

THE UTILITY OF OBSESSIVE COMPULSIVE ANALOGUE RESEARCH: A
COMPARISON OF OCD PATIENT, ANALOGUE, AND NONCLINICAL SAMPLES

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ABSTRACT

Laura E Fabricant: The Utility of Obsessive Compulsive Analogue Research: A Comparison of OCD Patient, Analogue, and Nonclinical Samples
(Under the direction of Jonathan Abramowitz)

Many researchers interested in studying obsessive compulsive disorder (OCD) often include individuals who do not meet full diagnostic criteria for OCD, but who experience some obsessive compulsive (OC) symptoms, as study participants. While research using these analogue samples is common, it is unclear as to how closely they resemble samples of individuals with a diagnosis of OCD. The current study thus examined the relationship between analogue and clinical samples in order to better understand the generalizability of data from these analogue samples. Specifically, this study compared an OC analogue sample to an OCD clinical sample, as well as to a healthy control group, on the following domains: OC symptom content, the frequency and severity of both obsessions and compulsions, distress and interference related to these symptoms, endorsement of obsessional beliefs that contribute to the development and maintenance of OC symptoms, and rates of psychiatric comorbidity.

We found that the analogue group scored below the clinical group, and above the control group, on measures of OC symptom severity, frequency, and impairment. Furthermore, the analogue group did not differ from the clinical group, but did differ from controls, in terms of OC symmetry symptoms, the presence of both obsessions and compulsions across content areas, and patterns of comorbidity. Finally, an important area of difference between sub-clinical and clinical OCD may be in the relationship between obsessional beliefs and OC symptoms. Taken

together these results provide general support for the use and utility of OC analogue samples and are largely consistent with dimensional perspectives of OCD.

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INTRODUCTION

Obsessive compulsive disorder (OCD) is a complex and disabling condition characterized by intrusive, unwanted thoughts or images that lead to increased anxiety (obsessions) and by repetitious, intentional rituals that are performed to neutralize the anxiety (compulsions) (American Psychiatric Association, 2013). Although OCD only affects approximately 2-3% of adults (Karno, Golding, Sorenson, & Burnam, 1988; Kessler et al., 2005), research shows that 80-90% of the population experiences unwanted, intrusive “obsession-like” thoughts (Rachman & de Silva, 1978). While these types of thoughts may differ from clinical obsessions in terms of their frequency and intensity, they are similar in content and form to clinical obsessions. That is, they can be images, impulses, doubts, and fears that are personally relevant, but unwanted, seemingly uncontrollable, and ego-dystonic (e.g. the thought of stabbing a loved one, the image of having sex with one’s sibling). Furthermore, many individuals who do not have OCD still report experiencing at least some distress associated with their unwanted intrusive thoughts, and they respond to these thoughts as do people with OCD (Ladouceur et al., 2000). Given this, and the relatively low prevalence of people who meet full diagnostic criteria for OCD, many researchers interested in studying this disorder often include individuals who do not meet full diagnostic criteria for OCD, but who experience some obsessive compulsive (OC) *symptoms*, as study participants. This allows for the collection of data from a larger sample more quickly than would be possible with using only patients diagnosed with OCD.

While research using these sub-clinical or “analogue” samples is common, there is debate in the field regarding how to best define analogue OCD samples, the nature of this sub-clinical

phenomenon, and most importantly, the overall utility of this type of research. A recent review (Abramowitz et al., 2014) suggested that research using these types of samples is likely to be relevant to understanding OCD; however this question has yet to be examined empirically. Specifically, no study to date has compared analogue samples to clinical samples across clinically relevant domains. Thus, although it is taken for granted, there are no empirical data that specifically speak to how closely analogue samples resemble samples of individuals with a diagnosis of OCD. It is becoming increasingly necessary to understand the utility of analogue OCD research given its growing prevalence in the field. Accordingly, the present study attempts to answer questions about the relationship between analogue and clinical samples in order to better understand the generalizability of data from these analogue samples.

Defining OC Analogue Samples

There is currently no universally agreed upon definition of what constitutes an OC analogue sample. In a literal sense, it refers to individuals who are thought to be comparable in some way to those with OCD. Historically, this has included research with animals, such as dogs that were conditioned to engage in behaviors similar to those seen in OCD and then subjected to extinction procedures reminiscent of modern exposure-based treatments (e.g. Solomon, Kamin, & Wynne, 1953). While research using animal analogues of OC symptoms still exists, the utility and theoretical basis of some of the more recent animal models of OCD (e.g., dogs that “compulsively” chase their tail; Dodman, 2006) has been criticized since only behaviors (as opposed to cognitions) are measurable in animals, and it is anthropomorphic to assume that animals are performing such behaviors in response to unwanted, intrusive thoughts (Abramowitz, Taylor, McKay, & Deacon, 2011).

In current human research, analogue OC samples are most often composed of non-treatment seeking individuals (e.g. undergraduate students) who do not meet full diagnostic criteria for OCD, but report experiencing some OC symptoms (e.g., they score highly on measures of OC symptoms; Fullana et al., 2007; Taberner, et al., 2009). While drawn from a nonclinical population, these individuals display “sub-clinical” presentations of OCD. For example, they might experience obsessions and compulsions, but not significant distress or interference relating to these symptoms (de Bruijn, Beun, de Graaf, ten Have, & Denys, 2010). It is thought that since these individuals experience some symptoms of OCD, they will be generally analogous to clinical samples. Given that the vast majority of studies employing analogue samples use individuals with sub-clinical presentations of OCD, the terms “analogue” and “sub-clinical” will be used interchangeably in the current paper.

Theoretical Basis Underlying the Use of Analogue Samples

Cognitive behavioral model. The use of analogue samples, in particular the idea that sub-clinical OC symptoms are analogous to OCD, has largely emerged from the cognitive behavioral (CB) conceptualization of OCD. This well-articulated and empirically supported model posits that clinical obsessions develop as a result of misinterpreting normally occurring unwanted, intrusive thoughts (Rachman, 1997). In a seminal study, Rachman and de Silva (1978) found that the majority of the general population reported experiencing unwanted, intrusive thoughts that were often indistinguishable from clinical obsessions in content and form. These results have been reproduced in a number of other studies, which indicate that between 80% and 99% of healthy individuals report having obsession-like intrusive thoughts (e.g. Clark, 1992; Clark & de Silva, 1985; Freeston, Ladouceur, Thibodeau & Gagnon, 1991, 1992; Purdon & Clark, 1993, 1994; Salkovskis & Harrison, 1984).

The CB model argues that these thoughts become obsessions when they are interpreted as being overly important, dangerous, or threatening, because this misinterpretation leads to anxiety, a preoccupation with the thought, and the urge to resist or control it (Rachman, 1997; Salkovskis, 1991). For example, one might believe that having a harmless thought such as, “I could use that knife to stab my spouse,” is actually indicative of deep-seated violent tendencies, or that having the thought makes this event more likely to happen. While appraising thoughts in this way is a core feature of OCD, a number of studies have found that this process also occurs in the general population (e.g. Belloch, Morillo, Lucero, Cabedo & Carrió, 2004; Salkovskis & Campbell, 1994). It is thus clear that obsessive thoughts and negative appraisals of these thoughts are not unique to a clinical population.

There is also evidence based on the CB model that compulsions do not occur exclusively in clinical samples. In this model, compulsions are defined as maladaptive responses to obsessions that are performed to minimize or prevent feared consequences and to reduce distress (Salkovskis, 1991). In this way, obsessions and compulsions have a functional relationship. While initial conceptualizations of OCD included only overt, behavioral compulsions (e.g. checking, washing; Teasdale, 1974), current conceptualizations broadly classify compulsions as “safety-seeking behaviors” and include reassurance seeking, avoidance, neutralizing, as well as rituals (Salkovskis, 1991). Though these strategies reduce distress and anxiety in the short-term, they maintain the salience of the thoughts over time by increasing one’s preoccupation with the thoughts and preventing erroneous beliefs about the thoughts from being disproved (Roper & Rachman, 1976; Salkovskis, Thorpe, Wahl, Wroe, & Forrester, 2003). A number of studies have found that these responses occur in the general population and function in a similar way (Burns et al., 1995; Frost, Lahart, Dugas, & Sher, 1988; Frost, Sher, & Geen, 1986).

Broadly, the CB model of OCD suggests that obsessions and compulsions can be experienced by individuals without “full-blown” OCD and thus serves as a foundation for examining OCD symptoms outside of clinical samples. Importantly, this model does not rely on a categorical framework for understanding OCD (i.e., present or absent) and instead emphasizes the factors that contribute to the development and maintenance of OCD symptoms. According to this model there is a progression from “normal” thoughts and behaviors to clinical obsessions and compulsions.

Dimensional models of psychopathology. The CB model exists within the context of a broader dimensional framework for understanding psychopathology. Our current system of diagnostic classification, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), relies upon a categorical conceptualization of psychopathology. According to this approach either a disorder is present, or it is not. Researchers have recognized the limitations of this approach since the advent of the current classification system, expressing concern that psychopathology and impairment extend beyond diagnostic thresholds, and emphasizing observable evidence of a continuum (Apter et al., 1996; Carson, 1991; Frances et al., 1991; Millon, 1991; Stein, Walker & Forde, 1994). However, the concern that categorical conceptualizations of psychopathology may not correspond with how these phenomena occur in nature seems to be increasing (Kessler et al., 2003; Krueger & Piasecki, 2002; Maser & Patterson, 2002; Regier, 2007), as is the evidence for a more dimensional approach (Holland & Kuppens, 2012). When viewed in the context of this evidence, categorical views of psychopathology seem to simply establish a point on the continuum at which psychopathology will be considered pathological rather than reflect the true nature of psychopathology.

Some of the most compelling evidence supporting a dimensional model of psychopathology has come from taxometric research. Meehl and colleagues (Meehl, 1995; Waller & Meehl, 1998) developed taxometric procedures to examine the latent structure of psychological phenomena and thus determine the nature of this structure (i.e. categorical or dimensional). Results from these statistically sophisticated studies broadly suggest that most groups of mental disorders, including anxiety disorders, are dimensional (see Haslam, 2003; Haslam, Holland & Kuppens, 2012 for reviews). Two studies to date have specifically focused on examining the latent structure of OCD. One of these studies examined three OC symptom domains and found strong support for the dimensional models of contamination and checking symptoms, but mixed support for a dimensional model of “obsessionality” (Haslam et al., 2005). The second study found evidence that strongly and consistently supported a dimensional latent structure for all OCD symptoms as measured by the OCI-R (Olatunji, Williams, Haslam, Abramowitz, & Tolin, 2008). These studies thus provide empirical support for a dimensional model of OCD.

When these findings are considered in concert with the larger movement in the field toward a more dimensional view of psychopathology as well as with the CB model of OCD, it appears that OCD is best conceptualized as occurring on a continuum, rather than in discrete categories. Since conclusions drawn from research with analogue samples are thought to have more merit if psychopathology truly exists on a continuum, these findings thus provide support for this type of research. In other words, both the CB model of OCD and a broader dimensional view of psychopathology suggest that sub-clinical presentations of psychopathology are quantitatively, but not qualitatively, different from clinical presentations, and thus may serve as true analogues to clinical samples.

Measuring OC Analogue Symptoms

The majority of research employing analogue samples uses validated self-report measures or diagnostic interviews to identify individuals exhibiting elevated scores on these measures. Despite similar methods in identifying analogue cases, there is a lack of consistency in measuring analogue OCD, as both different measures and different cut-off points are used. The most commonly employed self-report measures include the Maudsley Obsessional Compulsive Inventory (MOCI; Hodgson & Rachman, 1977), the Padua Inventory (PI; Burns, Keortge, Formea, & Sternberger, 1996), and the Obsessive-Compulsive Inventory- Revised (OCI-R; Foa et al., 2002). Each of these scales measures slightly different aspects of OC symptoms: the MOCI is more behaviorally focused, the PI targets distress associated with specific experiences, and the OCI-R is more comprehensive. It is thus likely that studies using these measures to identify OC analogue samples are capturing slightly different definitions of this phenomenon.

In addition to measuring different aspects of OC symptomatology, these measures are used differently throughout the field. That is, previous studies using either the MOCI or the PI to identify analogue samples have used a large variety of cut-off points on these measures (ranging from including the individuals with the highest 2-25% of scores on these measures; Frost et al., 1994; Gibbs, 1996; Sternberger & Burns, 1990). Additionally, while some of these studies have used total scores (e.g. Frost et al., 1994), other studies have used scores from various subscales (e.g. Olatunji, Connolly, Lohr, & Elwood, 2008). The OCI-R is generally used more consistently than the MOCI and PI, as Foa and colleagues (2002) published optimal cut-off scores based on the sensitivity and specificity of the measure. Thus, researchers using analogue samples often use the cut-off score that best discriminates between non-anxious controls and patients with OCD.

There is slightly more consistency in the use of diagnostic interviews to identify analogue OCD subjects, with many studies administering the OCD module of a structured diagnostic interview [e.g. Composite International Diagnostic Interview (CIDI; Kessler & Ustun, 2004)]. Individuals who report experiencing obsessions and/or compulsions on interview, but who do not meet all diagnostic criteria are then identified as having sub-clinical or analogue OCD (e.g. Adam et al., 2012). However, this varies as well; some studies define analogue samples as the presence of any OC symptom, while others require more than one symptom, or some degree of distress or interference.

Interestingly, the “gold-standard” measure of OCD symptoms, the Yale Brown Obsessive Compulsive Scale (Y-BOCS; Goodman, Price, Rasmussen, & Mazure, 1989a, 1989b), is rarely used to select analogue samples. This interview includes a 10-item severity scale that is frequently used to identify clinical samples, as well as measure symptom change over time. Individuals who score below the established clinical cut-off on this scale, but who endorse some degree of symptom severity would thus qualify as sub-clinical or analogue cases (Tolin, Abramowitz, & Diefenbach, 2005). While using this measure to identify sub-clinical OCD would be highly appropriate, it is much more thorough than the OCD modules of most structured diagnostic interviews, and thus requires more time to administer. This may explain its limited use in this context.

Considering the above concerns with measuring analogue OCD, the present study administered the most consistently used self-report measure of OC symptoms--the OCI-R-- to identify participants as OC analogues. We also employed the gold-standard interview measure (the Y-BOCS) to assess symptom severity.

The Use of Analogue Samples

There is a long history of using analogue samples in research on anxiety disorders and related phenomena. Even prior to the development and testing of the CB model, researchers identified sub-clinical individuals as potentially analogous participants in a range of studies. The first documented use of an analogue sample in anxiety research was a study on systematic desensitization that used “snake-fearful” college students to study fear reduction (Lang & Lazovik, 1963). This landmark study became a template for future research using analogue samples and many such studies followed. It is possible that the increasing interest in studying behavioral theories and techniques lent itself to the use of these analogue samples, but the ease of recruitment undoubtedly played a role. Since this time, studies using analogue samples have become quite common and are used within the context of a variety of different methodologies (e.g. correlational, experimental).

A number of these studies have examined associated features or psychological mechanisms that are thought to broadly relate to OCD (e.g. anxiety sensitivity); however, the constructs of interest in these studies vary widely. In fact, OCD analogue samples are used in precisely the same way OCD samples are: to study any and all variables associated with the development, maintenance and even treatment of this disorder. These types of samples have been used to study everything from disgust sensitivity (Deacon & Olatunji, 2007) to prospective memory (Cuttler & Taylor, 2012) to treatment response (Cogle, Wolitzky-Taylor, Lee, & Telch, 2007) in OCD. Much of this research also focuses on isolating specific aspects of OCD (e.g. contamination concerns). Given the breadth of research that employs analogue samples, it is clear that this type of research has important implications for our understanding of OCD and related constructs.

Benefits of analogue samples. Perhaps the most apparent benefit of using analogue samples relates to participant recruitment and enrollment. Since OCD occurs in a relatively small percentage of the general population, it can be time intensive and costly to recruit clinical samples of an adequate size. This is exacerbated by the fact that much of the research being conducted on OCD occurs in academic, rather than clinical, settings; thus placing the target population further out of reach. However, since many OC symptoms commonly occur in the general population, and sub-clinical OCD occurs more commonly than OCD (Adam et al., 2012; de Brujin et al., 2010; Fineberg et al., 2013), using participants with some degree of OC symptomatology allows researchers to cast a larger recruitment net. In other words, using analogue samples allows researchers to recruit larger samples more easily. This is an important point as the feasibility of any study is necessary to consider. It is likely that using analogue samples thus allows for more research to be conducted and may make some projects feasible that would otherwise be impractical. The ability to recruit larger samples more quickly may be especially relevant when considering research on specific symptom patterns (e.g. contamination obsessions). Due to the heterogeneity of OCD, only a sub-set of individuals with OCD experience any given symptom dimension. It can thus be very difficult to study these domains in clinical samples. Analogue samples provide an opportunity to examine more homogenous symptomatology, which also facilitates more basic research.

Additionally, using analogue samples rather than clinical samples may allow researchers to avoid some concerns relevant to research using clinical populations. First, since individuals with sub-clinical OCD are much less likely to seek treatment (Adam et al., 2012), using these samples reduces possible treatment confounds. This issue is, of course, most relevant in studies with multiple time points (e.g. prospective studies). Second, in studying clinical samples there

are often concerns regarding selection bias. That is, while it is common to recruit from treatment facilities, the population then being studied is not truly individuals with OCD, but individuals seeking treatment for OCD. There are likely to be differences between these populations. Since sub-clinical samples are generally screened samples recruited from the general population, this avoids this particular selection bias. Finally, in conducting studies of treatment components or mechanisms with clinical populations, there is an ethical concern in assigning a treatment-seeking patient with OCD to a control group that does not include active treatment. This concern is partially alleviated in studying non-treatment-seeking samples.

Limitations of analogue samples. Of course, the primary limitation in using analogue OCD samples is that these are not truly OCD samples, thus raising concerns about both internal and external validity. Researchers cannot be certain that (a) analogue samples are truly similar to OCD samples and (b) results obtained in studying analogue OCD will generalize to clinical OCD. The tentativeness that currently exists regarding this issue limits the utility of these studies. That is, results from analogue studies are frequently treated with caution and a disclaimer is commonly highlighted: these findings must be replicated in clinical samples before we can understand how our results relate to individuals with OCD. While replication is an important aspect of the scientific method, *requiring* this to occur before the results can even be interpreted with regard to OCD may negate the utility of analogue research. Despite the inconvenience of this approach, this caution seems appropriate given our current limited understanding of sub-clinical OCD. It is also possible to consider that analogue studies may have value even if they cannot stand on their own. That is, they may serve to identify constructs of interest in OCD research and thus facilitate the optimal use of clinical samples. The present study

thus sought to expand our current understanding of the comparability of OCD analogue samples by comparing this type of sample to a clinical sample on a number of domains.

The Relationship Between Analogue and Clinical OCD

While there is a growing body of research examining OC symptoms and related domains in analogue samples, and a long history of research examining these constructs in individuals diagnosed with OCD, there is little research directly comparing these samples. Furthermore, much of the research that does compare clinical groups to non-clinical groups does this using unscreened samples, rather than true analogue samples. Thus, there remain a number of unanswered questions regarding how analogue and clinical samples compare to each other. The following sections compare the findings from nonclinical and clinical samples across a number of domains in an effort to understand the specific questions that remain unanswered.

OCD symptoms. *The presence of obsessions and compulsions.* Previous research has examined the distinction between non-clinical and clinical obsessions and compulsions; however, very little of this research has focused on the differences between the obsessions and compulsions seen in sub-clinical and clinical OCD. Early research in this area compared the symptom profiles of non-clinical individuals with clinical individuals and found that while the vast majority of those with clinical OCD experienced both obsessions and compulsions (Rasmussen & Tsuang, 1986), this was not the case in non-clinical samples (Karno, et al., 1988; Weissman et al., 1994). Instead, these studies found that the majority of individuals in non-clinical populations who reported OCD symptoms experienced only obsessions *or* compulsions. They also found that individuals in non-clinical populations tended to experience these symptoms less frequently than those with OCD. These findings suggest that frequency as well as the experience of both obsessions *and* compulsions may be ways in which clinical OCD differs

from sub-clinical symptoms. This may represent a noteworthy difference between clinical and analogue samples, as experiencing compulsions without obsessions contradicts the functional model of OCD (Salkovskis, 1991). However, these results should be interpreted with caution, as there are a number of possible explanations for these findings, and research directly comparing analogue samples to clinical samples is needed.

One explanation for the above findings is that a functional relationship does not exist between obsessions and compulsions in non-clinical samples (Gibbs, 1996). Relatedly, it may be that individuals with “pure obsessions” are more likely to exhibit sub-clinical OCD symptoms, rather than meet full diagnostic criteria for OCD. That is, if an individual experiences less distress and anxiety associated with their obsessional thoughts, they may be less likely to attempt to reduce that distress and anxiety by engaging in compulsions. However, it is also possible that a different definition of compulsions may account for these findings. While current conceptualizations of compulsions include subtle, internal behaviors such as mental reviewing, reassurance-seeking, and avoidance (Salkovskis, 1991), it was previously common to only classify overt, external behaviors (e.g. washing) as compulsions (Teasdale, 1974). It may be that these early studies did not take these subtle safety-seeking behaviors into account, and thus classified individuals with subtle safety-seeking behaviors as having “pure obsessions”. It is also possible that individuals could have been identified as having “compulsions only” due to a different definition of compulsions (i.e. any repetitive behavior) or the presence of subtle obsessions. In these non-clinical samples it is likely that there is less distress associated with the experience of obsessions, and thus they may be more difficult to assess.

An additional concern with the above findings is that these two studies both used the OCD module of the Diagnostic Interview Schedule to assess the presence of obsessions and

compulsions. This measure does not acquire detailed information about obsessions and compulsions and instead relies on simple yes/no questions that may be easy to misinterpret, especially in samples from the general population. Given these concerns, it is not currently clear as to whether sub-clinical presentations of OCD differ from clinical presentations in terms of the presence of both obsessions and compulsions. In order to understand whether this is an important area of difference between analogue and clinical samples, it is necessary to thoroughly examine the presence of obsessions and compulsions in analogue samples and compare this to patterns observed in clinical samples. Accordingly, this is one of the aims of the present study.

Content of obsessions and compulsions. The content of obsessions and compulsions is heterogeneous in nature, varying substantially across individuals. Structural analyses indicate that particular obsessions and compulsions tend to co-occur, creating dimensions or sub-types of OCD (Mataix-Cols, Rosario-Campos, & Leckman, 2005; McKay et al., 2004). The most consistently replicated of these OC symptom dimensions include: contamination, responsibility for harm and mistakes, symmetry/ordering, and unacceptable thoughts (Abramowitz et al., 2010). While these dimensions appear to be fairly distinct, it is common for individuals with OCD to report the presence of obsessions and compulsions across multiple symptom dimensions (McKay et al., 2004). Given the heterogeneity of OC symptom presentation, it is possible that clinical and analogue samples differ with regard to the *types* of symptoms commonly reported in each sample. However, previous research has found little difference between the content of the obsessions and compulsions experienced by individuals with and without OCD. It is important to note that again much of this research has been conducted using non-clinical rather than sub-clinical samples.

Obsessions. Overall, the content of obsessions appears to be similar in clinical and non-clinical samples. That is, both clinical and non-clinical individuals commonly report obsessions relating to contamination, fears of harming oneself or others, sex, and aggression/violence (Belloch et al., 2004; Garcia-Soriano et al., 2011; Julien, O'Connor, & Aardema, 2009; Khanna, Kaliaperumal & Channabasavanna, 1990; Parkinson & Rachman, 1980; Purdon & Clark, 1993; Rasmussen & Eisen, 1989). Moreover, Rachman and deSilva (1978) found that trained clinicians could not distinguish between obsessions reported by clinical and non-clinical individuals based on content.

However, one study to date did find content differences between nonclinical and clinical obsessions (Rassin, Cogle & Muris, 2007). This study classified obsessions as either clinical or nonclinical and found that students were more likely to endorse a lifetime history of the obsessions considered to be “nonclinical”. However, without an OCD control group, the implications of these findings are unclear. Julien, O'Connor, and Aardema (2009) subsequently administered a similar questionnaire to both students and individuals with OCD and found that these groups did not differ in the prevalence of nonclinical obsessions relative to clinical obsessions. This more methodologically rigorous study thus provides additional evidence for the view that clinical and nonclinical obsessions are similar in content. The current study sought to provide additional support for this by comparing clinical and analogue groups on measures of symptom content.

Compulsions. Previous research has found that many of the compulsions often seen in OCD (e.g. checking, counting, repeating) are also common in non-clinical populations (Flament et al., 1989; Henderson and Pollard, 1988). Similarly, the covert neutralizing strategies described previously appear frequently in both types of samples (e.g., Ladouceur et al., 2000). However,

while washing and cleaning compulsions are very common in clinical populations (Khanna et al., 1990), there is evidence that they might be less common in non-clinical populations (Degonda Wyss & Angst, 1993; Valleni-Basile et al., 1994). Gibbs (1996) suggested that this difference might exist because individuals with washing compulsions may seek treatment more often, and thus be represented more heavily in clinical samples. She argued that since washing and cleaning may be more time-consuming and are considered to be “classic” symptoms of OCD, they may facilitate the detection of OCD and treatment-seeking (Gibbs, 1996). Another possibility is that it is more challenging to recognize sub-clinical washing and cleaning compulsions. Since these are behaviors that most people engage in throughout each day, and would generally not be considered compulsions, it may be difficult to assess when these behaviors are being performed in response to obsessional thoughts. It is possible, however, that differences in the prevalence of washing and cleaning compulsions is a key difference between clinical and sub-clinical OCD samples. If this is the case, sub-clinical samples may not be appropriate analogues for research focusing on washing and cleaning compulsions.

Based on this body of research, it appears that OC symptoms are generally similar in content and form in clinical and non-clinical populations. There may be differences between these groups with regard to the frequency of these symptoms, the presence of both obsessions and compulsions, and the presence of washing compulsions. However, this research is not conclusive and these constructs have not been examined in sub-clinical, or analogue, samples. One of the aims of the current study is thus to clarify the ways in which analogue samples may report more or less similar patterns of OC symptoms relative to clinical OCD samples.

Obsessive Beliefs and OC Symptoms. As discussed above, the CB model of OCD suggests that particular types of dysfunctional beliefs are related to the development and maintenance of

OCD symptoms. Specifically, researchers have identified six domains of “obsessional beliefs” thought to contribute to OC symptoms (Obsessive Compulsive Cognitions Working Group [OCCWG], 1997):

- **Overestimation of threat.** Individuals with OCD tend to exaggerate the likelihood and severity of harm that is featured in their obsessional thoughts (e.g. “It is very easy to contract HIV from a toilet seat”; Frost & Steketee, 2002).
- **Inflated sense of responsibility.** The belief that one is able to and obligated to prevent subjectively important negative events from occurring (e.g. “Not preventing harm is as bad as causing it”; Frost & Steketee, 2002).
- **Over-importance of thoughts.** The belief that merely the occurrence of thoughts implies that these thoughts are meaningful and/or dangerous (e.g. “Having a thought about having sex with my brother means that I want to do it”; Frost & Steketee, 2002).
- **Need to control thoughts.** The belief that it is possible and desirable to control thoughts, and that exerting this control is very important (e.g. “Having intrusive thoughts means that I’m out of control”; Frost & Steketee, 2002).
- **Perfectionism.** The belief that imperfection and mistakes cannot be tolerated (e.g. “Things are not right if they are not perfect”; Frost & Steketee, 2002).
- **Intolerance of uncertainty.** The belief that it is necessary to be certain and that ambiguity is intolerable and has negative consequences (e.g. “If I’m not sure of something, I’ll make a mistake”, Frost & Steketee, 2002).

Subsequent structural analyses of these six domains revealed that they form three factors: overestimates of threat and responsibility, the importance and need to control thoughts, and perfectionism and need for certainty (OCCWG, 2003, 2005). While no studies to date have

compared the presence of these beliefs in sub-clinical and clinical OCD, there is a large body of work examining the relationship between these beliefs and OCD symptoms in both clinical and nonclinical samples. In fact, both correlational and experimental studies demonstrate that obsessive beliefs are associated with global OC symptom severity in clinical and nonclinical samples (Abramowitz et al., 2006; Abramowitz & Deacon, 2006; Lopatka & Rachman, 1995; OCCWG, 2003, 2005; Steketee, Frost, & Cohen, 1998; Tolin, Woods, & Abramowitz, 2003).

Given the heterogeneous nature of OCD, there is also evidence supporting the relationship between specific OC symptom dimensions and specific obsessive beliefs. A number of studies have addressed this issue by measuring both OC symptoms and obsessional beliefs in large groups of OCD patients or nonclinical samples, and then using correlation, regression, and/or structural equation modeling techniques to examine relationships between symptoms and cognitions. Results from this body of research suggest a number of trends. First, contamination and washing symptoms are often predicted by overestimates of responsibility and/or overestimates of threat in both clinical (OCCWG, 2005; Tolin et al., 2008; Wheaton et al., 2010) and nonclinical (Mendlowicz et al., 2008; Taylor et al., 2010; Tolin et al., 2003) samples. Ordering and arranging symptoms are consistently predicted by perfectionism and/or the need for certainty in both clinical (Julien et al., 2006; OCCWG, 2005; Tolin et al., 2008; Wheaton et al., 2010) and nonclinical (Abramowitz et al., 2009; Myers et al., 2008; Taylor et al., 2010; Tolin et al., 2003) samples. Unacceptable obsessional thoughts have been routinely predicted by beliefs about the importance of and need to control thoughts in both clinical (Abramowitz & Deacon, 2006; Julien et al., 2006; Tolin et al., 2008; Wheaton et al., 2010) and nonclinical (Abramowitz et al., 2009; Myers et al., 2008; Taylor et al., 2010; Tolin et al., 2003) samples.

There are some inconsistencies across studies regarding checking symptoms in both clinical and nonclinical samples, with some studies implicating perfectionism and the need for certainty (Julien et al., 2006; OCCWG, 2005) and others implicating overestimates of responsibility and threat (Abramowitz et al., 2009; Wheaton et al., 2010) as being the strongest predictor of checking symptoms. It is thus not clear whether perfectionism and the need for certainty or overestimates of responsibility and threat represent the best predictor of checking symptoms, or if both of these types of beliefs function together in this domain. However, given the similar patterns observed in both clinical and nonclinical samples, this is not likely to be an area of difference between clinical and nonclinical samples.

When viewed in concert, previous research indicates that there is a similar relationship between obsessional beliefs and OC symptoms in clinical and nonclinical samples. Nevertheless, since no study to date has compared the presence and severity of these beliefs in sub-clinical and clinical samples, it is not clear how these beliefs may function in analogue samples. The present study aims to shed light on this issue by examining multiple domains of obsessional beliefs in both an analogue and a clinical sample.

Distress and impairment. While the distress associated with OC symptoms and impairment from these symptoms are separate constructs, they often studied together and play a similar role in the current definition of OCD (American Psychiatric Association, 2013). In understanding how analogue OCD relates to clinical OCD, this area is perhaps most heralded as the distinguishing marker between the two. In fact, it is often used to differentiate between clinical and sub-clinical cases. This seems appropriate, given that in order to meet full diagnostic criteria for OCD one must experience OC symptoms as well as distress or interference as a result of these symptoms (American Psychiatric Association, 2013). We would thus expect analogue

samples to report less distress and impairment associated with their OC symptoms than clinical samples.

While some of the existing research supports this claim, results are fairly mixed. In a general community sample, results indicated that 31-42% of people with no mental disorders reported having been bothered by obsessions for periods over 2 weeks; 25% reported experiencing obsessions for more than 1 hour per day, and 15% reported feeling emotionally upset by them (Fullana et al, 2009). Additionally, 33-45% reported performing compulsions for periods of more than 2 weeks and 11-12% reported being upset by them (Fullana et al, 2009). These results provide clear evidence that individuals in the general population with no psychiatric diagnoses experience distress associated with OC symptoms, especially obsessions.

In studies that have compared sub-clinical and clinical OCD, some have found that individuals with sub-clinical OCD experience more distress related to their symptoms than healthy controls, but less distress than those with OCD (Grabe et al., 2000), while other studies have found no significant differences between clinical and sub-clinical groups in terms of distress (de Bruijn et al., 2010; Apter et al., 1996). There is a similar pattern of results in studies that have examined impairment related to OCD; some studies have found that those with sub-clinical OCD experience more impairment than controls, but less than those with OCD (Adam et al., 2012; Grabe et al., 2000), while others have found that the sub-clinical group looks very much like the OCD group on measures of disability (de Bruijn et al., 2010).

Taken together, these findings suggest that sub-clinical OCD exists below OCD (and above controls) on a continuum of distress and impairment and may be closer to OCD than previous research indicated. However, it is too early to state this with certainty, especially given

the different measures that have been used to assess distress and interference. The present study will seek to replicate these findings with a widely used measure of symptom impairment.

Psychiatric comorbidity. Given the well-established rates of comorbid Axis I psychopathology in OCD, it is important to compare sub-clinical and clinical OCD on this domain in order to understand how these samples may be comparable. Rates of comorbid psychiatric disorders in clinical OCD populations are consistently high, particularly for mood and anxiety disorders. Estimates for the comorbidity of mood disorders ranges from 30-70% and from 40-86% for anxiety disorders (Tukel, Polat, Ozdemir, et al., 2002; Karno et al., 1988). Research on patterns of comorbidity in sub-clinical OC samples generally suggests that these rates are lower than in clinical samples, but higher than for controls.

Early research relevant to this topic examined levels of depression and anxiety in non-clinical samples. Studies that have examined the relationship between OCD symptom severity and levels of anxiety and depression have found that OC symptoms are positively associated with both depression and other anxiety symptoms (Freeston et al., 1992; Freeston, Ladoucer, Rheaume, Letarte, Thibodeau & Gagnon, 1994; Purdon & Clark, 1993; Tallis & DeSilva, 1992). Studies that compared non-clinical individuals who reported some level of OC symptomology with those who did not have OC symptoms consistently found that the analogue samples had higher levels of depression and anxiety than controls (Burns et al., 1995; Frost et al., 1986; Goodwin & Sher, 1992; Maki, O'Neill, & O'Neill, 1994; Sher, Frost, Kushner, Crews, & Alexander, 1989; Sher, Martin, Raskin, & Perrigo, 1991). These results are remarkably similar regardless of the specific construct of interest (e.g. worry, state anxiety, etc.), measures used, and screening methods.

More recent research has compared rates and patterns of co-morbidity between sub-clinical OCD and clinical OCD and has generally found that sub-clinical, or analogue, groups endorse lower rates of psychiatric comorbidity than clinical groups, but higher rates than controls (Adam et al., 2012; de Bruijn et al., 2010; Grabe et al., 2001). Sub-clinical groups may differ from OCD groups on rates of comorbid mood disorders and anxiety disorders more so than on rates of eating disorders, substance related disorders, or schizophrenia (de Bruijn et al., 2010). The present study sought to replicate these findings and explore any differences between groups across psychopathological domains.

The Current Study: Design and Hypotheses

While there is a well-articulated theoretical basis, as well as some empirical evidence, supporting the use of analogue samples in research on OCD, it is not yet clear as to how these samples compare to clinical samples on a number of important domains. It is thus difficult to speak to the generalizability of results that emerge from research using analogue samples. More specifically, it is currently not clear how analogue samples compare to clinical samples in terms of: OC symptom content, the frequency and severity of both obsessions and compulsions, distress and impairment related to these symptoms, endorsement of obsessional beliefs that contribute to the development and maintenance of OC symptoms, and rates of psychiatric comorbidity. Accordingly, the current study compared an OC analogue sample to an OCD clinical sample, as well as to a healthy (non-symptomatic) control group, on the above domains. This study represents the first empirical investigation directly evaluating the comparability of an OC analogue sample to an OCD sample in this way. In comparing these groups, we evaluated not only whether using analogue samples is useful in furthering OCD research, but *when* and *how* these samples might be more or less comparable to OCD samples. With the growing

popularity of OC analogue research, it is becoming increasingly necessary to understand how comparable these samples are to clinical samples, and in what ways.

Given the aforementioned problems in measuring OC symptoms in analogue samples, this study used the gold standard measure of OCD (Y-BOCS) to thoroughly assess these symptoms across groups. Additionally, this study sought to maximize ecological validity by defining the analogue and clinical groups based on the standards commonly used in the field; the analogue group was composed of undergraduate students who scored highly on a measure of OC symptoms and the clinical group was composed of treatment-seeking individuals diagnosed with OCD.

The current study investigated the following hypotheses:

Hypothesis 1: OC symptoms. A) The analogue group would score below the clinical group, but above the control group on measures of OCD symptom severity and frequency (both obsessions and compulsions). While previous research suggests that individuals in non-clinical populations may experience *either* obsessions or compulsions (Karno, et al., 1988; Weissman et al., 1994), there are many possible explanations for these findings. Based on the functional model of OCD (Salkovskis, 1991), which includes more modern definitions of obsessions and compulsions, we expected that, similar to the clinical group, the analogue sample would endorse both obsessions and compulsions.

B) The analogue group would report less severe OC symptoms than the clinical group, but more severe symptoms than the control group, within each of the following OC symptom content domains: contamination, unacceptable thoughts, responsibility for harm, and symmetry/ordering, based on dimensional conceptualizations of OC symptoms.

C) There would be no differences between the *types* of obsessions and compulsions endorsed by the three groups based on previous research that has found that a wide range of obsessions and compulsions occur outside of clinical samples (Belloch et al., 2004; Henderson & Pollard, 1988) and are largely indistinguishable from clinical obsessions and compulsions (Julien, O'Connor, & Aardema, 2009).

Hypothesis 2: Obsessional beliefs. A) The analogue group would score below the clinical group, but above the control group on measures of OC beliefs related to the development and maintenance of OCD. While no previous research has compared these groups on this domain, there is evidence that obsessional beliefs occur outside of clinical samples and are directly related to symptom severity (Frost & Steketee, 2002).

B) Additionally, we hypothesized that specific OC symptoms would be related to specific obsessional beliefs, and that these patterns would be similar across all three groups based on previous research suggesting that similar relationships exist between symptoms and beliefs in both clinical and nonclinical samples. Specifically, we hypothesized the following symptom-cognition associations: contamination and washing symptoms would be related to overestimates of responsibility and/or overestimates of threat; unacceptable obsessional thoughts would be related to beliefs about the importance of and need to control thoughts; ordering and arranging symptoms would be related to beliefs about perfectionism and the need for certainty; responsibility for harm and checking symptoms would be related to beliefs about perfectionism and the need for certainty and to beliefs about overestimates of responsibility and threat.

Hypothesis 3: Symptom impairment. The analogue group would score below the clinical group, but above the control group on measures of impairment related to OC symptoms based on previous research that has found this pattern (Adam et al., 2012; Grabe et al., 2000).

Hypothesis 4: Psychiatric comorbidity. The analogue group would score below the clinical group, but above the control group on measures of psychiatric comorbidity based on previous research that suggests a similar pattern (Adam et al., 2012; de Bruijn et al., 2010).

METHODS

Participants

Overall sample. The overall sample consisted of 30 males (28.3%) and 76 females (71.7%) and was 74.5% Caucasian, 9.4% African-American, 5.7% Hispanic, 5.7% “other”, and 4.7% Asian-American. The mean age of our sample was 24 years and 6 months and ranged from age 18-66. One participant discontinued participation during the interview portion of the study after reporting current suicidal ideation.

OCD group. The OCD group was composed of 35 treatment-seeking adults who met diagnostic criteria for OCD, as determined by a trained interviewer using a clinical interview and confirmed via validated self-report measures. Participants in this group participated in one of two treatment outcome studies addressing OCD conducted at the UNC Psychology Department Community Clinic. One treatment study examined the efficacy of a couples-based intervention for OCD, the other study compared an acceptance based treatment to traditional exposure and response prevention for OCD. Participants were not excluded if they reported symptoms of comorbid conditions. Participants were included in the present study whether or not they chose to fully participate in the treatment studies (e.g. if they dropped out during treatment).

Analogue group. The analogue group was composed of 25 non treatment-seeking individuals who reported the presence of some OC symptoms and scored above the clinical cut-off score of 18 on the OCI-R ($M = 26.20$, $SD = 6.88$). Participants in this group were recruited from undergraduate psychology classes (see Procedure section).

Control group. The control group included 46 non treatment-seeking individuals who scored below the clinical cut-off of 18 on the OCI-R ($M = 8.35$, $SD = 4.56$). Participants in this group were recruited from undergraduate psychology classes (see Procedure section).

Interviewer-Based Measures

Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). The MINI is a brief, structured diagnostic interview that assesses a selection of the most frequent psychiatric diagnoses according to DSM-IV-TR diagnostic criteria. The MINI has shown high inter-rater reliability, and test-retest reliability (Sheehan et al., 1998). In the present study the MINI was used to assess diagnostic comorbidity.

Yale-Brown Obsessive Compulsive Scale (YBOCS; Goodman et al., 1989a, 1989b). The YBOCS is a widely used interview measure of global OCD symptom severity that assesses obsessions and compulsions, independent of symptom theme, on the following five parameters: (a) time spent, (b) interference, (c) distress, (d) resistance, and (e) control. Based on these symptoms, the Y-BOCS includes two subscales: Obsessions and Compulsions. The instrument also includes a symptom checklist that measures the presence of specific types of obsessions and compulsions. The Y-BOCS has demonstrated good reliability and validity (Deacon and Abramowitz, 2005; Woody, Steketee & Chambless, 1995). The Y-BOCS displayed excellent internal consistency in the current sample for both the obsessions subscale ($\alpha = .90$), and the compulsions subscale ($\alpha = .92$). In the present study the YBOCS was used to assess OC symptom severity as well as OC symptom content.

Self-Report Measures

Beck Anxiety Inventory (BAI; Beck & Steer, 1993). The BAI is a 21-item self-report measure that assesses the severity of an individual's anxiety during the past month. This measure

asks participants to rate how much they are bothered by common symptoms of anxiety (e.g. dizziness, nervousness) on a 0 (not at all) to 3 (severely) scale. The reliability and validity of this measure have been well established (Beck, Epstein, Brown, & Steer, 1988; Freeston et al., 1994). The internal consistency was good in the current sample ($\alpha = .88$).

Beck Depression Inventory-II (BDI-II; Beck et al., 1996). The BDI is a widely used self-report instrument designed to measure depressive symptoms. It consists of 21 items that correspond to symptoms of depression and are rated on a 0 to 3 scale. The validity of the BDI with clinical and non-clinical samples has been well established (Beck, Steer, & Garbin, 1988) and demonstrated good internal consistency in the current sample ($\alpha = .90$).

Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010). The DOCS is a 20-item self-report measure that assesses the severity of the four most consistently replicated OCD symptom dimensions with four subscales: contamination, responsibility for harm and mistakes, symmetry/ordering, and unacceptable thoughts. To accommodate the heterogeneity of OCD symptoms each subscale begins with a description of the symptom dimension along with examples of representative obsessions and rituals. The examples clarify the form and function of each dimension's core obsessional fears, compulsive rituals, and avoidance behaviors. Within each symptom dimension, five items (rated 0 to 4) assess the following parameters of severity over the past month: time occupied by obsessions and rituals, avoidance behavior, associated distress, functional interference, and difficulty disregarding the obsessions and refraining from the compulsions. The DOCS subscales have excellent reliability and validity in clinical and nonclinical samples (Abramowitz et al., 2010) and demonstrated excellent internal consistency in the current sample (α 's = .93-94).

Obsessive Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). The OCI-R is an

18-item self-report questionnaire that assesses distress associated with various obsessive–compulsive symptoms. The OCI- R provides a total score (ranging from 0 to 72) and scores on six subscales: washing, checking, ordering, obsessing, hoarding, and neutralizing. The validity and reliability of this measure have been well established (Abramowitz & Deacon, 2006); this measure demonstrated good internal consistency in the current sample ($\alpha = .88$). In the present study, the OCI-R was used to classify participants in either the analogue or control groups based on the cut-off score determined to best distinguish between clinical and nonclinical individuals in the development of this measure (Foa et al., 2002).

Obsessional Beliefs Questionnaire (OBQ; OCCWG, 2005). The OBQ-44 is a 44-item (rated 1 to 7) self-report questionnaire that measures dysfunctional obsessive beliefs hypothesized to underlie OCD symptoms. The OBQ-44 contains three subscales: responsibility and threat overestimation (RT; 16 items), perfectionism and need for certainty (PC; 16 items), and importance and control of thoughts (ICT; 12 items). This instrument has good validity, internal consistency, and reliability (OCCWG, 2005) and displayed excellent internal consistency in the current sample (α 's = .90-.93)

Sheehan Disability Scale (SDS; Sheehan, 1983). The SDS is a measure of role-impairment caused by a medical or psychological disorder. It consists of three questions rated on a 10-point Likert scale assessing degree of impairment in three domains: work/school, social life, and family life/home responsibilities. The SDS is widely used and has established excellent internal consistency in a variety of community samples (Hambrick, Turk, Heimberg, Schneier & Liebowitz, 2004; Leon, Olfson, Portera, Farber & Sheehan, 1997; Mendlowicz & Stein, 2000); internal consistency in the current sample was also excellent ($\alpha = .90$). In the present study, the SDS was used as a measure of impairment specific to OC symptoms.

Procedure

Non-clinical groups. All data collection procedures were approved by the institutional review board (IRB) at the University of North Carolina at Chapel Hill. Participants in the control and analogue groups were recruited from the Psychology 101 Participant Pool. Students enrolled in the study via SONA, the online system used by the UNC Psychology Department. Since many of these unscreened participants were likely to fall into the control group, students who reported experiencing OC symptoms on a separate, internet-based study consisting entirely of self-report measures were invited to participate in the current study. This targeted recruitment allowed for the recruitment of similar sample sizes for both the analogue and control groups.

Upon arrival at the laboratory, the experimenter first reviewed the informed consent form with participants and confirmed that participants were able to speak and read in English and was over 18. After consenting to participate in the study, the two interview-based measures were completed (MINI, YBOCS) with the examiner. Interviewers were highly trained research assistants and graduate students. During the administration of the Y-BOCS, participants were provided with the standard definitions of obsessions and compulsions as well as information regarding the percentage of the population that may experience these types of thoughts and behaviors. Since the Y-BOCS was designed for use with clinical populations, this was intended to make this measure as accessible as possible.

Participants were then asked to complete the self-report measures, including the OCI-R, on a computer. Scores on this measure determined whether the participant was in the analogue or control group. The interviewers were thus blind to which group (analogue or control) participants were in, since participants completed the OCI-R *after* the interviews. The experimenter remained

in the room while the participant completed the self-report measures to answer questions. Lastly, participants were debriefed and given research credit for participation.

Clinical group. Participants in the clinical group participated in one of two IRB approved treatment studies for OCD conducted at the UNC Psychology Department Community Clinic. Participants were recruited for these studies through online advertisements including campus-wide emails, newspaper advertisements, and referrals from other treatment providers. Interested participants were first screened over the phone to ensure the presence of OC symptoms. A trained interviewer then assessed these participants before starting treatment using the above measures (YBOCS, MINI, all self-report measures). The data from this initial, pre-treatment assessment were used in the present study.

RESULTS

Demographic Characteristics

Demographic characteristics by group are reported in Table 1. One-way analyses of variance (ANOVAs) and chi-square tests of independence were conducted to examine group differences on these variables. These analyses revealed no significant differences between groups on ethnicity, $\chi^2(8) = 2.82, p = .95$. There were, however, differences between the clinical group and the other two groups in terms of gender, $\chi^2(2) = 13.14, p = .01$, with the clinical group including a higher proportion of female participants than both of the other groups. As expected, there were also differences between the clinical group and the other two groups in terms of age, $F(2, 103) = 32.69, p < .01$, with the clinical group being significantly older than the control and analogue groups. Given the between group differences on age and gender, we examined all subsequent analyses controlling for these factors as well as without these covariates; there were no differences in the pattern of results when controlling for age and gender.

Obsessive Compulsive Symptoms

Severity and frequency. To examine the hypothesis that the analogue group would score below the clinical group, but above the control group, on measures of OCD symptom severity, we conducted two one-way ANOVAs, comparing the three groups on their reported symptom severity as measured by the Y-BOCS. Group means are reported in Table 2. There were, in fact, significant differences between groups on both the Y-BOCS obsessions subscale, $F(2, 103) = 110.62, p < .01, \eta^2 = .68$, and the Y-BOCS compulsions subscale, $F(2, 103) = 127.96, p < .01, \eta^2 = .71$. Tukey's HSD post-hoc tests revealed that for both of these dependent variables there

were significant differences between each of the three groups (p 's $<.01$), such that the clinical group reported significantly more severe and frequent OC symptoms than the analogue and control groups, and the analogue group reported significantly more severe and frequent OC symptoms than the control group. Identical patterns were present for obsessions and compulsions.

Content domains. To examine the hypothesis regarding OC symptom content, we conducted four one-way ANOVAs, comparing the three groups on symptom severity within four symptom content domains as measured by the DOCS. Group means are reported in Table 2. There were significant differences between groups on the contamination subscale, $F(2, 103) = 33.94, p < .01, \eta^2 = .40$, the responsibility for harm subscale, $F(2, 103) = 30.02, p < .01, \eta^2 = .37$, the unacceptable thoughts subscale, $F(2, 103) = 20.03, p < .01, \eta^2 = .28$, and the symmetry subscale, $F(2, 103) = 10.97, p < .01, \eta^2 = .18$. Tukey's HSD post-hoc tests revealed that there were significant differences between each of the three groups on contamination (p 's $<.05$), responsibility for harm (p 's $<.01$), and unacceptable thoughts (p 's $<.05$), with the clinical group reporting significantly more severe OC symptoms than the control and analogue groups, and the analogue group reporting significantly more severe symptoms than the control group. For the symmetry subscale, there were significant differences between the control group and both the analogue and clinical groups (p 's $<.01$); however there was not a significant difference between the analogue group and the clinical group ($p = .57$).

Obsessions. To examine whether the presence of specific obsessions differed between groups, we conducted a series of chi-squared tests of independence with obsessional content domains on the Y-BOCS checklist as dependent variables. Given the number of comparisons, a Bonferroni correction was used. Results of these analyses are reported in Table 3. As can be

seen, both the analogue and clinical groups more frequently endorsed obsessions related to responsibility for harm, contamination, sexual thoughts, symmetry, as well as miscellaneous obsessions when compared to the control group. On each of these domains there were no significant differences between the clinical and analogue groups. There were no significant differences between any of the three groups on scrupulosity obsessions. Finally, the clinical group more frequently endorsed somatic obsessions when compared with the control group, but there were no significant differences between the analogue group and the other two groups. Furthermore, all participants in both the analogue and clinical groups reported the presence of at least one obsession; this was significantly higher than in the control group.

Compulsions. To examine whether the presence of specific compulsions differed between groups, we conducted a series of chi-squared tests of independence with compulsion content domains on the Y-BOCS checklist as dependent variables. Given the number of comparisons, a Bonferroni correction was used. Results of these analyses are reported in Table 4. As can be seen, both the analogue and clinical groups more frequently endorsed washing, repeating, counting, and mental compulsions when compared to the control group. On each of these domains there were no significant differences between the clinical and analogue groups. Furthermore, the clinical group reported significantly more checking and miscellaneous compulsions than did both the analogue and control groups, and the analogue group more frequently endorsed checking and miscellaneous compulsions than the control group. Finally, the clinical group more frequently endorsed ordering compulsions when compared with the control group, but there were no significant differences between the analogue group and the other two groups on this domain. Furthermore, all participants in both the analogue and clinical groups

reported the presence of at least one compulsion; this was significantly higher than in the control group.

Obsessional Beliefs

To test the hypothesis regarding obsessional beliefs, we conducted three one-way ANOVAs, comparing groups on the three subscales of the OBQ. Group means are reported in Table 2. There were significant differences between groups on the RT subscale, $F(2, 103) = 26.70, p < .01, \eta^2 = .34$, the PC subscale, $F(2, 103) = 10.79, p < .01, \eta^2 = .18$, and the ICT subscale, $F(2, 103) = 20.76, p < .01, \eta^2 = .29$. Tukey's HSD post-hoc tests revealed that there were significant differences between each of the three groups on the RT subscale (p 's $< .05$), with the clinical group endorsing stronger obsessional beliefs than the analogue and control groups, and the analogue group endorsing stronger obsessional beliefs than the control group. On both the PC and ICT subscales, the clinical and analogue groups reported significantly higher levels of obsessional beliefs than the control group (p 's $< .01$). There were no differences between the clinical and analogue groups on these subscales.

To determine whether specific OC symptoms were related to specific obsessional beliefs, we computed Pearson correlation coefficients between the four symptom domains as measured by the DOCS and the three types of obsessional beliefs as measured by the OBQ. These correlations in the overall sample are reported in Table 5. As can be seen, the DOCS contamination subscale was significantly correlated with the RT subscale of the OBQ; the DOCS harm subscale was significantly correlated with all three obsessional belief domains; the DOCS thoughts subscale was significantly correlated with the OBQ RT and ICT subscales; and the DOCS symmetry subscale was significantly correlated with the OBQ PC subscale.

Identical analyses were conducted within each group and are reported in Table 6. In the control group, the DOCS harm subscale was significantly correlated with both the RT and PC subscales of the OBQ. This pattern was identical in the clinical group, but not in the analogue group. Additionally, there was a significant relationship between the DOCS thoughts subscale and the ICT subscale of the OBQ only within the clinical group. There were no other significant relationships between OC symptoms and obsessional beliefs within any of the groups. Further, tests of equivalence revealed that the strength of these correlation coefficients significantly differed between (a) the clinical and control groups on the following domains: DOCS contamination with OBQ ICT ($p < .01$), and DOCS thoughts with OBQ ICT ($p < .01$); (b) the clinical and analogue groups on the following domains: DOCS harm with OBQ PC ($p = .03$), and DOCS thoughts with OBQ ICT ($p = .01$); and (c) the control and analogue groups on the following domain: DOCS harm with OBQ PC ($p = .04$).

Symptom Impairment

To test the hypothesis that the analogue group would score below the clinical group, but above the control group on the measure of symptom impairment, we conducted a one-way ANOVA with SDS scores as the dependent variable. Group means are reported in Table 2. We found a significant difference between groups, $F(2, 89) = 42.64, p < .01, \eta^2 = .49$. Tukey's HSD post-hoc tests revealed that there were significant differences between each of the three groups (p 's $< .01$), with the clinical group reporting greater symptom impairment than the analogue and control groups and the analogue group reporting greater impairment than the control group.

Psychiatric Comorbidity

To test the hypothesis that the analogue group scored below the clinical group, but above the control group on measures of psychiatric comorbidity we conducted two one-way ANOVAs,

comparing the three groups on mood and anxiety symptoms as measured by the BDI and BAI. Group means are reported in Table 2. There were significant differences between groups on both the BDI, $F(2, 103) = 14.71, p < .01, \eta^2 = .22$, and the BAI, $F(2, 89) = 12.60, p < .01, \eta^2 = .22$. Tukey's HSD post-hoc tests revealed that on the BDI, the clinical group reported higher levels of depression than both the analogue and control groups (p 's $< .05$); there was no significant difference between the analogue and control groups. On the BAI, however, the clinical and analogue groups reported significantly higher levels of anxiety than did the control group (p 's $< .01$). There was not a significant difference between the clinical and analogue groups.

Additionally, to compare the three groups on rates of diagnostic comorbidity as measured by the MINI, we conducted a series of chi-squared tests. Given the number of comparisons, a Bonferroni correction was used. Results of these analyses are reported in Table 7. As can be seen, significantly higher percentages of the analogue and clinical groups were diagnosed with generalized anxiety disorder (GAD) relative to the control group, with no differences between these groups. Furthermore, significantly higher percentages of both the analogue and clinical groups were diagnosed with any comorbid condition relative to the control group. There were no other between group differences.

DISCUSSION

The aim of the present study was to evaluate the utility of research employing OC analogue samples by comparing an analogue group to clinical and control groups on the following domains: OC symptoms, obsessional beliefs, symptom impairment, and psychiatric comorbidity. We found that the analogue group did not differ from the clinical group in terms of the severity of symmetry OC symptoms, the presence of both obsessions and compulsions across content areas, patterns of comorbidity, and levels of obsessional beliefs. Additionally, consistent with dimensional conceptualizations of OCD, the analogue group appeared to be quantitatively, but not qualitatively, different from the clinical group with regard to OC symptom severity, symptom frequency, and related impairment. The relationship between obsessional beliefs and OC symptoms, however, appears to be a notable exception to the above findings and may represent an important area of difference between analogue and clinical samples.

On the whole, our hypotheses regarding OCD symptom severity and frequency were supported. Specifically, the analogue group reported significantly fewer and less severe OC symptoms than the clinical group but significantly greater and more severe OC symptoms than the control group. This was expected, in part, based on our method of categorizing participants in the analogue or control group based on their self-reported OC symptom severity. However, the measure used to group participants greatly emphasizes compulsions and does not thoroughly address different obsessional content domains. Furthermore, the current study found that a similar pattern emerged for both obsessions and compulsions as measured by a clinical interview, as well as across OC symptom content domains with only one exception: the analogue

group reported similar levels of symmetry and ordering symptoms relative to the clinical group. These findings provide support for the view that analogue samples represent sub-clinical presentations of OCD that are similar in content and form, and different only in severity, from clinical samples. Furthermore, when viewed in concert with dimensional conceptualizations of OCD (Abramowitz et al., 2014), these results support the generalizability of data from analogue samples to understanding clinical presentations of OCD.

These findings also indicate that research focused on symmetry and ordering symptoms may be particularly well-suited to the use of analogue samples. While we expected that the clinical and analogue groups would report different levels of symmetry symptom severity, these findings are consistent with previous research suggesting that symmetry symptoms may be underrepresented in treatment-seeking samples (Ball, Baer, & Otto, 1996). That is, rather than the analogue group reporting particularly high levels of symmetry symptom severity, the clinical group reported relatively moderate levels of symmetry symptom severity that are similar to rates reported in prior research (Pinto, Mancebo, Eisen, Pagano, & Rasmussen, 2006). One possible explanation for this is that symmetry symptoms have been found to overlap with symptoms of obsessive compulsive personality disorder in individuals with OCD (Coles, Pinto, Mancebo, Rasmussen, & Eisen, 2008). These symptoms may thus be experienced as less personally distressing (i.e. more ego-syntonic) than other OCD symptoms, and this may prevent individuals who primarily experience symmetry symptoms from seeking treatment. While results from the current study indicate substantial overlap between the analogue and clinical groups in terms of symmetry symptom severity, future research comparing a purely clinical, rather than a treatment-seeking sample, to an analogue sample would clarify these findings.

In addition to OC symptom severity and frequency, the current study also examined the frequency with which participants endorsed specific categories of obsessions and compulsions. Overall, we found few differences between the analogue and clinical groups on the presence of specific obsessions and compulsions, with the analogue group reporting almost identical patterns of obsessions and compulsions to the clinical group. That is, the analogue group was not significantly different from the clinical group on any obsessional domains, and only significantly differed from the clinical group with regard to the frequency of endorsing checking and miscellaneous compulsions. Despite previous research suggesting that washing and cleaning compulsions may be relatively uncommon outside of clinical populations (Degonda et al., 1993; Valleni-Basile et al., 1994), the current study did not find a significant difference between the analogue and clinical groups on this domain. These results indicate that analogue samples may be appropriate in research examining all types of obsessions and compulsions, including cleaning and washing symptoms.

Furthermore, significantly higher proportions of the analogue and clinical groups endorsed both obsessions and compulsions relative to the control group. Contrary to prior research suggesting that individuals with sub-clinical OCD were more likely to experience only obsessions *or* compulsions (Karno, et al., 1988; Weissman et al., 1994), the current study found that the entirety of the analogue group reported the presence of both obsessions and compulsions. This pattern was identical to that in the clinical group, but significantly differed from that in the control group. Consistent with the CB model, it seems that a functional relationship between obsessions and compulsions exists in sub-clinical presentations of OCD. This finding provides additional support for the generalizability and utility of analogue samples, since the function, as well as the form, of OC symptoms does not differ between sub-clinical and clinical OCD.

We found mixed support for our hypotheses regarding obsessional beliefs. As we expected, there were significant differences between each of the three groups in terms of responsibility and threat overestimation, with the clinical group reporting significantly greater obsessional beliefs than the other two groups, and the analogue group reporting greater obsessional beliefs than the control group. For obsessional beliefs about perfection and certainty, as well as about the importance and need to control thoughts, we found no differences between the analogue and clinical groups, with both of these groups reporting significantly greater obsessional beliefs than controls. Taken together, these results suggest that individuals with sub-clinical OCD may not experience different levels of dysfunctional cognitions relative to those with clinical OCD, and thus provide additional support for the generalizability of data drawn from analogue samples.

Contrary to our hypotheses, however, we did not find similar patterns across groups with regard to the relationships between obsessional beliefs and OC symptoms. In the overall sample, we found positive associations between specific OC symptoms and specific obsessional beliefs consistent with previous research (OCCWG, 2005). Yet when these relationships were examined within the three groups, significant associations between symptoms and cognitions were only present in the control and clinical groups. That is, there were no significant relationships between any OC symptoms and obsessional beliefs in the analogue group. While the analogue group reported similar levels of obsessional beliefs relative to the clinical group, these cognitions did not appear to be related to OC symptoms as expected based on previous research. Thus, the extent to which obsessional beliefs are important psychological mechanisms involved in analogue OC symptoms is not clear and differs from what has been previously established (and what we found in the present study) in both nonclinical and clinical samples. Accordingly,

results from research using analogue samples to study the relationship between OC symptoms and obsessional beliefs should be interpreted with caution.

There are a number of possible explanations for the above findings. First, range restriction and small sample size may account, in part, for these results. Another explanation is simply that the associations between maladaptive cognitions and OC symptoms are weaker in analogue samples than they are in clinical groups; thus representing an area of important difference between these groups. It is possible that analogue groups include individuals who endorse high levels of obsessional beliefs, but who do not yet experience severe OC symptoms. In this case, obsessional beliefs might not be related to *current* levels of OC symptoms, but are possibly predictive of the future development of such symptoms. Furthermore, analogue groups may also include individuals who currently experience moderate levels of OC symptoms, but whose symptoms are transient and not connected to obsessional beliefs. While previous research has examined the conceptualization of sub-clinical OCD as a premorbid form of OCD, these studies are limited and results have been mixed (Coles, Hart & Schofield, 2012; Fullana et al., 2009; Valleni-Basile et al., 1996). Prospective research addressing the role that obsessional beliefs may play in sub-clinical OCD is warranted.

Our third hypothesis that the analogue group would score below the clinical group, but above the control group on measures of impairment related to OC symptoms was supported. The analogue group reported significantly more impairment at work, at home, and in interpersonal contexts than did the control group, but significantly less impairment than did the clinical group. On average, the analogue group reported mild to moderate impairment. These findings replicate previous research that has found similar patterns (Adam et al., 2012; Fineberg et al., 2013; Grabe et al., 2000) and thus support a dimensional model of impairment related to OC symptoms. This

provides additional evidence that research using analogue samples is likely relevant to understanding clinical OCD.

We found mixed support for our hypothesis that the analogue group would score below the clinical group, but above the control group on measures of psychiatric comorbidity. Specifically, both the analogue and clinical groups reported significantly greater general anxiety than did the control group, while the analogue and control groups reported significantly fewer symptoms of depression than did the clinical group. In this way, the analogue group appeared to overlap with the clinical group in terms of general anxiety, yet overlap with the control group in terms of depression. Since the clinical group reported higher levels of distress and impairment related to OCD, this may be reflected in their report of depression symptoms in the mild to moderate range. It was surprising that there was not a difference in depression symptoms between the analogue and control groups, given previous research reporting that analogue samples displayed higher levels of depression than did controls (e.g. Sher et al., 1991). Notably, while there was not a significant difference in the current study, we observed scores on the BDI in the analogue group that were consistent with mild levels of depression, while the control group reported lower levels consistent with little to no depressive symptoms.

Additionally, we found few differences between the three groups in terms of rates of comorbidity. This was somewhat surprising given the high rates of comorbidity often seen in OCD (Karno et al., 1988; Tukul et al., 2002), however it may reflect the low base rates of these individual disorders. That is, while the majority of the clinical group met criteria for a comorbid diagnosis (60%), the rates for each particular condition were much lower. As an exception, we found that GAD was diagnosed in a significantly higher number of analogue and clinical participants relative to the control group. Furthermore, a significantly higher proportion of both

the clinical and analogue groups were diagnosed with any comorbid disorder compared to the control group, indicating that participants in the analogue and clinical groups experienced significant higher rates of comorbidity than the control group. These results partially replicate previous findings that individuals with sub-clinical OCD endorse lower rates of psychiatric comorbidity than clinical groups, but higher rates than controls (Adam et al., 2012; de Bruijn et al., 2010; Grabe et al., 2001). Given the general similarity in patterns of comorbidity between the analogue and clinical groups, and differences between the analogue and control groups, these findings provide additional support for the generalizability of analogue samples to clinical samples.

Finally, we also observed differences between groups with regard to demographic characteristics. Specifically, we found that the clinical group was significantly older than the other two groups. This was expected, since the analogue and control groups were composed of undergraduate students in order to maximize ecological validity. Notably, the pattern of results observed in this study did not change when controlling for age; thus age does not account for the observed between group differences. This is consistent with previous research that has not found age to be significantly related to OCD symptom presentation or related features (Valleni-Basile et al., 1995).

The current study also observed between group differences in gender, with the clinical group including a significantly higher proportion of women than the other two groups. This was somewhat surprising, as previous research has generally found few gender differences in rates of OCD in adulthood (Karno et al., 1988; Torres et al., 2006; Weissman et al., 1994). A recent population-based cohort study, however, found higher rates of females than males in a clinical sample, but slightly higher rates of males than females in a sub-clinical sample (Fineberg et al.,

2013). These findings are similar to those observed in the current study, but are an exception to the large body of research on this topic. It is possible that the high percentage of women in the clinical group is not representative of typical clinical samples, and instead may be related to the fact that this was a treatment-seeking group, as previous research has found that women seek treatment more often than men for a variety of conditions (Rhodes et al., 2002; Wang et al., 2005). Even if systematic gender differences do exist, controlling for gender did not change the pattern of results and thus does not explain the between-group differences observed in the current study. This is consistent with previous research that has not found gender to be a predictor of OCD symptom severity or related features (Bogetto et al., 1999; Labad et al., 2008; Tükel et al., 2004). Future research comparing analogue samples to clinical, but not necessarily treatment seeking, samples may clarify gender differences between these groups.

Limitations and Future Directions

Several limitations of the current study should be noted. First, this study is cross-sectional in nature and thus cannot adequately address causal issues regarding the development and maintenance of OC symptoms. Second, the clinical group in this study was composed of individuals who were seeking treatment for OCD, and may differ from non-treatment seeking individuals with OCD in a number of ways (e.g. gender ratio, symptom impairment). Third, as previously mentioned, the analogue and control groups were made up of undergraduate students. While this was done intentionally to increase ecological validity, there may be differences between students and non-students with sub-clinical OCD (e.g. age). Finally, the smaller sample size of the analogue group, and range restriction relative to how groups were defined, may have reduced our ability to detect between group differences. This final limitation is partially mitigated, however, since assumptions regarding homogeneity of variance were not violated.

In order to further our understanding of the utility of OC analogue research, future research should examine the longitudinal course of OCD, with a particular focus on mechanisms related to the development of OC symptoms. This research would help clarify the nature of OC analogue samples; that is, whether sub-clinical OCD is best conceptualized as a pre-morbid form of OCD. Prospective research would also enhance our understanding of the relationship between psychological mechanisms and OC symptoms within individuals with sub-clinical OCD. Finally, research comparing analogue samples recruited from the general population to clinical, but not necessarily treatment seeking, samples would reduce sampling bias and thus further clarify the differences between analogue and clinical samples.

Conclusion

In sum, results from the current study provide general support for the use and utility of OC analogue samples. Consistent with dimensional conceptualizations of OCD, research employing these samples is likely to generate findings that are relevant to clinical OCD. In particular, the analogue group exhibited substantial overlap with the clinical group (and was different from controls) in terms of the severity of symmetry OC symptoms, the presence of both obsessions and compulsions across content areas, patterns of comorbidity, and levels of obsessional beliefs. The use of analogue samples may be particularly appropriate in research focused on these areas. Additionally, the analogue group appeared to be quantitatively, but not qualitatively, different from the clinical group in terms of OC symptom severity and frequency across content domains, and symptom impairment. These findings support the view that OC symptom severity and impairment occur on a continuum on which analogue samples exist below the clinical group, but above the control group. Finally, an important area of difference between sub-clinical and clinical OCD may be in the relationship between obsessional beliefs and OC

symptoms. Based on the current study, research examining this relationship in analogue samples is not expected to generalize to clinical samples, and thus should be conducted and viewed with caution.

Table 1

Demographic Characteristics by Group

Demographics	Control	Analogue	Clinical
Mean age (SD)	20.85 (5.76)	19.92 (2.00)	32.60 (10.60)
No. Female (%)	29 (39.1)	15 (60.0)	33 (94.3)
Racial/ethnic background			
No. White (%)	33 (71.7)	18 (72.0)	28 (80.0)
No. Latino (%)	2 (4.3)	2 (8.0)	2 (5.7)
No. African Amer. (%)	6 (13.0)	2 (8.0)	2 (5.7)
No. Asian (%)	2 (4.3)	2 (8.0)	1 (2.9)
No. Other (%)	3 (6.5)	1 (4.0)	2 (5.7)

Table 2

Means (and Standard Deviations) for All Measures by Group

	Control	Analogue	Clinical
YBOCS Obsessions	3.04 (3.37) ^a	5.20 (2.89) ^b	12.89 (2.58) ^c
YBOCS Compulsions	2.37 (2.52) ^a	6.00 (3.20) ^b	13.17 (3.47) ^c
DOCS Contamination	1.83 (2.09) ^a	4.40 (2.92) ^b	9.26 (6.13) ^c
DOCS Harm	2.22 (2.52) ^a	6.08 (3.90) ^b	9.34 (5.69) ^c
DOCS Thoughts	2.20 (2.40) ^a	5.20 (3.95) ^b	8.06 (5.78) ^c
DOCS Symmetry	1.67 (2.24) ^a	5.36 (3.16) ^b	4.43 (4.85) ^b
OBQ RT	51.20 (13.46) ^a	67.00 (15.43) ^b	79.46 (22.51) ^c
OBQ PC	57.15 (14.97) ^a	73.72 (14.88) ^b	73.91 (23.72) ^b
OBQ ICT	27.30 (10.05) ^s	38.24 (11.51) ^b	46.21 (17.16) ^b
BAI	6.57 (4.63) ^a	12.08 (8.10) ^b	15.48 (9.95) ^b
BDI	6.76 (6.02) ^a	10.48 (7.82) ^a	15.74 (8.60) ^b
SDS	3.91 (4.21) ^a	8.76 (5.80) ^b	17.24 (7.34) ^c

Means with different subscripts are significantly different from each other ($p < .05$).

Table 3

Frequencies (and %) of Obsessional Content by Group

Obsessions	Group			Chi-Square	<i>p</i>
	Control (n =46)	Analogue (n = 24)	Clinical (n = 31)		
Harm	12 (26%) ^a	13 (54%) ^b	22 (71%) ^b	15.73	<.01
Contamination	21 (46%) ^a	20 (83%) ^b	26 (84%) ^b	16.19	<.01
Sexual	1 (2%) ^a	5 (21%) ^b	10 (32%) ^b	13.16	<.01
Scrupulosity	6 (13%) ^a	7 (30%) ^a	10 (32%) ^a	4.62	.10
Symmetry	8 (17%) ^a	11 (46%) ^b	15 (48%) ^b	10.06	<.01
Somatic	12 (26%) ^a	10 (42%) ^{a, b}	18 (58%) ^b	7.97	.02
Misc	17 (37%) ^a	19 (79%) ^b	21 (68%) ^b	13.76	<.01
Any obsession	37 (80%) ^a	24 (100%) ^b	31 (100%) ^b	11.81	<.01

Frequencies with different subscripts are significantly different from each other using a Bonferroni correction.

Table 4

Frequencies (and %) of Compulsion Content by Group

Compulsions	Group			Chi-Square	<i>p</i>
	Control (n = 46)	Analogue (n =24)	Clinical (n = 31)		
Washing	10 (22%) ^a	13 (54%) ^b	23 (74%) ^b	21.49	<.01
Checking	15 (33%) ^a	17 (71%) ^b	30 (97%) ^c	33.35	<.01
Repeating	2 (4%) ^a	10 (42%) ^b	12 (39%) ^b	17.64	<.01
Counting	1 (2%) ^a	8 (33%) ^b	8 (26%) ^b	13.51	<.01
Ordering	3 (6%) ^a	5 (21%) ^{a, b}	14 (45%) ^b	16.25	<.01
Mental	14 (30%) ^a	16 (67%) ^b	25 (81%) ^b	20.72	<.01
Misc	15 (33%) ^a	15 (63%) ^b	30 (97%) ^c	31.74	<.01
Any compulsion	30 (65%) ^a	24 (100%) ^b	31 (100%) ^b	22.73	<.01

Frequencies with different subscripts are significantly different from each other using a Bonferroni correction.

Table 5

Correlations between OC Symptoms and Obsessional Beliefs

	OBQ RT	OBQ PC	OBQ ICT
DOCS Contamination	.41*	.26	.21
DOCS Harm	.68*	.50*	.33*
DOCS Thoughts	.30*	.25	.55*
DOCS Symmetry	.22	.37*	.19

*significant after Bonferroni adjustment, $p < .004$

Table 6

Correlations between OC Symptoms and Obsessional Beliefs by Group

	Group								
	Control			Analogue			Clinical		
	OBQ RT	OBQ PC	OBQ ICT	OBQ RT	OBQ PC	OBQ ICT	OBQ RT	OBQ PC	OBQ ICT
DOCS Contam	.28	-.01	.24	.11	.19	-.09	.02	.05	-.36
DOCS Harm	.50*	.43*	.12	.19	-.08	-.38	.61*	.48*	.04
DOCS Thoughts	-.01	.14	-.06	-.11	-.01	.05	.01	.05	.64*
DOCS Symmetry	.02	.16	.08	-.22	.12	-.03	.11	.32	-.02

*significant after Bonferroni adjustment, $p < .001$

Table 7

Frequencies (and %) of Comorbid Diagnoses by Group

Diagnosis	Group			Chi-Square	<i>p</i>
	Control (n= 46)	Analogue (n = 24)	Clinical (n = 31)		
Depression	2 (4%) ^a	3 (12%) ^a	2 (6.5%) ^a	1.50	.47
Dysthymia	0 (0%) ^a	1 (4%) ^a	3 (9.7%) ^a	4.60	.10
Manic Episode	0 (0%) ^a	0 (0%) ^a	1 (3%) ^a	2.28	.32
Hypomanic Episode	3 (7%) ^a	4 (17%) ^a	0 (0%) ^a	5.85	.05
Panic Disorder	1 (2%) ^a	0 (0%) ^a	4 (13%) ^a	6.17	.05
Social Phobia	0 (0%) ^a	2 (8%) ^a	3 (10%) ^a	4.45	.11
PTSD	0 (0%) ^a	0 (0%) ^a	0 (0%) ^a	--	--
Alcohol Dependence	3 (7%) ^a	1 (4%) ^a	1 (3%) ^a	2.07	.35
Alcohol Abuse	1 (2%) ^a	4 (17%) ^a	1 (3%) ^a	6.52	.04
Substance Dependence	3 (7%) ^a	1 (4%) ^a	0 (0%) ^a	2.07	.35
Substance Abuse	3 (7%) ^a	1 (4%) ^a	0 (0%) ^a	2.07	.35
Psychotic Disorder	0 (0%) ^a	0 (0%) ^a	0 (0%) ^a	--	--
Anorexia Nervosa	0 (0%) ^a	0 (0%) ^a	0 (0%) ^a	--	--
Bulimia Nervosa	0 (0%) ^a	2 (8%) ^a	1 (3%) ^a	3.81	.15
GAD	4 (9%) ^a	9 (36%) ^b	8 (26%) ^b	8.63	.01
Antisocial PD	0 (0%) ^a	0 (0%) ^a	0 (0%) ^a	--	--
Any diagnosis	14 (30%) ^a	15 (60%) ^b	18 (60%) ^b	8.80	.01

Frequencies with different subscripts are significantly different from each other using a Bonferroni correction.

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