AN EXAMINATION OF MAGICAL BELIEFS AS PREDICTORS OF OBSESSIVE-COMPULSIVE SYMPTOM DIMENSIONS

BY

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Abstract

Research suggests that the magical belief constructs of superstition, thought-action fusion (TAF), and magical ideation are related to Obsessive Compulsive Disorder (OCD). However, the nature of these relationships is poorly understood. The current study improved on methodological limitations of previous studies and used the *Dimensional Obsessive-Compulsive Scale* (*DOCS*) to conceptualize OCD as a dimensional construct. Relationships between magical belief constructs and four OCD symptom dimensions were examined in a large sample of undergraduates. The magical belief constructs were found to differentially predict all four OCD symptom dimensions. Specifically, magical ideation predicted the following three OCD symptom dimensions: contamination concerns and cleaning/washing compulsions; unacceptable violent, religious, and sexual obsessions and related compulsions; and symmetry obsessions and ordering compulsions. Superstition and TAF Likelihood-Self both predicted obsessions about responsibility for harm, injury, or bad luck and related compulsions. TAF Moral also predicted contamination concerns and cleaning/washing compulsions. Theoretical and clinical implications of these findings are discussed.

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This dissertation is dedicated to Mom, Dad, and Ryan, with love.

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Overview

Research has shown that there are relationships between a form of mental illness known as Obsessive Compulsive Disorder (OCD) and the magical belief constructs of superstition, thought-action fusion (TAF), and magical ideation. However, the nature of these relationships is, at present, poorly understood. The current study used methodology aimed at clarifying the above mentioned relationships.

Introduction

Obsessive-Compulsive Disorder

OCD is a form of mental illness affecting 1% to 3% of the world's population (Leckman et al., 2010). It is characterized by obsessions and/or compulsions. Obsessions are defined as "recurrent and persistent thoughts, impulses, or images that are experienced…as intrusive and inappropriate and that cause marked anxiety or distress" (American Psychiatric Association [*DSM-IV-TR*], 2000). Compulsions are defined as:

> Repetitive behaviors or mental acts that the person feels driven to perform in response to an obsession, or according to rules that must be applied rigidly. The behaviors or mental acts are aimed at preventing or reducing distress or preventing some dreaded event or situation; however, these behaviors or mental acts either are not connected in a realistic way with what they are designed to neutralize or prevent or are clearly excessive. (American Psychiatric Association [*DSM-IV-TR*])

Most individuals (80% to 90% of adults in the general population) experience some obsessive thoughts or compulsive behaviors, termed OC or OCD symptoms, depending on the author (Evans et al., 2002; Gibbs, 1996). OCD symptoms can be distinguished from OCD because they are less time-consuming, less frequent, and associated with less distress and impairment (Evans et al., 2002). OCD symptoms often resemble superstitious beliefs and behaviors (e.g., knocking on wood). Superstitious behaviors and OCD symptoms are differentiated from normal rituals (e.g., following the same bathroom routine every night) because they are based on a magical idea of bringing good luck or warding off harm (Leonard, Goldberger, Rapoport, Cheslow, & Swedo, 1990). Because OCD symptoms are so common in the general population, much of the research on OCD and its correlates has been conducted on nonclinical

(i.e., analog) samples. There are many benefits of using analog samples including ease of recruitment and ability to study etiological and vulnerability factors, because some members of this population may go on to develop diagnosable psychopathology (Gibbs, 1996). However, most individuals with OCD symptoms never go on to develop OCD.

Superstition

Superstitions have been defined as "irrational beliefs that an object, action, or circumstance that is not logically related to a course of events influences its outcome" (Damisch, Stoberock, & Mussweiler, 2010, p. 1014). Though superstitions can take the form of predicting positive outcomes, such as bringing good luck (e.g., finding a penny "heads up," finding a four-leaf clover, carrying a lucky rabbit's foot), they are more often associated with preventing bad luck or warding off harm (e.g., avoiding stepping on cracks to prevent a mother's back from breaking, and avoiding walking under ladders and breaking mirrors to prevent bad luck from occurring; Irwin, 2007; Zebb & Moore, 2003).

Superstitions are extremely common in the general population and are present in all cultures (Jahoda, 1969; Vyse, 1997). They have been found to be more prevalent among females than males (Vyse, 1997; Zebb & Moore, 2003), and age does not discriminate consistently between the superstitious and the non-superstitious (Rice, 2003; Woolley, 1997). Superstitions and magical thinking, in general, are common in children, but do not disappear across the developmental lifespan (Bolton, Dearsley, Madronal-Luque, & Baron-Cohen, 2002; Evans, Milanak, Medeiros, & Ross, 2002; Simonds, Demetre, & Read, 2009). This phenomenon is explained by dual-process theories, which propose that humans have the capacity to process emotions in two ways: intuitively (relying on life experience; more automatic) and analytically (relying on rational thought; more effortful and time-consuming). These two processing systems are said to tap independent databases and to have different rules of operation. Intuitive reasoning is the primary reasoning system in young children, whereas analytical reasoning develops later in the lifespan, but does not replace intuitive reasoning (Evans et al., 2002). Superstition is highly associated with intuitive reasoning (Lindeman & Aarnio, 2006). For this reason, adults rely on intuitive reasoning

and superstition in situations in which analytical reasoning is inefficient (e.g., when time is lacking) or impossible (e.g., when a scientific explanation is lacking). Dual-process theories are further supported by the finding that education level does not discriminate between the superstitious and non-superstitious. That is, greater knowledge of science has not been shown to decrease superstitiousness (Lindeman & Aarnio, 2006).

B.F. Skinner (1948) was among the first to describe the formation of superstitions. In a classic experiment, Skinner presented pigeons with food on a fixed time interval. Over time, the pigeons began to repeat random behaviors that were temporally associated with the appearance of food: "The bird behaves as if there is a causal relation between its behavior and the presentation of food" (Skinner, 1948, p. 171). Not all superstitions are acquired through operant conditioning, however. Many are simply transmitted through the culture and passed down from generation to generation (Buhrmann & Zaugg, 1981; White & Liu, 1995).

Superstitions have been shown to increase when uncertainty and ambiguity are high (Burger & Lynn, 2005; Keinan, 1994; Schippers & Van Lange, 2006; Vyse, 1997; Wright & Erdal, 2008), perceived control is low (Schippers & Van Lange, 2006), and psychological stress is high (Buhrmann & Zaugg, 1981; Keinan, 1994; Wright & Erdal, 2008). Therefore, it is not surprising that superstitious beliefs and practices are particularly prevalent among individuals who are commonly in high pressure situations, such as athletes (Ciborowski, 1997) and college students (Vyse, 1997). Anthropologist, Bronislaw Malinowski (1954) documented this effect in his study of Trobriand Islanders in Melanesia in the early 20th century. He observed an increase in superstitious behaviors among fishermen when they were in dangerous, unpredictable waters far from shore and a decrease in these behaviors when fishing in shallow, calm waters. Likewise, Keinan (1994) found that individuals living in areas of Israel prone to SCUD missile attacks during the Gulf War reported a higher degree of beliefs in superstition than those living far from the threat of missile attacks.

Recent research on compensatory control, defined as "psychological and perceptual systems designed to preserve a sense of order and nonrandomness even when personal control vanishes," has provided an explanation for the origin of superstitions (Kay, Whitson, Gaucher, & Galinsky, 2009, p. 264). This theory posits that humans have a fundamental need to preserve their sense of personal control and to see the world as orderly and predictable (Lindeman, 1998). When their sense of personal control is threatened (real examples of threat include suddenly losing a loved one, enduring a natural disaster, and engaging in games of chance) they experience discomfort and anxiety and cope by looking to external sources to restore their sense of control. Experimental manipulations decreasing personal sense of control have been shown to lead to increased superstitious beliefs and rituals (Kay et al., 2009; Kay, Gaucher, McGregor, & Nash, 2010; Laurin, Kay, & Moscovitch, 2008; Whitson & Galinsky, 2008). In other words, superstitious rituals appear to act as "substitute activities," providing the illusion of control and reducing anxiety associated with the knowledge that one cannot actually control a situation (Campbell, 1996, p. 154).

Researchers have shown that superstition can be beneficial by improving performance (Czech, Ploszay, & Burke, 2004; Damisch et al., 2010; Lobmeyer & Wasserman, 1986; Lonsdale & Tam, 2008). Among athletes, superstitious rituals are used to help maintain emotional balance and enhance team unity (Leonard, 1990). In addition, the illusion of control provided by superstition can lead to improved sense of self-efficacy (Damisch et al., 2010; Wright & Erdal, 2008) and reduced anxiety (Becker, 1975; Kay, et al., 2009; Neil, 1980; Womack, 1979) or psychological tension (Schippers & Van Lange, 2006).

However, researchers also caution that, in excess, superstitious behavior can be detrimental. Damisch et al. (2010) reported that some superstitious rituals can become "obsessive." Wright and Erdal (2008) suggested that there is a "complex relationship between superstitious behavior and psychologically healthy practices" (p. 197). Superstition has been found to be related to many forms of psychopathology including schizophrenia and schizotypy, in addition to OCD (Einstein & Menzies, 2004b).

Research on Superstition and OCD

OCD and superstition have many noticeable overlapping characteristics. For example, individuals with OCD often perform elaborate rituals to ward off harm (e.g., "If I do not tap this door frame 10 times, then a loved one will get cancer"). Such ritualistic behaviors often have no logical connection with their intended goal. A similar idea is seen with common superstitions (e.g., "If I step on a crack, then I will break my mother's back"). Adherence to this superstition would require going to great lengths to avoid stepping on cracks in order to prevent potential harm to a loved one. In addition, superstitious rituals have been identified as maladaptive methods of attempting to gain control in uncertain situations (Kay et al., 2009). Likewise, compulsive behaviors are maladaptive and performed with the intent of preventing or reducing anxiety associated with the obsessive thought (American Psychiatric Association [*DSM-IV-TR*], 2000). The control of thoughts (obsessions) and future situations are important goals of compulsive behavior, as well. Despite the obvious overlap between superstition and OCD, however, there has been very little research examining their relationship.

Leonard et al. (1990) conducted the first study on OCD and superstition. In this study, children diagnosed with OCD and matched non-OCD control group participants were surveyed about their current superstitious beliefs and practices. Using author-constructed measures of superstition and developmental rituals, the authors surveyed parents about their child's superstitious beliefs. They found that, in comparison with parents of matched controls, parents of children with OCD reported that their child had more developmental rituals (e.g., behaviors such as keeping the same bedtime or mealtime routine, playing games with elaborate rules like "jinx," starting collections such as baseball cards, becoming fixated on a particular teen heartthrob). However, children with OCD did not differ from control participants in the reported number of superstitious beliefs or behaviors. Superstitions are distinguished from developmental rituals because they are "based on some magical or supernatural idea thought to bring good luck or ward off bad fortune" (p. 18). Therefore, Leonard et al. concluded that "OCD is not on a continuum with superstitions" (p. 20).

Frost et al. (1993) studied the relationship between superstition and OCD symptoms in an analog sample of female college students. The authors created the *Lucky Beliefs* and *Lucky Behaviors* questionnaires and studied their correlations with the following measures of obsessive-compulsive phenomena: *Maudsley Obsessional-Compulsive Inventory* (*MOCI*; Rachman & Hodgson, 1980), *Compulsive Activity Checklist – Revised* (*CAC-R*; Steketee & Freund, 1992), *Obsessive Thoughts Questionnaire* (*OTQ*; Bouvard, Mollard, Cottraux, & Guerin, 1990), and *Everyday Checking Behavior Scale* (*ECBS*; Frost et al., 1986; Sher et al., 1983). They found that both superstition scales were positively correlated with total compulsiveness and obsessionality scores on the measures, as well as with their perfectionism and responsibility subscales. In addition, both superstition scales were significantly correlated with checking subscales, but not with cleaning/washing subscales. The authors concluded that "superstitiousness is correlated with obsessive-compulsive characteristics among nonclinical subjects" (p. 424). They also theorized that checking, like superstition, represents an attempt to reestablish control over one's environment *and* prevent future harm, whereas cleaning is more restorative in nature with less of a focus on preventing future harm. In addition, because correlations with measures of obsessions were higher than with measures of compulsions, they suggested that superstitiousness may be more related to obsessions than compulsions.

Almost ten years later, Sica, Novara, and Sanavio (2002) conducted the third study on the relationship between OCD and superstition. These authors used the *Obsessive Beliefs Questionnaire* (*OBQ*; Obsessive Compulsive Cognitions Working Group, 1997, 2001) to measure six dysfunctional cognitions that have been found to play a role in the etiology and maintenance of OCD: overestimation of threat, intolerance of uncertainty, overimportance of thoughts, control of thoughts, inflated responsibility, and perfectionism. They also used the *Interpretations of Intrusions Inventory* (*III*; Obsessive Compulsive Cognitions Working Group, 2001) to assess dysfunctional appraisals of intrusive thoughts, images, and impulses. This scale has three subscales: importance of thoughts, control of thoughts, and responsibility. To assess OCD symptoms, the *Padua Inventory* (*PI*; Sanavio, 1988) was used. This measure consists of

four subscales: impaired mental control, checking, contamination, and urges and worries. The *Beck Anxiety Inventory* (*BAI*; Beck, Epstein, Brown, & Steer, 1988) and *Beck Depression Inventory* (*BDI*; Beck, Steer, & Garbin, 1988; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) provided measures of psychopathology other than OCD. The *Worry Domains Questionnaire* (*WDQ*; Tallis, Davey, & Bond, 1994) was also employed. Finally, the authors constructed a 10 item questionnaire to measure common Italian superstitious beliefs (but not behaviors). The study participants were split into high and low superstitious groups and compared on the various variables. Significantly more females than males were in the high superstitious group which, in turn, reported significantly more anxiety, depression, worries, and obsessive-compulsive features than did participants in the low superstitious group. Even after controlling for anxiety and depression, the high superstitious group still scored significantly higher on the *PI* total score as well as on the impaired mental control and cleaning subscales. In addition, after controlling for anxiety and depression, the high superstitious group scored higher on the *WDQ* total score and *OBQ* overestimation of threat subscale. High superstitious individuals also scored higher on the following variables than did low superstitious individuals: threat overestimation, intolerance of uncertainty, and inflated responsibility. After controlling for anxiety and depression, only the *OBQ* threat estimation and perfectionism subscales discriminated high superstitious individuals from low superstitious individuals. However, whereas threat estimation was positively correlated with superstitiousness, perfectionism was negatively correlated with superstitiousness.

The authors drew the following conclusions: "high involvement in superstition seems to play a role in OCD phenomenology, particularly with obsessionality and cleaning behaviors" (p. 1010). These findings partially contradict those of Frost et al. (1993), who found checking, but not cleaning, to be related to superstition. Sica et al. (2002) theorized that this may be due to the specific cognitions reported by the Italian sample versus those of the American sample, as some OCD symptoms have been found to be associated with certain dysfunctional cognitions, but not with others.

Zebb and Moore (2003) conducted a study to replicate and extend the Frost et al. (1993) findings. They administered measures of specific anxiety disorders (e.g., agoraphobia, panic, worry, and social anxiety), general psychopathology (e.g., anxiety, depression, and stress), and OCD (the *MOCI* and *PI*) to an analog sample of college students. In addition, they adapted the superstition measure developed by Leonard et al. (1990). They also measured perceived control over anxiety-related events with the *Anxiety Control Questionnaire* (*AxCQ*; Rapee, Craske, Brown, & Barlow, 1996). Zebb and Moore (2003) replicated the finding that females are more superstitious than males. For females only, there was a significant relationship between superstition and OCD symptoms; particularly compulsive checking. This relationship was independent of the influence of other variables such as perceived control. The relationship between superstition and psychopathology was not found to be exclusive to OCD, however, as superstition also was significantly related to specific anxiety symptoms and general psychological distress. Finally, although superstition was related to perceived anxiety control, the latter had independent relationships in both males and females with various types of anxiety symptoms and general psychological distress.

In summary, despite some discrepancies in results, these studies show that superstition and OCD are related and that superstition is most strongly related to obsessions and checking compulsions. However, the relationship between superstition and OCD is not exclusive, as superstition is also related to other anxiety disorders and general psychological distress.

Magical Ideation and Thought-Action Fusion

After 2002, most research on superstition and OCD incorporated the related magical belief constructs of magical ideation and thought-action fusion (TAF). Einstein and Menzies (2004b) define magical ideation as "beliefs that defy culturally accepted laws of causality" (p. 539). Magical ideation includes beliefs in clairvoyance, astrology, spirit influences, and telepathy. Magical ideation is traditionally measured by the *Magical Ideation Scale* (Eckblad & Chapman, 1983), which was originally designed to measure psychosis-proneness. TAF consists of two components; TAF Likelihood and TAF

Moral. TAF Likelihood is further split into two constructs; TAF Likelihood-Self and TAF Likelihood-Others. These constructs reflect the belief that an unacceptable thought about a negative event occurring to oneself or others makes the event more probable (e.g., "If I think about my parents' plane crashing, it is more likely to happen"; Einstein & Menzies, 2004a). TAF Moral is "the belief that experiencing an intrusive thought is as morally unacceptable as acting on the thought" (Einstein & Menzies, 2004a, p. 176). An example of TAF Moral is "if I wish my brother would die it is morally equivalent to killing him." TAF is measured using the *Thought Action Fusion Scale – Revised* (*TAF-R*; Shafran, Thordarson, & Rachman, 1996). The similarities between these two constructs and superstition are striking. Superstition, TAF, and magical ideation all involve belief in irrational cause-and-effect relationships. Superstition and TAF Likelihood only differ in that superstition usually involves belief that *behaviors* increase the chance of future harm (e.g., stepping on a crack) whereas TAF involves belief that *thoughts* increase the chance of future harm.

Research on Magical Ideation, TAF, Superstition, and OCD

Einstein and Menzies conducted two studies, one on an analog undergraduate sample (2004a) and one on a sample of individuals diagnosed with OCD (2004b), to examine the relationships among magical ideation, superstition, and TAF and their relationships with OCD. They administered the *Magical Ideation Scale*, the *Lucky Beliefs and Lucky Behaviors Questionnaires*, and the *Thought Action Fusion – Revised Scale* to measure these constructs. OCD symptoms were assessed in the analog sample using the *PI* and the *MOCI*. However, in the clinical sample, the *MOCI* was replaced with the *Obsessive Compulsive Inventory – Revised* (*OCI-R*; Foa et al., 2002). With the exception of TAF Moral in the analog sample, the measures of superstition, TAF, and magical thinking were highly correlated with one another in both studies. In the analog sample, TAF Moral did not correlate with any of the other scales. In both studies, magical ideation displayed the strongest relationships with measures of OCD, though superstition and TAF were significantly related to OCD measures, as well. After controlling for magical ideation, none of the relationships among TAF and superstition and OCD remained significant in the

analog sample. All relationships between magical ideation and OCD remained significant when controlling for superstition and TAF, leading the authors to conclude that in an analog sample, "the TAF Likelihood scales and the Superstitiousness scales were related to obsessive-compulsive symptoms by virtue of their relationship with the MI Scale" (p. 177). They suggest that TAF and superstition are "derivatives" of the broader construct of magical ideation. In the analog sample, magical ideation was found to be significantly related to obsessive-compulsive checking, but not to washing. Einstein and Menzies (2004a) explain this finding:

> standing in front of a stove and repeatedly feeling the knobs to make sure that they are in the right place may require magical thinking, as the individual must continually deny the veracity of visual and other sensory input that they are receiving at the time. In comparison, cleaning behaviors require no magical thinking because the community is aware that germs are everywhere, numerous and invisible to the eye. Magical thinking is not required to believe that germs have not been removed after washing ones' hands. (p. 178)

In Einstein and Menzies' clinical sample (2004b), the only relationship that remained significant when controlling for magical ideation was between the *Lucky Beliefs Scale* and the *PI*, suggesting that superstitious beliefs may be related to OCD independently of magical ideation. Likewise, when superstition was held constant, the relationship between magical thinking and the *OCI-R* disappeared. The authors largely ignored these results in their conclusions and stated that, overall, the findings supported their earlier conclusion that superstition and TAF are derivatives of magical ideation. In addition, magical ideation was found to be related to some OCD symptoms in the clinical sample (e.g., checking, impaired mental control, urges and worries, aggressive obsessions, and atypical symptoms), but not to others (e.g., contamination/washing).

These studies showed that the concepts of superstition, magical ideation, and TAF are closely interrelated, but, in general, magical ideation has the strongest relationship with OCD. In addition, they replicated the finding that superstition, magical ideation, and TAF are strongly related to checking compulsions and obsessive thoughts, but not to contamination and washing symptoms. Despite some evidence that superstition may be related to OCD independently of magical ideation, subsequent research began to neglect the construct of superstition and instead focus on magical ideation and TAF.

Research on Magical Ideation, TAF, and OCD

As studies continued to show consistent significant relationships between magical ideation and OCD (Bolton et al., 2002; Einstein & Menzies, 2006; Einstein & Menzies, 2008; Rees, Draper, & Davis, 2010; Yorulmaz, Inozu, & Gültepe, 2011) and TAF and OCD (Berle & Starcevic, 2005; Rees et al., 2010; Shafran & Rachman, 2004), researchers began to question how these constructs might contribute to the etiology and/or maintenance of the disorder. Bocci and Gordon (2007) proposed that magical thinking may be present on both the "input" side of OCD (by creating a sense of threat with the belief that thoughts can cause harm) and on the "output" side of OCD (by leading to forms of neutralizing behavior and rituals in order to prevent harm and reduce anxiety), which is consistent with current cognitive models of OCD. Current cognitive models are based on Beck's (1976) cognitive specificity hypothesis, which proposes that certain types of psychopathology arise from certain types of dysfunctional beliefs. These models suggest that obsessions are normal occurrences which become pathological when they are interpreted, or appraised, in a catastrophic way (e.g., "These thoughts mean I am bad, mad, or dangerous."). Such appraisals cause distress, which leads to neutralizing (e.g., thought suppression, mental rituals, compulsive behaviors) in order to reduce anxiety. However, neutralizing is counter-productive in that it only causes the intrusive thoughts, and thus the compulsive behaviors, to intensify (Berle & Starcevic, 2005; Bocci & Gordon, 2007; Shafran & Rachman, 2004). TAF is believed to be just one type of dysfunctional cognition that can lead to catastrophic appraisals of intrusive thoughts (Berle & Starcevic, 2005; Shafran & Rachman, 2004). The original model of TAF centered on the belief that thoughts can cause harm, but Amir, Freshman, Ramsey, Neary and Brigidi (2001) showed that TAF is also related to the belief that thoughts can be used to prevent or avoid harm. This may be seen in the form of mental neutralizing in order to "right the wrong" after one perceives that he or she has already caused harm. Magical ideation and TAF have been shown to bring about neutralizing behavior (Einstein & Menzies, 2008; Marino, Lunt, & Negy, 2008; Shafran & Rachman, 2004). Therefore, TAF, "a specific

type of magical thinking" has been implicated in the maintenance of OCD (Berle & Starcevic, 2005, p. 266).

Though magical ideation and TAF are both related to OCD, the extent of their relationships with OCD may differ. Rees, Draper, and Davis (2010) found that, of the two constructs, magical ideation is the stronger predictor of OCD symptoms, though both magical ideation and TAF displayed independent relationships with OCD. In addition, the components of TAF have been found to differ in their relationships with OCD. The Likelihood component of TAF has been found to be related to OCD, whereas the Moral component of TAF has not (Shafran & Rachman, 2004). Numerous studies have shown that TAF and magical beliefs, like superstition, are not unique to OCD and are present in other anxiety disorders, eating disorders, and depression (Berle & Starcevic, 2005; Shafran & Rachman, 2004; Simonds, Demetre, & Read, 2009). TAF Likelihood has been found to be more related to anxiety, whereas TAF Moral has been found to be related to depression (Shafran & Rachman, 2004). Lee, Cougle, and Telch (2005) found that the relationship between Likelihood TAF and OCD largely disappeared when controlling for magical ideation. This finding lends more support to the theory that TAF is related to OCD because it is a derivative of magical ideation. Einstein and Menzies (2008) showed that treatment for OCD was associated with improvement in magical ideation scores. In addition, participants who had high magical ideation scores prior to treatment improved less than those who did not. Therefore, Einstein and Menzies suggested that individuals with OCD symptoms and high magical ideation may have a poor treatment prognosis.

Although many studies suggest that superstition and TAF are related to OCD mainly through their relationship to magical ideation, not all studies have replicated this finding. Marino et al. (2008) used structural equation modeling and found that, whereas TAF was a significant predictor of OCD symptoms, magical ideation was not. They explained this finding as follows: "It therefore may be the case that the previously observed impact of magical thinking on the relationships between TAF and OCD symptoms may be accounted for by an inflated sense of responsibility and tendency to engage in

neutralization strategies" (p. 852). It is clear that the relationships among superstition, TAF, magical ideation, and OCD are, at present, not well understood.

Dysfunctional Cognitions, OCD, and Magical Belief Constructs

As discussed previously, current cognitive models propose that dysfunctional cognitions contribute to the etiology and maintenance of OCD symptoms. Six types of dysfunctional cognitions have been found to be particularly relevant to OCD symptoms: (1) inflated responsibility, (2) overimportance of thoughts, (3) excessive concern about the importance of controlling one's thoughts, (4) overestimation of threat, (5) intolerance of uncertainty, and (6) perfectionism (Obsessive Compulsive Cognitions Working Group, 1997). The Obsessive Compulsive Cognitions Working Group (2001) developed the *Obsessive Beliefs Questionnaire* (*OBQ*) to assess the extent of these belief domains in individuals. They found that the six beliefs load on three factors: (1) inflated responsibility and tendency to overestimate threat, (2) need for perfectionism and certainty, and (3) overimportance of and need to control thoughts. In construction of the *OBQ*, the Obsessive Compulsive Cognitions Working Group recognized superstition, magical thinking, and TAF as important beliefs implicated in OCD and included them in the factor of overimportance of and need to control thoughts.

The three dysfunctional beliefs factors noted above have been found to be related to different OCD symptoms. In general, the factor of inflated responsibility and overestimation of threat has been shown to be primarily related to the OCD symptoms of contamination/washing (Taylor et al., 2010; Wheaton, Abramowitz, Berman, Riemann, & Hale, 2010) and obsessive doubts/thoughts of being responsible for harm and associated checking and reassurance-seeking rituals (Calleo, Hart, Björgvinsson, & Stanley, 2010; Taylor et al., 2010; Wheaton et al., 2010). The factor of need for perfectionism and certainty has been shown to be related to OCD symptoms of symmetry and ordering (Calleo et al., 2010; Taylor et al., 2010; Wheaton et al., 2010). The final factor, overimportance of and need to control thoughts, has been shown to be related to unacceptable obsessive thoughts (e.g., religious, sexual, violent obsessions) and checking and neutralizing strategies (Calleo et al., 2010; Taylor et al., 2010; Wheaton et

al., 2010). The latter finding is not surprising, given that superstition is represented by this factor and it has consistently been found to be strongly related to checking compulsions and obsessive thoughts (e.g., Frost et al., 1993). In addition, TAF has been shown to bring about neutralizing behaviors (e.g., Shafran & Rachman, 2004). These dysfunctional beliefs have been shown to have direct effects on OCD symptoms and also to interact with one another, leading to indirect effects on OCD symptoms (Taylor et al., 2010). It is likely that superstition, magical ideation, and TAF are also related, perhaps indirectly, to inflated responsibility and overestimation of threat given the relationship of that factor with checking and obsessive thoughts of being responsible for harm.

This research provides evidence that superstition, magical ideation, and TAF are related to (and may actually be) the main cognitive dysfunctions implicated in the etiology and maintenance of OCD. In particular, they show the strongest relationships with cognitive dysfunctions associated with obsessive sexual, religious, and aggressive thoughts and compulsive checking.

Control, OCD, and Magical Belief Constructs

Not all individuals with OCD report elevated dysfunctional beliefs on the *OBQ* (Polman, O'Connor, & Huisman, 2011). This has led researchers to examine other variables (cognitive, genetic, and environmental) that may be important in the etiology and maintenance of OCD. Recently, a number of studies have been conducted on the role of control-related variables in OCD. Excessive concern about the need to control one's thoughts is one of the six dysfunctional beliefs identified by the Obsessive Compulsive Cognitions Working Group (1997). However, Moulding and Kyrios (2006) recently proposed that broader control-related beliefs relating to one's perceived control and desired control over external situations may be related to OCD. A low sense of control was found to be related to high OCD symptoms (Moulding, Kyrios, Doron, & Nedeljkovic, 2009). High desire for control alone has not been found to be a risk factor for OCD, but when a high desire for control is matched with a low sense of control, this is associated with high OCD symptoms. Moulding et al. proposed that this discrepancy leads to distress and motivation to act to restore one's sense of control through compulsive actions. This theory

is similar to that for the development of superstitions. As previously discussed, superstitions have been shown to be generated when an individual has a low sense of control in an uncertain or dangerous situation. This leads to distress, which is alleviated through superstitious ritualizing. Though low sense of control was found to have a direct effect on OCD symptoms, it also was found to be indirectly related to OCD symptoms. Moulding et al. suggest that other cognitions, such as superstitious beliefs and TAF Likelihood may mediate this relationship.

Religion and Scrupulosity

Another source of indirect evidence for a relationship between magical belief constructs and OCD is research on the relationship between religiosity, scrupulosity, and OCD. Scholars have long debated the difference between superstition/magical ideation and religious beliefs with limited success. Many have come to the conclusion that one group's religion is another group's superstition (Woolley, 1997). Religion and superstition share many characteristics. Wain and Spinella (2007) define religion as "beliefs in manlike supernatural, mystical, uncanny, or bizarre beings" (p. 136). Religious belief in the possible existence of supernatural entities, like superstitious beliefs, is beyond the realm of scientific explanation and is not based on logical understandings of cause and effect. In addition, as with superstition, religious beliefs may persist in the face of contradictory evidence (Wain & Spinella, 2007).

Theories behind the development of superstitious and religious beliefs are also similar. Religion, like superstition, has been identified as a form of compensatory control (Kay et al., 2009; Kay et al., 2010). Research has shown that an individual's decreased sense of personal control results in anxiety, which is compensated for through increased superstitious and religious beliefs (e.g., belief in a controlling God; Kay et al., 2009). An example of this would be increased religious beliefs at the end of one's life, as the uncertainty surrounding death and lack of control over one's fate leads to anxiety. Religious beliefs have been found to correlate positively with paranormal (including superstitious) beliefs (Wain & Spinella, 2007). Religiosity has also been found to be correlated with OCD symptoms and dysfunctional cognitions (Sica, Novara, & Sanavio, 2002). Religion, like superstition, has been shown to be highly

correlated with obsessive-compulsive obsessionality and the cognitive dysfunctions of control of thoughts and overimportance of thoughts (Sica et al., 2002). Religiosity has also been found to be correlated with TAF Moral, which is not surprising given that many religious teachings (particularly those in Christianity) support the belief that immoral thoughts are equivalent to immoral behavior (Siev, Chambless, & Huppert, 2010). Sica et al. conclude that religion seems to play a role in obsessive-compulsive phenomena, but, as is the case with superstition, its exact role is currently unclear.

Scrupulosity is defined as "a psychological disorder primarily characterized by pathological guilt or obsession associated with moral or religious issues that is often accompanied by compulsive moral or religious observance and is highly distressing and maladaptive" (Miller & Hedges, 2008, p. 1042). Some researchers have proposed that scrupulosity is one of the many types of OCD presentations (Olatunji, Abramowitz, Williams, Connolly, & Lohr, 2007), whereas others propose that it is a separate disorder falling on the OC Spectrum (Miller & Hedges, 2008). Scrupulosity is only mentioned in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* as a symptom of Obsessive Compulsive Personality Disorder (OCPD; American Psychiatric Association [*DSM-IV-TR*], 2000), and the most recent proposals for the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM-5*) do not include scrupulosity as a discrete disorder on the OC Spectrum (Phillips et al., 2010). Scrupulosity obsessions include blasphemous mental images and intrusive thoughts that one has or will commit sin and that one will be punished by God (Olatunji et al., 2007). Scrupulosity-related compulsions consist of repetitive religious practices such as praying, confessing, ritualizing, and reassurance-seeking from clergy (Miller & Hedges, 2008; Olatunji et al., 2007) These compulsions are often completed with the intent of warding off harm or punishment (Miller & Hedges, 2008). Scrupulosity has been found to be strongly related to OCD symptoms, even when general anxiety and depression are controlled for (Olatunji et al., 2007). In dimensional models of OCD, religious obsessions have been found to load on a factor with sexual and aggressive obsessions; the factor most closely related to magical belief constructs. These particular obsessions are thought to be linked by an overly strict moral code. This is supported by the

finding that both TAF Moral and obsessional symptoms are significant predictors of scrupulosity (Nelson, Abramowitz, Whiteside, & Deacon, 2006). It is clear that scrupulosity and magical belief constructs are related: "in comparison with patients with contamination or symmetry-related obsessions, those with religious obsessions were more likely to show increased perceptual aberration and magical ideation, and decreased insight into the irrationality of obsessional fears" (Tolin, Abramowitz, Kozak, & Foa, 2001, p. 772). This provides additional evidence for the relationship between magical belief constructs and OCD.

Limitations of Previous Research

The numerous limitations of the reviewed research on magical belief constructs and OCD have likely contributed to the poor understanding of their relationships. These limitations include methodological, measurement, and definitional problems and should be corrected or eliminated if the nature of these relationships is to be better understood.

Measurement of superstition.

Methodological problems with the way in which superstition has been measured may have affected current research findings. One major problem is that there is no single, agreed-upon measure of superstition. Rather, authors often construct their own measures. Superstition has often been grouped with paranormal beliefs such as beliefs in ghosts, witchcraft, astrology, fortune-telling, flying saucers and ESP. However, according to Irwin (2007), "in investigations where some traditional superstitions were included in the item pool for a paranormal belief questionnaire, the application of factor analysis typically has identified superstitions as a discrete factor of paranormal belief" (p. 100). Therefore, it is important that superstition be considered as a distinct construct from other types of paranormal beliefs in research measures.

In addition, many studies have measured superstition using the superstition factor of the *Paranormal Beliefs Scale* (*PBS*; Tobacyk & Milford, 1983) and the *Revised Paranormal Beliefs Scale* (*RPBS*; Tobacyk, 1988, 2004). The superstition factor in these scales consists of just three items: "Black cats can bring bad luck," "If you break a mirror, you will have bad luck," and "The number '13' is

unlucky." According to Irwin, "so few items are hardly likely to provide a rigorous measure of any psychological construct" (p. 115). Also, these items deal only with negative superstitions (those related to bad luck). Irwin recommends the inclusion of positive superstitions (those related to good luck) on future scales of superstitiousness for a thorough understanding of the construct.

Finally, many scales, such as the *PBS*, only assess cognitive *belief* in superstition on a 7-point Likert scale from "Strongly Disagree" to "Strongly Agree," but do not question whether the individual *acts* upon the superstitious beliefs. This is important, as many individuals will deny belief in superstitions, yet report engaging in superstitious behavior anyway (Campbell, 1996). For example, in a 1984 Gallup Poll, only 26% of individuals surveyed reported that they "believed in" any superstitions, but 56% and 51% of individuals surveyed reported that they avoided walking under ladders and that they touched wood, respectively (cited in Campbell, 1996). Asking only about beliefs may obscure important information about actual practices. These measurement issues should be taken into consideration when developing improved measures of superstition.

Construct independence and definitions.

Most of the existing research considers superstition and TAF to be derivatives of a broader construct of magical ideation. This conclusion has been derived from a few studies (e.g., Einstein & Menzies, 2004 a and b), which found high intercorrelations between the measures and a generally strong relationship between magical ideation and OCD when other constructs are held constant. However, the finding that superstition has a relationship with OCD independent of magical ideation has largely been ignored (Einstein & Menzies, 2004b), and subsequent studies have used the terms "magical ideation" and "superstition" interchangeably. These constructs may appear to be more similar than they actually are due to the particular item content in the measures used. It is not surprising that magical ideation, superstition, and TAF are highly intercorrelated given the obvious item overlap on their measures. The *Magical Ideation Scale* consists of 30 items, 4 of which are superstition items: "I have sometimes been fearful of stepping on sidewalk cracks," "Numbers like 13 and 7 have no special powers," "Good luck charms don't

work," and "At times I perform certain little rituals to ward off negative influences." In addition, at least 2 of the items measure TAF: "It is not possible to harm others merely by thinking bad thoughts about them," and "I have felt that I might cause something to happen just by thinking too much about it." Though, by definition, superstition and TAF both involve magical thinking, use of the *MI Scale* in the Einstein and Menzies studies may have obscured some of the unique predictive ability of superstition independent of magical ideation, making it appear to be a derivative of a broader construct.

Measurement of OCD.

OCD is a heterogeneous disorder with presentations so varied that it is possible for two individuals with an OCD diagnosis to have no overlapping symptoms (Mataix-Cols, Rasario-Campos, & Leckman, 2005; Miller & Hedges, 2008). However, until recently, OCD has been measured, diagnosed, and conceptualized as a unitary construct. Recent studies have examined correlates of OCD based on its newly identified symptom dimensions. Leckman et al. (2010) define symptom dimensions as the "thematic content of an individual's obsessions and related compulsions" (p. 518). In contrast to subtyping, which groups individuals into discrete subcategories of OCD based on their dominant symptom, a dimensional approach allows each individual to be accounted for by more than one symptom dimension at a time. This is essential because individuals with OCD rarely exhibit only one type of symptom (Mataix-Cols, et al., 2005).

Dimensions have been identified through factor analytic studies of measures such as the *Yale-Brown Obsessive Compulsive Scale Symptom Checklist* (*Y-BOCS SC*; Goodman et al., 1989 a and b). Researchers currently disagree over the number of dimensions, or factors, in OCD, but most studies have arrived at four or five. The factors most consistently identified are those of contamination obsessions and washing/cleaning compulsions; symmetry obsessions and ordering compulsions; obsessions about causing harm, injury, or bad luck and checking compulsions; and violent, sexual, or religious obsessions and ritualizing/neutralizing compulsions (Abramowitz et al., 2010).

Taylor and Jang (2011) recently confirmed that different dysfunctional cognitions play an etiological role in different OCD symptom dimensions. They studied monozygotic and dizygotic twins and compared three models using structural equation modeling:

> (a) the belief causation model, in which genetic and environmental factors influence beliefs and OC symptoms, and beliefs also influence symptoms; (b) the symptom causation model, which is the same as (a) except that symptoms cause beliefs; and (c) the belief coeffect model, in which beliefs and OC symptoms are the product of common genetic and environmental factors, and beliefs have no causal influence on symptoms. (p. 174)

They found the belief causation model to be the best fitting model. Within this model, the dysfunctional cognition of inflated responsibility and overestimation of threat had the broadest influence on OCD symptoms (e.g., it was related to checking, neutralizing, obsessing, hoarding, and washing). The dysfunctional cognition of importance and control of thoughts was related only to obsessing, and the dysfunctional belief of perfectionism and intolerance of uncertainty was related only to ordering.

In addition, different dimensions have been found to have different co-morbid diagnoses, heritability estimates, patterns of brain activation, and responses to treatment (Leckman et al., 2010; Mataix-Cols et al., 2005). Given previous findings on the particular OCD symptom correlates of magical belief constructs, it may be that superstition, TAF, and magical ideation are cognitive etiological factors for some dimensions of OCD (e.g., obsessions and checking) but not others (e.g., contamination/washing). Treatment of OCD as a unitary construct likely obscured correlations between magical belief constructs and OCD in previous studies.

Most of the reviewed studies on superstition, TAF, and magical ideation measured OCD using the *PI* and *OCI-R*, which assess specific types of obsessions and rituals rather than assessing the severity of the symptom dimensions. In addition, they assess obsessions separately from compulsions, which is inconsistent with dimensional models of OCD symptoms (Wheaton et al., 2010). These instruments also emphasize the overt form of obsessions and rituals and overlook their functions. For example, checking behavior is often quite identifiable, but it is more difficult to identify the function behind this behavior. Checking related to perfectionism and certainty may be associated with “not just right” obsessions,

whereas checking related to inflated responsibility and tendency to overestimate threat may be related to obsessions associated with preventing feared consequences (Polman et al., 2011; Storch et al., 2008; Wheaton et al., 2010). Magical belief constructs would be most related to the latter checking function.

The Present Study

The reviewed research shows that there are relationships between magical belief constructs (e.g., superstition, TAF, and magical ideation) and OCD. However, the nature of these relationships is currently poorly understood. In the present study, I sought to clarify the nature of these relationships by improving on methodological limitations of previous research. I used a revised version of Zebb and Moore's (2003) superstition scale which has been praised for including both positive and negative superstitions as well as for assessing both superstitious beliefs and behaviors (Irwin, 2007). I also evaluated this measure using exploratory factor analysis, Cronbach's alpha, and a measure of convergent validity to determine its psychometric properties so that this information is available for future research on superstition. In addition, I eliminated item overlap on measures of superstition, magical ideation, and TAF in order to determine if these are discrete constructs with distinct relationships with OCD symptom dimensions. I theorized that if the individual measures did prove to have unique predictive ability, these terms should not be used interchangeably. Furthermore, by removing item overlap, I sought to gain a clearer picture of which constructs are the best predictors of OCD symptom dimensions.

Finally, I used the *Dimensional Obsessive-Compulsive Scale* (*DOCS*; Abramowitz et al., 2010), a newly developed measure which assesses the four most empirically supported OCD symptom dimensions. As research has shown that superstition, magical ideation, and TAF are not related to all OCD symptoms, use of a dimensional measure, rather than a measure of OCD as a unitary construct, provided a better picture of which OCD symptom dimensions are related to the magical belief constructs.

Research questions and hypotheses.

I used stepwise multiple regression analyses (Cohen & Cohen, 1983) to predict scores of each OCD symptom dimension on the *Dimensional Obsessive-Compulsive Scale (DOCS)* from measures of general negative affect and magical belief constructs in order to answer the following research questions:

Question 1: Are magical belief constructs related to some OCD symptom dimensions but not others?

Previous research has found significant relationships between magical belief constructs and the following ODC symptoms: violent, religious, and sexual obsessions and related compulsions (e.g., checking behaviors and other neutralizing strategies; Einstein & Menzies, 2004b; Frost et al., 1993; Zebb & Moore, 2003). Magical belief constructs have been shown to be related to cognitive dysfunctions (e.g., the overimportance of and need to control thoughts) that have been implicated in the aforementioned OCD symptoms, as well (Calleo et al., 2010; Taylor et al., 2010; Taylor & Jang, 2011; Wheaton et al., 2010). Therefore, I predicted that the magical belief constructs of superstition, TAF, and magical ideation would be related to the OCD symptom dimension of unacceptable violent, sexual, and religious obsessions and related compulsions. I did not expect the magical belief constructs to be related to the following OCD symptom dimensions: contamination obsessions and cleaning/washing compulsions; and symmetry obsessions and ordering compulsions. I allowed for the possibility that the magical belief constructs would be related to the fourth OCD symptom dimension, obsessions about responsibility for harm, injury, or bad luck and related compulsions, as luck and prevention of harm are common themes in magical beliefs. However, prior research did not support this hypothesis.

Question 2: Which magical belief constructs are the best predictors of OCD symptom dimensions?

Some studies have shown that magical ideation is the best predictor of OCD (e.g., Einstein & Menzies, 2004a). However, this finding has not always been replicated (Marino et al., 2008) and

methodological improvements were made in the current study to clarify this issue. Therefore, I considered this matter to be exploratory and did not offer a specific hypothesis.

Question 3: Do the relationships between magical belief constructs and OCD symptom dimensions remain after controlling for general negative affect?

Based on the findings of numerous previous studies (e.g., Sica, Novara, & Sanavio, 2002) on the relationship between magical belief constructs and OCD, I expected relationships to remain significant even when accounting for general negative affect.

Method

Participants

Participants consisted of 247 male and female undergraduate students at the University of Kansas. One participant was excluded due to an incomplete questionnaire. The final sample of participants consisted of 246 individuals. The sample had a mean age of 19.5 (SD = 2.3; range = 18-42). Other sample characteristics are reported in Table 1. Eligible participants scored at the 50th percentile or higher for obsessive-compulsive symptoms on the SONA prescreen (see below) and they were at least 18 years of age. Participants volunteered for the study as one way to fulfill a course research requirement. They were not aware of the topic of the study before they participated.

Table 1

Sample Characteristics

Characteristic	*n*	%
Sex		
Female	126	51
Male	120	49
Race or ethnicity		
African American or Black	3	1
Asian American or Asian	28	11
European American or White	196	80
Hispanic American or Latino/Latina	11	5
Native American or American Indian	0	0
Biracial or Multiracial	8	3
Other	0	0
International Student		
Yes	20	8
No	226	92

Note. Table entries are the *n*s and percentages of participants providing each response.

Procedure

Participants completed the *Obsessive-Compulsive Inventory-Revised* (*OCI-R*; Foa et al., 2002) during the Psychology Department's SONA prescreen. Those who received a score at the 50th percentile or higher for the sample were eligible to sign up electronically for one-hour timeslots through the SONA website.

The author administered each data collection session. Participants met in classrooms in groups of up to 20. They were seated in alternate seats to protect their privacy. Participants were given a consent form to read (see Appendix A). After reading the consent form, participants were asked to fill out a questionnaire that contained no identifier beyond a participant number. Each participant was given a blank envelope in which to return his or her completed questionnaire. When participants were finished, they were given the debriefing form (see Appendix B), which contained a list of available counseling services, as well as contact information for the researchers and the Institutional Review Board.

Measures

The questionnaire contained the following measures and a brief demographics section. Measures within the questionnaire were counterbalanced to control for order effects. See Table 3 for means and standard deviations of the following measures.

Obsessive-Compulsive Inventory – Revised (OCI-R; Foa et al., 2002). The *OCI-R* was used to screen for individuals who reported obsessive-compulsive symptoms on the Psychology Department's SONA prescreen. This is an 18-item measure with the following six subscales: washing, checking, obsessing, neutralizing, ordering, and hoarding. Participants rated the degree to which common obsessive-compulsive symptoms bothered them during the past month. The *OCI-R* is scored on a 5-point Likert scale with response options ranging from 0 (*not at all*) to 4 (*extremely*). The total score can range from 0 to 72. A total score at the 50th percentile or higher (a score of 13 or higher for this sample) qualified a participant for the current study. The *OCI-R* total score has been shown to have strong psychometric properties in nonclinical populations including good internal consistency reliability (.89) and test-retest reliability (.84). In addition, the *OCI-R* was shown to have good convergent validity with other common measures of OCD symptoms (ranging from .53 to .85; Foa et al., 2002).

Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010). The 20-item *DOCS* was used to assess the severity of the four most empirically supported symptom dimensions of OCD: (a) contamination, (b) responsibility for harm, (c) unacceptable thoughts, and (d) symmetry or ordering. The *DOCS* has four subscales corresponding to these dimensions. Each subscale begins with a description of the dimension and then provides examples of obsessions and compulsions commonly associated with the symptom dimension. The instructions stress that these examples are not all-inclusive and the participant may have similar experiences that are consistent with the symptom dimension. Each subscale contains 5 items (rated 0 to 4) which assess the severity of the following parameters over the past month: (a) time occupied by obsessions and rituals, (b) avoidant behavior, (c) associated distress, (d) functional interference, and (e) difficulty ignoring the obsessions and abstaining from the compulsions.

Scores are totaled for each subscale and can range from 0 to 20. In student samples, the *DOCS* subscales have been shown to have good to excellent internal consistency (ranging from .83 to .93) and adequate test-retest reliability (ranging from .55 to .66), as well as good convergent validity with the *OCI-R* (.71; Abramowitz et al., 2010).

Magical Ideation Scale (MI Scale; Eckblad & Chapman, 1983). The 30-item *MI Scale* was used to measure participants' beliefs in magical influences (e.g., astrology, clairvoyance, spirit influences, psychic energy). Examples of items are: "I have sometimes felt that strangers were reading my mind," "Horoscopes are right too often for it to be a coincidence," and "The government refuses to tell us the truth about flying saucers." Response options are *True* and *False*. Because the *MI Scale* contains six items relating to superstition and thought-action fusion (TAF), analyses were run with and without these items to determine if any relationships between magical ideation and OCD symptom dimensions are accounted for purely by the superstition and TAF items. In a student sample, the *MI Scale* has been shown to have good internal consistency reliability (ranging from .82 to .85) and convergent validity with other measures of aberrant perceptual experiences (.71; Eckblad & Chapman, 1983).

Superstitiousness Questionnaire (Zebb & Moore, 2003). The 18-item *Superstitiousness Questionnaire*, developed by Zebb and Moore (2003), was used to measure participants' beliefs in common superstitions associated with Western cultures. Examples of items are: "I believe that seeing a black cat brings bad luck," "I believe that the number 13 is unlucky," and I believe that finding a four leaf clover brings good luck." For the purposes of this study, we eliminated two of the original items which seem to be more reflective of other types of magical beliefs (e.g., clairvoyance) than common superstitions: "I believe that fortune tellers can predict the future" and "If I went to a fortune teller and that person predicted something, it would come true for me." The measure is scored on a 6-point Likert scale with response options ranging from 0 (*strongly disagree*) to 5 (*strongly agree*). Scores can range from 0 to 80 with higher scores indicating greater endorsement of superstition. I examined the psychometric properties of this measure because they had not yet been established.

Thought Action Fusion Scale – Revised (TAF-R; Shafran, Thordarson, & Rachman, 1996). The 19-item *TAF-R Scale* was used to measure the extent to which participants fuse their thoughts and actions. The *TAF-R Scale* consists of three subscales; the 12-item *TAF-Moral subscale*, the 4-item *TAF-Likelihood-Others subscale*, and the 3-item *TAF-Likelihood-Self subscale*. The *TAF-Moral subscale* measures the extent to which participants believe that having an immoral thought is the equivalent to acting on the thought (e.g., "Thinking of making an extremely critical remark to a friend is almost as unacceptable to me as actually saying it."). The *TAF-Likelihood-Others subscale* measures the extent to which participants believe that having a thought about something bad happening makes it more likely to occur to someone else (e.g., " If I think of a relative/friend falling ill this increases the risk that he/she will fall ill."). The *TAF-Likelihood-Self subscale* measures the extent to which participants believe that having a thought about something bad happening makes it more likely to occur to themselves (e.g., "If I think of myself being in a car accident, this increases the risk that I will have a car accident."). The measure is scored on a 5-point Likert scale with response options ranging from 0 (*disagree strongly*) to 4 (*agree strongly*). The *TAF-R Scale* has been shown to have good to excellent internal consistency reliability in student, adult, and clinical samples (ranging from .85 to .96; Shafran, Thordarson, & Rachman, 1996).

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The *Negative Affect (NA) Scale* of the *PANAS* was used to measure negative emotionality. The scale consists of ten items which assess the extent to which a participant experienced negative emotions during the past few weeks. The *PANAS* is scored on a 5-point Likert scale with response options ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). The *NA Scale* of the *PANAS* has been shown to have good internal consistency (.87) and adequate test-retest reliability (ranging from .39 to .71 depending on time frame), as well as good convergent validity with other measures of distress and psychopathology (ranging from .51 to .74; Watson, Clark, & Tellegen, 1988).

Analyses

The psychometric properties of the *Superstitiousness Questionnaire* were examined using Maximum Likelihood (ML) method of exploratory factor analysis (EFA) in order to determine how many factors best fit the measure. Correlations between each item on the measure and the latent factor(s) were calculated. Each item's correlation with the latent factor(s) was examined with the intention of eliminating those with correlations lower than 0.400, which indicates that they are not an acceptable measure of the latent factor(s). Internal consistency reliability was calculated using Cronbach's alpha and convergent validity was calculated using the Average Variance Extracted (AVE; Fornell & Larcker, 1981). This measure of convergent validity is derived from the sum of each item's shared variance with the latent factor(s) squared divided by the total variance (the numerator plus the sum of the error variance). An AVE of less than .50 indicates that, on average, there is more variance unaccounted for in the items than there is variance explained by the latent factor structure. Additionally, most statisticians suggest that a Cronbach's alpha value of .70 or above is indicative of adequate internal consistency reliability (Helms, Henze, Sass, & Mifsud, 2006).

Stepwise multiple regression analyses (Cohen & Cohen, 1983) were conducted to predict scores of each OCD symptom dimension on the *Dimensional Obsessive-Compulsive Scale (DOCS)* from the measures of general negative affect (*NA Scale* of the *PANAS*) and magical belief constructs (*TAF-R Scale*, *MI Scale*, and *Superstitiousness Questionnaire*). Zero-order correlations were calculated between each *DOCS* subscale and the general negative affect and magical belief construct scales. Tests of significant differences among correlation magnitudes were used to determine which of the scales had significantly stronger relationships with the *DOCS* subscales than others (Cohen & Cohen, 1983; Preacher, 2002). The hypotheses were tested by a series of regression analyses with each of the four *DOCS* subscales as the dependent or criterion variables. The following served as the six predictor variables: the *NA Scale* of the *PANAS*, the *TAF Likelihood-Self subscale*, the *TAF Likelihood – Others subscale*, the *TAF Moral subscale*, the *MI Scale*, and the *Superstitiousness Questionnaire*. Stepwise multiple regression was used

to determine which magical beliefs predicted which OCD symptom dimensions. In addition, stepwise multiple regression determined which of the magical belief constructs were the strongest independent predictors of each OCD symptom dimension with all other predictors held constant. A Bonferroni-corrected alpha of .0125 was used for all tests of significance to decrease the probability of Type 1 error.

Finally, because the *MI Scale* contains six items (item numbers 3, 7, 13, 18, 26, and 27) that measure either superstition or TAF, the regression analyses described above were conducted once with the six items included (full *MI Scale*) and once with the six items excluded (partial *MI Scale*). Results were compared to determine if item overlap on the *MI Scale* significantly impacted the outcome of the analyses.

Results

Exploratory Factor Analysis of the Superstitiousness Questionnaire

The psychometric properties of the *Superstitiousness Questionnaire* were examined using Maximum Likelihood (ML) method of exploratory factor analysis (EFA) in order to determine how many factors best fit the measure. Upon initial examination of the scree plot and eigenvalues (those greater than 1), it was determined that a one- to three-factor solution was likely appropriate (see Figure 1). A one factor solution was retained because it was most parsimonious and fit well with theory in the context of the current study.[1] All 16 items of the revised questionnaire were retained because their factor loadings were greater than 0.400 (see Table 2). The *Superstitiousness Questionnaire* was found to have strong internal consistency reliability ($\alpha = .89$). However, the average variance extracted indicated poor convergent validity (AVE = .36). This suggests that only 36% of the variance in the latent variable has

[1] Though a one factor model was used in the current study, there is still evidence for a two or three factor model. Chi square analyses showed that adding second and third factors significantly improved the fit of the model. Additionally, a review of factor loadings for a three factor model showed that the factors are interpretable (i.e., "good luck" items cluster together, "bad luck" items cluster together, and "other" items not referencing a specific superstition cluster together). The factors had good internal consistency reliability ($\alpha > .70$), but they still had poor convergent validity (AVE < .50). Regression analyses for the current study were conducted using three factors as well as one factor. Results did not differ when using three factors versus one factor, so the more parsimonious model (the one factor model) was retained.

been explained by the items on the measure. Therefore, the *Superstitiousness Questionnaire* may be an inadequate measure of the latent variable of superstition.

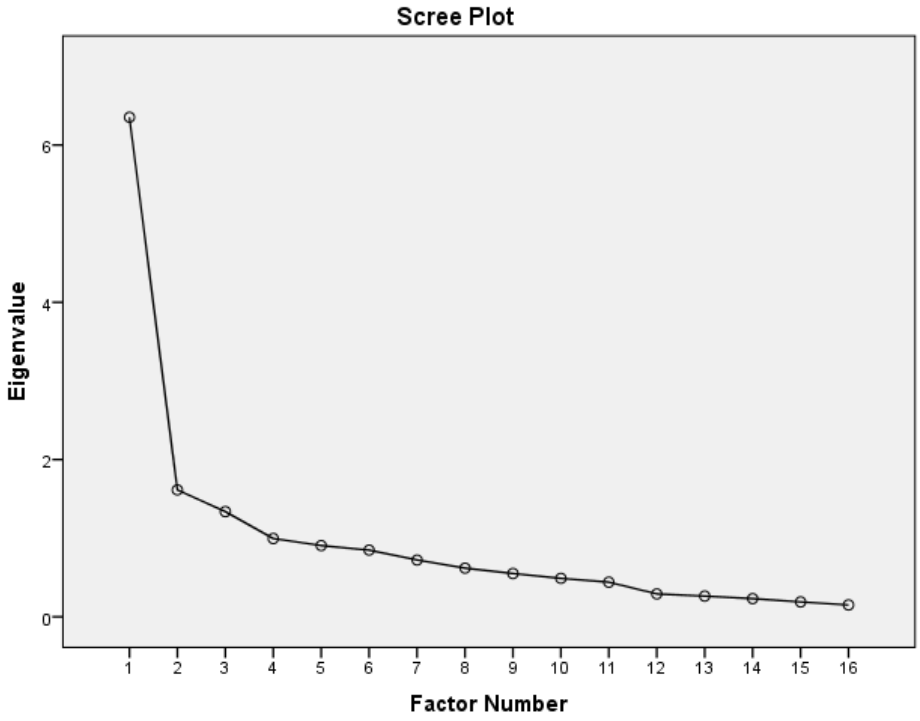

Figure 1. Scree Plot for 16 *Superstitiousness Questionnaire* Items

Table 2

Factor Loadings and Communalities for the Superstitiousness Questionnaire

Item	Factor Loading	Communality
1. I have a lucky number	.43	.18
2. Believe: black cat	.61	.37
3. Believe: walking under ladder	.66	.44
4. Avoid: walking under ladder	.52	.27
5. Believe: number 13	.47	.22
6. Believe: opening umbrella	.70	.49
7. Avoid: opening umbrella	.56	.31
8. Avoid: stepping on crack	.57	.32
9. Believe: four leaf clover	.64	.41
10. Believe: pick up penny	.75	.56
11. Believe: coin in fountain	.71	.51
12. Believe: knock on wood	.75	.57
13. Actually knock on wood	.71	.39
14. Do something for good luck	.50	.25
15. Do something to prevent bad luck	.52	.27
16. I have other superstition	.43	.18

Psychometric Properties of the Study Measures

Means, standard deviations, and Cronbach's alphas were calculated for each of the study measures (see Table 3). All of the measures were found to have strong internal consistency reliability ($\alpha >$ .70).

Table 3

Means and Standard Deviations for Study Measures

Measure	Mean (SD)	α
OCI-R	15.62 (10.19)	.89
PANAS NA Scale	23.63 (6.86)	.83
TAF Moral	19.65 (10.38)	.90
TAF Likelihood-Others	2.20 (3.50)	.95
TAF Likelihood-Self	3.38 (3.30)	.87
TAF total score	25.24 (13.52)	.90
MI Scale (Full)	8.84 (5.02)	.79
MI Scale (Partial)	6.65 (4.16)	.77
Superstitiousness Questionnaire	28.69 (16.50)	.89
DOCS		
Contamination	4.88 (3.44)	.83
Responsibility for Harm	4.85 (3.29)	.85
Unacceptable Thoughts	5.69 (4.08)	.90
Symmetry	4.99 (3.83)	.88

Note. $N = 842$ for the OCI-R. $N = 246$ for all other measures. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale.

Zero-order Correlations

Table 4

Zero-order Correlations between DOCS Subscales and Other Study Measures

Measure	DOCS subscale			
	Contamination	Responsibility for harm	Unacceptable thoughts	Symmetry
PANAS NA Scale	.09	.31***	.46***	.14*
TAF Moral	.24***	.06	.10	.16**
TAF Likelihood-Others	.14*	.16**	.10	.14*
TAF Likelihood-Self	.10	.25***	.06	.08
MI Scale (Full)	.30***	.31***	.33***	.30***
MI Scale (Partial)	.30***	.28***	.34***	.27***
Superstitiousness Questionnaire	.16**	.32***	.08	.20**

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4 displays the zero-order correlations between each *DOCS* subscale and the other study measures. *DOCS Contamination subscale* scores were significantly correlated with *TAF Moral subscale* scores, *TAF Likelihood-Others subscale* scores, the full and partial *MI Scale* scores, and *Superstitiousness Questionnaire* scores. Tests of significant differences among correlation magnitudes were performed (Cohen & Cohen, 1983; Preacher, 2002). The full and partial *MI Scale*s were both found to be more strongly related to the *DOCS Contamination subscale* than was the *TAF Likelihood-Others subscale* ($p < .05$). No other significant differences between study measures were found in respect to the strength of their relationship with the *DOCS Contamination subscale*.

DOCS Responsibility for Harm subscale scores were significantly correlated with *PANAS NA Scale* scores, *TAF Likelihood-Others subscale* scores, *TAF Likelihood-Self subscale* scores, the full and partial *MI Scale* scores, and *Superstitiousness Questionnaire* scores. Tests of significant differences among correlation magnitudes revealed that the *PANAS NA Scale*, the full *MI Scale*, and the *Superstitiousness Questionnaire* were all more strongly associated with *the DOCS Responsibility for Harm subscale* than was the *TAF Likelihood-Others subscale* ($p < .05$) No other significant differences between study measures were found in respect to the strength of their relationship with the *DOCS Responsibility for Harm subscale*.

DOCS Unacceptable Thoughts subscale scores were significantly correlated with *PANAS NA Scale* scores and the full and partial *MI Scale* scores. Tests of significant differences among correlation magnitudes revealed that the *PANAS NA Scale* was more strongly associated with the *DOCS Unacceptable Thoughts subscale* than was the full *MI Scale* ($p < .05$) No other significant differences between study measures were found in respect to the strength of their relationship with the *DOCS Unacceptable Thoughts subscale*.

DOCS Symmetry subscale scores were significantly correlated with *PANAS NA Scale* scores, *TAF Moral subscale* scores, *TAF Likelihood-Others subscale* scores, the full and partial *MI Scale* scores, and *Superstitiousness Questionnaire* scores. Tests of significant differences among correlation magnitudes

showed that the full *MI Scale* was more strongly associated with the *DOCS Symmetry subscale* than were both the *PANAS NA Scale* and the *TAF Likelihood-Others subscale* ($p < .05$) No other significant differences between study measures were found in respect to the strength of their relationship with the *DOCS Symmetry subscale*.

Regression Analyses

A series of stepwise multiple regression analyses was conducted with the four *DOCS* subscales as the criterion variables and the measures of general negative affect and magical belief constructs as the predictor variables. Two regression analyses were conducted for each *DOCS* subscale; one with the full *MI Scale* and one with the partial *MI Scale* (excluding item numbers 3, 7, 13, 18, 26, and 27). A Bonferroni-corrected alpha of .0125 was used for all tests of significance. Summary statistics for the final step of each regression analysis are presented in Tables 5 – 12.

DOCS Contamination subscale.

Analysis with the full MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Contamination subscale* (see Table 5 for summary statistics). In the first step of the regression analysis predicting *DOCS Contamination subscale* scores, the full *MI Scale* explained a significant amount of variance (Adjusted $R^2 = .09$, $p < .001$). In Step 2, adding the *TAF Moral subscale* significantly increased the variance accounted for (R^2 change = .03, $p < .01$) so that the variance explained by the final model (Adjusted $R^2 = .12$, $p < .01$) was statistically significant: F (2,243) = 16.95, $p < .001$. The final model explained 12% of the variance. Scores on both the full *MI Scale* and the *TAF Moral subscale* were found to be significant predictors of scores on the *DOCS Contamination subscale*. However, the full *MI Scale* was found to have a stronger influence on the *DOCS Contamination subscale* (Beta = .26) than did the *TAF Moral subscale* (Beta = .18).

Table 5

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Contamination Subscale (Full MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.06	.94	.35
TAF Moral		.18*	3.01	<.01
TAF Likelihood-Others		-.03	-.48	.63
TAF Likelihood-Self		-.05	-.82	.41
MI Scale (Full)		.26**	4.30	<.001
Superstitiousness Questionnaire		.03	.49	.62
Final Model	.12			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

Analysis with the partial MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Contamination subscale* (see Table 6 for summary statistics). In the first step of the regression analysis predicting *DOCS Contamination subscale* scores, the partial *MI Scale* explained a significant amount of variance (Adjusted $R^2 = .09$, $p < .001$). In Step 2, adding the *TAF Moral subscale* significantly increased the variance accounted for (R^2 change = .03, $p < .01$) so that the variance explained by the final model (Adjusted $R^2 = .12$, $p < .01$) was statistically significant: F (2,243) = 17.30, $p < .001$. The final model explained 12% of the variance. Scores on both the partial *MI Scale* and the *TAF Moral subscale* were found to be significant predictors of scores on the *DOCS Contamination subscale*. However, the partial *MI Scale* was found to have a stronger influence on the *DOCS Contamination subscale* (Beta = .27) than did the *TAF Moral subscale* (Beta = .19).

Table 6

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Contamination Subscale (Partial MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.06	.92	.36
TAF Moral		.19*	3.08	<.01
TAF Likelihood-Others		-.01	-.10	.92
TAF Likelihood-Self		-.03	-.45	.65
MI Scale (Partial)		.27**	4.37	<.001
Superstitiousness Questionnaire		.06	1.00	.32
Final Model	.12			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

DOCS Responsibility for Harm subscale.

Analysis with the full MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Responsibility for Harm subscale* (see Table 7 for summary statistics). In the first step of the regression analysis predicting *DOCS Responsibility for Harm subscale* scores, the *Superstitiousness Questionnaire* explained a significant amount of variance (Adjusted $R^2 = .10$, $p < .001$). In Step 2, adding the *NA Scale* of the *PANAS* significantly increased the variance accounted for (R^2 change = .09, $p < .001$). In Step 3, adding the *TAF Likelihood-Self subscale* again significantly increased the variance accounted for (R^2 change = .02, $p < .01$) so that the variance explained by the final model (Adjusted $R^2 = .21$, $p < .01$) was statistically significant: F (3,242) = 23.09, $p < .001$. The final model explained 21% of the variance. Scores on the *Superstitiousness Questionnaire*, the *NA Scale* of the *PANAS*, and the *TAF Likelihood-Self subscale* were all found to be significant predictors of scores on the *DOCS Responsibility for Harm subscale*. However, the *NA Scale* of the *PANAS* was found to have the strongest influence on

DOCS Responsibility for Harm subscale scores (Beta = .31), while the *Superstitiousness Questionnaire* had slightly less of an influence (Beta = .27), and the *TAF Likelihood-Self subscale* had the weakest influence (Beta = .16).

Table 7

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Responsibility for Harm Subscale (Full MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.31**	5.48	<.001
TAF Moral		-.01	-.22	.83
TAF Likelihood-Others		-.03	-.42	.68
TAF Likelihood-Self		.16*	2.67	<.01
MI Scale (Full)		.13	1.91	.06
Superstitiousness Questionnaire		.27**	4.47	<.001
Final Model	.21			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

Analysis with the partial MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Responsibility for Harm subscale* (see Table 8 for summary statistics). In the first step of the regression analysis predicting *DOCS Responsibility for Harm subscale* scores, the *Superstitiousness Questionnaire* explained a significant amount of variance (Adjusted $R^2 = .10$, $p < .001$). In Step 2, adding the *NA Scale* of the *PANAS* significantly increased the variance accounted for (R^2 change = .09, $p < .001$). In Step 3, adding the *TAF Likelihood-Self subscale* again significantly increased the variance accounted for (R^2 change = .02, $p < .01$) so that the variance explained by the final model (Adjusted $R^2 = .21$, $p < .01$) was statistically significant: F (3,242) = 23.08, $p < .001$. The final model explained 21% of the variance. Scores on the *Superstitiousness Questionnaire*, the NA Scale of the PANAS, and the *TAF*

Likelihood-Self subscale were all found to be significant predictors of scores on the *DOCS Responsibility for Harm subscale*. However, the *NA Scale* of the *PANAS* was found to have the strongest influence on *DOCS Responsibility for Harm subscale* scores (Beta = .31), while the *Superstitiousness Questionnaire* had slightly less of an influence (Beta = .27), and the *TAF Likelihood-Self subscale* had the weakest influence (Beta = .16).

Table 8

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Responsibility for Harm Subscale (Partial MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.31**	5.48	<.001
TAF Moral		-.01	-.22	.83
TAF Likelihood-Others		-.03	-.42	.68
TAF Likelihood-Self		.16*	2.67	<.01
MI Scale (Partial)		.13	2.07	.04
Superstitiousness Questionnaire		.27**	4.47	<.001
Final Model	.21			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

DOCS Unacceptable Thoughts subscale.

Analysis with the full MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Unacceptable Thoughts subscale* (see Table 9 for summary statistics). In the first step of the regression analysis predicting *DOCS Unacceptable Thoughts subscale* scores, the *NA Scale* of the *PANAS* explained a significant amount of variance (Adjusted $R^2 = .21$, $p < .001$). In Step 2, adding the full *MI Scale* significantly increased the variance accounted for (R^2 change = .06, $p < .001$) so that the variance explained by the final model (Adjusted $R^2 = .27$, $p < .001$) was statistically significant: F (2,243) = 46.56,

$p < .001$. The final model explained 27% of the variance. Scores on both the *NA Scale* of the *PANAS* and the full *MI Scale* were found to be significant predictors of scores on the *DOCS Unacceptable Thoughts subscale.* However, the *NA Scale* of the *PANAS* was found to have a stronger influence on the *DOCS Unacceptable Thoughts subscale* (Beta = .41) than did the full *MI Scale* (Beta = .27).

Table 9

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Unacceptable Thoughts Subscale (Full MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.41**	7.48	<.001
TAF Moral		.07	1.24	.22
TAF Likelihood-Others		.00	.02	.99
TAF Likelihood-Self		-.04	-.62	.54
MI Scale (Full)		.27**	4.82	<.001
Superstitiousness Questionnaire		-.04	-.63	.53
Final Model	.27			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

Analysis with the partial MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Unacceptable Thoughts subscale* (see Table 10 for summary statistics). In the first step of the regression analysis predicting *DOCS Unacceptable Thoughts subscale* scores, the *NA Scale* of the *PANAS* explained a significant amount of variance (Adjusted $R^2 = .21$, $p < .001$). In Step 2, adding the partial *MI Scale* significantly increased the variance accounted for (R^2 change = .06, $p < .001$) so that the variance explained by the final model (Adjusted $R^2 = .27$, $p < .001$) was statistically significant: F (2,243) = 46.96, $p < .001$. The final model explained 27% of the variance. Scores on both the *NA Scale* of the *PANAS* and the partial *MI Scale* were found to be significant predictors of scores on the *DOCS Unacceptable*

Thoughts subscale. However, the *NA Scale* of the *PANAS* was found to have a stronger influence on the *DOCS Unacceptable Thoughts subscale* (Beta = .41) than did the partial *MI Scale* (Beta = .27).

Table 10

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Unacceptable Thoughts Subscale (Partial MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.41**	7.46	<.001
TAF Moral		.07	1.31	.19
TAF Likelihood-Others		.03	.44	.66
TAF Likelihood-Self		-.01	-.20	.84
MI Scale (Partial)		.27**	4.88	<.001
Superstitiousness Questionnaire		.00	-.00	1.00
Final Model	.27			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

DOCS Symmetry subscale.

Analysis with the full MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Symmetry subscale* (see Table 11 for summary statistics). The full *MI Scale* was the only significant variable to emerge when predicting *DOCS Symmetry subscale* scores. It accounted for a significant amount of variance (Adjusted $R^2 = .09$, $p < .001$) and a significant model: $F(1,244) = 24.71$, $p < .001$. The model explained 9% of the variance. The full *MI Scale* had the strongest influence on the *DOCS Symmetry subscale* (Beta = .30).

Table 11

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Symmetry Subscale (Full MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.09	1.44	.15
TAF Moral		.11	1.73	.09
TAF Likelihood-Others		.02	.28	.78
TAF Likelihood-Self		-.04	-.62	.54
MI Scale (Full)		.30**	4.97	<.001
Superstitiousness Questionnaire		.09	1.33	.19
Final Model	.09			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

Analysis with the partial MI Scale.

The measures of general negative affect and magical belief constructs were regressed on the *DOCS Symmetry subscale* (see Table 12 for summary statistics). The partial *MI Scale* was the only significant variable to emerge when predicting *DOCS Symmetry subscale* scores. It accounted for a significant amount of variance (Adjusted $R^2 = .07$, $p < .001$) and a significant model: F (1,244) = 19.85, $p < .001$. The model explained 7% of the variance. The partial *MI Scale* had the strongest influence on the *DOCS Symmetry subscale* (Beta = .27).

Table 12

Summary Statistics for the Final Step of Regression Equation Predicting DOCS Symmetry Subscale (Partial MI Scale)

Predictor	Adjusted R^2	Beta	*t*	*p*
PANAS NA Scale		.09	1.48	.14
TAF Moral		.12	1.88	.06
TAF Likelihood-Others		.06	.88	.38
TAF Likelihood-Self		-.00	-.04	.97
MI Scale (Partial)		.27**	4.46	<.001
Superstitiousness Questionnaire		.13	2.03	.04
Final Model	.07			

Note. PANAS NA Scale = the Negative Affect Scale of the Positive and Negative Affect Schedule; TAF = Thought Action Fusion Scale; MI Scale = the Magical Ideation Scale; MI Scale (Full) = all scale items included; MI Scale (Partial) = MI Scale without overlapping superstition and TAF items; DOCS = Dimensional Obsessive Compulsive Scale. * $p < .0125$. ** $p < .001$.

Comparison of the Full MI Scale and the Partial MI Scale

Stepwise multiple regression analyses were conducted twice for each *DOCS* subscale; once using the full *MI Scale* and once using the partial *MI Scale* (excluding item numbers 3, 7, 13, 18, 26, and 27). The excluded items in the partial *MI Scale* were designed to measure TAF and superstition. Excluding these items reduces the problem of item overlap between measures and provides a purer measure of magical ideation. The results of each pair of regression analyses were examined to determine if the removal of the items on the partial *MI Scale* produced different outcomes.

For regression analyses containing the *DOCS Contamination subscale*, the pattern of results between the full and partial *MI Scale*s did not differ. Scores on both the full and partial *MI Scale*s and the *TAF Moral subscale* were significant predictors of *DOCS Contamination subscale* scores.

For regression analyses containing the *DOCS Responsibility for Harm subscale*, the pattern of results between the full and partial *MI Scale*s did not differ. Scores on the *Superstitiousness Questionnaire*, the *NA Scale* of the *PANAS*, and the *TAF Likelihood-Self subscale* were significant

predictors of *DOCS Responsibility for Harm subscale* in both analyses. However, the alpha in the current study was Bonferroni-corrected to decrease the risk of Type I error. If a less stringent alpha was used (< .05), the pattern of results would differ between the two analyses. The full *MI Scale* would remain a non-significant predictor. However, partial *MI Scale* scores would emerge as a significant predictor of *DOCS Responsibility for Harm subscale* scores. That is, with a less stringent alpha, the *MI Scale* accounts for unique variance in the *DOCS Responsibility for Harm subscale* scores only when the problem of item overlap is removed.

For regression analyses containing the *DOCS Unacceptable Thoughts subscale*, the pattern of results between the full and partial *MI Scale*s did not differ. In both analyses, the scores on *NA Scale* of the *PANAS* and on the full and partial *MI Scale*s are the only significant predictors of *DOCS Unacceptable Thoughts subscale* scores.

Finally, for regression analyses containing the *DOCS Symmetry subscale*, the pattern of results between the full and partial *MI Scales* did not differ. In both analyses, the *MI Scale* (full and partial) was the only significant predictor of *DOCS Symmetry subscale* scores. However, with a less stringent alpha (< .05), the pattern of results does differ. In the analysis with the full *MI Scale*, this is still the only significant predictor of *DOCS Symmetry subscale* scores. Whereas in the analysis with the partial *MI Scale*, the *Superstitiousness Questionnaire* emerges in addition to the partial *MI Scale* as a significant predictor of *DOCS Symmetry subscale* scores. That is, when the item overlap is removed from the full *MI Scale*, other scales are able to account for unique variance in the dependent variable.

Discussion

The present study was designed to clarify the nature of the relationships between three magical belief constructs (superstition, TAF, magical ideation) and OCD symptom dimensions by answering the following research questions:

Question 1: Are magical belief constructs related to some OCD symptom dimensions but not others?

Question 2: Which magical belief constructs are the best predictors of OCD symptom dimensions?

Question 3: Do the relationships between magical belief constructs and OCD symptom dimensions remain after controlling for general negative affect?

In response to Question 1, "*Are magical belief constructs related to some OCD symptom dimensions but not others?,"* I hypothesized that, based on previous research findings, magical belief constructs would be related to the OCD symptom dimensions of unacceptable violent, religious, and sexual obsessions and related compulsions (e.g., checking behaviors and other neutralizing strategies; Einstein & Menzies, 2004b; Frost et al., 1993; Zebb & Moore, 2003). Support for this hypothesis was also derived from studies showing that the magical belief constructs are related to dysfunctional cognitions (e.g., the overimportance of and need to control thoughts) that have been implicated in the aforementioned OCD symptom dimension (Calleo et al., 2010; Taylor et al., 2010; Taylor & Jang, 2011; Wheaton et al., 2010). Based on previous research, I did not expect the magical belief constructs to be related to the following OCD symptom dimensions: contamination obsessions and cleaning/washing compulsions; and symmetry obsessions and ordering compulsions. I allowed for the possibility that the magical belief constructs would be related to the fourth OCD symptom dimension, obsessions about responsibility for harm, injury, or bad luck and related compulsions, as luck and prevention of harm are common themes in magical beliefs. However, prior research did not support this possibility.

The findings of the present study partially supported previous findings in that some magical belief constructs were related to the two hypothesized OCD symptom dimensions: obsessions about responsibility for harm, injury, or bad luck and related compulsions; and unacceptable violent, religious, and sexual obsessions and related compulsions. However, contrary to the hypotheses, at least one type of magical belief construct was related to each of the four OCD symptom dimension. None of the magical belief constructs was related to all OCD symptom dimensions. Magical ideation had the broadest pattern of relationships with OCD symptom dimensions in that it was a significant predictor of three dimensions (contamination concerns and cleaning/washing compulsions; unacceptable violent, religious, and sexual obsessions and related compulsions; and symmetry obsessions and ordering compulsions), but not of the

fourth dimension (obsessions about responsibility for harm, injury, or bad luck and related compulsions). TAF Moral was a significant, independent predictor of contamination concerns and cleaning/washing compulsions. TAF Likelihood-Self and superstition were both significant, independent predictors of the OCD symptom dimension of obsessions about responsibility for harm, injury, or bad luck and related compulsions. Therefore, the answer to Question 1 is that magical belief constructs were differentially related to the four OCD symptom dimensions in this study.

The findings of the present study may differ from those of previous studies due to the use of a dimensional measure of OCD symptoms. Relationship patterns between magical belief constructs and OCD may have been obscured in previous research because magical belief constructs have been studied in respect to their relationships with individual symptoms of OCD (e.g., checking, obsessionality) rather than with empirically supported symptom dimensions of OCD (e.g., unacceptable violent, religious, and sexual obsessions and related compulsions). In addition, the current study used a more comprehensive measure of superstition, a revised version of Zebb and Moore's (2003) superstition scale, which has been praised for including both positive and negative superstitions as well as for assessing both superstitious beliefs and behaviors (Irwin, 2007). This measure may have captured more information about superstition than the previous measures that implemented fewer questions and a more restricted range of superstitious beliefs and/or behaviors.

The pattern of results of the present study, even when inconsistent with results of previous studies, often makes theoretical sense. For example, it is not particularly surprising that superstition was a significant predictor of the OCD symptom dimension of obsessions about responsibility for harm, injury, or bad luck and related compulsions, as the item contents of the *Superstitiousness Questionnaire* and the *DOCS Responsibility for Harm subscale* were similar. This OCD symptom dimension includes obsessive thoughts about being responsible for harm or injury to self and/or others (e.g., "A doubt that you might have made a mistake that could cause something awful or harmful to happen.") and about being responsible for bad luck (e.g., "The thought that a terrible accident, disaster, injury, or other bad luck

might have occurred and you weren't careful enough to prevent it."). In addition, this dimension includes compulsions of mental ritualizing (e.g., "Mentally reviewing past events to make sure you didn't do anything wrong"), checking (e.g., locks), and reassurance-seeking (e.g., "Repeatedly asking or checking for reassurance that something bad did not (or will not) happen"). Likewise, the *Superstitiousness Questionnaire* contains many items assessing beliefs about one's actions causing bad luck (e.g., "I believe that walking under ladders will bring bad luck"). It also assesses what one actually does to avoid bad luck (e.g., I avoid opening an umbrella inside."). Luck and harm are themes of both superstition and this OCD symptom dimension.

Furthermore, it is not surprising that the other significant predictor of the OCD symptom dimension of obsessions about responsibility for harm, injury, or bad luck and related compulsions was TAF Likelihood-Self, which reflects the belief that unacceptable thoughts about a negative event occurring to oneself make the event more probable (Einstein & Menzies, 2004a). All of the items assessing TAF Likelihood-Self on the *TAF-R Scale* deal with causing harm or injury to oneself (e.g., "If I think of myself being injured in a fall, this increases the risk that I will have a fall and be injured"). Both superstition and TAF Likelihood-Self were related to the OCD symptom dimension of obsessions about responsibility for harm, injury, or bad luck and related compulsions because they deal with harm and bad luck are, thus, conceptually similar to the dimension.

It is a bit puzzling that TAF Likelihood-Others was not also related to the OCD symptom dimension of obsessions about responsibility for harm, injury, or bad luck and related compulsions. TAF Likelihood-Others reflects the belief that unacceptable thoughts about a negative event occurring to someone else make the event more probable (Einstein & Menzies, 2004a). All of the TAF Likelihood-Others items on the *TAF-R Scale* deal with the belief that thoughts can cause harm, injury, or bad luck to others. Though the prompts on the *DOCS Responsibility for Harm subscale* do not specifically mention whether this responsibility is for oneself or others, perhaps the participants in this study experienced these obsessive-compulsive symptoms predominantly in relation to themselves.

Though some previous studies have failed to find a relationship between magical belief constructs and contamination obsessions and washing/cleaning compulsions (e.g., Einstein & Menzies, 2004 a and b; Frost, et al., 1993), in the current study, both magical ideation and TAF Moral were significant, independent predictors of the OCD symptom dimension of contamination concerns and cleaning/washing compulsions. TAF Moral reflects the belief that having an unacceptable thought is morally equivalent to acting on the unacceptable thought (Einstein & Menzies, 2004a). TAF Moral has been found to be related to religiosity (Siev, Chambless, & Huppert, 2010) and to be a significant predictor of scrupulosity (Nelson et al., 2006). It is possible that the relationship between TAF Moral and the OCD symptom dimension of contamination concerns and cleaning/washing compulsions exists because one who believes that his or her thoughts are morally reprehensible or sinful may also be likely to feel morally contaminated or impure. Washing oneself with water is, in many religious traditions, symbolic of moral cleansing and purification. Therefore, the link between these two constructs may exist because obsessive thoughts about moral rather than physical (i.e., germs) contaminants lead to symbolic purification rituals and compulsions.

Magical ideation had the broadest pattern of relationships with OCD symptom dimensions. It was a significant, independent predictor of contamination concerns and cleaning/washing compulsions; unacceptable violent, religious, and sexual obsessions and related compulsions; and symmetry obsessions and ordering compulsions. Previous studies have concluded that, among the magical belief constructs, magical ideation is the best predictor of OCD (e.g., Einstein & Menzies, 2004 a and b). Magical ideation may be the "best predictor of OCD" in that it significantly predicts the largest number of symptom dimensions. However, contrary to Einstein and Menzies' theory, superstition and TAF were not found to be derivatives of a larger construct of magical ideation in the current study. TAF Moral and magical ideation accounted for significant, unique variance in the OCD symptom dimension of contamination concerns and cleaning/washing compulsions, and TAF Likelihood-Self and superstition were found to be independent predictors of the OCD symptom dimension of obsessions about responsibility for harm,

injury, and bad luck and related compulsions, whereas magical ideation was not. Therefore, it appears that the magical belief constructs have unique predictive properties and should not be used interchangeably in future studies.

Magical ideation may be the magical belief construct with the broadest pattern of relationships with OCD symptom dimensions because, unlike TAF and superstition, which are deal specifically with good and bad luck, thoughts being the moral equivalent of actions, and thoughts causing harm to oneself or others, magical ideation is a broader construct which includes beliefs about many different types of paranormal phenomena that defy laws of causality and empirical evidence. Magical ideation is also a prominent feature of many disorders in which reality testing is impaired (Eckblad & Chapman, 1983), and may, therefore, be related to most OCD symptom dimensions by virtue of the fact that both magical ideation and OCD rely on irrational cause and effect connections.

In response to Question 2, *"Which magical belief constructs are the best predictors of OCD symptom dimensions?,"* I considered the matter to be exploratory and did not advance a specific hypothesis. Previous research showing that magical ideation is the best predictor of OCD (e.g., Einstein & Menzies, 2004a) has not always been replicated (Marino et al., 2008) and methodological improvements were made in the current study to clarify this issue. In general, the present findings are in line with previous research in that magical ideation was the strongest predictor among the magical belief constructs of three OCD symptom dimensions. Magical ideation was a stronger predictor than TAF Moral of contamination concerns and cleaning/washing compulsions. It also was the only significant predictor among the magical belief constructs of unacceptable violent, religious, and sexual obsessions and related compulsions; and symmetry obsessions and ordering compulsions. However, magical ideation was not significantly related to obsessions about responsibility for harm, injury, or bad luck and related compulsions. Here, superstition was found to be the strongest predictor of obsessions about responsibility for harm, injury, or bad luck and related compulsions.

In response to Question 3, "*Do the relationships between magical belief constructs and OCD symptom dimensions remain after controlling for general negative affect?*," I hypothesized, based on the findings of numerous previous studies (e.g., Sica, Novara, & Sanavio, 2002), that the relationships between magical belief constructs and OCD symptom dimensions would remain significant even when accounting for the effects of general negative affect. This hypothesis was supported. Even when general negative affect did emerge as a significant predictor of OCD symptom dimensions (in the case of obsessions about responsibility for harm, injury, or bad luck and related compulsions; and unacceptable violent, religious, and sexual obsessions and related compulsions), magical belief constructs also remained significant, independent predictors. Therefore, magical belief constructs demonstrated significant relationships with OCD symptom dimensions even when controlling for general negative affect.

Implications

Theoretical implications.

The findings of the current study, that magical belief constructs were differentially related to all four OCD symptom dimensions, provide support for the cognitive specificity hypothesis (Beck, 1976). This hypothesis posits that certain types of psychopathology arise from certain types of dysfunctional beliefs. Whereas magical ideation had relationships with three different OCD symptom dimensions, the magical belief constructs of TAF Moral, TAF Likelihood-Self, and superstition each had specific relationships with only one OCD symptom dimension. The cognitive specificity model suggests that obsessions are normal occurrences which become pathological when they are interpreted, or appraised, in a catastrophic way. For example, it is normal to have thoughts about wanting to hurt someone, but an individual high on the construct of TAF Moral is more likely to appraise this thought in a catastrophic way (e.g., "Having this thought is just as bad as actually hurting someone else"). Such appraisals cause distress, which leads to neutralizing (e.g., compulsive washing or cleaning) in order to reduce anxiety. Such an individual might view him or herself as morally impure or contaminated and feel compelled to

perform cleansing rituals to restore feelings of morality. However, ritualizing is counter-productive in that it can exacerbate intrusive thoughts and cause compulsive behaviors to intensify (Berle & Starcevic, 2005; Bocci & Gordon, 2007; Shafran & Rachman, 2004). This serves as an example of how a dysfunctional cognition, such as TAF Moral, might contribute to the etiology and maintenance of the OCD symptom dimension of "contamination obsessions and cleaning/washing compulsions."

The three factors of dysfunctional cognitions included on the *Obsessive Beliefs Questionnaire* (*OBQ*; Obsessive Compulsive Cognitions Working Group, 2001) have been shown to be differentially related to OCD symptom dimensions. In general, the factor of inflated responsibility and overestimation of threat has been shown to be primarily related to the OCD symptoms of contamination/washing (Taylor et al., 2010; Wheaton, Abramowitz, Berman, Riemann, & Hale, 2010) and obsessive doubts/thoughts of being responsible for harm and associated checking and reassurance-seeking rituals (Calleo, Hart, Björgvinsson, & Stanley, 2010; Taylor et al., 2010; Wheaton et al., 2010). The factor of need for perfectionism and certainty has been shown to be related to OCD symptoms of symmetry and ordering (Calleo et al., 2010; Taylor et al., 2010; Wheaton et al., 2010). The final factor, the overimportance of and need to control thoughts, has been shown to be related to unacceptable obsessive thoughts (e.g., religious, sexual, violent obsessions) and checking and neutralizing strategies (Calleo et al., 2010; Taylor et al., 2010; Wheaton et al., 2010). In the construction of the *OBQ*, the magical belief constructs of the current study were subsumed under the cognitive dysfunction of the overimportance of and need to control thoughts (The Obsessive Compulsive Cognitions Working Group, 2001).

The question remains whether magical belief constructs affect OCD symptom dimensions directly or indirectly (via mediation) through other types of dysfunctional cognitions, such as the ones included on the *OBQ*. In the current study, magical ideation was related to the OCD symptom dimension of unacceptable violent, religious, and sexual obsessions and related compulsions. This relationship, therefore, may be direct or indirect based on previous studies showing that the dysfunctional cognition of the overimportance of and need to control thoughts is also related to this OCD symptom dimension.

However, the current study provides evidence that magical belief constructs may not solely affect OCD symptom dimensions indirectly through relationships with other dysfunctional cognitions. The magical belief constructs of magical ideation, TAF Moral, TAF Likelihood-Self, and superstition were significantly related to OCD symptom dimensions other than unacceptable violent, religious, and sexual obsessions and related compulsions. If magical belief constructs were truly subsumed under the cognitive dysfunction of the overimportance of and need to control thoughts, they would only be related to the OCD symptom dimension of unacceptable violent, religious, and sexual obsessions and related compulsions.

Taylor and Jang (2011) recently found that different dysfunctional cognitions play an etiological role in different OCD symptom dimensions. It may be that the magical belief constructs are also directly involved in the etiology and maintenance of different OCD symptom dimensions. However, it is important to note that the percentage of variance accounted for in each of the OCD symptom dimensions by the magical belief constructs and general negative affect varied from 9% in the case of symmetry obsessions and ordering compulsions to 27% in the case of unacceptable violent, religious, and sexual obsessions and related compulsions. For all OCD symptom dimensions there still remains a large percentage of variance unaccounted for. Therefore, although magical belief constructs may be involved in the etiology and maintenance of OCD symptom dimensions, there likely are many other variables involved, such as other types of dysfunctional cognitions, genetics, and environmental factors.

Results of the current study support the use of the *DOCS* as a valid measure of OCD symptom dimensions. Just as different OCD symptom dimensions have been found to have different co-morbid diagnoses, heritability estimates, patterns of brain activation, and responses to treatment (Leckman et al., 2010; Mataix-Cols et al., 2005), they also have been found to be related to different magical belief constructs. For example, superstition was a significant predictor of the OCD symptom dimension of obsessions about responsibility for harm, injury, and bad luck and related compulsions, but not of other OCD symptom dimensions.

Clinical implications.

The finding that magical belief constructs are differentially related to OCD symptom dimensions has important clinical implications, particularly for cognitive-behavioral theoretical perspectives. As these magical belief constructs may be contributing to the etiology and maintenance of OCD symptom dimensions, it follows that it may be possible to target them in OCD treatments. For example, if an individual presents with OCD symptoms related to obsessions about harm, injury, or bad luck and associated checking compulsions, an intervention could be employed to target the related magical beliefs of superstition and TAF Likelihood-Self. Specifically, the belief that one's thoughts or actions (e.g., opening an umbrella inside) can bring about harm or bad luck could be challenged. The individual could be exposed to the feared behavior (e.g., systematically and gradually instructed to approach the behavior of opening an umbrella inside) and prevented from engaging in the associated compulsive ritualizing. If an individual presents with symptoms related to contamination obsessions and cleaning/washing compulsions, the belief that having unacceptable thoughts is the moral equivalent of acting on these thoughts could be challenged. Finally, as magical ideation is related to all OCD symptom dimensions except obsessions about responsibility for harm, injury, or bad luck and related compulsions, cognitive restructuring aimed at challenging irrational cause and effect connections that defy empirical evidence could be useful. Knowledge of which particular dysfunctional cognition, or magical belief, is associated with which OCD symptom dimension may allow for a better understanding of how each dimension can be more effectively treated.

Limitations and Future Directions

The dysfunctional cognitions included on the *Obsessive Beliefs Questionnaire* (*OBQ*; Obsessive Compulsive Cognitions Working Group, 2001) have been shown to be involved in the etiology and maintenance of OCD symptom dimensions (Taylor & Jang, 2011). Therefore, it is likely that cognitive dysfunctions such as magical belief constructs are also involved in the etiology and maintenance of OCD symptom dimensions. However, due to the correlational and cross sectional design of the current study, it

is impossible to draw causal inferences. Longitudinal studies should be conducted to determine if individuals who score high on measures of magical belief constructs go on to develop the OCD symptoms of the related dimension (e.g., an individual who scores high on TAF Moral would go on to develop contamination obsessions and cleaning/washing compulsions). Likewise, it would be useful to conduct studies to determine if therapeutically targeting specific magical beliefs leads to improved treatment outcomes (i.e., reduced scores on measures of the appropriate OCD symptom dimension).

OCD symptom dimensions have been shown to be etiologically complex (Taylor & Jang, 2011). The current study provides evidence that magical belief constructs have direct relationships with OCD symptom dimensions. It was theorized that if magical belief constructs were found to be related only to the OCD symptom dimension of unacceptable violent, religious, and sexual obsessions and related compulsions, this would provide support for the theory that they are indirectly related to this OCD symptom dimension because of their relationship with the cognitive dysfunction of the overimportance of and need to control thoughts. However, the current study showed that magical belief constructs are related to all four OCD symptom dimensions, which provides support for the idea that magical beliefs affect OCD symptom dimensions directly. Nevertheless, it is still possible that magical belief constructs affect OCD symptom dimensions indirectly through relationships with other dysfunctional cognitions and control-related variables. Magical ideation, for example, was a significant predictor of unacceptable violent, religious, and sexual obsessions and related compulsions. It may be that magical ideation is only indirectly related to this OCD symptom dimension because of its relationship with the cognitive dysfunction of the overimportance of and need to control thoughts. Future studies could include measures of both magical belief constructs and other dysfunctional cognitions in order to determine which variables have direct and indirect relationships with OCD symptom dimensions.

In the current study, regression analyses were conducted twice for each OCD symptom dimension; once with the full *MI Scale* and once with the partial *MI Scale*. Items with content dealing with TAF and superstition were removed from the full *MI Scale* to form the partial *MI Scale*. The purpose

of this was to reduce the problem of item overlap and provide a purer measure of magical ideation. The pattern of results between the pairs of regression analyses did not technically differ for the current study due to the use of the Bonferroni-corrected alpha of .0125 to account for the multiple comparisons. However, results would have differed if a less stringent alpha (< .05) had been used. Specifically, the partial *MI Scale* would have emerged as another significant predictor of the OCD symptom dimension of obsessions about responsibility for harm, injury, or bad luck and related compulsions. The inclusion of the superstition and TAF items on the full *MI Scale* likely obscured the relationship between the pure MI items and the OCD symptom dimension. Additionally, if a less stringent alpha had been used, superstition would have emerged as another significant predictor of the OCD symptom dimension of symmetry obsessions and ordering compulsions. The relationship between superstition and the OCD symptom dimension of symmetry obsessions and ordering compulsions was accounted for by the superstition items on the full *MI Scale*. The item overlap did not allow for the *Superstitiousness Questionnaire* to emerge as a significant predictor of the OCD symptom dimension. However, when the superstition items were removed from the full *MI Scale*, the *Superstitiousness Questionnaire* was the only measure that was able to account for the relationship between superstition and the OCD symptom dimension, and it therefore emerged as a significant predictor. Future studies examining the unique contribution of various types of magical belief constructs should consider using the partial *MI Scale* so as not to obscure significant results; particularly if using fewer comparisons and a less stringent alpha.

Use of the *Superstitiousness Questionnaire* is another limitation of the current study. Though this is thought to be the best available measure of superstition (Irwin, 2007), its psychometric properties are questionable. Despite its high internal consistency reliability, it was shown to have poor convergent validity, suggesting that it may not be adequately capturing the underlying construct of superstition. Additionally, results of the current study show that it consists of between one to three factors. Though the current study used a one-factor model, future studies using the *Superstitiousness Questionnaire* might consider using two or three factors, particularly when interested in differentiating between good and bad

luck. Future research should also focus on the development of an entirely new, psychometrically valid measure of superstition.

The current study used self-report measures, which can be problematic in that they require participants to have insight into their thoughts and behaviors. In addition, self-report measures are susceptible to both the over- and under-reporting of symptoms (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Participants in the current study would have had little incentive to over-report their symptoms, as they had nothing to gain as a result. However, it is possible that participants engaged in the under-reporting of symptoms because it can be socially undesirable to admit to symptoms of psychopathology. If the pattern of the results in the current study were obtained by participants under-reporting symptoms, it is likely that the relationships between the constructs would only be stronger if symptoms were reported accurately. A measure of social desirability could be included as a covariate in future studies. Additionally, it may be beneficial for future studies to use a more objective measure of OCD along with self-report measures.

The sample in the current study consisted of mostly young, Caucasian, undergraduates at a large public school in the Midwestern United States. Therefore, these findings may not generalize to other populations. Future studies should replicate the findings with populations of diverse ages and ethnicities. In addition, the current study used an analog (nonclinical sample) to draw conclusions about OCD, a clinical phenomenon. Because OCD symptoms are so prevalent in the general population, it is common practice to use analog samples to study OCD and its correlates (Gibbs, 1996). Nevertheless, future studies should replicate the current findings using clinical samples of individuals diagnosed with OCD. Finally, though magical belief constructs have been shown to exist cross culturally (Jahoda, 1969; Vyse, 1997), the specific magical beliefs used as items on the measures in the current study may not. For example, the superstition that seeing a black cat brings bad luck may be relevant only in Western cultures. Future studies should examine whether the current findings can be replicated in other cultures using measures of magical belief constructs that may be more culturally relevant.

Conclusion

The purpose of the current study was to clarify the nature of the relationships between magical belief constructs (magical ideation, superstition, and TAF) and OCD. This study is important because it adds to the growing body of literature that conceptualizes OCD as a dimensional construct. It is the only study to date that examines the relationships between magical belief constructs and OCD symptom dimensions. The magical belief constructs were shown to differentially predict all four OCD symptom dimensions. Magical ideation was a significant predictor of three OCD symptom dimensions (contamination concerns and cleaning/washing compulsions; unacceptable violent, religious, and sexual obsessions and related compulsions; and symmetry obsessions and ordering compulsions). TAF Moral was also a significant predictor of contamination concerns and cleaning compulsions. Both superstition and TAF Likelihood-Self were significant predictors of obsessions about responsibility for harm, injury, or bad luck and related compulsions. The relationships between magical belief constructs and OCD symptom dimensions remained significant when general negative affect was controlled for. The findings of the current study suggest that the three magical belief constructs are distinct from one another and should not be used interchangeably in future research. In addition, this study has important implications for theoretical cognitive models of OCD and for more effective cognitive-behavioral interventions for the particular symptom dimensions of the disorder.

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Appendix A

Informed Consent

Information Sheet

INTRODUCTION: The Department of Psychology at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You are free to decide whether or not participate in this study. Even if you agree to participate, you are free to withdraw at any time without penalty. If you do withdraw from this study, it will not affect the credit you received up to that point

PURPOSE OF THE STUDY: Most people have some beliefs that are not strictly logical. This study is interested in seeing if such beliefs tend to cluster together to form particular groupings.

PROCEDURES and INFORMATION TO BE COLLECTED: This study involves questionnaires. The questionnaires will be anonymous and will take no more than an hour of your time. The questionnaires will ask you about various beliefs you may or may not hold and behaviors in which you may or may not engage.

ANONYMITY: The questionnaires are completely anonymous. Nowhere on the questionnaires do we ask for your name or KUID, and we have avoided asking questions that might identify you indirectly. Everyone will be able to fill out this questionnaire, whether or not he or she holds the beliefs or engages in the behaviors we ask about.

RISKS and BENEFITS: We do not anticipate that participating in this study will cause any risks. If you are uncomfortable with any of the questions, you may skip them.

Regarding benefits to society, we hope that the information we gather on certain ways of illogical thinking and their groupings will help us to better understand these groupings. In addition, insight may be gained into how to improve the logical thinking of these groups.

PAYMENTS: Although you will not receive financial compensation for your time and effort in your participation, you will receive one credit toward your research requirement for every half hour or portion thereof that you participate.

USE OF THE DATA: The data collected in this study will be used by graduate student Lauren Brian, Professor Ray Higgins, and Dr. Sarah Kirk to better understand how certain ways of thinking cluster together to form groups.

QUESTIONS ABOUT PARTICIPATION: Questions about procedures can be directed to the researcher conducting the session, to the researchers listed below, and/or to the Human Subjects Committee Lawrence Campus (see next section).

PARTICIPANT CERTIFICATION: I have read this Information Sheet. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385 or write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7563, email irb@ku.edu.

Completion of the questionnaire indicates your willingness to participate in this project and that you are at least 18 years old.

Researcher Contact Information

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Appendix B

Debriefing Form

Debriefing Form

The goal of this study is to examine the relationships between magical beliefs and Obsessive-Compulsive Disorder (OCD). Magical beliefs include common superstitions (e.g., walking under a ladder is bad luck), thought-action fusion (e.g., the belief that thinking something makes it more likely to occur OR that thinking something is the moral equivalent of acting on the thought), and magical ideation (e.g., belief in clairvoyance, astrology, UFOs, etc.). Magical beliefs are quite common. Symptoms of OCD are also prevalent in the general population. Therefore, college students make excellent participants in studies on these topics, even if they do not actually have OCD. Obsessive-compulsive (OC) symptoms are distinguished from OCD by the fact that they are less time-consuming, less frequent, and associated with less distress and problems with functioning. OCD, however, is a debilitating illness, affecting 1% to 3% of the world's population. Individuals with this illness have recurrent and intrusive thoughts, images, and impulses that cause marked anxiety and distress. These troubling thoughts are often accompanied by repetitive behaviors that the individual feels compelled to complete. These behaviors are carried out according to rigid rules in order to reduce anxiety or prevent the dreaded thought from occurring.

There are many patterns of OCD. Researchers have recently identified reliable OC symptom dimensions based on common thematic content of obsessions and compulsions. The symptom dimensions included in this study were (1) concerns about germs and contamination, (2) concerns about being responsible for harm, injury, or bad luck, (3) unacceptable thoughts, and (4) concerns about symmetry, completeness, and the need for things to be "just right." Researchers have found that OC symptom dimensions differ on important variables such as heritability, patterns of brain activation, and treatment response. Therefore, it is also possible that the dimensions are caused and maintained by different factors.

Based on your answers to the questionnaires, we will analyze how magical beliefs related to endorsement of different obsessive-compulsive symptom dimensions. This research is important in that it may help to shed light on factors involved in the formation and maintenance of OC symptoms, and, in doing so, better inform treatment for different types of symptoms. **Thank you** for your participation in this study!

Because of the personal nature of this research topic, you may have questions or issues that you would like to discuss further. We have provided information about how to contact us in case you would like to talk about your feelings concerning your participation in this study. We have also listed the phone numbers of some organizations on campus and in Lawrence that provide counseling services.

The graduate student conducting this study: Lauren Spears, M.A. Email: lbrian@ku.edu

The faculty advisors for this study: Raymond Higgins, Ph.D. and Sarah Kirk, Ph.D.
Phone: (785) 864-9856 and (785) 864-9853 Email: rhiggins@ku.edu and skirk@ku.edu

Counseling services:

- KU Psychological Clinic, 340 Fraser Hall, (785) 864-4121. Small fee per session.
- Counseling and Psychological Services (CAPS), Watkins Health Center, (785) 864-2277. Small fee per session.

- Headquarters Counseling Center, available by phone 24 hours a day, 7 days a week, free, for any concern: (785) 841-2345.
- Kansas City Center for Anxiety Treatment (KCCAT), 10555 Marty St., Overland Park, KS 66212, (913) 649-8820

To discuss your rights as a research participant:
Human Subjects Committee Lawrence, (785) 864-7429 irb@ku.edu