concerned that he would make others sick by spreading contaminants. This obsession about harming someone else through spreading contaminants resulted in his developing an excessive hand washing compulsion. He is overly concerned with the prevention or removal of contact with contaminants. He also reports checking locks, the stove and other appliances more often than necessary to make sure that he hasn't left something unlocked or switched on, which might lead to a catastrophe and harm others around him. When asked to provide an example, he described how, when he is angry, he has the compelling thought to purposely leave the oven switched on so as to burn the house down. "Those are the situations when I have to double check that I didn't leave it on and need to reassure myself about that by asking my wife."

He also reports intrusive thoughts with "forbidden" or perverse sexual content and associated images coming easily into his mind. He mentions not watching TV anymore, as specifically "the news stirs him up". He also reports the TV pictures or headlines as triggering

thoughts of harming others, in a perverse or sexual way. When asked about his exact belief about what might happen when intrusive thoughts of this nature enter his mind, he reports that he fears that from those thoughts “a daemon could take over his body and he would do something he wouldn't have done when in control and eventually someone would die”. He reports that he doesn't want to take the risk and would rather leave the TV switched off. He says: “I feel like, if I am not shaking off those thoughts or I don't say “NO” and mentally stop these thoughts, I will put a curse on someone and I might be responsible for this person dying. I am afraid that I am responsible for something happening and no one can prove that I didn't do it.”

He further spontaneously mentioned that “...when symptoms were worse I couldn't touch or tap anything as I thought it would be inappropriate and sexually molesting...”. When he first started working as a physiotherapist this became a major problem for him, as he sometimes had to massage clients and these thoughts would come into his mind. Since he became the father of a little daughter (3 years old at time of interview) these kind of thoughts have been heavily impacting upon his family life and especially his relationship with his daughter. He reports that he still has the fear that he will do something inappropriate to her and that sexual thoughts come into his mind especially when she is sitting on his lap. He reports: “...my daughter is 3 years old now and is exactly at the height of my crutch when I hug her. I sometimes have to push her away when the thoughts come into my mind”.

In general at the time of the interview, he reports avoiding going to church as he fears that there are “super” spiritual persons attending who could read his mind and would then know about his bad thoughts.

When asked the primary belief currently related to his OC symptoms that was of most concern, OCD10 nominated:

If I have a bad thought, it will curse someone else and then something bad will happen to them, so it will be my fault and I need to reverse it with a spiritual healer.

Case OCD 10: Insight and Delusional Ideation

Evaluation of Case OCD 10's specific OC related belief showed moderate overall scores, with an overall score of 8/24 on the BABS, 4.5/10 on the OVIS and 12/30 on the NBS (see Table 2).

More detailed assessments of his insight resulted in his admitting that his thoughts or behaviours might seem a bit unreasonable or excessive, although he is not overly convinced about this (as per the Y-BOCS insight item). Accordingly, he admits it is somewhat probable (OVIS insight item) and even completely certain that his belief is related to/caused by a psychological/psychiatric disorder (NBS, BABS insight items). As for conviction, he is fairly convinced that his belief is true on the BABS, but indicates remaining a little doubtful according to the self-rated OVIS score, and then again is more convinced on the NBS. His overall rating for general delusional ideation as assessed using the total PDI score indicates a very low, subclinical score (see Table 1). His total conviction about his PDI beliefs related to general delusional ideation was also low: 29/105 (see Table 2).

Case: OCD 15

OCD 15 was a 41-year-old woman with a Masters' degree in Social Work who was working as a counsellor at the time of the interview. She has been diagnosed with OCD by a psychiatrist and is taking medications for her symptoms. When asked about her family history, she reports that her father has been suffering from fears of contamination for 12 years.

Her symptoms first started at 9 years of age, when she developed concerns that she might harm someone else if she is not careful enough or that something else terrible could happen. She is concerned that she will do morally wrong things and experiences violent and horrific intrusive images. When morally wrong thoughts, such as sexual thoughts, enter her mind, she repeats certain prayers mentally to erase these intrusive thoughts. However, she still does not want her niece to sit on her lap as a precaution against letting the intrusive sexual thoughts come true by her harming her niece. In general, she avoids watching any TV shows that she feels have a bad or evil nature. This is because she fears causing the “emotional contamination” of her family.

She is also concerned with spreading illnesses, in particular cancer and AIDS. To stop spreading contaminants to loved ones, she started washing her hands compulsively in a special routine. To make sure that there is no harm coming to her family she has also started to check door locks and windows repeatedly.

Her current main concern and fear is her partner’s safety, so she makes it a point to drive him to, and pick him up from, his work as a precaution against any harm that he might experience. Since this was her primary preoccupation at the time of interviewing it became the focus of the belief-related interview items although this belief was less bizarre in content.

When asked the primary belief currently related to her OC symptoms that was of most concern, OCD 15 nominated:

If I am not driving my partner to work, something would happen to him and I would be responsible. I could have avoided it if I had driven him.

Case OCD 15: Insight and Delusional Ideation

The assessment of Case OCD15's current particular belief related to her OC symptoms (see Table 2 below) resulted in generally low scores on the OVIS, BABS and NBS, with an overall score of 5/24 on the BABS, 3.4/10 on the OVIS and 8/30 on the NBS (see Table 2). Accordingly she presented with the "best" insight into the unreasonableness of her belief. Also in accord with her generally good insight, she acknowledges the absurdity or excessiveness of her thoughts and associated behaviours, however, she can not be completely convinced of this (according to the Y-BOCS and OVIS insight scores) and thinks it is only probably or most likely related to/caused by a psychological/psychiatric disorder (according to the NBS and BABS insight items). She also appears to be doubtful that her belief is true (on the BABS) and suggests that her belief is somewhat weaker (according to the OVIS) and probably not true at all (according to the NBS). Thus the strength of her belief and conviction about its truthfulness seems weak and quickly wanes with continued probing. Her overall rating for general delusional ideation according to the total PDI total score indicates no delusional ideation (see Table 1: since no PDI items were endorsed, there were no ratings of conviction to report in Table 2).

Case: OCD 17

OCD 17 was a 23-year-old female Psychology student, formally diagnosed with OCD with an age of onset of 18 years of age. Her OCD mainly involves obsessions. She is taking no medication, but has been seeing a psychologist for Cognitive Behavioural Therapy (CBT) fortnightly. She reports having an older sister who has checking obsessions similar to her own but not as severe. A close family member, her paternal uncle, has been diagnosed with schizophrenia when she was a very young child.

Late in her adolescence, at the age of 18, the participant started to worry that she was developing the mental disorder, schizophrenia, and so would be like her uncle. At this time she also developed the excessive need to find out more information about schizophrenia. She also became extremely concerned that she would insult other people and that the things she would say would harm others. Moreover, she feared harming someone by somehow spreading contaminants to them. She also became concerned about apparent changes to her body whenever she detected them. For example, she became extremely nervous about the size and appearance of freckles and started to worry about melanoma, browsing the internet excessively to find out more information. She would also go to the doctor's office to have them check any possible body changes. Her concern about developing schizophrenia developed into a constant fear, so that she would constantly check her own appearance (e.g., she was aware that she should not dress in an eccentric manner, like some people with schizophrenia). She even avoided a friend who had been diagnosed with schizophrenia so as not to "take anything on from her" to cause her to have schizophrenia herself or to pass it on.

At the time of interviewing, she still has the obsessive concern that she is developing another disorder and is afraid she might pass it on to someone else. She wants to do the morally right things and takes precautions whenever she can. She is very concerned and careful when it comes to sexual interactions with her partner, as the fear of getting an infectious disease is always present. In her need to find out as much as she can about disorders she might develop, she is compelled by the urge to know more and to accurately remember facts and information (e.g., she started collecting information sheets and prescriptions).

Because of her need to make sure that she won't be responsible for something terrible happening to other people around her, she also checks locks and that appliances are switched off, for example, her hair wand/straightener.

In addition, she has developed rereading rituals to make sure that she has the correct information and that she writes things down correctly (e.g., she sometimes needs half an hour to write a mobile text message). Because of her need to remember correctly, she also makes excessive lists and continually asks for reassurance that she has the facts correct. She also reports the urge to confess when she thinks she might have done something wrong.

When asked the primary belief currently related to her OC symptoms that was of most concern, OCD 17 nominated:

I might harm someone by being careless and then I am responsible for something terrible happening to this other person.

Case OCD 17: Insight and Delusional Ideation

With overall scores of 13/24 on the BABS, 7.5/10 on the OVIS and 22/30 on the NBS (see Table 2 below), the evaluation of OCD 17's nominated belief indicated high overall scores, similar to Case OCD 1, with an overall poor understanding of the unreasonableness and overvalued meaning of her belief.

A closer look at OCD 17's insight ratings showed that she, like case OCD 10, acknowledges that her thoughts or behaviours might seem a bit unreasonable or excessive although she is not overly convinced of this (according to the Y-BOCS insight item). However, she thinks that it is unlikely (on the NBS), somewhat improbable (on the OVIS) and even definitely not possible (on the BABS) that her belief is related to/caused by a psychological/psychiatric disorder.

With regard to conviction, she is completely convinced that her belief is false (according to the BABS). But then again strongly believes that her belief is (probably) true (according to the OVIS and NBS). Her general delusional ideation assessed using the PDI total score reveals a low score (see Table 1) and this was also the case with regard to the PDI conviction score 26/105 (see Table 2).

Table 2

Insight and Delusional Ideation Scores in order that the clinical interviews were administered: Yale-Brown Obsessive-Compulsive Scale (Y-BOCS Insight), Brown Assessment of Belief Scale (BABS Total, Insight, Conviction), Overvalued Idea Scale (OVIS Total, Insight, Strength of belief), Nepean Belief Scale (NBS Total, Insight, Conviction). The Peters Delusions Inventory (PDI) Conviction subscale score are also provided.

Cases	OCD 1	OCD 10	OCD 15	OCD 17
<i>Y-BOCS Insight (0 to 4)</i>	3	2	1	2
<i>BABS</i>				
<i>Total (0 to 24)</i>	15	8	5	13
<i>Insight (0 to 4)</i>	3	0	1	4
<i>Conviction (0 to 4)</i>	4	3	1	0
<i>OVIS</i>				
<i>Total (1 to 10)</i>	6.9	4.5	3.4	7.5
<i>Insight (1 to 10)</i>	2	2	1	8
<i>Strength of belief (1 to 10)</i>	10	7	3	9
<i>NBS</i>				
<i>Total (6 to 30)</i>	25	12	8	22
<i>Insight (1 to 5)</i>	3	1	1	4
<i>Conviction (1 to 5)</i>	2	4	1	4
<i>PDI-21 Conviction subscale</i>	44	29	---	26

Interim Summary

The total scores for the BABS, OVIS and NBS, and the scores for insight from the various measures, clearly varied across the cases despite that all cases exhibited bizarre belief content associated with their OC symptoms. Across these four cases the BABS conviction score for the specific OC related belief content also ranged across the whole scale from 0 to

4. According to scores for the later questions about the same primary OC related belief on the OVIS and NBS ratings also varied within cases.

A Comparison Case

So as to provide a contrast to these four more unusual cases, and to demonstrate the characteristics of a more typical case of OCD we also briefly report another case and the scores on the same instruments.

Case: OCD 19

OCD 19 was a 34-year-old woman, who works as a Personal Trainer, and who has been formally diagnosed with OCD. She mainly has obsessions that began when she was 7 years of age. She uses meditation to help her cope with her OC symptoms and does take medication. She reports a family history with her mother having OCD and her aunt from her mother's side as being diagnosed with anxiety disorder and suffering panic attacks. Her cousin experiences intrusive aggressive thoughts and her grandmother has bipolar disorder.

Her obsessions mainly relate to a desire for symmetry and a need for exactness. She described how she had to stop wearing her engagement ring because it wasn't absolutely straight and had to be taken to a jeweller. She also experiences a need to know things and to remember correctly and will excessively ask questions of others or reread texts several times. There is also some additional excessive concern with dirt from animals (e.g., pigeons) and she reports the urge to check door locks and the stove to make sure that she does not make a mistake that might cause harm to others or herself. She did not volunteer any unusual thoughts about why she had these experiences.

When asked the primary belief currently related to her OC symptoms that was of most concern, OCD 19 nominated:

I need to know or to ask about certain things, and to get people to repeat information, because it is important that I have the exact details.

Case OCD 19: Insight and Delusional Ideation

The assessment of OCD 19's particular belief revealed extremely low overall scores, with an overall score of 2/24 on the BABS, 2.5/10 on the OVIS and 3/30 on the NBS. Her insight into the unreasonableness of her belief presented itself as excellent and she is fully rational about her belief (Y-BOCS insight = 0/4; BABS insight = 0/4; OVIS insight = 1/10; NBS insight = 1/5). She is completely convinced that her belief is false (BABS conviction = 0/4), very weak in strength (OVIS strength = 2.5/10) and not true at all (NBS conviction = 0/5). Her general ideation scores according to the PDI were also low, indeed at zero (PDI Overall Total = 0/336).

DISCUSSION

The general aim of this study was to examine in detail four unusual OCD cases with some bizarre, magical features. While OCD cases of this type are relatively rare, their outcome and prognosis can be much worse (Jakubovski et al., 2011; Yorulmaz et al., 2011). Our primary interest was to gain insights concerning the nature of any delusional thought processes in such cases and to use a range of instruments to probe belief conviction and insight.

Contrary to some previous findings (O'Dwyer & Marks, 2000), the four case studies reported here did not present with particularly severe OC symptoms. Moreover, while it might be expected that such unusual cases with more bizarre belief content would show more severe obsessions than compulsions, that is not what we found. Overall, there was little difference in the Y-BOCS severity ratings for obsessions and compulsions and both ratings were generally moderate. This was somewhat unexpected but accords generally with research from Fear, Sharp, and Healy (2000) who found that obsessions and compulsions are no more prominent in unusual OCD cases than more classical cases.

However, deeper consideration of insight, conviction and strength of OC related belief was of more interest. The first point to make here is that neither general proneness to delusional ideation/magical thinking nor general ideas of thought action fusion were notable across these four unusual cases, despite that they all reported unusual bizarre belief content as part of their OC phenomenology. Thus it seems that a general proneness to magical ideas/delusional thoughts with a range of potential belief content is not a particular feature of these four cases; instead, the more magical belief content expressed by these cases seemed to be specifically related to their OC symptoms. Perhaps, as the OC symptoms took hold, the magical thoughts related specifically to those OC symptoms then began to develop

in these cases. In other words, it seems unlikely that general delusion-proneness preceded the increasing severity of the OC symptoms in these cases.

The second point relates to the insight levels of these four cases. Insight was moderate to fair overall, and the various insight scores of these four cases were not consistently more extreme than the more typical OCD case (OCD 19). Thus, at this point, our findings suggest that poor insight is not a consistently distinguishing feature of unusual cases of the type presented here. Previous research (Grenier, O'Connor, & Belanger, 2006; Kozak & Foa, 1994; Markova et al., 2009; Nicolau, Fortuny, Ruiz, & Pedraza, 2003; Sanders et al., 2006) suggests that the reason for such variable results in relation to insight is that insight is multi-dimensional, and overall scores intertwine different insight-related factors into one item irrespective of whether the focus is obsessions or compulsions. For example, probes concerning insight into the unreasonableness of one's OC related belief(s) (see, e.g., Y-BOCS insight probes) will most likely be answered differently for obsessions and compulsions than probes concerning the ability to attribute one's OC related belief(s) to a psychological or psychiatric disorder (NBS; Brakoulias, 2012; BABS; Eisen et al., 1998; Y-BOCS; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b; OVIS; Neziroglu et al., 1999). Finally, conviction in the specific belief is also mentioned in some probes for insight (see, e.g., Y-BOCS insight probes) and so must also be taken into account as an additional factor when assessing insight on some scales. Hence, belief conviction is not consistently separated from insight into disorder across different assessment tools and these differences across assessment instruments may have contributed to our mixed results concerning insight. For example, while Cases OCD 1 and OCD 17 showed generally poor understanding of the unreasonableness and overvalued meaning of their OC related belief, Cases OCD 10 and OCD 15 showed better insight by acknowledging that their OC related belief was probably related to a psychiatric/psychological disorder. Hence, we suggest that separate assessments of

different insight factors, as occurs in schizophrenia research (see e.g., Kemp & David's (1995) Schedule for Assessment of Insight-Expanded version (SAI-E)) may offer more valuable information concerning possible distinctions between unusual OCD cases with magical features and more typical OCD cases.

Next we consider our findings concerning the levels of conviction in the OC related belief(s) of these four cases. Other researchers suggest this measure is of more importance with regard to indexing OC related beliefs with delusional/magical qualities (Catapano, Sperandeo, Perris, Lanzaro, & Maj, 2001; Jacobsen et al., 2012). As discussed by Jacobsen et al. (2012) and Catapano et al. (2010), high conviction (as rated on the BABS conviction item – Item 1, for example) is suggested to be a strong indicator for the presence of delusional thought processes being associated with the OC related beliefs. In accordance with other researchers' interpretation of the BABS conviction rating (Catapano et al., 2001; Eisen et al., 1998), one of our cases (with a rating of 3/4) would be described as strongly convinced about the reasonableness of their unjustified OC related belief, and another one (with a rating of 4/4) would be termed fully delusional (Eisen et al., 1998). However, only one of these two cases also showed a minimum total score of 12 on the BABS, which is another criterion for delusionality according to Catapano et al. (2010). Another two cases, however, with ratings of 0 or 1/4 would be considered fully rational or at least quite unconvinced about the reasonableness of their belief and therefore not delusional. Hence, conviction in one's nominated primary OC related belief, as suggested by Jacobsen et al. (2012), seems not to be a consistent indicator for the presence of bizarre magical features related to delusional thought processes across our four cases. Finally, it is worth noting that the conviction/strength of belief ratings of OC related beliefs in those two cases with initially high BABS conviction ratings were not consistently maintained when probed about conviction/strength of belief on subsequent instruments (i.e., on the OVIS and NBS) – see,

for example, Case OCD 1 who dropped from 4/4 on the BABS conviction item to 2/5 on the NBS conviction item.

Thus, no case stood out as consistently showing a lack of, or poor, insight, or stayed consistently high in their ratings of conviction/strength of the OC related belief. This variance in ratings could perhaps be explained, in part, by the interviewees becoming frustrated with responding to repeatedly similar probes; so some respondents may have thought that they were expected to answer in a certain way, since similar questions were repeatedly being asked. They might have started to say what they thought the interviewer wanted to hear.

Overall though, neither insight nor belief conviction ratings, related to the primary OC related belief, provided a consistently distinguishing index of the four unusual cases with bizarre features, as investigated by some researchers (Jacobsen et al., 2012). One possibility here is that, although all four cases reported unusual bizarre belief content as part of their overall OC phenomenology, their scores on the instruments used in this study were likely highly influenced by the particular content of the core belief that was focused upon when evaluating insight and indications of delusional ideation. However, that particular belief was only one among several beliefs and, although it was nominated as the most distressing current belief by the interviewee, it was probably not the most bizarre belief that the participants mentioned. Perhaps, shifting the focus of assessment towards the OC related belief with the most bizarre unjustified content would reveal different results with regard to the ratings of insight and belief conviction.

Another possibility, however, is that it may indeed be the case that the nature of delusional thought processes in OCD are not quite the same as that seen in acute psychotic cases who show high conviction in their beliefs (Garety et al., 2005; Waller, Freeman, Jolley, Dunn, &

Garety, 2011) and rigidly maintain their beliefs. Perhaps the extreme doubting experienced by many OCD patients plays a more prominent role than previously considered, particularly with regard to whether or not OCD cases with bizarre delusion-like thoughts will fixedly maintain their beliefs.

In conclusion, findings hint at differences between delusion-like beliefs in OCD and the nature of delusions seen in psychotic conditions, such as schizophrenia. Firstly, none of our cases showed higher levels of either a general proneness to delusional ideation or magical thinking, which has been suggested to index a proneness to schizophrenia-related disorders. Moreover, only two cases showed high conviction in their OC related belief, although we acknowledge possible limitations in focusing on the most distressing OC related belief rather than the OC related beliefs with more bizarre content when rating insight and belief conviction. Those cases that did initially show high conviction, did not then fixedly maintain high conviction levels, which also raises questions about the overlap between delusion-like thinking in OCD and delusions in psychotic mental illness. It must be acknowledged, however, that we have focused on only four unusual cases and have relied on details of the more general clinical phenomenology to establish presence or absence of delusion-like thinking at the time of interview. Hence, future research might consider further empirical investigation of the same factors that have been associated with delusions in psychotic disorders in people who experience OC symptoms with and without features of delusion-like thinking. Such empirical investigation may better identify specific features that will distinguish between those more classic insightful cases of OCD and those with more unusual and bizarre OC related beliefs.

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PAPER 4

**A preliminary investigation of delusional ideation and insight
associated with obsessive-compulsive (OC) beliefs in people with
OC symptoms with and without schizophrenia**

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Abstract

Introduction: While delusions are characteristic of schizophrenia, and have traditionally been contrasted with obsessional thoughts in obsessive-compulsive disorder (OCD), there is growing awareness of a spectrum of insight and delusion-like thinking in OCD. There is also a high comorbidity of OC symptoms in schizophrenia, a disorder characterised by delusions. This overlap opens up questions about possible commonalities and differences between delusion-like thinking in OCD and in people with schizophrenia and comorbid OC symptoms. To address this gap in understanding, we conducted a preliminary study to compare OCD patients to schizophrenia patients with OC symptoms on various measures of general delusional ideation/magical thinking and facets of belief (e.g., insight, conviction) associated specifically with OC-related beliefs.

Method: 21 OCD patients and 8 patients with schizophrenia or schizoaffective disorder and comorbid OC symptoms participated in in-depth interviews. The Yale-Brown Obsessive Compulsive Scale (Y-BOCS) and the Obsessive Compulsive Inventory (OCI) were used to confirm presence of OC symptoms above threshold for an OCD diagnosis and to rate OC symptom severity. General delusional ideation/magical thinking and cognitive insight associated with psychosis were evaluated using the Peters' Delusions Inventory (PDI), the Magical Ideation Scale (MIS), Beck's Cognitive Insight Scale (BCIS) and the Illusory Beliefs Inventory (IBI). Thought processes proposed to play more of a role in OCD were examined using the Thought Action Fusion (TAF) scale and the Metacognition Questionnaire (MCQ-30). Facets of belief and insight related specifically to OC symptoms were evaluated using the Overvalued Idea Scale (OVIS), Brown Assessment of Belief Scale (BABS), Nepean Belief Scale (NBS) and Maudsley Assessment of Delusions Schedule (MADS).

Results: The two groups did not differ on the Y-BOCS in clinician rated severity of OC symptoms while the schizophrenia patients self-reported higher levels of distress associated with OC symptoms on the OCI. The schizophrenia group also reported an older age of onset for OC symptoms and higher levels of general delusional ideation/magical thinking associated with psychosis. Levels of thought action fusion and metacognitive biases did not differ between the two groups with OC symptoms. The schizophrenia group also showed worse insight and greater conviction/strength of belief associated with the primary OC related belief. Nevertheless there was considerable individual variability within both groups and overlap in insight/conviction ratings.

Conclusion: The higher levels of distress concerning OC symptoms reported by the schizophrenia group suggest that these OC symptoms may be an unmet treatment need in schizophrenia cases with comorbid OC symptoms. On average, there were higher levels of general delusional ideation and delusion-like thinking associated with OC symptoms in people with schizophrenia and OC symptoms. Nevertheless, considerable individual variability and overlap in the ratings of insight/belief associated with the OC symptoms suggests that a symptom-focused transdiagnostic approach may be useful to investigate the underlying factors that contribute to delusion-like thinking in some OC cases.

INTRODUCTION

Researchers and clinicians have, for many years, attempted to define the core nature of delusional beliefs. A primary focus has been on delusions in schizophrenia, for which delusions are a characteristic diagnostic criterion. Changing views about the nature of delusions in schizophrenia can be understood in the historical variations in definitions, as seen in revisions of the Diagnostic and Statistical Manual of Mental Disorders (DSM), with the fifth version only recently released (DSM-5; American Psychiatric Association, 2013). Whereas earlier versions of DSM had focused on “falsity” in their definition of delusions, DSM-5 focuses more on fixity and resistance to counter-evidence in their definition of delusions as: “... fixed beliefs that are not amenable to change in light of conflicting evidence. Their content may include a variety of themes (e.g., persecutory, referential, somatic, religious, grandiose). [...] Delusions are deemed bizarre if they are clearly implausible and not understandable to same-culture peers and do not derive from ordinary life experiences. [...] The distinction between a delusion and a strongly held idea is sometimes difficult to make and depends in part on the degree of conviction with which the belief is held despite clear or reasonable contradictory evidence regarding its veracity.” (American Psychiatric Association, 2013, p. 87)

While this definition describes delusions in psychotic disorders such as schizophrenia, it is unclear whether such a definition applies equally to unusual bizarre and delusion-like thoughts in other clinical conditions. This is of particular interest in relation to obsessive-compulsive disorder (OCD). While the core features of OCD are obsessional thoughts (e.g., about contamination, symmetry, exactness or causing harm to others by not being careful enough) and compulsive repetitive acts or rituals (e.g., washing, cleaning, checking or even mental rituals) (Abramowitz & Foa, 1998), some OCD cases fail to show a good

understanding of the unreasonableness of their obsessions and compulsions, suggesting poor insight and delusion-like thinking (Fear, Sharp, & Healy, 2000; Fontenelle et al., 2008; Insel & Akiskal, 1986; Jaafari et al., 2011; O'Dwyer & Marks, 2000). For example, O'Dwyer and Marks (2000) described an OCD case of a man who believed that “spirits” made him engage in compulsive rituals and Fontenelle et al. (2008) reported an obsessional young man, who insisted that several parts of his body consistently exhaled smelly odour so that he had to engage in compulsive washing rituals. They also described a woman who persistently complained about black dots on her hand that she believed to be her own feces. This was despite doctors and family reassuring her that there were no such black dots. Such cases indicate a greater diversity and complexity of OC phenomenology and suggest a closer relationship between obsessive thoughts in some cases of OCD and delusions in schizophrenia. Still, it remains unclear when an obsessional thought becomes so extreme as to be considered delusional. What exactly, if anything, distinguishes a bizarre thought in some extreme cases of OCD, as mentioned above, from a delusion in schizophrenia? That this question is not easy to answer is acknowledged in the new DSM-5 definition for OCD, which now allows for a continuum of insight in an attempt to distinguish between insightful and more delusional OCD cases.

Research examining possible commonalities between OCD and schizophrenia has found that OCD patients, like some schizophrenia patients, show abnormal metacognitions (Laroi & Van der Linden, 2005; Moritz, Peters, Laroi, & Lincoln, 2010; Myers & Wells, 2005), although negative metacognitive biases (e.g., thinking it is useful to worry) appear to play a particular role in OCD. Other researchers have noted that thoughts can sometimes be experienced as magical and supposedly world or event changing (George & Neufeld, 1987; Tolin, Abramowitz, Kozak, & Foa, 2001; Yorulmaz, Inozu, & Gultepe, 2011) in both OCD and

schizophrenia. Moreover, it has been found that magical thinking in the general population, including intrusive thoughts, can predispose to schizotypal symptoms and a proneness to develop a psychotic mental illness (Eckblad & Chapman, 1983; Kwapil, Miller, Zinser, Chapman, & Chapman, 1997). Other researchers, focusing more on OCD, have proposed that “thought action fusion” is an important facet of magical thinking affecting the severity of outcome in OCD cases (Amir, Freshman, Ramsey, Neary, & Brigidi, 2001; Berle & Starcevic, 2005; Rassin, Diepstraten, Merckelbach, & Muris, 2001; Rassin, Merckelbach, Muris, & Spaan, 1999). Thought action fusion refers to the belief that thinking about an event would make it more likely to actually happen and the person might therefore feel responsible for this future outcome. Yet, while such thoughts seem closely related to psychotic delusional beliefs, little is known about thought action fusion in schizophrenia. Moreover, although, it has been found that obsessions and/or compulsions are comorbid in up to 29% of people with schizophrenia (Cassano, Pini, Sacttoni, Rucci, & Dell'Oso, 1998, see also Paper 2), relatively little is known about delusional thinking associated specifically with OC symptoms in people with schizophrenia and comorbid OC experiences. While Paper 2 found relations between OC symptom severity and some delusions (i.e., delusions of influence) in schizophrenia, which is broadly consistent with research from Jobe and Harrow (2005) and Harrow and Jobe (2007) who found that delusions influence treatment outcome in schizophrenia, previous research has not specifically probed the primary OC related beliefs of people with schizophrenia and comorbid OC symptoms.

Current knowledge of the delusional nature of OC related beliefs is based primarily on single-case clinical presentations of OCD cases with unusual magical features (Fontenelle et al., 2008; Insel & Akiskal, 1986; O'Dwyer & Marks, 2000, see also Paper 3). More specific investigations of the characteristics and impact of delusion-like thinking related specifically to OC symptoms, including the patients' interpretations of their OC related beliefs and their

conviction levels, across both disorders (i.e., OCD and schizophrenia) has not been a primary focus of research to date (Poyurovsky & Koran, 2005).

Despite the relative lack of understanding concerning delusion-like thinking in OCD (compared to schizophrenia, for example), assumptions seem to exist concerning how one can use presence or absence of insight into the reasonableness of a patient's OC symptoms, and attribution of the OC experiences to a disorder, as the primary means to distinguish between non-delusional and delusional OCD cases, with the latter thought to be closer to delusional schizophrenia patients (Faragian, Kurs, & Poyurovsky, 2008; Nicolau, Fortuny, Ruiz, & Pedraza, 2003; Ongur & Goff, 2005; Poyurovsky et al., 2007). Such an assumption seems to be reflected in the new DSM-5 guidelines for diagnosing OCD, which allow for a spectrum of insight. But, then again, when one considers the DSM-5 definition of delusions (in particular, "the distinction between a delusion and a strongly held idea [...] depends in part on the degree of conviction with which the belief ..."), it could also be argued that it is the strength of the unreasonable OC related belief(s), rather than insight, that is the key element for judging presence of delusional thinking in some OCD cases (see Catapano, Sperandeo, Perris, Lanzaro, and Maj (2001), Jacobsen, Freeman, and Salkovskis (2012) or van der Zwaard, de Leeuw, van Dael, and Knook (2006)).

Against this background, the general aim of this study was to conduct a preliminary comparison of delusion-like thinking in people with OC symptoms with and without comorbid schizophrenia. A large battery of different measures were administered to subgroups of people with OC symptoms, with and without schizophrenia, to assess: (1) OC symptom severity; (2) general delusional ideation/magical thinking and poor cognitive insight associated with psychosis; (3) thought action fusion and metacognitive biases which may relate more to development of OC symptoms; and (4) insight and conviction related

specifically to the primary OC related beliefs. It was expected that those with a primary diagnosis of OCD and those with a primary diagnosis of schizophrenia, but with comorbid OC symptoms, would differ on some demographic measures (i.e., we expected fewer years of formal education in the schizophrenia subgroup, since the onset of schizophrenia, typically in late adolescence, interferes with educational attainment). It was also expected that the “pure” OCD subgroup would present with an overall higher severity of OC symptoms but lower levels of general delusional ideation and magical thinking associated with a proneness to psychosis (i.e., delusion-like thinking not associated specifically to the OC related beliefs). In contrast, the ideas of thought action fusion and negative metacognitive biases that have been implicated in development of OC symptoms were expected to be similar in the two groups, both of which experienced OC symptoms. Finally, as suggested by the four Paper 3 case studies, we expected that the group results for insight involving the attribution of OC symptoms to a disorder might not match the group results for measures related more specifically to the OC related beliefs themselves (e.g., belief conviction). In particular, while we expected insight concerning OC symptoms to be generally better in the OCD cases, we expected quite a lot of individual variability and overlap between the subgroups with regard to strength of OC related beliefs and conviction in such beliefs.

GENERAL METHOD

Participants

There were 21 patients, comprising 14 females and 7 males, who were referred from Nepean Hospital, or recruited via word-of-mouth or advertisement from OCD support groups in New South Wales, and for whom a diagnosis of OCD was reported according to treating psychiatrist/clinician. An OC symptom severity score was established using the clinician-rated semi-structured Yale-Brown Obsessive Compulsive Scale (Y-BOCS) and the self-reported Obsessive Compulsive Inventory (OCI). There were also 8 cases with a primary diagnosis of schizophrenia or schizoaffective disorder, either confirmed by the Diagnostic Interview for Psychosis (DIP; Castle et al., 2006) and recorded on the Macquarie Belief Formation Register or via the treating psychiatrist. These schizophrenia cases had either spontaneously reported their OC experiences, or were observed to engage in obsessive-compulsive behaviour during clinical interviews for previous schizophrenia studies, or had been referred to Nepean Hospital for treatment of OC symptoms. None of the schizophrenia patients who had taken part in the mail-out survey (Paper 2) lived close enough to attend face-to-face interviews. This schizophrenia subgroup consisted of 3 females and 5 males. Examination of the DIP records revealed lifetime histories of a range of delusions (e.g., delusions of influence, grandiose delusions) and hallucinations (mainly auditory verbal hallucinations) in the schizophrenia subgroup.

All participants had a minimum age of 16 years and an English-speaking background (although English did not need to be the first language). Ethics approval was granted from Concord Repatriation Hospital (CH62/6/2012-081) (see Appendix 4) and Macquarie University (5201200243) (see Appendix 5).

General procedure

All participants gave written informed consent and were mailed out the self-report measures (see below) before being interviewed face-to-face with an extensive battery of clinical tools (see below).

Study design

Given the large amount of data collected, we introduce four different sections, each addressing specific content of interest. Under each section relevant materials, results and the related discussion will be reported for:

- (1) The nature and severity of OC symptoms;
- (2) General delusional ideation/magical thinking and cognitive insight;
- (3) General thought processes associated with OC symptoms; and
- (4) Insight and facets of belief related specifically to OC symptoms.

Independent samples t-tests (assuming non-equal variance where appropriate) were used to compare the two subgroups (Scz+OC subgroup and OCD group) on a range of measures. Since this was an exploratory study with relatively small numbers, alpha was set at 0.05 for all comparisons and the power was not calculated.

(1) The nature and severity of OC symptoms

MATERIALS

Yale-Brown Obsessive Compulsive Scale (Y-BOCS)

The Y-BOCS (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b) is a semi-structured clinician rated instrument to assess obsessions and compulsions, and was originally designed for OCD

patients. The scale consists of 10 items, for which the interviewer assesses the patient's symptom severity on a 5-point Likert scale (0 = 'no symptom', 1 = 'mild', 2 = 'moderate', 3 = 'severe', 4 = 'extreme'). Patients' current OC symptoms are identified prior to ratings using the Y-BOCS Symptom Checklist. Obsessions and compulsions are assessed separately according to preoccupation, distress, level of resistance, control over symptoms, and interference with private and work life. Separate subtotals are generated for obsessions (Item 1 to 5 range 0 to 20) and compulsions (Item 6 to 10, range 0 to 20) and can be combined for a total severity score (range of 0 to 40). The higher the scores the greater is the severity. According to Loretz (2005), the total score can be used to approximate overall severity (e.g., 0 to 7 = 'subclinical', 8 to 15 = 'mild', 16 to 23 = 'moderate', 24 to 31 = 'severe' and 32 to 40 = 'extreme'). Another six items (e.g., for insight, doubting, indecisiveness or avoidance) are optional and were included to provide a more complete picture of OCD (they were rated separately).

Previous research from Goodman, Price, Rasmussen, Mazure, Fleischmann, et al. (1989b) has reported a good reliability with an overall Cronbach's alpha = .89 for total Y-BOCS scores in a sample of OCD patients. Data also suggest Y-BOCS scores accurately reflect severity of OCD and types of OC symptoms, indicating good construct validity, with moderate to strong inter-correlations indicating a highly convergent validity (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a).

Obsessive Compulsive Inventory (OCI)

Participants also self-reported their current OC symptoms using the Obsessive Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998). The original version of the OCI requests respondents to rate 42 items (e.g., "I repeatedly check doors, windows, drawers

etc.”; “After I have done things, I have persistent doubts about whether I really did them” or “I sometimes have to wash or clean myself simply because I feel contaminated.”) according to the degree of associated distress using a 5-point Likert scale (‘not at all’, ‘a little’, ‘moderately’, ‘a lot’, ‘extremely’). These distress ratings were totalled for each of seven dimensions, washing and obsessions (8 items per subscale; scores ranging from 0 to 32), ordering (5 items; scores ranging from 0 to 20), doubting and hoarding, (3 items per subscale; ranging from 0 to 12), neutralising (6 items; ranging from 0 to 24), and checking (9 items; ranging from 0 to 36) and then added for an overall OCI total score (ranging from 0 to 168).

Previous research (Foa et al., 1998) has reported good test-retest reliability for the OCI distress ratings ($r = .89$ in a control sample and $.87$ in an OCD sample). Also, the OCI shows good convergent and divergent validity (Foa et al., 1998).

RESULTS

First we report basic demographics for the two subgroups. Given that group results can sometimes obscure interesting individual differences, Appendix 1 also provides brief case descriptions for each individual participant, as well as age, age of onset of OC symptoms, and education, broken down by subgroup.

In brief, the OCD subgroup had a mean age of 44 years and was generally well educated; many OCD participants reported having completed a Bachelor Degree (33%) and all had completed high school. The average age of onset for OC symptoms was 18 years, with multiple diagnoses often being identified later. While most OCD participants were diagnosed with more than OCD (e.g., also reporting General Anxiety Disorder, Depression, Phobias and

Post Traumatic Stress Disorder: PTSD), no case with a primary OCD diagnosis reported schizophrenia or a related psychotic condition.

For the subgroup of 8 schizophrenia patients with comorbid OC symptoms, the average age was similar at 49.5 years. Levels of formal education were lower, however, with only one person completing a Bachelor Degree. Three were diagnosed with a schizoaffective disorder and four with schizophrenia. The mean age of onset of OC symptoms was later, 29 years on average. However, onset was very variable with four participants stating their OC symptoms occurred many years after being diagnosed with either schizophrenia or a schizoaffective disorder and four reporting some OC symptoms prior to their schizophrenia diagnosis. Half mentioned additional mental diagnoses (e.g., Bipolar Disorder, General Anxiety Disorder). Table 1 below summarises group results. Statistical testing revealed a significant difference in mean age of onset for OC symptoms: $t(27)=2.23$, $p=.034$, but not in age or gender distribution.

Table 1

Demographic and OC symptom severity data: mean scores (standard deviations) and group comparisons (t-test results) for OCD cases and schizophrenia (Scz) plus OC cases.

	OCD cases (n = 21) Mean (SD)	Scz+OC cases (n = 8) Mean (SD)	Independent samples t-test results (assuming non-equal variance where appropriate - Levene's test)
Age	44.35 (17.85)	49.50 (5.13)	$t(26.10)=-1.45$, $p=.160$
Age of OC symptom onset	17.69 (11.62)	29.38 (15.19)	$t(27)=-2.23$, $p=.034^*$
Y-BOCS Total	17.43 (6.52)	18.50 (6.78)	$t(27)=0.39$, $p=.699$
Y-BOCS Global Severity	2.45 (0.98)	1.88 (0.64)	$t(27)=-1.60$, $p=.121$
Y-BOCS Obsessions	8.00 (4.25)	9.63 (3.29)	$t(27)=0.97$, $p=.340$
Y-BOCS Compulsions	9.43 (2.60)	8.88 (4.79)	$t(27)=-0.40$, $p=.691$
OCI Distress Total	44.89 (20.85)	75.86 (23.48)	$t(24)= 3.25$, $p=.003^*$

* $p < .05$

Appendix 1 also provides full details for individuals' OC scores on the Y-BOCS and OCI. Note that some participants refused to complete the self-report inventories and would only talk about their experiences in the face-to-face interviews. Given the relatively small sample

sizes, especially in the schizophrenia subgroup, missing data was not imputed. According to recommendations for overall subdivisions (Loretz, 2005) based on the clinician rated Y-BOCS, the majority of OCD participants ($n = 12$) had moderate symptom severity, while 4 were mildly and 3 severely affected by their symptoms. No OCD participant reached extreme ratings. Participants in the schizophrenia plus OC (Scz+OC) subgroup consisted of four cases with moderate, and three with mild symptom severity, and one showing extreme OC severity ratings. Table 1 summarises group results. An independent samples t-test revealed higher mean overall OCI scores for the Scz+OC subgroup than for the OCD subgroup and this difference was significant. While the OCD subgroup showed, on average, a lower score for Y-BOCS Obsession than the Scz+OC subgroup, the pattern was opposite for the Y-BOCS Compulsions score. However, none of these differences on the clinician rated Y-BOCS measures were statistically significant.

DISCUSSION

OC symptom severity was, somewhat surprisingly, found to be lower in the OCD subgroup without schizophrenia than the Scz+OC subgroup when distress was self-rated on the OCI but not when severity was clinician rated on the Y-BOCS. (Note that this different pattern was not due to the missing OCI data for five participants.) This result for the OCI ratings is contrary to our expectations and also at odds with the results in Paper 2, where we found OCI severity ratings to be lower in a general sample of schizophrenia cases with OC symptoms. This is likely a reflection of how the 8 schizophrenia cases were selected for this study. We were aiming to recruit schizophrenia patients with OC symptoms of sufficient severity to meet criteria for diagnosis of OCD. And, indeed, this was the case. Moreover, the subgroups were matched on OC symptom severity according to the Y-BOCS. Therefore it is of some note that the Scz+OC cases in this study self-reported differentially more distress

about their OC symptoms than the OCD cases, despite the subgroups being matched for the clinician rated Y-BOCS ratings. This may have been because the OCD cases were more “used to” their OC symptoms than the schizophrenia cases and had better “learned to live with” their OC symptoms since these symptoms were the primary focus of their diagnosis and treatment. In contrast, the OC symptoms would not have been a primary focus of treatment in the schizophrenia subgroup (with the exception of the case referred to Nepean Hospital). This proposal might also be consistent with the older average age of onset of OC symptom in the schizophrenia subgroup (almost double the age of onset for the OCD subgroup) – in other words, the schizophrenia subgroup had been living with their OC symptoms for relatively less time. However, such an explanation is not consistent with studies of OCD cases with early versus late onset OC symptoms (Fontenelle, Mendlowicz, Marques, & Versiani, 2003; Rosario-Campos et al., 2001; Sobin, Blundell, & Karayiorgou, 2000; Tükel et al., 2005). Such studies have not found more severe OC symptoms in those with a later onset of the OC symptoms. It remains possible therefore that some other factor(s) influence the perception of OC symptom severity in the people with schizophrenia and OC symptoms. As Poyurovsky and Koran (2005) suggests schizophrenia patients with OC symptoms have a worse prognosis with complications for treatment. This generally worse prognosis might cause the perceived experience of OC symptoms to be more severe in the people with both diagnoses rather than those with more “pure” obsessions and compulsions (Eisen & Rasmussen, 1993). Overall though, while acknowledging the very small schizophrenia sample, the current findings suggest the possibility that some affected schizophrenia cases with comorbid OC symptoms might benefit from treatment focused on their OC symptoms.

(2) General delusional ideation/magical thinking and cognitive insight

Here we focus on general measures of delusional ideation associated with proneness to psychosis

MATERIALS

Schizophrenia-like Delusional Ideation – Peters' Delusions Inventory (PDI)

Delusional thinking of the kind typically seen in schizophrenia was measured using the 2004 version of the Peters' Delusions Inventory (PDI; Peters, Joseph, Day, & Garety, 2004). This version of the PDI comprises 21 items that probe presence of unusual beliefs (e.g., "Do you ever feel as if your own thoughts were being echoed back to you?" or "Do you ever feel as if there is a mysterious power working for the good of the world?"). For each item, the respondent answers 'yes' or 'no'. If the response is yes, the respondent then rates associated distress, preoccupation and conviction on a 5-point rating scale (1 = indicating 'not at all distressing/ hardly ever think about it/ don't believe it's true' and 5 = 'very distressing/think about it all the time/believe it to be absolutely true'). Separate scores are obtained for a PDI total yes -score (range 0 to 21), and total distress, preoccupation, and conviction scores, all ranging from 0 to 105. A grand total PDI score (summing the three dimension scores and the PDI total yes score) can also be obtained (range 0 to 336).

The PDI has adequate inter-item reliability with a reported Cronbach's alpha = .82; good test-retest reliability of $r = .80$; and confirmed validity using the 2004 version of the Peters' Delusions Inventory (PDI; Peters et al., 2004).

Magical Thinking

Magical Ideation Scale (MIS)

General magical ideation associated with proneness to psychosis was also assessed using the Magical Ideation Scale (MIS; Eckblad & Chapman, 1983). Respondents rate 30 statements about their magical thinking and behaviour as being TRUE or FALSE (e.g., “Things sometimes seem to be in different places when I get home, even though no one has been there.” or “I sometimes have a feeling of gaining or losing energy when certain people look at me or touch me.”). A total score out of 30 is then calculated, after reverse-coding where required. Higher scores indicate more extreme magical thinking.

Reliability has been reported between $\alpha = .81$ and $\alpha = .79$ in a clinical sample with evidence of good construct validity (Eckblad & Chapman, 1983).

Illusory Beliefs Inventory (IBI)

The Illusory Belief Inventory (IBI; Kingdon, Egan, & Rees, 2012) has also been included as a new measure of magical thinking in the general population. Like the MIS, it evaluates the wider concept of magical thinking, however it also assesses characteristics of the specific beliefs, superstitions and thought action fusion that are seen, especially in OCD. Three dimensions are assessed with the inventory: (1) the idea that some events happen due to a magical cause and cannot be explained scientifically (10 items, e.g., “I sometimes perform special rituals for protection”), (2) the belief in a special force or directing nature, a greater power (9 items, e.g., “I believe guardian angels or other spiritual forces protect me”) and (3) the belief that events can be predicted by having special feelings or dreams about it and that thoughts have a certain power (5 items, e.g., “My thoughts alone can alter reality”). All 24 items are self-rated on a 5-point scale from 1 = ‘strongly disagree’ to 5 = ‘strongly agree’

indicating how much the statement describes and reflects the typical reaction or feelings of the participant. In addition to each subscale score, an overall score can be calculated, ranging from 24 to 120, with higher scores reflecting a stronger illusory belief.

Test-retest reliability has been reported to range from $r = .72$ to $.91$ for all subscales of the IBI with a good discriminant validity for all subscales (ranging from $r = .11$ to $.33$) (Shihata, Egan & Rees, 2014).

IBI-Magical Beliefs-Subscale

As well as the IBI total score, the IBI subscale about magical beliefs is of particular interest as the intention of the subscale is to detect a general undermining belief that there is a universal order to everything that can determine actual world outcomes. The IBI magical beliefs subscale thus seems more closely related to magical OC specific thinking and consists of the items stating: “I do something special to prevent bad luck”, “I avoid unlucky numbers”, “Magic causes miracles to happen”, “Magical forces have impacted on my life”, “Most things that happen to us are the result of fate”, “I sometimes perform special rituals for protection”, “It is not possible to cast a magic spell”, “Good luck charms do not work”, “I believe in magic” and “You should never tempt fate”.

Cognitive Insight (BCIS)

Participants’ capacity to self-reflect and accept that one’s beliefs might be mistaken was assessed using Beck’s Cognitive Insight Scale (BCIS; Beck, Baruch, Balter, Steer, & Warman, 2004). The BCIS comprises 15 items rated using a 4-point scale (0 = ‘do not agree at all’, 1 = ‘agree slightly’, 2 = ‘agree a lot’ and 3 = ‘agree completely’, used for the current study), and includes two subscales. The self-reflectiveness (or objectivity) subscale comprises nine items and assesses participants’ reflectiveness and openness to feedback (e.g., “Some of the ideas

I was certain were true turned out to be false.” or “There is often more than one possible explanation for why people act the way they do.”), with scores ranging from 0 to 27. Higher scores are thought to index better introspection and willingness to acknowledge being wrong. The self-certainty subscale comprises six items (e.g., “If something feels right, it means that it is right.” or “I cannot trust other people’s opinion about my experiences.”) and assesses confidence and conviction in one’s own beliefs (e.g., “I know better than anyone else what my problems are.”), with scores ranging from 0 to 18. Higher scores reflect overconfidence in decision-making. An overall score can also be calculated by subtracting the self-certainty score from the self-reflectiveness score (range -18 to 27), with higher scores purported to index better overall insight. However, since previous studies of non-clinical delusional ideation have found that both higher self-reflection and higher self-certainty associate with higher levels of delusional ideation (Carse & Langdon, 2013), the current study did not use this composite score.

Reliability has been reported as Cronbach’s alpha = .68 for the self-reflectiveness subscale and .60 for the self-certainty subscale in a clinical sample (Beck et al., 2004), with similar internal consistencies reported in a nonclinical sample (Warman & Martin, 2006).

RESULTS

Table 2 summarises the results. Markedly significant group differences were revealed for the evaluation of general delusional ideation associated with psychosis-proneness. Overall, the Scz+OC group revealed higher scores, although differences were only significant for the PDI and MIS and not the IBI. Instead only trends were seen for the IBI, which places more emphasis on thinking associated with OC experiences. The Scz+OC subgroup also reported being more self-reflective but not more self-certain on the BCIS.

Table 2

General delusional ideation/magical thinking and cognitive insight associated with psychosis-proneness: mean scores (standard deviations) and group comparisons (t-test results) of OCD cases and Scz+OC cases.

	OCD cases (n = 21) Mean (SD)	Scz+OC cases (n = 8) Mean (SD)	Independent samples t-test results (assuming non-equal variance where appropriate - Levene's test)
PDI Total	6.58 (7.74)	17.17 (4.40)	t(23)=3.16, p=.004*
MIS	6.16 (4.35)	13.83 (6.37)	t(23)=3.37, p=.003*
IBI Total	62.33 (19.37)	77.17 (8.57)	t(22)=1.80, p=.086
IBI Magical Beliefs	22.72 (8.53)	29.66 (6.19)	t(22)=1.83, p=.081
BCI self-reflectiveness	20.79 (3.34)	25.17 (2.79)	t(23)=2.89, p=.008*
BCI self-certainty	13.00 (3.40)	14.00 (4.77)	t(23)=0.57, p=.574

* p < .05

DISCUSSION

Assessment of general delusional ideation/magical thinking associated with psychosis-proneness revealed results that were generally expected based on earlier research findings (Eckblad & Chapman, 1983; George & Neufeld, 1987). Consistent with some related research on delusion-proneness and schizophrenia (Boyette, Swets, Meijer, Wouters, & Group, 2011; Buckley, Miller, Lehrer, & Castle, 2009; Cunill, Castells, & Simeon, 2009; Garety et al., 2005; Garety & Hemsley, 2013; George & Neufeld, 1987; Langdon & Coltheart, 1999; Langdon, Ward, & Coltheart, 2010; Moritz & Woodward, 2005, 2007), delusional and magical thinking was shown to be noticeably more marked in the schizophrenia patients. Although there were no significant group differences found for magical ideation as assessed using the IBI, this may be because the IBI focuses more on the sort of magical thinking that predisposes to OC symptoms and both groups had OC symptoms. While general self-certainty assessed using the BCIS did not differ between groups, the schizophrenia group scored higher on BCIS self-reflection. Carse and Langdon (2013) have found that the BCIS self-reflectiveness score associates with rumination. If so, the schizophrenia group may have been ruminating more on their thoughts and experiences, which may be consistent with their higher OCI distress ratings.

(3) General thought processes associated with OC symptoms

MATERIALS

Thought Action Fusion

Previous research has suggested that thought action fusion is seen in patients when intrusive thoughts are interpreted as having a specific significance. In other words, the simple thought of an event makes it more probable to happen and the thought itself is experienced as being as bad as the actual event itself.

Thought Action Fusion Scale (TAF Scale)

This phenomenon was assessed using the Thought Action Fusion Scale (TAF-Scale; Shafran, Thordarson, & Rachman, 1996). The revised TAF Scale used here contains 19 items, measuring thought action fusion on 12 "Moral" items (e.g., "Thinking about swearing at someone else is almost as unacceptable to me as actually swearing."), 4 items for "Likelihood-for-Others" (e.g., "If I think of a relative/friend falling ill this increases the risk that he/she will fall ill.") and 3 items for "Likelihood-for-Self" (e.g., "If I think of myself being injured in a fall, this increases the risk that I will have a fall and be injured."). Participants rate each item on a scale from 0 = 'disagree strongly' to 4 = 'agree strongly' (Shafran et al., 1996). The overall score ranges from 0 to 76 with greater scores demonstrating stronger cognitive thinking biases.

A satisfactory internal reliability has been reported by Rassin, Merckelbach, Muris, and Schmidt (2001) with Cronbach's alphas ranging above .75 for the total scale and subscales. The same group further confirmed the construct validity of the scale (Rassin, Merckelbach, et al., 2001).

IBI- Internal state and thought action (IBI)

The IBI subscale of “Internal state and thought action” is also relevant to this construct and uses the following statements to be self-rated: “If I think too much about something it will happen.” “If I think too much about something bad, it will happen.” “My thoughts alone can alter reality.” “Sometimes I get a feeling that something is going to happen, before it happens” and “I have sometimes changed my plans because I had a bad feeling”.

Metacognitive biases

Metacognition Questionnaire (MCQ-30)

Aspects of metacognition, as conceived by Wells, were assessed using a short form of the Metacognition Questionnaire-30 (Wells & Cartwright-Hatton, 2004). The MCQ-30 was developed to assess the control and modification of one’s own thinking in relation to psychological disorder (Cartwright-Hatton & Wells, 1997). Participants rate their level of agreement on a 4-point scale (1 = ‘do not agree’, 2 = ‘agree slightly’, 3 = ‘agree moderately’ and 4 = ‘agree very much’) for 30 statements comprising six statements for each of five subscales: Cognitive confidence (e.g., “My memory can mislead me at times.”), Positive beliefs (e.g., “Worrying helps me to avoid problems in the future.”), Cognitive self-consciousness (e.g., “I am constantly aware of my thinking.”), Uncontrollability and danger (e.g., “My worrying could make me go mad”) and Need to control thoughts (e.g., “It is bad to think certain thoughts.”). Higher scores on Cognitive confidence indicate lack of confidence in one’s own memory ability and attention, while high scores on Positive beliefs indicate belief in the value of worrying thoughts. Scoring high on Cognitive self-consciousness indicates paying undue attention to one’s own thought processes. Finally, high scores on Uncontrollability and danger and Need to control thoughts indicate negative beliefs about worrying thoughts and not being able to control thoughts and their consequences.

Scores for each subscale are totalled (range from 6 to 24). Subsequently a total MCQ-30 score across the five dimensions is summed (range from 30 to 120) to give a global picture of participants' thinking about their thinking, with higher scores indicating generally more maladaptive metacognitive thinking.

Reliability has been reported as Cronbach's alpha = .93 for Cognitive confidence, = .92 for Positive beliefs alpha, = .92 for Cognitive self-consciousness, = .91 for Uncontrollability and danger, = .72 for Need to control thoughts, with an overall MCQ-30 Cronbach's alpha = .93 in a healthy sample (Wells & Cartwright-Hatton, 2004). The convergent validity of the MCQ-30 items is also supported (Wells & Cartwright-Hatton, 2004).

RESULTS

Table 3 summarises results (see also Appendix 1 for the individual results of all participants). While thought action fusion as assessed using the TAF did not differ between the two subgroups with OC symptoms, the IBI Internal State and Thought Action subscale did differ with scores being higher in the Scz+OC subgroup. Finally, group comparisons did not reveal any differences in metacognitive biases between the two subgroups with OC symptoms.

Table 3

Data on thought processes associated with OC symptoms (TAF, IBI internal state & thought action, MCQ30): mean-scores (standard deviations: SDs) and group comparisons (t-test results) of OCD cases and Scz+OC cases.

	OCD cases (n = 21) Mean (SD)	Scz+OC cases (n = 8) Mean (SD)	Independent samples t-test results (assuming non-equal variance where appropriate - Levene's test)
TAF	21.74 (12.58)	27.33 (18.27)	t(23)=0.85, p=.403
IBI Internal State & Thought Action	10.72 (5.45)	15.67 (3.14)	t(22)=2.09, p=.049*
MCQ30	65.74 (24.23)	79.33 (16.13)	t(23)=1.28, p=.214
MCQ Cognitive Confidence	12.42 (6.34)	13.33 (3.83)	t(23)=0.33, p=.744
MCQ Positive Beliefs	11.58 (5.06)	14.33 (2.94)	t(23)=1.26, p=.222
MCQ Cognitive Self-consciousness	15.42 (5.39)	17.83 (4.71)	t(23)=0.98, p=.337
MCQ Uncontrollability & Danger	14.16 (6.30)	17.83 (4.07)	t(23)=1.33, p=.196
MCQ Need to control Thoughts	12.16 (5.11)	16.00 (5.06)	t(23)=1.61, p=.121

* p < .05

DISCUSSION

Thus far, while the schizophrenia subgroup had reported more delusional ideation associated with psychosis-proneness, as discussed in the previous section, the two subgroups, both of which had OC symptoms, did not differ markedly on the measures of negative thinking as named and assessed using the TAF scale associated with OC symptoms. In more detail, the scores for thought action fusion (TAF), found to be often prominent in people with OC symptoms (Rachman & Shafran, 1999; Shafran & Rachman, 2004; Shafran et al., 1996) did not differ between the subgroups. There was, however, more of a difference for the IBI Internal state and thought action subscale, with the schizophrenia subgroup showing higher scores. This may be because this IBI subscale taps more of a mix of thought action fusion and magical thinking generally found in psychosis-prone populations. There were no group differences for metacognitive biases. Overall, findings are in general accordance with related previous research (Abramowitz, Whiteside, Lynam, & Kalsy, 2003; Muris & Merckelbach, 2003) and shows that neither thought action fusion nor metacognitive biases distinguished between the OC participants with and without diagnosis of schizophrenia.

(4) Insight and facets of belief related specifically to OC symptoms

MATERIALS

Y-BOCS Insight (Y-BOCS Item 11)

The Y-BOCS insight item was of particular interest to evaluate participants' insight into the occurrence of OC symptoms as being due to a disorder. Participants were asked: "Do you think your concerns or behaviours are reasonable? [Pause] What do you think would happen if you did not perform the compulsion(s)? Are you convinced something would really happen?..." (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b). Again, the interviewer rates participants' insight on a 5-point Likert scale (0 = 'excellent insight, fully rational', 1 = 'good insight. Readily acknowledges absurdity or excessiveness of thoughts or behaviours but does not seem completely convinced that there isn't something besides anxiety to be concerned about (i.e., has lingering doubts).', 2 = 'fair insight'. Reluctantly admits thoughts or behaviour seem unreasonable or excessive, but wavers. May have some unrealistic fears, but no fixed convictions.', 3 = 'poor insight. Maintains that thoughts or behaviours are not unreasonable or excessive, but acknowledges validity of contrary evidence (i.e. overvalued ideas present).', 4 = 'lacks insight, delusional. Definitely convinced that concerns and behaviour are reasonable, unresponsive to contrary evidence').

Brown Assessment of Belief Scale (BABS)

The Brown Assessment of Beliefs Scale (Eisen et al., 1998) is used to assess beliefs and related facets of insight, including the degree of belief conviction and delusionality, as seen in a range of psychiatric disorders, according to the interviewee's beliefs during the past week. The semi-structured scale was developed to evaluate the particular belief a patient

reports as causing most distress (in this case, the primary belief currently associated with the participant's OC symptoms) on 7 items each rated on a 5-point Likert scale (generally ranging from 0 = 'non-delusional or least severe' to 4 = 'delusional or most severe'). A total score combines the ratings of the first 6 items (for "Conviction", "Perception of others' views", "Explanation of differing views", "Fixity of ideas", "Attempt to disprove beliefs" and "Insight") and ranges between 0 and 24. An additional item "ideas/delusions of reference" complements the global picture of the interviewee's BABS overall insight score.

Cronbach's alpha has been reported as .83 and the BABS shows good inter-item reliability as well as good to excellent inter-rater reliability. Test-retest reliability varies from .79 to .98 (median = .95). Good validity was established through high correlation with measures of delusional ideation and low correlation with general measures of symptom severity (Eisen et al., 1998).

For the purposes of this study, participants nominated the OC related belief that was causing the most current distress (see Paper 3 for more detail). We were primarily interested in the BABS total score, the BABS conviction and insight rating (see below).

BABS Conviction (Item 1)

This item requires the interviewee to answer "How convinced are you of these ideas/beliefs? Are you certain your ideas/beliefs are accurate? (What do you base your certainty on?" and the interviewer rates the respondent's conviction on a 5-point Likert scale (0 = 'completely convinced beliefs are false', 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') (Eisen et al., 1998).

BABS Insight (Item 6)

The BABS insight item – item 6 - is also of particular relevance to this study. The interviewees here are required to give information about the associated reason for their beliefs: “What do you think has caused you to have these beliefs?” and “Do they have a psychiatric (or psychological) cause, or are they actually true?”. The interviewee’s insight is again rated by the interviewer on a 5-point Likert scale (from 0 = ‘beliefs definitely have a psychiatric/ psychological cause’ to 4 = ‘beliefs definitely do not have a psychiatric/ psychological cause’) (Eisen et al., 1998).

Overvalued Ideas Scale (OVIS)

The Overvalued Ideas Scale (OVIS; Neziroglu, McKay, Yaryura-Tobias, Stevens, & Todaro, 1999) was also used to probe delusional facets of the OC related belief. The OVIS was developed to examine different domains of thought processes associated with belief stability for up to three separate beliefs. The 10-item scale assesses interviewees’ strength of beliefs, reasonableness and accuracy of their beliefs as well as asking about the perspective of others, attribution of others’ thoughts, effectiveness of compulsion, insight into a disorder causing the belief, and strength of resistance. The features that are assessed include: bizarreness of belief, belief accuracy, belief persistence (fixity), effectiveness of compulsions, reasonableness, pervasiveness of belief, reasons that others do not share the belief and two items evaluating the stability of the belief. Each item is rated on a 10-point scale, with 1 being the lowest rating and 10 the strongest. Combining the 10 ratings, a total score from 0 to 10 is calculated. An additional 11th item assessed the duration of the belief but is not included in the overall score.

Psychometric properties of the OVIS were established as good with a test-retest reliability of $r = 0.93$ overall and confirmed medium to large convergent validity (Neziroglu et al., 1999).

Again, participants nominated the OC related belief that was causing the most current distress (see Paper 3 for more detail) and the OVIS total score, OVIS strength of belief and insight ratings (see below) were reported.

Overvalued Ideas Scale (OVIS) Strength of belief (1)

Item 1 is of particular interest since it assesses the strength of a belief (or conviction). Interviewees are asked: “How strongly do you believe that [*belief*] is true? How certain/convinced are you this belief is true?” and “Can your belief be “shaken” if it is challenged by you or someone else?”. The interviewer then rates the interviewees conviction using a 10-point scale, ranging from 1 = ‘belief is very weak’ to 5 = ‘belief is weaker than stronger’ to 10 = ‘belief is very strong’.

Overvalued Ideas Scale (OVIS) Insight (9)

Item 9 is also of relevance and is evaluated according to the questions: “To what extent do you think that your disorder has caused you to have this belief?; How probable is it that your beliefs are due to psychological or psychiatric reasons?”; and “Do you think that your belief is due to a disorder?” This item is also rated by the interviewer on a 10-point scale ranging from 1 = ‘totally probable’ to 5 = ‘more probable than improbable’ to 10 = ‘totally improbable’.

Nepean Belief Scale (NBS)

The Nepean Belief Scale (NBS; Brakoulis, 2012) was developed to evaluate specific OC related beliefs on six dimensions: conviction, fixity, fluctuation, resistance, awareness of unreasonableness of the belief, and attribution to an illness or disorder. All items are rated by the interviewer on a 5-point scale (e.g., 1 = ‘not at all’ to 5 = ‘definitely’) and summed for a total score. The higher the total the more extreme is the belief. The NBS’s psychometric properties are still to be fully tested and initial findings show a better application when

reducing the NBS to 5 instead of 6 items, with the last (“insight”) item removed (Brakoulis & Starcevic, 2011). The latest revised version thus assesses the OC-related belief on 5 items. Due to the focus on insight in the present study, the original 6-item NBS was administered. Here too, participants nominated the OC related belief that was causing the most current distress (see Paper 3 for more detail) and the NBS total score, the NBS conviction as well as the insight rating (see below) were reported.

Nepean Belief Scale (NBS) Conviction (1)

Item 1 assesses belief conviction and is of particular relevance. It is assessed by asking the interviewee to report “How much do you think that your belief is true?” with responses scored by the interviewer on a 5-point Likert Scale (1 = ‘not true at all’, 2 = ‘probably not true’, 3 = ‘is possible, but remains uncertain/unsure’, 4 = ‘probably true’ and 5 = ‘definitely true’).

Nepean Belief Scale (NBS) Insight (6)

Given the focus of the current study, the Insight Item of the NBS was not omitted, as noted above. For this item, the interviewer asks: “Do you think that your belief may be due to an illness, disorder or psychological cause?” and responses are rated using a 5-point Likert scale: 1 = ‘yes: completely certain about this’, 2 = ‘thinks it likely’, 3 = ‘is uncertain/unsure’, 4 = ‘thinks it unlikely’ and 5 = ‘no: completely unconvinced (does not think that is the case)’.

Maudsley Assessment of Delusions Schedule (MADS)

The OC related belief and other related delusional experiences were also assessed using the Maudsley Assessment of Delusions Schedule (MADS; Buchanan et al., 1993). Respondents are asked to express their beliefs and contextual mental state in a semi-structured interview probing seven dimensions: conviction of the belief (“How sure are you about X” rated from 0 = ‘doubt it’ to 4 = ‘absolutely certain’), belief maintenance factors (e.g., “When you think

about it now is it at all possible that you are mistaken about X?” rated as ‘yes’, ‘no’ or ‘don’t know’), affect relating to chosen belief (e.g., “How does the belief make you feel? Anxious?, ...” rated ‘yes’ or ‘no’), behavioural reaction (e.g., “Have you tried to stop X happening?” rated ‘no’, ‘occasionally’, ‘often’ or ‘N/A’), preoccupation and systematisation rated on a scale from 0 = ‘none’ to 4 = ‘all’) and insight into the unreasonableness of the belief (e.g., “How far do you think others share your belief?” rated from 0 to 2) (Buchanan et al., 1993). Originally the interview was developed to systematically evaluate the multifaceted nature of thinking, feeling and action related to delusions over time (Taylor et al., 1994).

Psychometric results have revealed a good reliability with a generalised kappa from 0.65 to 1.00 and a satisfactory inter-rater reliability of between a weighted kappa coefficient of 0.40 and 1.00. Validity has also been supported (Wessely et al., 1993).

RESULTS

First we note that the MADS proved difficult to apply to the primary OC related belief in the same way that the other instruments were used. This was because OC beliefs were closely related to reactive compulsive behaviours, which are, in themselves, not of an unusual nature, albeit that they are performed excessively. Being asked to focus on the OC belief and not consider the compulsive associated behaviour, as directed by the probes on the MADS, appeared to be confusing for participants. Since participants’ information from the MADS was therefore suspected to be unreliable, no MADS results are reported. However, all other results are summarised below in Table 4.

While Table 4 summarises group results, Appendix 1 provides full details of individuals’ results. With a higher mean score on the Y-BOCS insight item for the subgroup of schizophrenia patients compared to the OCD subgroup, insight into the reason for the

occurrence of OC symptoms being a disorder was worse, on average, in the schizophrenia patients. Similarly, the subgroups also differed for some ratings of the main belief associated with OC symptoms on the OVIS, BABS and NBS, although only showing a significant difference for the BABS total score and the strength of belief and conviction ratings on the OVIS and NBS, respectively.

Table 4

Data for measures of insight and facets of belief associated specifically with OC symptoms: mean scores (standard deviations) and group comparisons (t-test results) of OCD cases and Scz+OC cases.

	OCD cases (n = 21) Mean (SD)	Scz+OC cases (n = 8) Mean (SD)	Independent samples t-test results (assuming non-equal variance where appropriate - Levene's test)
Y-BOCS Insight	1.10 (0.89)	2.88 (0.99)	t(11.57)=-4.44, p=.001*
BABS			
Total	7.76 (4.94)	12.38 (5.81)	t(27)=2.15, p=.041*
Conviction	1.95 (1.69)	3.00 (1.07)	t(20.22)=-1.99, p=.061
Insight	1.38 (1.20)	2.38 (1.85)	t(9.36)=1.41, p=.190
OVIS			
Total	4.82 (1.61)	6.15 (1.63)	t(27)=1.98 p=.058
Strength of belief	6.02 (2.88)	8.50 (1.20)	t(27)=-2.33, p=.027*
Insight	3.48 (2.54)	3.63 (3.38)	t(27)=0.13, p=.899
NBS			
Total	14.52 (6.40)	18.38 (7.09)	t(27)=1.53, p=.138
Conviction	2.62 (1.53)	3.88 (1.25)	t(27)=-2.07, p=.049*
Insight	1.95 (1.12)	2.00 (1.07)	t(27)=0.10, p=.918

* p < .05

Although the above group results revealed differences and trends with regard to the measures of delusional thinking and insight associated specifically with OC symptoms, similar to the patterns seen for the general delusional thinking measures, there was considerable overlap of scores between the two subgroups (see Appendix 1). For example, three of the Scz+OC cases and five of the OCD cases had BABS item 1 scores of “4” and six of the Scz+OC cases and nine of the OCD cases had BABS total scores of “10” or more.

DISCUSSION

Of special interest here was participants' insight into their OC symptoms and OC-related belief. In general, schizophrenia patients were less insightful regarding the possibility that their OC symptoms may be caused by a disorder than participants without schizophrenia. This finding is at odds with some previous research. In particular, good to excellent insight into the fact that OC symptoms are caused by a disorder has been shown previously, not only in OCD patients (Markova, Jaafari, & Berrios, 2009), but also in "schizo-obsessive" patients (Faragian et al., 2008). On the other hand, other studies have found that schizophrenia patients show generally higher (delusional) conviction than OCD and control groups (Jacobsen et al., 2012).

Overall, these findings of group differences between the two subgroups with regard to insight and conviction related to the OC symptoms is consistent with the traditional conception of obsessive thoughts in OCD being generally more insightful than delusional thinking in psychotic mental illness. However, there was also substantial individual variability and overlap between the two subgroups on the scores associated with delusional thinking about the specific OC related beliefs, indicating that some of the OCD cases showed indications of delusional thinking about their OC symptoms similar to that seen in the schizophrenia subgroup.

GENERAL DISCUSSION

It was the aim of the current study to investigate common or distinguishing features of beliefs in people with OC symptoms, with or without an additional schizophrenia diagnosis.

Firstly, we expected some differences in demographic and clinical data. Results showed that the two groups were of a similar age on average, and no differences were found for gender ratio. Overall, education levels were higher in the OCD participants, however. Most of the OCD group also mentioned multiple disorders, while only half of the schizophrenia group mentioned additional diagnoses. OC symptoms in the schizophrenia group occurred many years after being diagnosed with either schizophrenia or a schizoaffective disorder, on average, resulting in a markedly higher mean age of onset of OC symptoms.

With regard to the severity of OC symptoms, previous studies have not found more severe OC symptoms in those with a later onset of the OC symptoms (Fontenelle et al., 2003; Rosario-Campos et al., 2001; Sobin et al., 2000; Tükel et al., 2005). However, our pattern of results differed. That is, OC symptom severity was found to be lower in the OCD subgroup without schizophrenia, who had a younger age of onset of OC symptoms, than the schizophrenia subgroup when distress was self-rated on the OCI. However, severity of OC symptoms was also clinician rated on the Y-BOCS and, in this case, both subgroups were rated with equal severity of OC symptoms. Since self-reported OC symptoms were rated as more distressing by the schizophrenia patients than OCD patients, this might indicate that the schizophrenia patients were less “used to” their OC symptoms than the OCD patients and had not “learned to live with” their OC symptoms as well. This possibility is also consistent with the older average age of onset of OC symptom in those schizophrenia patients. Another tentative implication might be that OC symptoms in these schizophrenia cases with comorbid OC symptoms were a relatively unmet treatment need, as compared to

the OCD cases, since their psychotic symptoms would have likely been the primary focus of their treatment. While speculative, this is important to consider since it has been proposed that the presence of OC symptoms in schizophrenia patients complicates treatment and indicates an overall worse prognosis, as proposed by Poyurovsky and Koran (2005).

With regard to levels of general delusional ideation and poor cognitive insight which previous research has found to be associated with psychosis (see e.g., Boyette et al., 2011; Buckley et al., 2009; Cunill et al., 2009; Garety et al., 2005; Garety & Hemsley, 2013; George & Neufeld, 1987; Langdon & Coltheart, 1999; Langdon et al., 2010; Moritz & Woodward, 2005, 2007), general delusional ideation and magical thinking that was not specifically associated with OC beliefs was shown to be noticeably more marked in the schizophrenia patients.

In contrast, the two groups did not differ markedly on the measures of negative thinking (e.g., thought action fusion as rated on the TAF) and metacognitive biases, which previous research had found to be prominent in people with OC symptoms (see, e.g. Abramowitz et al., 2003; Muris & Merckelbach, 2003).

In sum, while there were group differences for measures of general delusional ideation, neither thought action fusion nor metacognitive biases distinguished between the OC participants with and without diagnosis of Schizophrenia.

Focusing now on participants' insight into their OC symptoms and OC related beliefs, which was of particular interest in this study, our findings revealed that the schizophrenia patients with OC symptoms were generally less insightful that their OC symptoms (i.e., concerns and behaviours including compulsions) may be caused by a disorder, than the OCD participants without schizophrenia. This is inconsistent with some previous research, which found good to excellent insight in "schizo-obsessive" patients (Faragian et al., 2008; Markova et al.,

2009). However, the reason for this difference from previous studies may be the different means of assessing insight across studies. Notably, in this study, for those scales that focused on assessing insight and delusion-like thinking associated specifically with the OC beliefs (and not addressing behaviours or compulsions), significant group differences were not found. Consideration of conviction in OC beliefs, did however reveal significant group differences as schizophrenia patients were more convinced that their OC belief was true and reasonable compared to the OCD participants without schizophrenia. This finding is perhaps not so surprising, since a higher (delusional) conviction regarding a range of delusional ideas, as assessed by the PDI and MIS, in the schizophrenia patients would also likely associate with the specific OC related beliefs (see for example by Jacobsen et al. (2012)).

Prior to concluding comments, limitations of the study must be acknowledged. One main limitation is the small and unequal numbers in the subgroups. The small number of eight participants in the schizophrenia subgroup is of particular note. Hence, results might not be representative for a general schizophrenia and comorbid OC symptoms sample. Accordingly, future research with larger and different samples is needed to replicate the patterns of results reported here.

In conclusion, while group results are generally consistent with the traditional conception of obsessive thoughts in OCD as being insightful as compared to delusional as seen in the delusional thinking that characterises schizophrenia; there was substantial individual variability and overlap between the two subgroups on the scores regarding the specific OC related beliefs. In contrast, the group differences were marked and highly significant with regard to the measures of general delusional ideation and magical thinking associated with psychosis. Hence, given this substantial overlap between the OCD cases and the

schizophrenia cases with regard to individuals' ratings for facets of the primary OC related belief, it is suggested that a symptom-focused transdiagnostic approach to investigating the underlying factors that contribute to delusion-like thinking associated with OC symptoms is warranted.

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PAPER 5

**Is unwarranted conviction in beliefs about
obsessive-compulsive symptoms underpinned by the same
processes that contribute to delusions in psychosis?**

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Abstract

Introduction: Despite traditional cases of obsessive-compulsive disorder (OCD) being conceived as insightful, previous research has reported unusual OCD cases where patients report bizarre, delusion-like obsessional thoughts and do not consider their ideas to be unreasonable. Strong conviction in an implausible obsessive-compulsive (OC) belief is proposed to identify 'delusional' OC cases. Yet, little is known about whether such cases with high conviction also show abnormal performances on the probabilistic reasoning, Theory of Mind and attributional style tasks that have revealed impairments in delusional people with schizophrenia.

Method: 29 participants with diagnosable OC symptoms according to the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) and the Obsessive Compulsive Inventory (OCI) were divided according to their conviction score on the Brown Assessment of Belief Scale (BABS) into a low conviction group (N = 21 with BABS score < 4) and a high conviction group (N = 8 with BABS conviction score = 4). Groups were compared first for IQ and neuropsychological function and then on the measures of probabilistic reasoning (using the "Beads" task), Theory of Mind and attributional biases. The between-group comparison were followed by correlational analyses to examine relations between task measures and participants' insight and conviction concerning their primary OC belief, assessed using the Overvalued Idea Scale (OVIS), the BABS, and the Nepean Belief Scale (NBS).

Results: The groups did not differ in severity of OC symptoms, IQ or neuropsychological function and no group differences in probabilistic reasoning, Theory of Mind or attributional measures were found. The correlational analyses also failed to reveal any significant

relations between task measures and the clinical ratings despite that the task measures intercorrelated as would be expected from previous schizophrenia research. There were some indications of differences between the OC sample, as a whole, and normative data.

Conclusion: Findings were consistently null with regard to any relations between task measures associated with delusional thinking in psychosis and conviction/insight ratings of participants' primary OC belief. Implications are discussed with regard to questions about how best to identify and quantify delusion-like thinking in people with OC symptoms. Understanding whether other factors associated with the underlying OC belief (i.e., not just conviction) may be an important step forward.

INTRODUCTION

The nature of obsessive-compulsive disorder (OCD) is heterogeneous with a range of obsessions and compulsions concerning diverse worries and themes being reported. The disorder is also heterogeneous with regard to the level of insight into the unreasonableness of one's obsessive thoughts and compulsive actions. Indeed, aside from those well-known traditional cases of OCD where the patients are typically insightful about their obsessive-compulsive (OC) symptoms, several unusual, severe OCD cases have been reported (Jaafari et al., 2011; Jakubovski et al., 2011). In such cases, the patients present bizarre, delusion-like obsessional thoughts and do not consider their ideas to be unreasonable. Instead, these cases experience their OC thoughts as warranted and reasonable and their associated compulsive reactions as being justified (i.e., to prevent feared future consequences) (Stanley, Turner, & Borden, 1990). For example, O'Dwyer and Marks (2000) described a case of a woman who believed that an external supernatural power was responsible for the insertion of thoughts into her mind. These thoughts compelled her to engage in ritualistic counting, hand-washing and checking. She admitted that it was excessive to perform these rituals and presented with some degree of insight into the bizarreness of her beliefs by acknowledging that her rituals might not actually prevent any harm to her family and friends. However, she was convinced that a supernatural power put these thoughts into her mind and that she had to obey. Thus, while typical OCD patients will generally recognise their OC related thoughts to be unreasonable and caused by a disorder (OCD), some extreme and unusual cases appear delusional, although showing a degree of insight into their condition, with regard to the implausibility of the content of their OC related belief(s).

The apparent existence of delusion-like thinking in some OCD cases (at least with regard to unwarranted conviction as seen in the above example) raises questions about whether the same underlying factors that contribute to delusions in psychotic mental illnesses also underpin the delusion-like thinking that is sometimes associated with OC symptoms (see e.g., Jacobsen, Freeman, and Salkovskis (2012); Poyurovsky et al. (2007)). Research into the factors that contribute to delusions in psychotic mental illnesses, such as schizophrenia, has considered the role of abnormal reasoning processes such as a “jumping to conclusion” bias, “Theory of Mind” difficulties and attributional biases (Bell, Halligan, & Ellis, 2006). The main aim of this study is to compare these task measures in delusional and non-delusional cases with OC symptoms.

Reasoning processes have been found to be significantly different in delusional and non-delusional persons with psychotic illness, as substantial research on probabilistic reasoning in schizophrenia patients confirms (Garety et al., 2005; Garety & Hemsley, 2013; Garety, Hemsley, & Wessely, 1991; Jacobsen et al., 2012; Langdon, Ward, & Coltheart, 2010). According to investigations of reasoning biases using the so called “jumping to conclusions” (JTC) probabilistic reasoning tasks, the most common of which is the “Beads” task in which participants must decide from which of two jars a sequence of beads is being drawn (Phillips & Edwards, 1966), people with delusions tend to collect less evidence before coming to a decision. In more detail, evidence shows that people with delusions decide after fewer draws on the classic “decide” version of the “Beads” task. Somewhat surprisingly, on another “estimate” version of the “Beads” task, delusional people have also been found to shift their estimates of which jar the beads are coming from far more dramatically when there is a change in the evidence being presented, compared to non-delusional people (Langdon, Ward, & Coltheart, 2010). This suggests that delusional people focus more on the

immediate perceived evidence rather than the build-up on previous evidence (see e.g., Garety et al., 2005; Griffiths, Langdon, Le Pelley, & Coltheart, 2014; Langdon et al., 2010). Based on this line of evidence, JTC tasks (in particular, the “Beads” task) are thought to be particularly useful when investigating the presence of delusional thinking processes.

It is therefore somewhat surprising that, when Jacobsen et al. (2012) used the Bead task when comparing OC cases with and without delusional thinking, they found that their two groups did not differ in draws to decision (or JTC) on the “Beads” task. However, there are some limitations to this study. First, this study only used the decide version of the “Beads” task and did not also include the estimate version. Another consideration is that this study reported that the delusional group was identified as those cases currently experiencing delusions with $\geq 50\%$ belief conviction about the feared consequence of not ritualising, as rated during the Structural Clinical Interview (SCID-I). This approach differs from the recommendations of researchers such as Poyurovsky et al. (2007), who suggest that a more precise marker of the presence of delusional thinking is a score of ‘4’ for conviction about the primary OC belief on the BABS, which is the most extreme score for this scale. The current study followed Poyurovsky et al.’s (2007) recommendations.

Much is also known about the impairment of another facet of reasoning – that is, thinking about other people’s mental perspectives to understand their behaviour (or “Theory of Mind”: ToM) – in delusional people, particularly in schizophrenia (see e.g., Langdon et al., 2010a). Indeed, there is pervasive evidence of ToM impairment in schizophrenia across a range of ‘first-order’ and ‘second-order’ ToM tasks (Mazza, De Risio, Surian, Roncone, & Casacchia, 2001) and Langdon and colleagues (Langdon et al., 2010) found that such ToM impairment correlated with abnormal performances on the Beads probabilistic reasoning task and measures of delusion-proneness in their schizophrenia sample. Related research on

ToM in OCD has reported that basic ToM abilities may be intact in people with OCD while only more advanced ToM abilities may be impaired to some degree (Sayin, Oral, Utku, Baysak, & Candansayar, 2010). Whether ToM abilities are more impaired in people with OC symptoms who present with delusion-like thinking about their intrusive obsessive thoughts remains unknown however, and will be examined in this study.

One other type of reasoning anomaly that has also been examined extensively in delusional people with psychosis involves attributional style (Langdon, 2010; Randjbar, Veckenstedt, Vitzthum, Hottenrott, & Moritz, 2011). In more detail, delusional schizophrenia patients, in particular, those with persecutory delusions, show an externalising bias (i.e., a self-serving tendency to externalise blame for negative events compared to positive events) and a personalising bias (a tendency to blame other people rather than circumstances for negative events attributed to an external cause). Little research to date has examined whether these biases associate with delusion-like thinking about OC symptoms and the nature of OCD casts some doubt on this possibility. This is because OCD patients seem more likely to attribute the cause of all events, whether negative or positive, to themselves, rather than attributing the cause to circumstances. Research on thought suppression and attributional style in OCD (Magee & Teachman, 2007) has reported that non-clinical adults with high levels of OC symptoms, well above the threshold for clinical diagnosis, make more self-blaming attributions compared to those with low levels of OC symptoms. Indeed Fear, Sharp, and Healy (2000) found this same internalising attributional style in OCD patients with delusions and without delusions. This internalising style differs markedly from the attributional style seen in paranoid delusional schizophrenic patients, who show the opposite (externalising) pattern. However, Fear et al.'s (2000) findings also showed more stability for the causal attributions of OCD patients with delusions than those without delusions. In the current

study, we focused on measures of externalising and personalising bias, since normative data exists for these measures. Based on Fear et al.'s (2000) findings we did not expect any differences between delusional and non-delusional cases with OC symptoms on measures of externalising bias. However, in contrast to the approach of Fear et al. (2000), we used the Internal Personal and Situational Attributions Questionnaire (IPSAQ; Kinderman & Bentall, 1996), rather than the Attributional Style Questionnaire (ASQ; Peterson et al., 1982), which allowed us to also examine levels of personalising bias as well as externalising bias. This is because the ASQ is not constructed to measure personalising bias as the IPSAQ is. Whether or not there might be a difference in levels of personalising bias between delusional and non-delusional cases with OC symptoms is unknown.

Against this background, the aim of this study was to examine whether the same factors that associate with delusions in psychotic mental illness also associate with bizarre delusion-like thinking about OC symptoms. In accord with the recommendations of Poyurovsky et al. (2007) we initially used conviction in the primary OC related belief (in particular as rated using the BABS) as the index of presence or absence of delusion-like thinking related to OC symptoms. We therefore initially compared people with OC symptoms with a BABS conviction score of '4' for their primary OC related belief to those with lower BABS conviction levels on reasoning tasks, similar to those reviewed above. Based on the studies reviewed above, it is hypothesised that, if unwarranted conviction in OC related beliefs (as indexed by the BABS conviction item) indexes delusional thinking similar to that seen in delusional psychotic patients, a 'high conviction' OC group will perform significantly differently to a 'low conviction' group on tasks assessing probabilistic reasoning and Theory of Mind. In particular, we expect more extreme performances on probabilistic reasoning tasks (in particular, evidence of jumping to conclusions and being swayed more by

immediate evidence rather than prior experience) and poorer Theory of Mind ability, and in a 'high conviction' OC group. We have no strong hypotheses concerning group differences in attributional bias measures.

However, questions remain about whether unreasonable conviction in an unjustified belief (as seen in delusions in schizophrenia) or poor insight, as typically focused upon when considering the presence of bizarre magical ideas in OCD, is the best indicator of delusion-like thinking in OCD (Jacobsen et al., 2012; Markova, Jaafari, & Berrios, 2009). That is why we also used correlational analyses to examine relations between performances on tasks assessing probabilistic reasoning, Theory of Mind and attributional biases and various ratings of belief conviction, strength of belief and insight.

METHOD

Participants

The same 29 participants with OC symptoms, who were reported in Paper 4, took part in this study. There were 21 patients, 14 females and 7 males, with a primary diagnosis of OCD who were referred from the Nepean Hospital, or recruited via word-of-mouth or advertisement from OCD support groups in New South Wales. There were also 8 cases with a primary diagnosis of schizophrenia or schizoaffective disorder, either confirmed according to the records for the Diagnostic Interview for Psychosis (DIP; Castle et al., 2006) on the Macquarie Belief Formation Register or via the treating psychiatrist. These cases had either spontaneously reported their OC experiences, were observed to engage in obsessive-compulsive behaviour during clinical interviews for previous schizophrenia studies or had been referred for assessment to Nepean Hospital. This schizophrenia subgroup consisted of 3 females and 5 males. As reported in Paper 4, all participants met criteria for a diagnosis of

OCD and the severity of OC symptoms, as assessed by a clinician, did not differ between the OCD and the schizophrenia subgroups.

All participants had a minimum age of 16 years and an English-speaking background had to be confirmed prior to participation in the study, although English did not need to be the first language. Ethics approval was granted from Concord Repatriation Hospital (CH62/6/2012-081) (see Appendix 4) and Macquarie University (5201200243) (see Appendix 5).

General Procedure

As reported in detail in Paper 4, all of these participants had been interviewed using the Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989a; Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989b) and had completed the Obsessive Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998) to establish presence of OC symptoms that would meet criteria for a diagnosis of OCD. Features of delusional thinking and levels of insight associated with the primary OC related belief at the time of interviewing/testing had also been evaluated using the Y-BOCS insight item, the Brown Assessment of Beliefs Scale (BABS; Eisen et al., 1998), the Overvalued Ideas Scale (OVIS; Neziroglu, McKay, Yaryura-Tobias, Stevens, & Todaro, 1999) and the Nepean Belief Scale (NBS; Brakoulis, 2012). See Papers 3 and 4 for full details. In brief, the measures of insight and belief conviction that we focus on in this Paper include scores for the Y-BOCS Insight Item, the BABS conviction item (Item 1), BABS Insight item (Item 6), OVIS Strength of Belief item (Item 1), OVIS Insight item (Item 9), NBS Conviction item (Item 1) and NBS Insight item (Item 6).

In accord with the recommendations of Poyurovsky et al. (2007), the 29 participants were divided into a 'high conviction' group if their BABS conviction score was '4' (suggesting delusion-like thinking about their primary OC related belief) (N = 8) and a 'low conviction' group if the BABS conviction score was less than '4' (N = 21). The two groups were then compared on the various task measures using parametric or non-parametric analyses as appropriate. Spearman's correlations were then used to examine relations between the BABS conviction score (as well as other measures of strength of belief and insight from the Y-BOCS, OVIS, and NBS) and the various task measures for the entire sample of 29. Finally, given the differences on indices of delusional thinking reported in Paper 4 between the 21 'pure' OCD cases and the 8 cases with schizophrenia and comorbid OC symptoms, the same correlations were re-examined within the subgroup of only 21 OCD cases.

Since this was an exploratory study with relatively small numbers, the power was not calculated and statistical methods used were robust for small samples. All results with $p < .05$ were commented upon.

Tasks and Measures

General Cognitive Functioning

IQ: Spot-the-Word-Test

The Spot the Word Test (Baddeley, Emslie, & Nimmo-Smith, 1993) provides an estimate of premorbid intelligence based on lexical decision. Sixty word pairs with each pair comprising one real word and one non-word (e.g., element (real word) – pargler (non-word)) are presented to participants who are required to identify and indicate the real word at their own pace. Correctly identified real words are subsequently summed and the sum used to generate an index score according to the appropriate norms for different age groups.

The test has two versions with each showing good reliability (form A with .78 and form B with .83) and reasonable parallel form reliability with .78. Both test versions have shown acceptable validity. (Baddeley et al., 1993)

Version A was used in the current study.

Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)

The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Green et al., 2008; RBANS; Randolph, 1998) was used to assess participants' general neuropsychological performance in five cognitive domains: Immediate memory (List Learning and Story Memory); Delayed memory (i.e., list recall, list recognition, story recall, figure recall); Visuospatial/Constructional (i.e., figure copy, line orientation); Language (i.e., picture naming, semantic fluency) and Attention (i.e., digit span, coding) (RBANS; Randolph, 1998). With an approximate administration time of 30 minutes, this instrument has become popular in clinical settings and for different patient populations, despite being designed originally for dementia research (Green et al., 2008).

The reliability for the RBANS Total score has been found to be high across all age groups with a reliability coefficient between .80 and .94. An overall good test-retest reliability across age groups has also been determined for each cognitive domain with Immediate Memory (.84 to .90), Visuospatial/Constructional (.77 to .84), Attention (.83 to .88), Language (.75 to .87) and Delayed Memory (.92 to .95). Good convergent validity with other cognitive measures is also confirmed. (Gold, Queern, Iannone, & Buchanan, 1999; Hobart, Goldberg, Bartko, & Gold, 1999)

In this study we used Form B of the RBANS and focus on the 'Total index' score.

Probabilistic Reasoning (“Beads” task)

Probabilistic reasoning (or jumping to conclusions) was tested using the so-called “Beads” task developed originally by Phillips and Edwards (1966). Two versions were administered in a fixed order. Firstly, in the ‘decide’ version, as used by McKay, Langdon, and Coltheart (2006), participants are shown two jars containing coloured beads (red and green) in the ratios of 85:15 and 15:85. A fixed pseudorandom sequence of beads that had been drawn from one of the jars beforehand is then read out one at a time to the participant who must decide from which jar the beads had been drawn; see McKay et al. (2006) for full details. The number of draws taken before making a decision is the primary measure, although participants also rate their decision confidence from 50-50% (unsure) to 100% confident.

In the second ‘estimate’ version of the task, which then uses jars of blue and yellow beads in the same ratios as above, participants have to indicate their certainty that a bead came from either ‘jar A’ or ‘jar B’ after every draw of a bead in a series of 20 colours of beads (Garety et al., 1991; Langdon et al., 2010). Participants are required to show their decision certainty on a rating scale ranging from ‘100% sure drawn from jar A’ to ‘50% A – 50% B (unsure from which jar)’ to ‘100% sure drawn from jar B’, after presentation of each bead. Ratings are then converted into scores from 0 to 100 and a shift in certainty is then calculated every time the colour of a bead changes. The average shift in certainty across all such trials is then calculated (Garety et al., 1991; Langdon et al., 2010).

In sum, three measures were examined for this task: number of draws to decision and decision confidence from the decide version of the task and average shift in certainty from the estimate version of the task.

Theory of Mind (ToM)

Story Comprehension Task or verbal ToM

A verbal story comprehension task (Langdon, Connors, & Connaughton, 2014), based on the ToM task of Harrington, Langdon, Siegert, and McClure (2005), was used to test participants' verbal Theory of Mind (ToM) ability. A booklet of four stories in fixed order is presented to participants who answer the questions at their own pace. Each story comprises written text and related cartoon pictures with comprehension questions at the end. For each story, participants are asked to answer one comprehension question which requires ToM understanding about the characters' behaviour in each story, then to explain the cause of the characters' behaviour and finally to answer a third control comprehension question which does not require ToM understanding. Correct responses about the characters' behaviour yield 1 point and incorrect 0. A clear causal explanation receives a score of 2, an incomplete but partially correct response a 1, and an incorrect answer a 0. Scores for the two ToM questions are summed across the four stories (maximum = 12), as are scores for the general comprehension questions (maximum = 4).

We report results for the total ToM score and the total score for the control questions.

False-belief Picture Sequencing Task or non-verbal ToM

The version of non-verbal picture sequencing task used here was developed first by Langdon et al. (1997) and then refined by Langdon and Coltheart (1999). There are four sets of 4-card pictures stories. The four sets include: 4 'social-script' control stories to test logical reasoning about social events; 4 'mechanical' stories controlling for participants' reasoning ability about cause and effect; 4 'capture' control stories to test participants' inhibitory control; and the 4 critical 'false belief' stories that test reasoning about a character's inaccurate belief to

understand the correct sequence of their behavior. Participants are shown all 16 stories, in a predetermined pseudorandom order, after first receiving instructions and two practice stories. For each story, cards are laid face down in a prearranged incorrect order. The participant is then asked to turn all four cards over and to arrange them into a logical sequence of events. The final order of each 4-card story is recorded and scored from 0 to 6. Scores for each of the 4 sets are then summed and averaged (Langdon & Coltheart, 1999; Langdon et al., 2014; Langdon et al., 2010)

We report results for the social-script, mechanical, and capture control scores, as well as the critical false-belief ToM picture sequencing score.

The Internal, Personal and Situational Attributions Questionnaire (IPSAQ)

Developed by Kinderman and Bentall (1996), the IPSAQ assesses participants' attributional style, that is, their tendency to justify and rationalise personally important events in a specific way. This 32-item questionnaire consists of 16 socially positive and 16 negative situations, in a fixed random order and presented in a passive voice to the reader (e.g., "A friend bought you a present. What caused your friend to buy you a present?"). The participant is then required to generate and note down the most probable causal explanation for the presented situation, before subsequently classifying the cause as either being (a) something about you, (b) something about another person (or a group of people) or (c) something about the situation. Numbers of internal, external, and situational causes are summed and then two bias scores are calculated for (1) the 'external bias' (EB: self-attributions for positive events minus self-attributions for negative events - representing degree of self-serving bias) and (2) the personalizing bias (PB: proportion of external attributions of negative events blamed on other people rather than situational factors). A score exceeding 0.5 for PB reflects

a tendency to blame others for negative events while an EB score greater than zero indicates a self-serving bias (Kinderman & Bentall, 1996; Martin & Penn, 2002)

The internal reliability of the IPSAQ has been proven acceptable by (Kinderman & Bentall, 1996; Martin & Penn, 2002) with a mean Cronbach's alpha of .72 for EB and .76 for PB. Good validity of the IPSAQ is also supported (Kinderman & Bentall, 1996).

We report results for EB and PB.

RESULTS

Basic and Clinical Demographic Data

Table 1 below summarises basic and clinical demographic data for the whole sample and for the high and low conviction groups separately (see Appendices 1 and 2 in Paper 4 for more background information on the clinical details). As a group there was an overall mean age of 45 years, with 12 participants (41%) being male and 17 who were female (59%). The range of participants' years of age when they were first experiencing OC symptoms was wide (4 to 55 years of age), with the average age of onset of OC symptoms being 21 years.

Of most importance to consider initially are possible demographic differences between the high and low conviction groups. Analyses revealed that there were no differences between these two groups in mean age ($t(27)=21$, $p=.835$), mean age of onset of OC symptoms ($t(27)=-0.37$, $p=.715$) or mean severity of OC symptoms according to the Y-BOCS ($t(27)=-0.37$, $p=.718$) and the OCI ($t(24)=0.54$, $p=.597$). While the proportion of males in the high conviction group was higher, this difference was not significant (Chi Square = 2.03, $p=.154$; Fisher's exact test $p=.218$.)

Table 1

Basic demographic and clinical data: frequencies, mean-scores (standard deviations: SDs) and ranges or percentages for the 29 participants overall and for the two subgroups with low (N= 8) and high (N=21) conviction

	N	Full sample M (SD) (range)	N	Low Conviction M (SD) (range)	N	High Conviction M (SD) (range)
Age	29	45.00 (15.56) (range: 22 – 76)	21	44.62 (14.85) (range=22 – 76)	8	46.00 (18.37) (range=22 – 72)
Age of OC symptom onset	29	20.90 (13.51) (range: 4 – 55)	21	21.48 (12.81) (range: 7 – 55)	8	19.38 (16.04) (range: 4 – 55)
		Percentage	Percentage		Percentage	
Gender						
Male	12	41%	7	33%	5	63%
Female	17	59%	14	67%	3	37%
	N	Full sample M (SD) (range)	N	Low Conviction M (SD) (range)	N	High Conviction M (SD) (range)
OC symptoms						
Y-BOCS TOTAL	29	17.72 (6.49) (range: 5 – 32)	21	18.00 (5.98) (range: 5 – 31)	8	17.00 (8.08) (range: 7 – 32)
OCI distress total score	26	53.23 (25.33) (range: 19 – 112)	20	51.75 (23.17) (range: 20 – 99)	6	58.17 (33.61) (range: 19 – 112)
General cognitive function						
IQ Index	29	10.17 (2.17) (range: 7 – 15)	21	10.48 (2.20) (range: 7 – 15)	8	9.38 (2.00) (range: 7 – 12)
RBANS total index	29	90.62 (10.61) (range: 62 – 106)	21	92.14 (10.99) (range: 62 – 106)	8	86.63 (8.93) (range: 76 – 100)

General cognitive functioning

Prior to the main group analyses, and given the findings of Paper 4, we investigated any possible differences in IQ and RBANS scores between the pure OCD cases and those with schizophrenia and comorbid OC symptoms using independent samples t-tests. Results revealed group differences in RBANS neuropsychological performances, $t(27)=-2.42$, $p=.023$ but not in IQ, $t(27)=-1.03$, $p=.312$. However, of more import, no differences between the high ($n = 8$) and low ($n = 21$) conviction groups were significant. Table 1 above also summarises results for IQ and the RBANS measure of neuropsychological functioning for the low and high conviction groups. The groups were well matched for these measures and there were no significant differences between groups (RBANS, $t(27)=-1.27$, $p=.216$; IQ, $t(27)=-1.23$, $p=.229$).

Comparisons of high and low conviction groups on task measures implicated in delusions

Prior to the main group analyses, and given the findings of Paper 4, we also initially investigated any possible differences in task scores between the pure OCD cases and those with schizophrenia and comorbid OC symptoms using parametric and non-parametric statistics as appropriate. Differences for the measures of probabilistic reasoning, Theory of Mind and attributional style were marginal and not significant (all p-values < .05). Hence, it can be assumed that any differences based on levels of belief conviction, if found, are not due to any differential effect of primary diagnostic group but rather reflect unique characteristics of being low or high conviction. In more detail, the high conviction group comprises five pure OCD cases and three with schizophrenia and comorbid OC symptoms. Table 2 summarises results for the task measures for the high and low conviction group and as a whole compared to normative data taken from previous studies.

Table 2

Task results: mean scores primarily, although median scores are reported if the latter are more appropriate and labelled as Md in the Table (otherwise assume the mean is reported); standard deviations (SDs); and ranges for the low (N= 8) and high (N=21) conviction subgroups and for the sample of 29 as a whole. Normative data is also provided (Langdon et al., 2010a) for the Probabilistic Reasoning Task (BEADS) and Attributional Biases (IPSAQ), and from Langdon et al. (2014) for the Theory of Mind Tasks (Story Comprehension Task (verbal), and Picture Sequencing Task (non-verbal)). Note that there is missing data as reported in the N column.

	N Low/ High	Low Conviction	High Conviction	Overall	Norm Data Healthy controls
		Mean or Md or % (SD) (range)	Mean or Md or % (SD) (range)	Mean or Md or % (SD) (range)	Mean or Md or % (SD)
Probabilistic Reasoning (Jumping to Conclusion - "Beads" task)					
<i>Beads Draws to Decision</i>	21/8	Md = 3 (1.67) (range: 1 – 7)	Md = 4 (5.44) (range: 2 – 18)	Md = 3 (3.41) (range: 1 – 18)	Md = 3.90 (1.86)
<i>Percentage of extreme scores (e.g. deciding after 1 draw)</i>	21/8	28.6%	0%	20.70%	11.80%
<i>Decision confidence</i>	21/8	80.00 (11.07)	86.75 (9.65)	81.86 (10.96)	84.80 (12.6)
<i>Beads Average Shift in Certainty</i>	20/8	Md = 7.14 (21.92) (range: 0 – 71.86)	Md = 12.50 (19.70) (range: 0 – 44.86)	Md = 7.14 (20.96) (range: 0 – 76)	Md = 4.2
Story Comprehension Task (verbal)					
<i>ToM Accuracy (/12)</i>	19/7	8.15 (2.83)	6.86 (4.18)	7.80 (3.21)	9.76 (2.35)
<i>Control Comprehension Accuracy (/4)</i>	19/7	3.84 (0.37)	3.71 (0.49)	3.81 (0.40)	3.92 (0.28)
Picture Sequencing Task (non-verbal)					
<i>Social Script (/6)</i>	21/8	5.75 (0.47)	5.5 (0.52)	5.68 (0.49)	5.83 (0.52)
<i>Mechanical (/6)</i>	21/8	5.68 (0.56)	5.34 (0.81)	5.59 (0.64)	5.79 (0.46)
<i>Capture (/6)</i>	21/8	4.25 (0.89)	4.00 (1.22)	4.18 (0.97)	4.55 (1.27)
<i>False Belief (/6)</i>	21/8	4.56 (1.74)	4.03 (1.54)	4.42 (1.67)	5.15 (0.80)
Attributional Biases (IPSAQ)					
<i>PB</i>	18/6	0.58 (0.33)	0.52 (0.30)	0.56 (0.32)	0.54 (0.26)
<i>EB</i>	18/6	3.10 (4.16)	2.00 (2.93)	2.79 (3.84)	2.32 (4.56)

Analyses of the probabilistic reasoning task measures from the decide version of the task revealed that participants with low belief conviction reached a decision in fewer rather than more draws (Median = 3) compared to those with high conviction (Median = 4), however this difference was not significant (M-W $Z=-1.57$, $p=.116$). The higher median score in the high conviction group was largely driven by one high conviction participants who took 18 draws to reach a decision (see range for this measure in Table 2). Results for the sample of

29 as a whole on the draws to decision measure were very similar to the healthy control data reported by Langdon et al. (2010) and used as the norms here for comparison purposes. However, the full sample of 29 did look more extreme, with almost double the percentage of participants than the normative data when we considered the percentage of 'extreme responders' (i.e., those who reached a decision in only one draw: see Table 2). While almost 29% of participants with low conviction reached a decision after one draw, no one in the high conviction group decided after only one draw, with 20.70% of the OC group as a whole deciding after only one draw compared to 11.8% for the normative sample. However, this difference to the normative sample was suggestive but not significant. Also, the low and the high conviction groups were equally, about 80%, confident about their decision on the decide version of the "Beads" task. All 29 OC participants as a whole were also as confident about their decision as the normative sample reported by Langdon et al. (2010). Finally, as expected, participants' shift in certainty on the estimate version of the task was more extreme in the high conviction participants ($M = 12.5\%$) than the low conviction participants ($M = 7.14\%$), although not significantly different with $t(26)=0.19$, $p=.850$. Overall, however, the OC sample as a whole showed a greater shift of certainty than a normative control sample of healthy participants with the high conviction participants showing more than three times greater certainty shift (12.5% compared to 4.2% in the normative healthy participants). The difference between the OC sample as a whole and the normative sample was not, however, significant, as shown by the SDs reported in Table 2 above. Of most note here is the variability in this measure in the OC cases, with the scores ranging as high as 72, suggesting that some OC cases were showing quite aberrant task performances.

Turning now to the ToM results, the non-verbal picture sequencing task results for the false belief stories revealed slightly higher scores for the low conviction group ($M = 4.5$) than the high conviction group ($M = 4.13$), but the difference was marginal and did not even approach significance, $t(27)=-0.75$, $p=.458$. Similar results were seen for the control scores on this task. There was more of a difference when the OC sample as a whole was compared to the normative sample for the critical false belief score (4.42 vs. 5.15), however, as indicated by the SD's this difference was not significant. More of a difference was seen for the verbal ToM measure. Participants with high belief conviction scored a little lower on the verbal ToM measure ($M = 6.86$) than those with low belief conviction ($M = 8.15$), but once again this difference was not significant, $t(24)=-0.91$, $p=.371$. Similar to the results for the non-verbal ToM task, there was a difference found between the OC sample as a whole ($M = 7.80$) and the normative healthy sample ($M = 9.76$) on this task, but, once again, group differences were not significant as indicated by the SDs in Table 2.

Findings also showed no significant differences between the high and low conviction groups for the attributional bias measures assessed using the IPSAQ (IPSAQ PB: $t(22)=-0.39$, $p=.701$; IPSAQ EB: $t(22)=-0.68$, $p=.502$). The 29 OC participants as a whole were, however, more inclined to externalise blame for negative events (EB) than the healthy norm sample, although they personalised blame (PB) similarly to healthy controls. Nevertheless these overall differences between the OC sample as a whole and the normative sample were not significant, as indicated by the SDs in Table 2.

Follow-up correlational analyses

Further investigations using a correlational approach were then conducted to examine relations between the BABS conviction scores and the task measures in the sample of 29 OC cases, although we also considered correlations with the other clinical measures of insight and strength of belief/belief conviction from the Y-BOCS, OVIS and NBS (see Table 3).

In sum, there were no significant differences between the low and high conviction groups, and the OC sample, as a whole, was not significantly different to the healthy norm samples, on any task measure. There were, however, some hints of differences between the OC sample as a whole and the normative data, especially for the “Beads” task measures (i.e., with regard to extreme responding and shift in certainty), and quite notable variability in these scores within the OC sample. This suggests that some of the OC cases were performing abnormally on these task measures although these abnormal task performances clearly did not align with being in the high BABS conviction group.

In brief, no relations were significant at $p < .05$. (We did not consider any trend results given the large number of correlations that were examined.) Correlations were also re-examined within the 21 pure OCD cases. Once again, no significant results were found.

Table 3

Spearman's correlations: results for all 29 participants' probabilistic reasoning scores ("Beads" task), Theory of Mind abilities (Story comprehension task, Picture sequencing task) and attributional style measures (IPSAQ) with clinical ratings for insight (Y-BOCS 11, OVIS 9, NBS 6, BABS 6) and belief conviction (OVIS 1, NBS 1, BABS 1).

	INSIGHT MEASURES				CONVICTION MEASURES		
	Y-BOCS 11	OVIS9	NBS6	BABS6	OVIS1	NBS1	BABS1
	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)
Probabilistic Reasoning ("Beads" task)							
<i>Beads Draws to Decision</i>	-0.13 (0.501)	0.16 (0.397)	0.22 (0.252)	-0.05 (0.818)	0.05 (0.789)	0.14 (0.481)	0.23 (0.238)
<i>Beads Decision confidence</i>	0.23 (0.233)	-0.20 (0.298)	-0.32 (0.086)	-0.18 (0.363)	0.13 (0.511)	0.12 (0.541)	0.298 (0.116)
<i>Beads Average Shift in Certainty</i>	-0.12 (0.529)	-0.27 (0.173)	-0.35 (0.065)	-0.16 (0.416)	-0.14 (0.492)	-0.16 (0.420)	-0.13 (0.508)
Story Comprehension Task (verbal)							
<i>ToM Accuracy (/12)</i>	-0.32 (0.111)	-0.01 (0.965)	-0.03 (0.877)	-0.15 (0.461)	-0.13 (0.538)	0.089 (0.664)	-0.08 (0.705)
Picture Sequencing Task (non-verbal)							
<i>False Belief (/6)</i>	-0.23 (0.235)	0.20 (0.296)	0.29 (0.123)	-0.05 (0.808)	0.09 (0.630)	-0.15 (0.454)	-0.23 (0.225)
Attributional Biases (IPSAQ)							
<i>PB</i>	0.17 (0.426)	0.01 (0.968)	0.08 (0.707)	0.01 (0.964)	0.06 (0.791)	0.04 (0.865)	-0.29 (0.167)
<i>EB</i>	-0.06 (0.766)	-0.36 (0.052)	-0.09 (0.657)	-0.11 (0.565)	0.02 (0.935)	-0.10 (0.608)	-0.11 (0.562)

* p<.05

At this point we note that, although no relations were found between the insight or conviction scores with the task measures, the intercorrelations of task measures did suggest that the tasks were behaving as expected based on previous studies examining these inter-relationships (Langdon et al., 2010). For example, across the 29 OC cases, the two ToM task measures correlated positively ($\rho=.50$, $p=.009$); the number of draws to decision on the Bead task correlated negatively with average shift in certainty, as would be expected on this task ($\rho=-.45$; $p=.015$); ToM scores also correlated negatively with average shift in certainty ($\rho=-.47$; $p=.018$); and more extreme EB scores correlated positively with average shift in certainty ($\rho=.511$; $p=.014$) and negatively with draws to decision ($\rho=-.44$; $p=.03$). In other word, those OC participants who externalised blame more, jumped to conclusions more quickly and over-reacted more to the immediate evidence at hand.

A post-hoc consideration of OC cases showing aberrant task performances

Given the indications of some differences between the OC sample as a whole and the normative data, especially with regard to the proportion of extreme responders on the decide version of the *were* behaving as expected based on previous studies examining measures in the OC sample, we selected some OC cases with unusual extreme scores for further consideration. In particular, we were interested to see whether we could identify anything that might stand out in these cases. For this purpose, we focused on the extreme responders who made a decision on the decide version of the “Beads” task in one draw. We were interested to see whether any of these cases also performed abnormally on the other task measures (e.g., by showing excessive decision confidence and poor ToM performance).

Table 4 below summarises the task results, focusing on the critical scores (i.e., not including scores for the control conditions) as well as the BABS conviction scores, and the contents of their primary OC related beliefs, for these unusual cases, as identified with regard to their task performances. There were six such cases in total. Firstly, it should be noted that only one of these six selected cases – OCD15 – was one of the four single cases reported in detail in Paper 3. One of the other three cases reported in Paper 3 made a decision in 2 draws on the “Beads” task and also performed relatively poorly on the non-verbal picture sequencing ToM task. So, we also include these three other cases from Paper 3 in Table 4 below.

We also note that the six cases selected on the basis of their aberrant task performances included two cases with a schizophrenia diagnosis and OC symptoms (Scz+OC cases Scz8 and Scz3). Overall, these two Scz+OC cases also performed poorly on the ToM tasks but showed no obvious deviations with regard to the attributional bias measures. This pattern is entirely consistent with the relations between task measures that were observed by Langdon et al. (2010) in their study of delusional schizophrenia patients. Of the four OCD cases selected on

the basis of their aberrant task performance on the “Beads” task, cases OCD2 and OCD8, and to a lesser extent OCD15, also showed odd performances on at least some other task measures. However, the BABS scores of those six cases varied considerably and there was nothing particularly magical or bizarre that stood out in the primary OC related beliefs that were being evaluated for insight and conviction/strength of belief.

Focusing now on the four unusual cases reported in Paper 3, only OCD17 showed some indications of odd performance on the “Beads” task (two draws with 95% decision confidence, albeit nothing unusual about shift in certainty) and poorer performance on one ToM task (the non-verbal picture sequencing task).

In summary, two of the four unusual cases reported in Paper 3 (OCD15 and OCD17) showed some indications of unusual task performances and the majority of the six cases who were extreme responders on the “Beads” task also showed other indications of aberrant task performances on measures that have been associated with delusions in schizophrenia (Langdon et al., 2010).

Table 4

Task results (Mean/Md and SDs) for probabilistic reasoning (“Beads” task), Theory of Mind abilities (Story comprehension task and Picture sequencing task) and attributional style (IPSAQ) of those participants with extreme draws to decision on the “Beads” task (N=6) and the other extreme belief cases from Paper 3 (N=3). Individuals’ belief description and their belief conviction scores (BABS 1) are mentioned too.

Cases showing aberrant task performances							The other 3 cases from Paper 3		
Cases	OCD 20	SCZ 8	OCD 2	SCZ 3	OCD 8	OCD 15	OCD 1	OCD 10	OCD 17
Primary OC related Belief Description	I have to check door locks, windows etc. to make sure I do not break rules (inherited from military), fear of mistakes, being responsible for mistakes	I have to check the light switches, doors, medication to make sure nothing bad will happen	I have to collect and keep things to make sure I have them for later when I need them.	I have to check the kettle to make sure it's off and I don't set fire to the house	I wash my hands more often to avoid being contaminate d with poison	If I am not driving my partner to work and something would happen to him I would be responsible. I could have avoided it if I drove him	I have to arrange and order things in a specific order so that I can make sure that everything gets the equal opportunity to be worn and used.	If I have a thought that curses so. and then something will happen to them, it will be my fault and I need to reverse it with a spiritual healer	If I might harm someone by being careless I am responsible for something terrible to happen to this person
Probabilistic Reasoning (Jumping to Conclusion - “Beads” task)									
Beads Draws to Decision	1	1	1	1	1	1	8	5	2
Beads Decision confidence	85	100	100	75	75	75	90	60	95
Beads Average Shift in Certainty	70	Missing	71.86	14.29	0.00	44.86	0.00	2.14	1.86
Story Comprehension Task (verbal ToM)									
ToM Accuracy (/12)	8	2	7	5	6	9	11	10	11
Picture Sequencing Task (non-verbal ToM)									
False Belief (/6)	6	0.00	4.5	2.75	0.5	5	6	6	3
Attributional Biases (IPSAQ)									
PB	---	1.00	0.71	0.57	0.06	0.75	0.43	0.80	0.45
EB	---	0.00	13.00	6.00	0.00	6.00	3.00	-1.00	3.00
BABS Conviction (0 to 4)	0	1	1	3	3	1	4	0	3

DISCUSSION

It was the overall aim of this study to investigate whether performances on tasks that have been used to investigate delusions in schizophrenia discriminate between 'delusional' and 'non-delusional' OC cases, identified as such on the basis of the BABS conviction rating for the participants' nominated primary OC related belief. It was therefore predicted that people who are highly convinced about their primary OC belief would perform differently to a 'low conviction' OC group on measures of probabilistic reasoning like the "Beads" task and Theory of Mind abilities. We had no firm hypotheses about possible group differences in attributional style. In addition to the group comparisons of OC participants with low and high conviction, correlations within a sample of 29 OC cases were also examined between task measures and clinical ratings of, not only belief conviction, but also insight, in accord with the suggestions of other researchers who propose that insight into the unreasonableness of an OC belief is most important with regard to identifying delusion-like cases (Catapano, Sperandeo, Perris, Lanzaro, & Maj, 2001; Grenier, O'Connor, & Belanger, 2006).

Our findings, however, provided no support for our predictions. The group comparisons revealed that the probabilistic reasoning measures were not affected by participants' degree of conviction in the primary OC belief. The number of draws to reach a decision as well as decision confidence and the tendency to shift certainty in a decision was found to be similar in the two groups. These results are consistent with, and extend, the findings of Jacobsen et al. (2012), thus revealing no evidence that high conviction associates with either jumping to conclusion, over-confidence or more extreme reaction to a change in immediate evidence on the "Beads" task. In other words, whether one uses a confidence rating of 50% sure or

more, as used by Jacobsen et al. (2012), or uses a more conservative approach by identifying OC cases with extreme conviction ratings as being 'delusional', as per the current study, (and also extends the number of "Beads" task measures) or uses a correlational approach, the findings concerning aberrant probabilistic reasoning and high conviction in OC cases are consistently null. Of some interest, however, the results on this task for the 29 OC cases as a whole suggested quite a high percentage who made a decision after only one draw, more similar to the percentages of extreme responders in delusional Schizophrenia samples (Freeman, 2007) than the healthy norms (Langdon et al., 2010).

Further, this study found that Theory of Mind (ToM) impairments also failed to discriminate between the low and high conviction groups. Results for the OC sample as a whole are, however, were generally consistent with previous findings, suggesting an unimpaired basic ability to comprehend and understand false beliefs in people with OC symptoms (Sayin et al., 2010). In line with Sayin et al. (2010), it seems that people with obsessive thoughts misinterpret the importance and the meaning of their particular thoughts but do not, as a whole, present with difficulties in the basic ability to reflect on thoughts as separate to reality, as tested on classic ToM tasks. Thus, while delusional schizophrenia patients show impaired ToM task performances, as reported by Langdon et al. (2010), people with OC symptoms and high BABS belief conviction scores do not, as we had predicted. Furthermore, the non-significant correlations of ToM task scores with insight and belief conviction and strength of belief measures were consistent with the null group results. In sum, we found no evidence that the strength in the OC belief or the degree of insight into a disorder causing the OC belief associates with ToM ability to infer mental states that are about reality but separate from reality.

Finally, with regard to the planned group comparisons for the attributional bias measures, our results showed no greater tendency for people with OC symptoms and high conviction

to externalise or personalise blame on the IPSAQ (Kinderman & Bentall, 1996) more than a low conviction OC group. Our results for the 29 OC cases as a whole also failed to differ from the healthy norm data. Therefore there was no evidence that would accord with the suggestions from Magee and Teachman (2007), that people with high levels of obsessions and compulsions might predict unusual, especially externalising, attributional biases. The correlations also suggested that neither strength in an OC belief or insight correlates with the same attributional bias measures, which have been found to be more extreme in persecutory delusional people with schizophrenia (Martin & Penn, 2002).

Although we found no evidence of relations between the task measures and the clinical insight and belief conviction measures, the inter-relations between the task measures were as expected, suggesting that there was nothing unusual about how the tasks were run in this study. There were also some indications that the OC sample, as a whole, performed a bit more extremely on the “Beads” task and a bit more poorly on the ToM tasks compared to the normative data. We also noted high variability in some of the task measures. This led us to select out those OC cases with more aberrant task performances to try to identify any common features. We focused on the extreme responders on the “Beads” task since this percentage had appeared most different to the normative data. Six extreme responders were thus identified and some of these cases also showed relatively poor performances on the ToM task measures, but not the attributional bias measures, which is generally consistent with the pattern of inter-relations between the same task measures in delusional people with schizophrenia reported by Langdon et al. (2010). However, these same six cases did not show consistently high BABS conviction scores (‘4’). Moreover, consideration of the content of the primary OC related belief that was rated for insight and conviction did not

reveal anything particularly bizarre or magical, except for one case that has been reported in Paper 3 in detail.

Before concluding comments, limitations and strengths of the current study are addressed. Beginning first with strengths of the study, to our knowledge this is the first study to compare high and low conviction OC groups identified according to the highest rating on the BABS belief conviction item (item BABS1). As suggested by (Poyurovsky et al., 2007) and consistent with DSM-5's definition of a delusion (American Psychiatric Association, 2013, p.87), it is this high conviction in an implausible belief that is proposed to be the best index of delusional thinking processes. However, since it has also been proposed that insight into whether a belief is implausible and conviction in that implausible belief reflect distinct aspects of delusional thinking, including in OCD (e.g., see Brakoulias & Starcevic, 2011; Catapano et al., 2001; Jacobsen et al., 2012; Poyurovsky et al., 2007), we had also used correlational analyses and included a range of clinical insight and conviction measures to examine relations with task measures. Therefore we can be confident that the null results are not a consequence of the scores that were used to select groups or the particular clinical measures that were focused upon. While many studies use a symptom-focused rather than a syndrome-focused approach, as we did by including people with various diagnoses, but all showing OC symptoms, some might consider this approach a limitation. With that potential criticism in mind, we also followed up our initial analyses by conducting correlational analyses with the 21 OCD cases without schizophrenia to examine relations between task measures and clinical ratings and did not find any significant results. Nevertheless, it must be acknowledged that a major limitation of this study is the relatively small sample size of 29 OC cases, including 21 'pure' OCD cases. There was also a very small number in the high belief conviction group (N = 8) compared to the low conviction group. This is why, in part, we

also used correlational analyses. However, those correlational results were based on a relatively small sample of 29 and so a larger sample size is warranted in future related research. Still, the null results were strikingly consistent across multiple measures and using between-group and correlational analyses.

In conclusion, our findings suggest no relations between task measures associated with delusions in psychotic mental illness and clinical ratings of insight and conviction concerning the primary OC belief of participants. The comparisons between the OC sample as a whole and the normative data do suggest, however, that future research might re-examine probabilistic reasoning and ToM in OCD, perhaps using different variants of probabilistic reasoning task, as developed by schizophrenia researchers, and more sensitive ToM tasks, such as the Faux Pas Recognition Test (Stone, Baron-Cohen, & Knight, 1998). In order to better understand any 'delusional' features of people with bizarre, unusual OC beliefs, future studies might also consider other ways of operationalising a measure of delusional thinking processes associated with OC symptoms. We offer this suggestion because there was nothing particularly magical or implausible about the content of the primary OC belief that was rated in our 29 cases (see Appendix 1), including in the six cases who showed indications of aberrant performances on tasks associated with delusions in psychosis. Better understanding of which OC beliefs to focus upon when attempting to measure the extent of delusional features may also impact on future studies with similar aims to the current study – that is, to identify the cognitive underpinnings of delusion-like thinking in some OC cases as an important first step towards developing cognitive treatment better targeted at delusional thinking in people with OCD.

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Summary and Conclusions

The overall aim of this thesis was to explore the extent and nature of delusional thinking associated with obsessive-compulsive (OC) symptoms across different diagnostic categories, in particular, obsessive-compulsive disorder (OCD) and schizophrenia.

In more detail, previous chapters focussed on:

Paper 1: Obsessive-compulsive symptoms and their associations with metacognitions, magical thinking and delusional ideation

Paper 2: Obsessive-compulsive symptoms: exploring their prevalence and profile in Australian patients with schizophrenia and related psychotic disorders

Paper 3: Four single cases of obsessive-compulsive disorder with unusual associated beliefs: A comparison of different instruments to assess delusional thinking and insight

Paper 4: A preliminary investigation of delusional ideation and insight associated with obsessive-compulsive (OC) beliefs in people with OC symptoms with and without schizophrenia

Paper 5: Is unwarranted conviction in beliefs about obsessive-compulsive (OC) symptoms underpinned by the same processes that contribute to delusions in psychosis?

This chapter will summarise the main research aims and predictions in each Paper and the related outcomes and implications. Following this, a concluding section will address general limitations and discuss broader implications and future directions.

Paper 1:

In Paper 1 we aimed to gain preliminary insights concerning how an intrusive thought in OC cases may become delusional using an on-line survey. It was predicted that the severity of OC symptoms would be associated with indices of delusional ideation (including indices of magical thinking and poor cognitive insight) and metacognitive biases and/or deficits. It was also predicted that any such relationships would be stronger for the thought-oriented OC subtypes, such as obsessions and doubting. We also considered a possible mediating role of metacognitive biases in explaining any observed relations between delusional ideation and severity of OC symptoms.

Of 162 respondents who completed at least some parts of an on-line survey, 90 self-reported OC symptoms. Relationships between severity of self-reported OC symptoms and measures of delusional ideation and magical thinking (but not cognitive insight) were found in this sample of 90 cases with OC symptoms, as predicted. Thus, it appears that respondents' general preoccupation and fixation with delusion-like/magical ideas is closely related to the severity of their OC symptoms. That these higher levels of delusional ideation might also associate with more intense delusional preoccupations and fixity about the primary beliefs associated with the OC symptoms seems possible but could not be directly tested in this study. However, we found no evidence that poorer cognitive insight, as assessed using Beck's Cognitive Insight Scale (Beck, Baruch, Balter, Steer, & Warman, 2004), impacts upon severity of OC symptoms. Metacognitive biases, but not metacognitive deficits associated with a poor theory of mind, were also found to associate with severity of OC symptoms and the measures of delusional ideation/magical thinking. Also, as predicted, the observed relations were stronger for the thought-oriented OC symptoms, such as Obsessions and Neutralising, although strong relations were also seen for the OC subtype of

Ordering. Counter to our expectations concerning the mediating influence of metacognitive biases, metacognitive biases did not fully mediate the links between delusional ideation/magical thinking and severity of OC symptoms. Our findings suggest that delusional ideation and/or magical thinking have a direct effect on respondents' self-reported severity of OC symptoms, independent of any effects of metacognitive biases.

The implications of these findings include that delusional and magical thinking should be taken into consideration as an influential factor in determining severity of OC symptoms and when considering how to target psychological treatments. Group treatments that have been developed to improve the disturbed thinking processes that are believed to associate with a general proneness to delusional ideation in psychotic mental illnesses, such as in Schizophrenia (e.g., Metacognitive Training: Moritz & Grp, 2012), have already been proven to also benefit people who experience OC symptoms, as seen in research from Moritz and Hauschildt (2010), and also consistent with this Paper's findings. However, as previously proposed by Himle, Van Etten, Janeck, and Fischer (2006) and by Kishore, Samar, Reddy, Chandrasekhar, and Thennarasu (2004), it may also be worthwhile to individually target an OCD patient's intrusive thoughts as they reach towards delusional intensity, more in the style of individually targeted Cognitive Behavioural Therapy (CBT) programs. Such an approach may be more relevant for extreme OCD cases with more of the thought-oriented OC symptoms.

Paper 2:

Given the 'grey area' between delusional beliefs in schizophrenia and magical thought processes in some extreme OCD cases, and the reported high prevalence of comorbid OC symptoms in schizophrenia samples outside Australia, Paper 2 aimed to establish the prevalence of any OC symptoms in an Australian sample of people with schizophrenia. We

also aimed to estimate the prevalence of diagnosable OCD. As the general aim of this thesis is to explore the nature of delusional thinking associated with OC symptoms, we were also interested to examine whether the profile of OC symptoms in people with a primary diagnosis of Schizophrenia (characterised by delusional thinking) and comorbid OC symptoms would resemble the profile of subtypes of OC symptoms seen in a general sample of people with OC symptoms who had not reported comorbid Schizophrenia (the Paper 1 sample). To meet our aim, we were able to access the Australian Schizophrenia Research Bank (ASRB) Volunteer Register to mail out a self-report instrument, the Obsessive Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998) to 340 volunteers registered on the East Coast of Australia. Of those 340, 321 had valid addresses, and of these, 96 Schizophrenia patients reported some OC symptoms. Their responses on the OCI were then studied in more detail.

The response rate indicated that roughly one third of the schizophrenia patients who received the survey, self-reported current experiences of some OC symptoms. This prevalence estimate for an Australian schizophrenia sample is in general accordance with previous estimates in other countries of prevalence rates of any obsessions, and/or compulsions in schizophrenia over a lifetime (Swets et al., 2014). Prevalence of comorbid diagnosable OCD in the schizophrenia patients was estimated to be much lower, at 7.5%, which was also generally consistent with some previous prevalence estimates of diagnosable OCD in schizophrenia in other countries, and with other estimates ranging from 0.6% (Niehaus et al., 2005) to as high as 29% (Cassano, Pini, Sættoni, Rucci, & Dell'Osso, 1998), over a lifetime.

Respondents reported being most distressed by the OC symptoms, which generally involve mental processes and thought distortions, such as obsessions and neutralising. They also self-reported being more frequently preoccupied, during the day, with these particular OC symptoms. In contrast, compulsive behaviours, such as washing and checking, were reported to be less distressing and less time consuming. However, the general profile of OC symptoms in this schizophrenia sample was very similar to that seen in a general OC sample without schizophrenia (see Paper 1) although of reduced severity, with the exception of levels of hoarding.

By drawing on data from the ASRB for the 96 respondents with OC symptoms, we were also able to establish that poorer neuropsychological performance, as assessed using the Repeatable Battery for the Assessment of Neuropsychological Status (Randolph, 1998), related to generally greater severity of OC symptoms. Relations between severity of OC symptoms and lifetime ratings of delusions of influence were also found and remained significant, even when neuropsychological abilities were taken into account.

Summing up the implications of the findings of this Paper, obsessions and compulsions were found to co-occur with psychotic symptoms in quite a high percentage (roughly 30%) of Australian schizophrenia patients. Moreover, relations were found between the severity of OC symptoms and some types of delusions, especially, delusions of influence, suggesting that the presence of OC symptoms may promote delusions of this type in schizophrenia, or vice versa. Either way, the presence of comorbid OC symptoms appears to complicate the psychotic phenomenology of people with schizophrenia. This may be more so for those with thought-oriented OC symptoms, like obsessions, as previously found in other related research (Guillem, Satterthwaite, Pampoulova, & Stip, 2009), Future research into the

longitudinal course of these relations between delusions and OC symptoms in patients with schizophrenia and comorbid OC symptoms is needed so as to advance understanding of whether it might be better to initially target the delusions (using CBT, for example) or the OC symptoms to improve treatment outcomes in these particular patients.

Paper 3:

Since bizarre delusion-like features have been reported in some OCD cases, raising questions about possible similarities and differences to delusional beliefs in Schizophrenia patients, and how best to identify and quantify the distinction between ‘unusual’ delusion-like and ‘normal’ OCD cases, Paper 3 focused on four unusual and more bizarre OCD cases. The case histories of these four single cases were presented and a range of clinical instruments for assessing insight and conviction associated with the primary OC-related beliefs were administered. It was expected that an absence of insight alone would not necessarily be a key feature of these cases, despite that patients’ insight into the cause of their OC symptoms (e.g., the attribution of these symptoms to a disorder) is commonly understood to be the primary means of distinguishing between delusional and non-delusional OCD cases. We also considered participants’ attempts to reason about their own OC symptoms and the conviction and strength of their primary OC related beliefs, although, it has been suggested that the conviction with which delusional beliefs in schizophrenia are held may be somewhat different to the conviction about the reasonableness of excessive OC-related beliefs (Garety et al., 2005; Waller, Freeman, Jolley, Dunn, & Garety, 2011).

Contrary to expectations, none of the four cases presented with particularly severe OC symptoms. While all four cases reported unusual bizarre belief content as part of their OC phenomenology, neither general proneness to delusional ideation/magical thinking nor general ideas of thought action fusion were notable. Therefore it appeared that the more

magical belief content was specifically related to the OC symptoms in these four cases. Insight was moderate overall, although consistently more extreme than a more typical OCD case who was also presented for comparison. Nevertheless, there was considerable variability of insight scores across the four cases suggesting that very poor insight is not a reliably distinguishing feature of these unusual cases. Findings concerning conviction in the primary OC-related belief also revealed a mix of high and low conviction ratings on the Brown Assessment of Belief Scale (BABS; Eisen et al., 1998). Even for those participants who were rated with high conviction initially, the high conviction levels were not maintained when strength of belief was further probed using the Overvalued Ideas Scale (OVIS; Neziroglu, McKay, Yaryura-Tobias, Stevens, & Todaro, 1999) and the Nepean Belief Scale (NBS; Brakoulias & Starcevic, 2011).

In summary, it was quite clear from the detailed observations of all four cases that no case presented with markedly poor insight. Moreover, the four cases did not show consistently high conviction/strength of belief or fixed maintenance of belief conviction, when the interviews focused on the primary OC related belief. Further, a marked proneness to neither general delusional ideation nor magical thinking was observed in these four cases. The implications here are that the indications of delusion-like thinking in the case histories of unusual OCD cases do not appear to associate with either marked conviction in the primary OC related belief or general insight or fixity of belief conviction or even a general proneness to magical ideas as seen in psychotic conditions, such as schizophrenia. This may be because the characteristics of delusion-like thinking in OCD differ from the delusional thought processes seen in psychosis. Alternatively, the ways in which interview tools are currently used to probe delusional features of thinking related to OC symptoms may not adequately

consider the delusional nature of such thinking in those more bizarre OCD cases who present with magical delusion-like ideas.

Paper 4:

Paper 4 reported a preliminary investigation of common or possibly distinguishing features of delusion-like thinking in people with OC symptoms with or without a comorbid schizophrenia diagnosis. Traditionally, obsessional thoughts in obsessive-compulsive disorder (OCD) are conceived as insightful and distinct from the delusional thinking that is seen in psychosis. However, there is growing awareness of a spectrum of insight in OCD and reported instances of more bizarre thinking in some people with OC symptoms. Case reports of this type raise questions about whether the DSM-5 definition of delusions can be applied, not only to delusions in psychotic disorders, but also to unusual bizarre and delusion-like thoughts in other clinical conditions, including in OCD. However, previous research has not yet specifically explored the delusion-like characteristics of primary OC related beliefs of people with schizophrenia and comorbid OC symptoms and compared these with the ratings of similar characteristics in people with primary OC symptoms but without schizophrenia (Poyurovsky & Koran, 2005).

Subsequently, we assessed the severity of OC symptoms in two subgroups of people with OC symptoms, one with and one without schizophrenia, and administered self-report inventories, as well as clinical interviews to measure insight and belief to investigate (1) OC symptom severity; (2) general delusional ideation/magical thinking and poor cognitive insight associated with psychosis; (3) thought action fusion and metacognitive biases that have been linked more specifically with the development of OC symptoms, and (4) insight and conviction related specifically to the primary OC related beliefs.

(1) Firstly, we expected some differences in participants' levels of OC symptom severity. Contrary to our expectations, and also at odds with the results in Paper 2, OC symptom severity was lower in the OCD subgroup without schizophrenia than the subgroup with schizophrenia (Scz+OC) when distress was self-rated on the Obsessive Compulsive Inventory (OCI; Foa et al., 1998)) but not when severity was clinician-rated on the Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman et al., 1989). As expected, the age of onset of OC symptoms in the Scz+OCD subgroup was higher, on average, with the schizophrenia subgroup reporting almost double the age of onset compared to the OCD subgroup.

(2) As generally expected based on previous related findings (Eckblad & Chapman, 1983; George & Neufeld, 1987) and consistent with research on delusion-proneness and schizophrenia (Boyette, Swets, Meijer, Wouters, & Group, 2011; Buckley, Miller, Lehrer, & Castle, 2009; Cunill, Castells, & Simeon, 2009; Garety et al., 2005; Garety & Hemsley, 2013; George & Neufeld, 1987; Langdon & Coltheart, 1999; Langdon, Ward, & Coltheart, 2010; Moritz & Woodward, 2005, 2007), the Scz+OCD subgroup showed noticeably higher levels of delusional and magical thinking than the OCD subgroup, but no group differences were found for magical ideation as assessed using the Illusory Beliefs Inventory (IBI; Kingdon, Egan, & Rees, 2012). This may be because the IBI also probes the sort of magical thinking that may associate more with OC symptoms, and which were present in both subgroups. Also, while the schizophrenia subgroup scored higher on BCIS self-reflection, which may be consistent with their higher levels of self-reported distress on the OCI, the two subgroups' general self-certainty assessed on the BCIS did not differ.

(3) In general accordance with related previous research (Abramowitz, Whiteside, Lynam, & Kalsy, 2003; Muris & Merckelbach, 2003), both subgroups did not differ markedly on the

measures of negative thinking associated with OC symptoms, that is, thought action fusion (TAF), which is generally prominent in people with OC symptoms (Rachman & Shafran, 1999; Shafran & Rachman, 2004; Shafran, Thordarson, & Rachman, 1996), although the Scz+OCD subgroup showed higher scores on the IBI 'Internal state and thought action' subscale. There were also no group differences for levels of metacognitive biases assessed using the Metacognitive Questionnaire (MCQ-30; Wells & Cartwright-Hatton, 2004).

(4) Of special interest in this study was participants' insight into their OC symptoms and their OC related belief and their conviction in their OC beliefs. In general, schizophrenia patients were found to be less insightful that the reason for the occurrence of their OC symptoms might be a disorder than participants without schizophrenia. The general patterns on the other measures also showed higher scores in the Scz+OC subgroup, although group differences were not always significant. Overall, these findings are generally consistent with the traditional conception of OCD patients as being more insightful about their obsessive thoughts than patients with a psychotic mental illness are about their delusional thinking. However, we also found substantial individual variability and overlap between the two subgroups on the conviction and insight ratings of the primary OC related belief. If these ratings do measure aspects of delusion-like thinking, this suggests that some OCD cases may show delusional thinking about their OC symptoms that is similar to that seen in the schizophrenia subgroup.

In sum, our findings based on the group analyses are generally consistent with the traditional concept of more insightful obsessive thoughts in OCD patients compared to delusional thinking in patients with a psychotic mental illness like schizophrenia. Nevertheless, substantial individual variability and overlap between the two subgroups with

regard to the individuals' ratings for facets of the primary OC related belief were found. This degree of overlap would be consistent with a symptom-focused transdiagnostic approach to investigate the underlying factors that associate with higher conviction and insight measures related to OC symptoms. Overall, however, the major limitation of a small schizophrenia subgroup and the unequal numbers in the two subgroups, warrants future research with larger samples to attempt to replicate the patterns of results reported here.

Paper 5:

Unusual OCD cases with bizarre, delusion-like obsessional thoughts have been previously reported and some researchers propose that what characterises these unusual cases is that these individuals do not consider their implausible OC belief to be unreasonable and are strongly convinced about their OC beliefs. Accordingly, the high conviction in the primary OC related belief has been suggested by some (e.g., Poyurovsky et al., 2007 and Jacobsen, Freeman, and Salkovskis, 2012) to identify 'delusional' OC cases. Hence, the aim in Paper 5 was to examine whether the same factors that associate with delusions in psychotic mental illness also associate with bizarre delusion-like thinking about OC symptoms, as indicated by high versus low conviction in the primary OC related beliefs. Relatively, little is known to date about whether such cases with high conviction also show abnormal performances on tasks that have revealed impairments in delusional people with schizophrenia, in particular, on tasks assessing probabilistic reasoning, theory of mind and attributional style.

Conviction in the primary OC related belief (according to the Brown Assessment of Beliefs Scale, BABS), as recommended by Poyurovsky et al. (2007), was therefore used in this study as the index of presence or absence of delusion-like thinking related to OC symptoms. We compared people with OC symptoms with a high BABS conviction score of '4' for their primary OC related belief to those with lower BABS conviction levels on probabilistic

reasoning, theory of mind and attributional style tasks. We expected more extreme performances on probabilistic reasoning tasks and poorer theory of mind in the high conviction OC group. No specific hypotheses were made about group differences in attributional bias measures. The OC sample as a whole was also compared to healthy normative data. Since questions still remain about whether unreasonable conviction in an unjustified belief or poor insight is the better indicator of delusion-like thinking in OCD (Jacobsen et al., 2012; Markova, Jaafari, & Berrios, 2009), we also used correlational analyses to examine relations between performances on these tasks mentioned above and participants' ratings of belief conviction, strength of belief and insight.

Firstly with regard to the background variables, no differences between the high and the low conviction groups were found in regards to their age, their age of onset of OC symptoms, their IQ or their severity of OC symptoms according to the Y-BOCS and the OCI. While there was some difference in neuropsychological performances between the pure OC cases and those with schizophrenia and comorbid OC symptoms, the two groups with high and low belief conviction did not differ on these neuropsychological measures.

With regard to the task measures associated with delusions in psychosis, the high and low conviction groups did not differ in the measures of probabilistic reasoning, theory of mind or attributional biases.

Also, no relations were found between the participants' ratings of belief conviction, strength of belief and insight and their performances on these same task measures. However, the intercorrelations between task measures were as expected and suggest that the tasks were behaving as expected.

Some suggestions of differences did emerge, however, when the full sample of 29 OC cases were compared to healthy normative data. For example, the OC sample showed a greater shift of certainty on the estimate version of the Beads task and a higher percentage of 'extreme responders' (i.e., those who reached a decision in only one draw) than the normative data. The ranges of some scores on this task were also marked in the OC sample. The OC group also performed more poorly on the theory of mind tasks while there was little difference for the attributional bias measures. However, none of these differences reached significance. Nevertheless, the apparent trends warrant future studies to compare OCD cases and matched healthy controls using, for example, more sensitive measures of probabilistic reasoning and theory of mind.

While the OC group, as a whole, was not significantly different to the healthy normative data on any task measure, the great variability within the overall OC group on some task scores suggested a post-hoc consideration of those cases showing more extreme scores. We therefore selected six OC cases who had made a decision after only one draw on the Beads task and examined their other task performances. Some of these cases also performed relatively poorly on the theory of mind tasks. Of note, only one of those six selected cases was one of those unusual cases described in paper 3. Another one of the four unusual cases from Paper 3 also showed some indications of poorer performances on the tasks that have been associated with delusions in schizophrenia (Langdon et al., 2010) as did the majority of the selected six cases. However, of most note, the BABS conviction scores of those six cases with the most aberrant task performances (at least on the Beads task) varied greatly and the content of their primary OC related beliefs did not appear to be particularly magical or bizarre.

In sum, no relations between ratings of conviction or insight concerning the primary OC related belief of participants and measures on tasks associated with delusions in psychotic mental illness were found. That some cases showed quite aberrant task performances like delusional people with schizophrenia does suggest, however, that there is something delusion-like about the thinking of some these OC cases. Whatever this might be it was not associated with a high BABS conviction score or any other strength of belief or insight scores for the primary OC related belief. This raises questions about how best to identify and quantify delusion-like thinking in some people with OC symptoms. We may need a different approach for the clinical measurement of any 'delusional' features of people with bizarre, unusual OC beliefs. It is therefore suggested, that using different variations of current measures might be useful in future research to re-examine possible relations with aberrant probabilistic reasoning and poor ToM. Future studies that aim to identify other underpinnings of 'delusion-like' thinking in some unusual, bizarre OC cases (i.e. other than the factors examined in the tasks used here) might also advance understanding of the development of the underlying 'delusion-like' OC belief and its persistent reoccurrence. One possibility here is the 'Bias Against Disconfirmatory Evidence' task (BADE; Moritz & Woodward, 2006; Woodward, Moritz, Cuttler, & Whitman, 2006). With regard to using different variations of current measures, as mentioned above, it may also be useful to consider, not only the most distressing OC related belief, but also the most unusual or implausible OC related belief when attempting to measure the extent of delusional features and to inform the development of related cognitive treatments (e.g., to reduce stress versus to promote plausibility checking) for people with OC symptoms and delusional thinking.

Future directions and final comments

In accord with a symptom-focused approach to investigating delusion-like thinking associated with OC symptoms, this thesis aimed to advance understanding of the nature and profile of bizarre, unusual delusion-like beliefs associated with OC symptoms in people with various diagnoses, but all showing OC symptoms.

Some directions for future research indicated by the thesis findings include the need for future longitudinal studies of the development of OC symptoms in patients with schizophrenia and comorbid OC symptoms. This is because we found a high comorbidity for OC symptoms in schizophrenia and relations with some delusions, albeit using lifetime delusions ratings. Longitudinal studies of this type may advance understanding of whether it might be better to initially target the delusions or the OC symptoms in people with a primary schizophrenia or schizoaffective disorder. We also found higher self-ratings of distress associated with the OC symptoms in 8 schizophrenia cases compared to 21 OCD cases, despite the lack of difference in clinician rated severity. While acknowledging that the schizophrenia sample was very small, this pattern of results does suggest that these symptoms may have been an unmet treatment need, at least in these 8 cases.

At the same time we found that delusional ideation and magical thinking in people with primary OC symptoms are influential factors affecting the severity of OC symptoms, independent of metacognitive biases. The presence of such delusional thinking should therefore be taken into consideration when determining the severity of OC symptoms and when considering how best to target psychological treatments.

Overall though, we were primarily focused on identifying the underlying factors that contribute to the 'delusional' nature of beliefs associated with OC symptoms in some OCD cases. Our group results comparing high conviction and low conviction were null. As were our correlation results that also considered other insight and strength of belief measures. One possibility then is that delusion-like thinking in OCD may be quite distinct from the nature of delusional beliefs seen in psychotic conditions, such as schizophrenia. For example, the contents of the primary OC related beliefs of cases, even in those bizarre and unusual OCD cases, do not seem to be implausible in the same way that the contents of psychotic delusions are implausible. The contents of psychotic delusions concern the objective state of the world while the contents of OC beliefs are mostly about internal needs and compulsions. People with OC symptoms also do gain some evidence about the plausibility or effectiveness of their obsessive thoughts when they obey their obsessive beliefs and engage in compulsive rituals, resulting in the easing of tension. This would also help to explain those patients with awareness of a disorder accounting for their OC belief but who also show strong conviction in their primary OC-related belief. However, there are still some OCD cases with very bizarre and unusual OC beliefs who are not easily explained in this way.

A related possibility then is that the failure of this thesis to find any relations between measures on tasks associated with delusions in psychosis and measures of delusional thinking about OC beliefs concerns the ways in which delusional thinking in OCD is currently measured. After all, the wide variability in our OC cases' performances on the task measures studied in this thesis suggest that there are some OC cases who perform just like delusional schizophrenia cases and for whom neither an OCD diagnosis nor a psychotic delusional diagnosis may be completely adequate. Future studies might therefore investigate a 'schizo-obsessive' (sub-)type of OCD as suggested by (Attademo, De Giorgio, Quartesan, & Moretti, 2012; Poyurovsky & Koran, 2005) compared to other clinical groups. Detailed examinations

of such cases who might perhaps best be identified on the basis of their case histories could then include measures of probabilistic reasoning and theory of mind. Alternatively, interview tools that are currently used to assess extent of delusional features of thoughts related to OC symptoms may not adequately tap into the delusional nature of those more bizarre, magical and delusion-like OC beliefs, as presented in the cases reported in Paper 3. Perhaps the most unusual OC belief should be focused upon instead of, or as well as, the most distressing belief, as required in all tools for belief assessments used here (Brown Assessment of Belief Scale, Overvalued Ideas Scale and the Nepean Belief Scale), when attempting to measure the extent of delusional features.

In a similar vein, it may be worthwhile to individually target the specific contents of a person's intrusive thoughts as they reach towards delusional intensity, as previously proposed by Himle et al. (2006) and by Kishore et al. (2004). Cognitive Behavioural Therapy (CBT) programs that have been developed for psychotic patients to target a specific delusion and to work on the patient's understanding of the unreasonableness of the belief and their poor logic might then be incorporated with group programs that have already been found to be effective in OCD (e.g., Metacognitive Training: Moritz & Grp, 2012) as seen in research from Moritz and Hauschildt (2010).

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Appendix 1: Case descriptions and demographics of 29 participants

Case descriptions and socio demographic data: age, gender, education, age of onset, Y-BOCS and OCI scores for each participant in the OCD subgroup (N=21) and the schizophrenia +OC group (N=8) respectively, and mean summaries for each subgroup (e.g., mean age or mean total OCI).

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
OCD 1	<i>Case study 1 (see Paper 3 for details)</i>	22	Male	Bachelor Degree (4y)	15	19.00	2.00	8.00	11.00	57.00
OCD 2	She is mainly obsessive about hoarding. Because she compulsively saves and collects books, she avoids going to second hand stores. She also has a constant fear of losing things and she started checking locks repeatedly. She also developed repeating rituals and needs to reread and rewrite things to make sure they are correct and that she does not forget about something. The lucky number '3' takes over her life (e.g., she has to count to 3 when she is climbing up stairs). She acknowledges the habit of picking her hair and fingernails too.	55	Female	Highschool/ GED	38	16.00	3.00	7.00	9.00	51.00
OCD 3	His obsession concerns hoarding and saving things from council cleanups, so he collects compulsively torches, newspapers, books	72	Male	Highschool/ GED	55	13.00	2.00	7.00	6.00	26.00
OCD 4	He has a constant fear he will steal things and is afraid of making a mistake. Therefore he checks compulsively and goes through things he's done to make sure nothing went wrong and needs to wave his hands to finally get over his worries.	71	Male	some College	4	7.00	1.00	1.00	---	---

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
OCD 5	She has intrusive images she might harm someone by burning down the house and will then be responsible for something terrible happening, like a fire. She is therefore checking heater, locks and taps that nothing terrible will happen and she did not harm others or loosing things. She has also a fear of blurting out insults. Her hoarding and saving obsessions lead her to collect newspapers and books. She needs to reread and rewrite things to make sure she didn't make a mistake and excessively makes lists.	47	Female	Bachelor Degree (4y)	12	27.00	4.00	15.00	12.00	59.00
OCD 6	She has an extensive need for symmetry and exactness and orders and arranges compulsively, as everything has to be at its place in order, neat and tidy. She also has the need to touch. She checks that she doesn't become sick, excessively makes lists to not leave business unfinished.	57	Female	Bachelor Degree (4 years)	15	7.00	1.00	0.00	7.00	21.00
OCD 7	There is a constant need to know or remember, as she fears she might say certain things or not say the right thing. She wants to make sure nobody got offended by what she was saying as she also has the fear she might harm others. Therefore she more often has to reread and rewrite messages again. To make sure she did not make a mistake she checks especially car locks and backdoors and developed excessively ritualistic handwashing, showering and bathing. She needs to repeat routine activities and has a ritualised day-to-day eating behaviour. Compulsively counting in a rhythm and steps and ordering and folding socks in a certain way is one of her concerns. She also collects especially books, clothes and pens.	41	Female	College Degree (2 years)	18	23.00	4.00	11.00	12.00	---

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
OCD 8	Her concern is disgust with bodily waste or secretions, as she fears she will get ill because of contaminants. She is mainly concerned with poison in other houses that have been carpet cleaned with poisons and also fears to touch hands of others. She therefore developed ritualistic handwashing and does this excessively.	76	Female	College Degree (2 years)	26	17.00	2.00	9.00	8.00	39.00
OCD 9	Her main concern is contaminants or stains and she developed disgust with bodily waste or secretions and unclean behaviour. She is overly concerned she will get others contaminated by spreading germs. She has an obsession with symmetry and exactness to be clean and tidy and prevents or removes contact with contaminants especially in room and bed. Hence, she excessively washes her hands and showers more often to keep inside the house clean from outside. She avoids public transport and knowingly dirty spots that are contaminated.	28	Female	Bachelor Degree (4 years)	8	22.00	3.00	10.00	---	---
OCD 10	<i>Case study 10 (see Paper 3 for details)</i>	32	Male	Bachelor Degree (4 years)	15	20.00	2.00	10.00	10.00	63.00
OCD 11	Obsessive thoughts she might harm others is leading her to excessively check on her baby. She further has a need for symmetry and exactness so that she is ordering things in certain places and constantly straightens things up. She reports to count things up to 4 as this is supposed to be a good number.	29	Female	College Degree (2 years)	10	11.00	2.00	3.00	8.00	54.00

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
OCD 12	Her main concern is her hoarding obsession. Since she can't waste anything she collects shoes, clothes, earrings, stamps and coins and therefore avoids certain shops and companies to not be reluctant to shop. She also has an excessive concern that she might be contaminated when petting animals, especially dogs. Her need for exactness requires her to check things are in the right place and she reported eating excessively to feel good and to taste nice things.	63	Female	Bachelor Degree (4 years)	17	15.00	2.00	7.00	8.00	26.00
OCD 13	His main excessive worry concerns germs and being contaminated with environmental biohazard as well as animals' contaminants and fears to that he will get ill because of contaminants. He therefore avoids public transport, public toilets and bathrooms. He gets also extremely distressed by sticky substances (mango). He developed an excessive showering ritual and washes cutlery excessively to prevent contaminants. Beside his contamination fears, he checks locks, windows and the garage door to make sure that nothing terrible happens. It has been counted in a lucky number as it is not the right number it feels wrong for him. The colour green and any other cold colours easily annoy him. Ordering and arranging utensils at a certain spot is important for him as well as avoiding metal objects and blackboards he doesn't like the feeling of materials.	23	Male	some College	14	21.00	3.00	9.00	12.00	---

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
OCD 14	Besides her obsessive hoarding of plastic bags and different other belongings she excessively has to arrange glasses and plastic containers in a specific order as she has the need for symmetry and exactness. She has the urge to remember what she said and make sure she said or does the right things, even excessively makes lists to remember and compulsively tells things more often and rereads emails, number plates and shop signs. When taking clothes from hook she counts them in the washing machine and has to repeat this procedure when she miscounted. She is extremely bothered by intrusive music in the form of specific childhood songs and suffers from exceptional procrastination.	40	Female	some College	25	19.00	4.00	8.00	11.00	40.00
OCD 15	<i>Case study 15 (see Paper 3 for details)</i>	41	Female	Master's Degree	9	22.00	2.00	12.00	10.00	53.00
OCD 16	He is generally concerned he himself will get ill because of contaminants and by spreading contaminants he will get others ill. Intrusive thoughts about the possibility of close ones dying goes regularly through his mind. He therefore is excessively involved in handwashing, cleaning of appliances (microwaves, tables) and other household items. Things have to be in the right place for him otherwise he has to order eg. his desk and items on the desk repeatedly. He needs to know that everything is correct. When in doubt he needs to rereading texts, emails six times to make sure he didn't make a mistake. He needs to know precisely about information and tends to ask again. His constant concern also applies to cornflakes, he has to collect, as he fears he might run out one time and so has to get a package of the same kind every time he goes shopping. He reports a saving obsession, reflected in overwhelming indecisiveness.	25	Male	Master's Degree	7	14.00	2.00	6.00	8.00	69.00

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
OCD 17	<i>Case study 17 (see Paper 3 for details)</i>	23	Female	Highschool/G ED	18	22.00	3.00	12.00	10.00	48.00
OCD 18	<p>She is mainly concerned about getting sick because of contamination with bodily waste or secretions and dirt or germs and therefor engages in excessive hand washing, tooth brushing, routine showering and cleaning of household items. She urges to prevent or remove contact with contaminants by avoiding big crowds like at a party and tries to meet people one on one to reduce germ contamination. She has a vaccination for many things and is sexually overly careful.</p> <p>She also has a need for symmetry and exactness, so that she has e.g. to cut pizza evenly and wear matching colours and orders and arranges constantly. Checking door locks, windows, power points in the house as well as rereading her emails and assignments several times helps her to make sure she did not make a mistake. She reports to collect multiple copies of items like DVDs, books, toilet paper, bottles of shower gel and shampoo even medications. She often fears to blurt out insults when she is speaking with others and needs to ask people if what she said was logical.</p>	51	Female	Highschool/G ED	18	31.00	4.00	15.00	16.00	99.00
OCD 19	<p>Her main obsession relates to symmetry and exactness as she mentioned that she had to stop wearing her engagement ring that wasn't absolutely straight until that got fixed. She also suffers from the need to know and to remember and asks others excessively or needs to reread texts several times.</p> <p>Apart from an additional excessive concern with animal dirt (pigeons) she reports the urge to check door locks and the stove to make sure she did not make mistakes, nothing happened that might harm others or her.</p>	34	Female	College Degree (2 years)	18	16.00	2.00	8.00	8.00	24.00

<i>Cases</i>	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
<i>OCD 20</i>	Lacking any obsessions, he reports to checking windows twice and locks and doors in 3 (3 times) and repeats this ritual when number 2 or 3 was not reached properly. He mentions that security is reason and to make sure he did not make a mistake and nothing happens he might be responsible for. When checking that the computer is switched off he involves in mental rituals and says "lock 1,2,3" until it feels neutral.	57	Male	Highschool/G ED	7	5.00	1.00	0.00	5.00	20.00
<i>OCD 21</i>	She is overall excessively concerned with what is right and wrong so that she for example deletes online messages after sending them to not being judged and humiliated if someone sees it. She doesn't want to appear imperfect. In this sense she reports to have contamination obsessions especially with bodily waste related to her period. During this time she compulsively washes and showers herself and prevents touching sanitary items by wearing gloves and changes bed sheets constantly during this time. Besides her disgust she is overly afraid to be contaminated with stains from household items, especially the carpet and then gets others ill by spreading contaminants. She therefore avoids putting things on the carpet or putting clean clothes on the laundry basket.	22	Female	Bachelor Degree (4 years)	15	19.00	3.00	10.00	9.00	56.00
<i>OCD Mean Total</i>		44.35			16.90	17.43	2.45	7.90	9.45	44.89

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
SCZ1	Due to a constant concerns with dirt or germs he developed excessive handwashing. More prominent is a constant fear of loosing things (e.g. his backpack). To make sure that nothing terrible will happen he checks twice that locks, stove, switches in the house and his guitar is switched off when not in use. He also checks that he does everything right and does not make a mistake and that his actions are morally correct; he checks to put his 'mind in ease'. To make sure he's doing things right and to help make others feel better he prays repetitively until it feels right again. Those prayers keep him calm.	48	Male	Bachelor Degree (4 years)	26	22.00	2.00	11.00	11.00	82.00
SCZ 2	Due to a constant and excessive concern with dirt and germs, household items, animals, sticky substances, residues she is worried she will get ill because of their contaminants and engages in excessive or ritualized handwashing. She is collecting things just to have it and is afraid of loosing things and involves in ordering, arranging compulsions. Therefore she has the urge to know and remember and checks door locks, that the stove is turned off so that she is certain she is not making a mistake. She is also fearing to do something embarrassing and worries not to do or to say morally the right thing or maybe something blasphemic wrong. Sometimes she is bothered by certain reoccurring sounds and believes in lucky/unlucky numbers.	49	Female	Highschool/G ED	21	32.00	2.00	16.00	16.00	112.00

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
SCZ 3	With an excessive concern about animals and especially animal residues, she fears that she will get ill because of contaminants and will get others ill when she touches them by spreading contaminants to them. She excessively washes her hands in a ritualistic way and needs to moisturize them every time she goes out. She has a constant concern to lose things and saves/hoards different materials for her art crafts. Apart from unlucky and lucky numbers she reports intrusive nonsense sounds (engines), checks locks and the kettle, as she fears to forget to do things.	51	Female	some College	48	17.00	2.00	7.00	10.00	52.00
SCZ 4	Because of his sexual obsessions that involve homosexuality and certain sexual behavior towards others of an aggressive nature, he has a constant fear of people reading his thoughts. He believes that he will be responsible for something happening because of those thoughts. Therefore he compulsively checks windows, doors, his cheques he is writing, and repetitively rereads and rewrites notes and messages trying to makes sure that he will not harm others.	47	Male	some College	32	15.00	1.00	6.00	9.00	44.00
SCZ 5	A constant concern or disgust with urine, feces, dirt or germs is driving him to repetitively seek reassurance that he didn't develop any illness or disease. He needs to know or to remember and engages out of fear to forget in excessive listmaking. He fears to say not just the right things or certain things he doesn't want to say. However, he always feels the need to confess things and over disclose himself. His fear of losing things makes him check the doors, locks, cards, his bag and phone several times. He avoids social situations and bookstores, he also collects books.	45	Male	College Degree (2 years)	10	19.00	2.00	7.00	12.00	---

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
SCZ 6	An excessive concern with animal contamination worries her and she repeatedly thinks she is getting ill due to touching and being around them. She developed superstitious fears about the devil, therefore avoids the number 666 and anything with Friday 13th and believes that the good always has to win over evil. She is counting stairs and is stepping on those with lucky numbers (7,8,16...), and tries to avoid the stairs with unlucky numbers. She is also often bothered by certain sounds and noises. Excessive concerns with morality drive her to constantly confess to her parents and siblings that she has done something wrong. She reports forbidden thoughts and is concerned with sacrilege and blasphemy. She liked to go to church but now avoids any church persons, because of her belief that they think she is a bad person and that she only goes to church to make friends not just for church.	43	Female	College Degree (2 years)	25	9.00	2.00	9.00	.00	66.00
SCZ 7	His concern evolves around him having done something wrong and the fear of insulting someone by blurting out something. Specifically, he is afraid to approach aboriginal people as he fears that they might be nasty and is due to this also afraid meeting new people. He reports perfectionism to always have it just right and do the right thing. He is also collecting and hoarding things he might need later.	54	Male	Highschool/G ED	18	14.00	1.00	9.00	5.00	90.00

Cases	Description	Age	Gender	Education	Age of Onset	Y-BOCS				OCI
		(years)	Male/ Female		(years)	Total (0-40)	Global Severity (0 to 4)	Obsessions (0-20)	Compulsions (0-20)	Total (0 to 168)
SCZ 8	His constant fear is about smokers being persecuted (he is a smoker) and him one time writing to the government about affairs and things he has done. He reports a fear to act on constant forbidden sexual thoughts and discovered that he often stares at someone. He believes in words that are good and bad and lucky or unlucky numbers and engages in repeating rituals (4,8,18,24 times). The obsessive urge to save and hoard things leads him to hoard books/DVDs. He also checks doors, light switches, medications, and keys repeatedly and rewrites and rereads letters. He compulsively reorders and arranges the coffee table and excessively makes lists of several items.	59	Male	Highschool/G ED	55	20.00	3.00	12.00	8.00	85.00
SCZ Mean Total		49.5			29.38	18.50	1.88	9.63	8.88	75.86

Appendix 2: Cases' primary belief and insight and conviction of 29 participants

Case Belief descriptions and insight and delusions data: Yale Brown Obsessive-Compulsive Scale (Y-BOCS insight), Brown Assessment of Belief Scale (BABS total and Conviction), Overvalued Idea Scale (OVIS Total), Nepean belief Scale (NBS Total), Peters Delusions Inventory (PDI Total), Magical Ideation Scale (MIS Total), Becks Cognitive Insight Scale (BCIS self-certainty and self-reflectiveness), Thought-action-Fusion Scale (TAF Total), Metacognitive Questionnaire (MCQ30 Total), Illusory Beliefs Inventory (IBI total and internal state and thought action) for each participant in the OCD subgroup (N=21) respective the Schizophrenia subgroup (N=8) and according mean summaries for each subgroup (e.g., mean Y-BOCS insight or mean total PDI).

Cases	Belief Description	PDI-21	MIS	BABS Conviction	Y-BOCS Insight	BABS	OVIS	NBS	IBI	IBI magical beliefs	IBI Internal state thought action	TAF
		(0 to 105)	(0 to 30)	(0 to 4)	(0 to 4)	(0 to 20)	(0 to 10)	(0 to 30)	(24 to 120)	(10 to 50)	(5 to 25)	(0 to 76)
OCD 1	I have to arrange and order things in a specific order so that I can make sure that everything gets the equal opportunity to be worn and used.	29.00	6.00	4.00	3.00	15.00	6.90	25.00	71.00	29.00	11.00	28.00
OCD 2	I have to collect and keep things to make sure I have them for later when I need them.	6.00	11.00	1.00	2.00	3.00	4.90	11.00	97.00	33.00	22.00	33.00
OCD 3	I keep things (newspapers) because I might need them later one day	18.00	14.00	4.00	1.00	12.00	5.30	21.00	76.00	30.00	15.00	29.00
OCD 4	I am waving my hands to relieve anxiety/ to get stress relief and to feel more confident	2.00	3.00	4.00	0.00	6.00	2.60	23.00	29.00	10.00	5.00	0.00
OCD 5	I have to check that I didn't do a mistake,(cause financial problems) and to prevent something bad is going to happen	0.00	0.00	0.00	1.00	2.00	1.70	9.00	47.00	10.00	5.00	36.00
OCD 6	My house has to be tidy, clean and in order to give me a sense of peace and control and power	4.00	8.00	.00	0.00	1.00	4.40	13.00	80.00	29.00	14.00	24.00

Cases	Belief Description	PDI-21	MIS	BABS Conviction	Y-BOCS Insight	BABS	OVIS	NBS	IBI	IBI magical beliefs	IBI Internal state thought action	TAF
		(0 to 105)	(0 to 30)	(0 to 4)	(0 to 4)	(0 to 20)	(0 to 10)	(0 to 30)	(24 to 120)	(10 to 50)	(5 to 25)	(0 to 76)
OCD 7	I have to count things more often to a certain number to reassure myself that it is right			4.00	2.00	14.00	6.30	18.00				
OCD 8	I wash my hands more often to avoid being contaminated with poison	0.00	8.00	3.00	1.00	13.00	6.10	20.00	54.00	20.00	5.00	0.00
OCD 9	I have to wash/handwash myself excessively to protect the cleanliness of my room, personal space	13.00	1.00	3.00	1.00	6.00	4.70	11.00	49.00	15.00	5.00	6.00
OCD 10	If I have a thought that curses someone and then something will happen to them, it will be my fault and I need to reverse it with a spiritual healer	12.00	9.00	3.00	2.00	8.00	4.50	12.00	78.00	28.00	16.00	39.00
OCD 11	I have to count up to 4 to take the badness out of the house away from me and my family (when watching sth. on TV like police things, count to neutralise it)	2.00	8.00	3.00	0.00	10.00	3.80	15.00	71.00	34.00	14.00	30.00
OCD 12	I have to collect/hoard things to make me feel good and look at nice things/have nice things	2.00	0.00	0.00	1.00	1.00	4.30	11.00	61.00	27.00	7.00	15.00
OCD 13	I do not use public bathrooms or toilets because I fear I get sick			1.00	0.00	9.00	5.20	14.00	---	---	---	---

Cases	Belief Description	PDI-21	MIS	BABS Conviction	Y-BOCS Insight	BABS	OVIS	NBS	IBI	IBI magical beliefs	IBI Internal state thought action	TAF
		(0 to 105)	(0 to 30)	(0 to 4)	(0 to 4)	(0 to 20)	(0 to 10)	(0 to 30)	(24 to 120)	(10 to 50)	(5 to 25)	(0 to 76)
OCD 14	I need to remember things I read to make sure I have it in mind to be more helpful to other persons	3.00	2.00	0.00	0.00	10.00	4.80	17.00	65.00	18.00	13.00	14.00
OCD 15	If I am not driving my partner to work and sth. would happen to him I would be responsible. I could have avoided it if I drove him	0.00	7.00	1.00	1.00	5.00	3.40	8.00	85.00	34.00	18.00	33.00
OCD 16	When I am going shopping I am weighing up pros and cons excessively because I want to make the right choices	6.00	11.00	4.00	1.00	10.00	5.10	19.00	40.00	14.00	7.00	31.00
OCD 17	If I might harm someone by being careless I am responsible for something terrible to happen to this person	8.00	12.00	0.00	2.00	13.00	7.50	22.00	48	14	15	29.00
OCD 18	I have to clean myself excessively to appear clean and acceptable to be not rejected	15.00	9.00	3.00	2.00	15.00	8.20	20.00	73.00	26.00	16.00	28.00
OCD 19	I need to know or to ask about certain things, to get people to repeat some information because I need to know details have the exact details	0.00	4.00	0.00	2.00	2.00	2.50	3.00	63.00	25.00	10.00	18.00

Cases	Belief Description	PDI-21	MIS	BABS Conviction	Y-BOCS Insight	BABS	OVIS	NBS	IBI	IBI magical beliefs	IBI Internal state thought action	TAF
		(0 to 105)	(0 to 30)	(0 to 4)	(0 to 4)	(0 to 20)	(0 to 10)	(0 to 30)	(24 to 120)	(10 to 50)	(5 to 25)	(0 to 76)
OCD 20	I have to check door locks, windows etc. to make sure I don't break rules (inherited from military), fear of mistakes, being responsible for mistakes	0.00	1.00	0.00	0.00	0.00	3.90	1.00	23.00	10.00	5.00	1.00
OCD 21	I should be able to control my own body and not contaminate others with unpleasant bodily fluids	5.00	3.00	3.00	1.00	8.00	5.20	12.00	60.00	17.00	5.00	19.00
OCD Mean Total		6.58	23.38	1.95	1.10	7.75	4.78	14.65	61.63	22.63	11.20	21.00

Cases	Belief Description	PDI-21	MIS	BABS Conviction	Y-BOCS Insight	BABS	OVIS	NBS	IBI	IBI magical beliefs	IBI Internal state thought action	TAF
		(0 to 105)	(0 to 30)	(0 to 4)	(0 to 4)	(0 to 20)	(0 to 10)	(0 to 30)	(24 to 120)	(10 to 50)	(5 to 25)	(0 to 76)
SCZ 1	I have to check the lock, the keys, the heater to make sure that no unwanted consequences happen	21.00	64.00	3.00	3.00	15.00	7.40	28.00	68.00	26.00	14.00	24.00
SCZ 2	I have to wash my hands to make sure that I am not contaminated with germs/dirt	9.00	40.00	4.00	3.00	17.00	8.20	25.00	82.00	29.00	18.00	26.00
SCZ 3	I have to check the kettle to make sure it's off and I don't set fire to the house	21.00	116.00	3.00	4.00	15.00	6.80	24.00	91.00	37.00	17.00	49.00
SCZ 4	There might be the possibility that I have harmed someone, that's why I have to check to make sure	18.00	90.00	2.00	1.00	4.00	3.50	9.00	69.00	20.00	13.00	17.00
SCZ 5	I have to reassure myself (ask my wife) to not make a mistake, seek certainty.			4.00	3.00	11.00	4.60	19.00	---	---	---	---
SCZ 6	I don't touch animals cause I fear getting contaminated	17.00	112.00	4.00	4.00	20.00	7.60	16.00	77.00	35.00	12.00	1.00
SCZ 7	I have the fear to make mistakes, thoughts doing things wrong and being judged and rejected because if mistakes			3.00	2.00	13.00	5.80	17.00	---	---	---	---
SCZ 8	I have to check the light switches, doors, medication to make sure nothing bad will happen	17.00	95.00	1.00	3.00	4.00	5.30	9.00	76.00	31.00	20.00	47.00
SCZ Mean Total		17.16	86.17	3.00	2.88	12.38	6.15	18.38	74.40	28.20	15.40	23.00

**Appendix 3: Socio-Demographic Questions included in the online
survey (Paper1) and administered in Face-to-Face Interviews for
later studies**

Socio-Demographic Questions

1. What is your age?

2. Are you Male or Female?

- ☐ Male (1)
☐ Female (2)

3. Were you born in Australia?

- ☐ Yes (1)
☐ No (2)

3a. In which country were you born?

4. Is English your first language?

- ☐ Yes (1)
☐ No (2)

4a. What is your first language?

5. What is the highest level of education you have completed?

- ☐ less than Highschool (1)
☐ Highschool/GED (2)
☐ some College (3)
☐ College Degree (2 years) (4)
☐ Bachelor Degree (4 years) (5)
☐ Master's Degree (6)
☐ Doctoral Degree (7)
☐ Professional Degree (Medical or Juris Doctor) (8)
☐ other (9)

5a. Describe your education, including number of years:

6. What is your profession?

7. Do you have a religion?

- ☐ Yes (1)
- ☐ No (2)

7a. What is your religion?

- ☐ Christian (1)
- ☐ Jewish (2)
- ☐ Muslim (3)
- ☐ Hindu (4)
- ☐ Buddhist (5)
- ☐ other (6)

7b. Describe what kind of religion:

8. How old were you the first time your symptoms of OCD occurred?

9. Have you been diagnosed with a mental disorder?

- ☐ Yes (1)
- ☐ No (2)

9a. What Diagnosis?

10. Do you currently take any Medication?

- ☐ Yes (1)
- ☐ No (2)

10a. Please list your Medication here:

11. Do you currently receive any other treatments?

- ☐ Yes (1)
- ☐ No (2)

11a. Please list these treatments here:

12. Do you know about a family member with medical conditions?

- ☐ Yes (1)
- ☐ No (2)

12a. Please describe who and what medical conditions you think that have:

Appendix 4: NEAF Ethics Approval from Concord Hospital

Contact: Sydney Local Health District Human Research Ethics Committee –
CRGH
Concord Repatriation General Hospital (CRGH)
Concord NSW 2139
Telephone: (02) 9767 5622 Fax (02) 9767 6569
Email: ethicscrgh@email.cs.nsw.gov.au

Our Ref: (HREC/12/CRGH/104)



CONCORD
REPATRIATION GENERAL
HOSPITAL

25 September 2012

A/Professor Robyn Langdon
Department of Cognitive Science
MACQUARIE UNIVERSITY
NSW 2109

Dear Professor Langdon,

Re: HREC/12/CRGH/104 CH62/6/2012-081 – R Langdon
Meta-cognition in Obsessive-Compulsive Disorder with and without delusional ideation

Thank you for submitting the above multi-centre project for single ethical and scientific review. This project was first considered by the Sydney Local Health District Human Research Ethics Committee – CRGH at its meeting held on 28 June 2012. This Human Research Ethics Committee (HREC) has been accredited by the NSW Ministry of Health as a lead HREC under the model for single ethical and scientific review, and certified by the National Health and Medical Research Council (NHMRC) under the National model for Harmonisation of Multicentre Ethical Review (HoMER).

This lead HREC is constituted and operates in accordance with the NHMRC's *National Statement on Ethical Conduct in Human Research* and the *CPMP/ICH Note for Guidance on Good Clinical Practice*.

I am pleased to advise that the Committee has granted ethical approval of this research project.

The documents reviewed and approved include:

National Ethics Application Form (NEAF) – submission code AU/1/E19E06

Protocol - Version 2 dated 10/08/2012

Information for Participants & Consent Form (Stage 1) – Master Version No. 3 dated 10/09/2012

Information for Participants & Consent Form (Stage 3) – Master Version No. 3 dated 10/09/2012

Other:

Interviews and Questions (74 pages) - Version 1 dated 24/05/2012

Recruitment Flyer – Version 2 dated 13/08/2012

The Interpersonal Reactivity Index (IRI; Davis 1980)

The HREC has provided ethical and scientific approval for the following sites:

1. Concord Repatriation General Hospital
2. Nepean Hospital

Appendix 5: Ethics Approval from Macquarie University

Ethics Secretariat <ethics.secretariat@mq.edu.au>

5/10/12

to A/Prof, anne.jager

Dear A/Prof Langdon

Re: "Meta-cognition in obsessive-compulsive disorders with and without delusional ideation" (Ethics Ref: 5201200243)

Thank you for your recent correspondence. Your response has addressed the issues raised by the Human Research Ethics Committee and you may now commence your research.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/e72.pdf.

The following personnel are authorised to conduct this research:

A/Prof Robyn Langdon

Dr Vlasios Brakoulis

Miss Anne Jager

NB. STUDENTS: IT IS YOUR RESPONSIBILITY TO KEEP A COPY OF THIS APPROVAL EMAIL TO SUBMIT WITH YOUR THESIS.

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).
2. Approval will be for a period of five (5) years subject to the provision of annual reports.

Progress Report 1 Due: 10 May 2013

Progress Report 2 Due: 10 May 2014

Progress Report 3 Due: 10 May 2015

Progress Report 4 Due: 10 May 2016

Final Report Due: 10 May 2017

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University.

This information is available at the following websites:

<http://www.mq.edu.au/policy/>

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have final approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

Please retain a copy of this email as this is your official notification of final ethics approval.

Yours sincerely

Dr Karolyn White

Director of Research Ethics

Chair, Human Research Ethics Committee

Appendix 6: Australian Schizophrenia Research Bank (ASRB)



**SCHIZOPHRENIA
RESEARCH
BANK**

Jason Bridge
ASRB Research Coordinator
Centre for Translational Neuroscience & Mental Health
PO BOX 833
Newcastle NSW 2300

Local Telephone: (02)4033 5723
Toll Free: 1800 639 295
International: +61 2 4033 5723
Facsimile: (02)4033 5692
Email: Jason.Bridge@newcastle.edu.au
Website: www.schizophreniaresearch.org.au

30 April 2013

Anne Jaeger
Department of Cognitive Science
ARC Centre of Excellence in Cognition and its Disorders
The Australian Hearing Hub
16 University Avenue
Macquarie University NSW 2109

Dear Anne Jaeger,

Research Project: ASRB-P64 - 'Delusional ideation in OCD'

I am pleased to inform you that on 29th April 2013 the Australian Schizophrenia Research Bank; ASRB Access Committee approved your application to use the resources of the ASRB.

Please ensure that you have read and understand the "Guidelines for Researchers", provided with your Resource Access Application Form. If you agree to proceed, and have not done so already, please sign the Access Agreement Statement and return it to us, ASRB, PO Box 833, Newcastle NSW 2300, as soon as possible.

I also take this opportunity to remind researchers of their obligation provided in item 16, Access Agreement Statement. It is a requirement to acknowledge the ASRB in any publications or presentations which result from the use of Materials or Research Volunteers using one of the three format options listed. During and after the term of this agreement, the Recipients must provide the ASRB with copies of all manuscripts submitted or published. Additionally, the following statement must be included on all publications and presentations:

This study was supported by the Australian Schizophrenia Research Bank (ASRB), which is supported by the National Health and Medical Research Council of Australia, the Pratt Foundation, Ramsay Health Care, the Viertel Charitable Foundation and the Schizophrenia Research Institute.



**SCHIZOPHRENIA
RESEARCH
BANK**

Currently, access to ASRB resources is on a cost recovery basis (Item 8 Cost Recovery) and payment of this access fee will be required prior to contacting volunteers. I will forward you an invoice for the agreed amount shortly. These costs will be paid by the investigator to the Schizophrenia Research Institute, which manages funds on behalf of the ASRB.

On behalf of the Schizophrenia Research Institute, and the ASRB, I wish you well with your research. Please do not hesitate to contact me if you have any further enquiries.

Yours sincerely,

Jason Bridge
ASRB Research Coordinator

SCHIZOPHRENIA RESEARCH BANK

Toll Free: 1800 639 295 ■ Website: www.schizophreniaresearch.org.au ■ Email: asrb@schizophreniaresearch.org.au

NEWCASTLE

Head Office

Centre for Translational
and Mental Health

BRISBANE

Mental Health Centre
Floor K, Royal
Brisbane

MELBOURNE

Melbourne
Neuropsychiatry
Centre, Sunshine

ORANGE

Centre for Rural and
Remote Mental
Health,

PERTH

Centre for Clinical
Research
Neuropsychiatry,

SYDNEY

Schizophrenia
Research
Institute, Victor Chang

Appendix 7: Regression tables for mediation analyses (paper 1)

GET

FILE="/Volumes/Anne's/#1.Online Study_paper/web-based study (Qualtrics-Program)/CLOSEDOnline Survey31.01.2014_90.sav".

DATASET NAME DataSet1 WINDOW=FRONT.

CORRELATIONS

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/PRINT=TWOTAIL NOSIG

/STATISTICS DESCRIPTIVES

/MISSING=PAIRWISE.

Correlations

Descriptive Statistics

	Mean	Std. Deviation	N
OCI_TOTAL_SUM	72.5000	32.41246	90
MCQ30_TOTAL	77.5844	18.01706	77
PDloverall_new	66.5375	46.57482	80

Correlations

		OCI_TOTAL_SUM	MCQ30_TOTAL	PDloverall_new
OCI_TOTAL_SUM	Pearson Correlation	1	.570**	.297**
	Sig. (2-tailed)		.000	.007
	N	90	77	80
MCQ30_TOTAL	Pearson Correlation	.570**	1	.347**
	Sig. (2-tailed)	.000		.002
	N	77	77	77
PDloverall_new	Pearson Correlation	.297**	.347**	1
	Sig. (2-tailed)	.007	.002	
	N	80	77	80

** . Correlation is significant at the 0.01 level (2-tailed).

```

REGRESSION
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/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT MCQ30_TOTAL
/METHOD=ENTER PDloverall_new.

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Regression

Descriptive Statistics

	Mean	Std. Deviation	N
MCQ30_TOTAL	77.5844	18.01706	77
PDloverall_new	65.8571	44.52253	77

Correlations

		MCQ30_TOTAL	PDloverall_new
Pearson Correlation	MCQ30_TOTAL	1.000	.347
	PDloverall_new	.347	1.000
Sig. (1-tailed)	MCQ30_TOTAL	.	.001
	PDloverall_new	.001	.
N	MCQ30_TOTAL	77	77
	PDloverall_new	77	77

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	PDloverall_new ^b	.	Enter

a. Dependent Variable: MCQ30_TOTAL

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.347 ^a	.120	.109	17.00988

a. Predictors: (Constant), PDloverall_new

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2970.499	1	2970.499	10.267	.002 ^b
	Residual	21700.203	75	289.336		
	Total	24670.701	76			

a. Dependent Variable: MCQ30_TOTAL

b. Predictors: (Constant), PDloverall_new

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	68.337	3.477		19.656	.000
	PDloverall_new	.140	.044	.347	3.204	.002

a. Dependent Variable: MCQ30_TOTAL

```

REGRESSION
/DESCRIPTIVES MEAN STDDEV CORR SIG N
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT OCI_TOTAL_SUM
/METHOD=ENTER PDloverall_new MCQ30_TOTAL.

```

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
OCI_TOTAL_SUM	67.5195	29.22715	77
PDloverall_new	65.8571	44.52253	77
MCQ30_TOTAL	77.5844	18.01706	77

Correlations

		OCI_TOTAL_SUM	PDloverall_new	MCQ30_TOTAL
Pearson Correlation	OCI_TOTAL_SUM	1.000	.362	.570
	PDloverall_new	.362	1.000	.347
	MCQ30_TOTAL	.570	.347	1.000
Sig. (1-tailed)	OCI_TOTAL_SUM	.	.001	.000
	PDloverall_new	.001	.	.001
	MCQ30_TOTAL	.000	.001	.
N	OCI_TOTAL_SUM	77	77	77
	PDloverall_new	77	77	77
	MCQ30_TOTAL	77	77	77

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	MCQ30_TOTAL, PDloverall_new ^b	.	Enter

a. Dependent Variable: OCI_TOTAL_SUM

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.597 ^a	.356	.339	23.76959

a. Predictors: (Constant), MCQ30_TOTAL, PDloverall_new

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23111.712	2	11555.856	20.453	.000 ^b
	Residual	41809.509	74	564.993		
	Total	64921.221	76			

a. Dependent Variable: OCI_TOTAL_SUM

b. Predictors: (Constant), MCQ30_TOTAL, PDloverall_new

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.187	12.050		-.347	.729
	PDloverall_new	.123	.065	.187	1.876	.065
	MCQ30_TOTAL	.820	.161	.506	5.083	.000

a. Dependent Variable: OCI_TOTAL_SUM

This calculator uses the Sobel test to tell you whether a mediator variable significantly carries the influence of an independent variable to a dependent variable; i.e., whether the indirect effect of the independent variable on the dependent variable through the mediator variable is significant. This calculator returns the Sobel test statistic, and both one-tailed and two-tailed probability values.

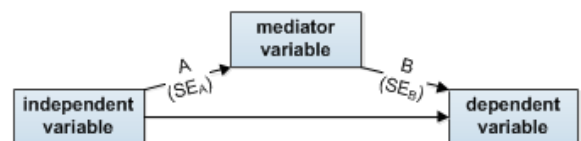
Please supply the necessary parameter values, and then click 'Calculate'.

A: ?

B: ?

SE_A: ?

SE_B: ?



Sobel test statistic: 2.69851251
One-tailed probability: 0.00348251
Two-tailed probability: 0.00696501

```

CORRELATIONS
/VARIABLES=OCI_TOTAL_SUM MCQ30_TOTAL MIS_TOTAL
/PRINT=TWOTAIL NOSIG
/STATISTICS DESCRIPTIVES
/MISSING=PAIRWISE.

```

Correlations

Descriptive Statistics

	Mean	Std. Deviation	N
OCI_TOTAL_SUM	72.5000	32.41246	90
MCQ30_TOTAL	77.5844	18.01706	77
MIS_TOTAL	7.4824	4.63581	85

Correlations

		OCI_TOTAL_SUM	MCQ30_TOTAL	MIS_TOTAL
OCI_TOTAL_SUM	Pearson Correlation	1	.570**	.357**
	Sig. (2-tailed)		.000	.001
	N	90	77	85
MCQ30_TOTAL	Pearson Correlation	.570**	1	.281*
	Sig. (2-tailed)	.000		.013
	N	77	77	77
MIS_TOTAL	Pearson Correlation	.357**	.281*	1
	Sig. (2-tailed)	.001	.013	
	N	85	77	85

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

```

REGRESSION
/DESCRIPTIVES MEAN STDDEV CORR SIG N
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT MCQ30_TOTAL
/METHOD=ENTER MIS_TOTAL.

```

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
MCQ30_TOTAL	77.5844	18.01706	77
MIS_TOTAL	7.4416	4.74756	77

Correlations

		MCQ30_TOTAL	MIS_TOTAL
Pearson Correlation	MCQ30_TOTAL	1.000	.281
	MIS_TOTAL	.281	1.000
Sig. (1-tailed)	MCQ30_TOTAL	.	.007
	MIS_TOTAL	.007	.
N	MCQ30_TOTAL	77	77
	MIS_TOTAL	77	77

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	MIS_TOTAL ^b	.	Enter

a. Dependent Variable: MCQ30_TOTAL

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.281 ^a	.079	.066	17.40813

a. Predictors: (Constant), MIS_TOTAL

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1942.484	1	1942.484	6.410	.013 ^b
	Residual	22728.217	75	303.043		
	Total	24670.701	76			

a. Dependent Variable: MCQ30_TOTAL

b. Predictors: (Constant), MIS_TOTAL

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	69.660	3.706		18.798	.000
MIS_TOTAL	1.065	.421	.281	2.532	.013

a. Dependent Variable: MCQ30_TOTAL

REGRESSION

```

/DESCRIPTIVES MEAN STDDEV CORR SIG N
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT OCI_TOTAL_SUM
/METHOD=ENTER MIS_TOTAL MCQ30_TOTAL.

```

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
OCI_TOTAL_SUM	67.5195	29.22715	77
MIS_TOTAL	7.4416	4.74756	77
MCQ30_TOTAL	77.5844	18.01706	77

Correlations

		OCI_TOTAL_SUM	MIS_TOTAL	MCQ30_TOTAL
		M		
Pearson Correlation	OCI_TOTAL_SUM	1.000	.345	.570
	MIS_TOTAL	.345	1.000	.281
	MCQ30_TOTAL	.570	.281	1.000
Sig. (1-tailed)	OCI_TOTAL_SUM	.	.001	.000
	MIS_TOTAL	.001	.	.007
	MCQ30_TOTAL	.000	.007	.
N	OCI_TOTAL_SUM	77	77	77
	MIS_TOTAL	77	77	77
	MCQ30_TOTAL	77	77	77

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	MCQ30_TOTAL, MIS_TOTAL ^b	.	Enter

a. Dependent Variable: OCI_TOTAL_SUM

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.602 ^a	.362	.345	23.65236

a. Predictors: (Constant), MCQ30_TOTAL, MIS_TOTAL

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23523.078	2	11761.539	21.024	.000 ^b
	Residual	41398.143	74	559.434		
	Total	64921.221	76			

a. Dependent Variable: OCI_TOTAL_SUM

b. Predictors: (Constant), MCQ30_TOTAL, MIS_TOTAL





Coefficients^a

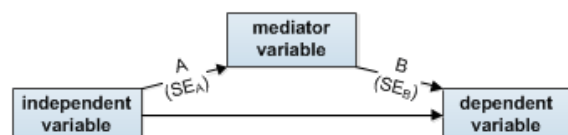
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.372	12.033		-.530	.598
	MIS_TOTAL	1.233	.595	.200	2.072	.042
	MCQ30_TOTAL	.834	.157	.514	5.316	.000

a. Dependent Variable: OCI_TOTAL_SUM

This calculator uses the Sobel test to tell you whether a mediator variable significantly carries the influence of an independent variable to a dependent variable; i.e., whether the indirect effect of the independent variable on the dependent variable through the mediator variable is significant. This calculator returns the Sobel test statistic, and both one-tailed and two-tailed probability values.

Please supply the necessary parameter values, and then click 'Calculate'.

A: 
 B: 
 SE_A: 
 SE_B: 



Sobel test statistic: 2.28393848
One-tailed probability: 0.01118757
Two-tailed probability: 0.02237515