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Perfectionism and cognitive functioning : clarifying relationships between OCD and OCPD

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ABSTRACT

PERFECTIONISM AND COGNITIVE FUNCTIONING: CLARIFYING RELATIONSHIPS BETWEEN OCD AND OCPD

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Obsessive-compulsive disorder (OCD) and obsessive-compulsive personality disorder (OCPD) have had a long history of being confused and confounded in the literature. The current study looks to shed light on the continuing debate about the relationship between OCD and OCPD by examining the role of one key variable, perfectionism, in the overlap between these two disorders. If perfectionism is what underlies some of the comorbidity/overlap between these disorders, that may suggest the need for the specific and thorough assessment of perfectionism in OCD rather than the broader assessment of OCPD. This study also seeks to contribute to the literature by exploring the nature of neuropsychological functioning in OCPD in order to better understand differences between OCD and OCPD, as well as to understand whether OCPD itself may be related to a cognitive style that is inflexible and rigid and which therefore leads to impaired cognitive performance. At the same time, the potential for perfectionism as a trait to have an impact on neuropsychological functioning was also explored. This study found that OCPD traits were moderately related to OCD symptoms ($r = .43$); this remained true even after controlling for perfectionism and symptoms of depression and anxiety ($\beta = .247$, $p < .05$). Perfectionism significantly predicted OCD symptoms only when the model did not include symptoms of depression and anxiety. Regarding executive functioning, results were in the

opposite direction as predicted; increases in OCD symptoms and OCPD traits were both independently predictive of performance on a measure of set-shifting, after controlling for inhibition and working memory (βs = .210 and .189, respectively, ps < .05). Meanwhile, perfectionism demonstrated no significant associations with set-shifting.

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TABLE OF CONTENTS

Chapter **Page**

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

Obsessive-compulsive disorder (OCD) and obsessive-compulsive personality disorder (OCPD) are two conditions defined in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013). They are conceptually distinct but share similarities in their naming and, to a degree, in observable manifestations of specific symptoms (e.g., orderliness). Particular OCD symptoms (i.e., symmetry and ordering) are associated with comorbid OCPD (Leckman et al., 2010) as well as with specific cognitive/executive functioning deficits in the realm of set-shifting (Chamberlain et al., 2007; Gu et al., 2008; Lawrence et al., 2006). Both OCD and OCPD also share conceptual and empirical relations with the trait of perfectionism (Hummelen, Wilberg, Pedersen, & Karterud, 2008; Morey et al., 2004; Sanislow et al., 2002; Wu & Cortesi, 2009; Yiend, Savulich, Coughtrey, & Shafran, 2011).

Given these relations, this study seeks to determine whether perfectionism can account for positive correlations observed between OCD symptoms and OCPD traits. A second goal is to determine whether OCPD symptoms predict cognitive deficits similar to those identified in individuals with OCD, particularly with respect to symmetry/ordering symptoms. A third goal is to establish whether perfectionistic attitudes and tendencies may be uniquely associated with deficits in cognitive performance. This paper will begin by briefly reviewing the history of

contemporary views on the relationship between OCD and OCPD. Next, associations between both disorders and the personality trait of perfectionism will be reviewed. This will be followed by a review of literature regarding cognitive functioning in OCD and OCPD. Finally, in light of these findings, the design of the proposed study will be provided in detail.

OCD and OCPD

The symptoms relevant to OCPD were first identified by Janet and later elaborated on by Freud, who linked traits such as obstinacy, parsimony, and orderliness to what he termed an anal-retentive character (Jones, 1938). Freud believed that individuals with this character experienced too much parental interference during early experiences with bathroom training, forcing premature and unwanted control of the otherwise gratifying process of elimination. This led them, as adults, to maintain control of their behavior and avoid outside influence through withholding to the point of procrastination and miserliness, becoming rigidly preoccupied with orderliness and details, and expressing stubbornness and hostility when challenged to change their behavior (Jones, 1938).

Current conceptualizations of OCPD no longer incorporate Freud's views of etiology; however, the main traits identified by Freud still are prominent in the diagnostic criteria of OCPD. The DSM-5 defines OCPD as a preoccupation with orderliness, perfection, and control, as well as a corresponding reduction of flexibility, openness, and efficiency. This pattern is characterized by the presence of at least four of eight criteria: (1) preoccupation with details, rules, and organization; (2) perfectionism that interferes with task completion; (3) devotion to

work and productivity above leisure activities and friendships, workaholism; (4) overconscientious behavior and inflexibility about morality, ethics, or values; (5) inability to get rid of worn-out, worthless items even when they lack sentimental value, being a pack rat; (6) reluctance to delegate tasks or work with others, unless they submit to doing it exactly his or her way; (7) miserly spending towards self and others; and (8) notable rigidity and stubbornness.

On the other hand, OCD is an anxiety-based disorder characterized by either obsessions or compulsions. Obsessions are defined in the DSM-5 as repetitive and intrusive thoughts that are experienced as unwanted, distressing, and involuntary. Compulsions are repetitive behaviors or thought activities performed in an attempt to reduce, correct, or prevent the anxiety or feared harmful outcome; however, these acts are either not realistically connected to the source of anxiety or they are in clear excess. Most models of OCD identify different symptom domains depending on the content of obsessions and the resulting compulsions. Common domains include doubting/checking, contamination/washing, and symmetry/ordering. These domains often differentially correlate with other variables. For example, symmetry/ordering symptoms show increased patterns of comorbidity with OCPD, panic with or without agoraphobia, bipolar disorder, and tic disorders; cleaning/contamination symptoms show increased comorbidity with eating disorders; hoarding symptoms are associated with increased overall personality disorder (PD) comorbidity, particularly among the Cluster C (Anxious-Fearful) PDs (Leckman et al., 2010). Of note, it is possible that some of the association is due to criterion overlap; for example, the first OCPD criterion includes a preoccupation with order, which bears similarity to symmetry/ordering symptoms.

Perhaps the most prominent distinction between OCD and OCPD regards the difference in how they are characterized: OCD as a clinical disorder marked by dysfunctional symptoms, and OCPD as a personality disorder consisting of dysfunctional traits. As such, it is worth spending some time examining the distinction between symptoms and traits. Traditionally, symptoms have been used as a way of describing an underlying condition; they are often primary markers of distress and impairment and are almost always a target of treatment. Traits, on the other hand, have typically been considered more characteristic of the individual in question, in that they are pervasive and enduring. Furthermore, they are typically attributed with more causality regarding the dysfunctional behaviors of the individual in question. Personality disorders were those syndromes that were considered very difficult, if not impossible, to fully treat or change, not only due to the characteristic traits underlying the disorder but also due to the fact that individuals with personality disorders often do not recognize their traits or behaviors as dysfunctional (Hirschfeld, 1993).

However, as the field has developed, the clear demarcation between these terms has become less certain. A number of other clinical disorders incorporate insight into their conceptualization (e.g., OCD), such that a poor degree of insight is no longer exclusive to personality disorders. Also, increasingly there is evidence for the idea that traits, while resistant to change, are not immutable. For instance, many of the traits underlying borderline personality disorder have been linked to etiological factors such as poor emotional regulation. These skill deficits, and the corresponding traits associated with borderline personality disorder, have been responsive to treatment using specifically designed approaches such as dialectical behavior therapy (DBT; Linehan et al., 2006). Finally, formal relationships have been proposed between

particular personality disorders and clinical syndromes. For instance, social phobia has relatively recently been understood as consisting of two major subtypes: a relatively circumscribed social anxiety, limited to performance settings and interactions with authority figures, and a more pervasive and severe fear of intimacy and interpersonal interactions that is analogous to, if not identical to, avoidant personality disorder (APA, 2013).

In other words, while the distinctions between clinical disorders and personality disorders are not meaningless, an argument can be made that in many cases formal personality disorders per se may be considered analogous to clinical syndromes, except that they are generally more severe, more pervasive, and more typically characterized by a lack of insight than those conditions classically included within Axis I of the previously multiaxial editions of the DSM.

It is not within the scope of this paper to fully engage any debate regarding the nature of and distinction between so-called symptoms and so-called traits. In the framework of this paper, both terms shall be used in a manner consistent with each syndrome's classification within the DSM. That said, while these terms will be used separately for the sake of clarity in distinguishing these two conditions, it is not unusual to find others who use these terms interchangeably. In either case, it should be understood that these terms are used in both cases to refer to the maladaptive behavioral, cognitive, and emotional signs formally associated with each condition.

In exploring the possibility of a relationship between OCD and OCPD, it is worthwhile to begin with a review of similarities and differences, with respect to both overall conceptualization and specific symptoms. Pollak (1987) cites various traits that have been characterized as overlapping between OCD and OCPD, including symptoms related to a need for control, orderliness, and cleanliness, as well as problems with indecision, self-doubt, and the avoidance

of risk or change. At the same time, he points out that whereas OCD conceptually involves distressing and disruptive symptoms that are hard to control, OCPD is more characterized by integrated, ego-syntonic tendencies toward control, orderliness, and perfectionism. Ultimately, whereas the two syndromes may share some superficial similarities in symptom presentation, they are not simply different versions of the same disorder (Pollak, 1987). The possibility remains, however, that OCPD, although distinct, has a clinically meaningful relationship with OCD. Based on a review of the literature, this question appears to be as yet unresolved.

Some of the recent research using DSM-IV-TR criteria has suggested that 24-35% of individuals with primary OCD have comorbid OCPD (Coles, Pinto, Mancebo, Rasmussen, & Eisen, 2008; Garyfallos et al., 2010; Hummelen et al., 2008; Lochner et al., 2011; Pinto, Liebowitz, Foa, & Simpson, 2011). This is significantly higher than the rate of OCPD diagnoses in the general population (approximately 2-8%; APA, 2013). However, in many of these studies, it is not made clear whether this is just the product of the general elevation of personality pathology that might be expected in a clinical sample or whether the prevalence of OCPD is uniquely elevated in OCD.

To address this question, Wu, Clark, and Watson (2006) examined the comorbidity rates of Axis II disorders in samples of college students, individuals with OCD, and general outpatients. For this study, they used the Schedule for Nonadaptive and Adaptive Personality-2 (SNAP-2; Clark, Simms, Wu, & Casillas, in press), which assesses for the presence of the 10 DSM-IV-TR PDs but allows for data analysis at multiple levels. First, using categorical diagnoses, they examined whether OCPD occurred more frequently in individuals with OCD versus the outpatient sample; no significant differences were found. Second, they investigated

whether OCPD was diagnosed more frequently than the other PDs in individuals with OCD; avoidant personality disorder (APD) had the highest base rate (21%) in individuals with OCD, surpassing that for OCPD (15%). Third, they approached these questions using dimensional scoring of each of the 10 DSM-IV-TR PDs; consistent with categorical data, individuals with OCD endorsed less severe OCPD symptoms relative to other PDs, including APD pathology, dependent personality disorder (DPD) pathology, and schizoid personality disorder (SPD) pathology. Furthermore, there was no difference in OCPD severity between the OCD group and the outpatient group (Wu et al., 2006).

Despite studies like these, which do not support a specific link between OCD and OCPD, the relationship between these two disorders still is investigated and reported in the literature. OCPD is still reported as being significantly related to OCD based on comorbidity data (Hummelen et al., 2008) and has been investigated as a potential candidate for inclusion in the obsessive-compulsive spectrum (Fineberg, Sharma, Sivakumaran, Sahakian, & Chamberlain, 2007), and measures have been investigated for their ability to distinguish between OCD and OCPD (Wellen et al., 2007). Of particular recent interest, questions have been raised as to the clinical significance of comorbid OCPD within OCD (Coles et al., 2008; Garyfallos et al., 2010; Lochner et al., 2011; Pinto et al., 2011).

OCD with OCPD: Subtype or Severity?

One of the first studies to extensively explore the clinical differences between individuals with OCD and a comorbid OCPD diagnosis (OCD + OCPD) and individuals with OCD in the

absence of an OCPD diagnosis (OCD – OCPD) was conducted by Coles et al. (2008); their methodology and analyses were later replicated by Garyfallos et al. (2010) in a Greek population. In both studies, diagnoses of OCD and OCPD were established using semi-structured clinical interviews. Coles et al. used the Structured Clinical Interview for DSM-IV Axis I Disorders - Patient Version (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1996) and the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II; First, Gibbon, Spitzer, Williams, & Benjamin, 1997); Garyfallos et al. used the Mini International Neuropsychiatric Interview 5.0.0/DSM-IV (MINI; Sheehan et al., 1998) to assess Axis I diagnosis and the International Personality Disorders Examination (IPDE; Loranger, 1999) to assess Axis II diagnosis. Both the MINI and IPDE had been translated and adapted for use in a Greek population (Fountoulakis et al., 2002; Papadimitriou, Berati, Matsoukas, & Soldatos, 2004).

Both studies found that compared to OCD – OCPD, individuals with OCD + OCPD had an earlier age for initial onset of OCD symptoms (η = .17; $r_{y\lambda}$ = .25). Both studies also found an increase in the prevalence of symmetry (φ = .34-.41), ordering (φ = .26-.37), and hoarding (φ = .28-.34) symptoms among individuals with OCD + OCPD, compared to those with OCD – OCPD. Individuals with OCD + OCPD in the Coles et al. study demonstrated more functional impairment via the Social and Occupational Functioning Assessment Scale (SOFAS; APA, 2000; η = .20) and in both studies via the Global Assessment of Functioning Scale (GAF; APA, 2000; η = .22; $r_{y\lambda}$ = .30). It is important to note that this finding of impairment was identified despite the fact that there was no significant difference in OC symptom severity as measured by the Yale-Brown Obsessive Compulsive Scale (YBOCS; Goodman et al., 1989).

Beyond this convergence, there also were some inconsistencies between these two studies. Coles et al. (2008) found significantly more repeating (φ = .25) and cleaning (φ = .17) symptoms in the OCD + OCPD group compared to the OCD – OCPD group; Garyfallos et al. did not. Garyfallos et al. (2010) found significantly more checking (φ = .26) symptoms as well as an earlier age for full clinical onset of OCD in the OCD + OCPD group ($r_{y\lambda}$ = .24); Coles et al. did not. Finally, whereas both studies found that OCD + OCPD presented with more comorbid APD than OCD-OCPD (φ = .18-.23), only Coles et al. (2008) found increased comorbidity with Axis I anxiety disorders (φ = .17). It is possible some of these differences are reflective of slight variations in how the different measures assess for OCD symptoms and OCPD traits. It is also possible that the endorsement of different symptom types is slightly different for Greek individuals than European-American individuals.

Taken together, these studies offer preliminary evidence that OCD + OCPD, as compared to OCD – OCPD, presents with an earlier age of onset for initial symptoms, differences in symptom presentation, and increased impairment in the absence of increased OCD symptom severity. Further, it does not appear that these findings can be attributed only to idiosyncrasies in measurement, as different instruments were used in these studies. Based on these findings, the authors interpreted these studies as supporting the notion of an OCD + OCPD subtype.

Lochner et al. (2011) also investigated the significance of OCD + OCPD and offered possible explanations for the nature of the relations that might exist between OCPD and OCD. The first possibility considered is that a comorbid OCPD diagnosis could be a severity indicator of OCD. If this were the case, we might expect individuals with OCD + OCPD to display similar symptom profiles as individuals with OCD – OCPD, only at a higher level of severity. If,

however, individuals with OCD + OCPD differ from individuals with OCD – OCPD with respect to type of symptoms experienced, genetic profiles, or response to treatment, this might indicate that OCD + OCPD defines a unique subtype of OCD.

Lochner et al. (2011) then examined this issue in individuals with OCD who were assessed for Axis I and Axis II comorbidity using the SCID-I and SCID-II. Some of their findings were similar to those cited above. Specifically, using the Disability Profile (DP; Schneier et al., 1994), they found increased current and lifetime impairment in individuals with OCD + OCPD versus those with OCD – OCPD. In addition, they reported that hoarding and symmetry obsessions were more frequent in the OCD + OCPD group compared to the OCD – OCPD group, as well as ordering, arranging, repeating, checking, counting, and hoarding compulsions. It is noteworthy that many of the OCD symptoms which were elevated are those most similar to OCPD traits (e.g., a preoccupation with order, lists, and rules; miserliness; reluctance to discard old and used items). The only compulsions that were not elevated were cleaning/washing and mental compulsions, neither of which has a direct parallel in the OCPD criteria.

Whereas some of their findings converged with previous research, Lochner et al. also found some conflicting results. For instance, they found no differences in age of initial symptom onset or full clinical onset of OCD between OCD + OCPD and OCD – OCPD. They also found evidence for increased OC symptom severity in OCD + OCPD compared to OCD – OCPD; both YBOCS total scores and YBOCS compulsions were elevated in the former. This contradicts the previous findings suggesting increased impairment in OCD + OCPD despite similar symptom severity and is more suggestive of a severity interpretation of OCD + OCPD. In addition,

Lochner et al. found no difference in retrospective reports of treatment response between the two groups. Finally, Lochner et al. tested for differences in genetic polymorphisms in genes proposed to be relevant to OCD; they found no significant differences between OCD + OCPD and OCD – OCPD. Based on their findings, the authors conclude that OCPD likely does not define a specific subtype; instead, it may serve as a severity indicator, particularly given that those symptoms that are more frequent in OCD + OCPD relative to OCD – OCPD are those that are most similar to OCPD symptomatology (e.g., ordering, perfectionism). However, the authors acknowledge their findings with respect to treatment response are limited by the retrospective nature of the reporting.

In a longitudinal study more explicitly examining treatment response, Pinto et al. (2011) found that in individuals diagnosed with OCD, both OCPD diagnosis and OCPD severity (i.e., number of criteria endorsed) were predictive of diminished response to treatment (i.e., higher remaining symptom severity, as measured by the YBOCS). After an 8-week, 15-session course of exposure and response prevention, both comorbid OCPD diagnosis (β = .34) and number of OCPD symptoms endorsed (β = .29) significantly predicted higher post-treatment YBOCS symptom severity scores, controlling for baseline YBOCS symptom severity (which did not differ between groups), other Axis I/II comorbidity (assessed with the SCID-I and SCID-II), prior treatment, quality of life, and gender. However, after examining each OCPD criterion, they found that perfectionism alone continued to significantly predict higher post-treatment YBOCS symptom severity scores beyond the listed covariates (β = .29). As the authors note, the strength of the relation between perfectionism and treatment outcome is as strong as that between overall OCPD severity and treatment outcome.

Thus, although some studies have found evidence for differences in clinical presentation between OCD + OCPD and OCD – OCPD, including an earlier age of onset, a reduced response to treatment, different symptom presentation, and increased functional impairment in the absence of increased symptom severity (Coles et al. 2008; Garyfallos et al. 2010; Pinto et al., 2011), some of these findings may be accounted for by other factors. Different symptom presentation could be reflective of criterion overlap, given that symptoms that are elevated in OCD + OCPD relative to OCD – OCPD are those most reflective of OCPD criteria (e.g., orderliness, hoarding). Furthermore, earlier age of onset and poorer response to treatment both could reflect an increase in shared vulnerability factors, such as perfectionism, rather than a specific interaction between OCD symptoms and OCPD traits. Perfectionism is a transdiagnostic trait in that it has been shown to be associated with several forms of psychopathology (Frost, Marten, Lahart, & Rosenblate, 1990; Grzegorek, Slaney, Franze, & Rice, 2004; McGrath, Fossum, & Allen, 2010; Rice, Leever, Christopher, & Porter, 2006; Rice & Van Arsdale, 2010). Also, perfectionism is perhaps the only OCPD trait that is strongly and reliably elevated in individuals with OCD, without being explicitly reflected in the measurement of OCD symptoms. Thus, to the extent that it can independently account for a unique presentation of OCD, it may be more appropriate to characterize these individuals as presenting with high levels of trait perfectionism in the context of an OCD diagnosis, rather than as an OCD + OCPD subtype. Finally, the assessment of OCD symptom severity is often inconsistent; traditional measures of OCD have historically confounded variety of symptom presentation (e.g., endorsement of several checking-type behaviors) with severity, inquired primarily about prototypical symptoms (e.g., checking locks or stoves), and have relied on unidimensional ratings of symptom severity (e.g., distress or number

of symptoms endorsed). Thus, findings of an increased functional impairment in the absence of increased symptom severity may be more reflective of measurement issues than significant differences in clinical presentation of OCD + OCPD as compared to OCD – OCPD.

Perfectionism

As the study by Pinto et al. (2011) demonstrated, perfectionism as a personality trait may have specific relevance to the relationship between OCD and OCPD. To the extent that individuals with OCD + OCPD are characterized predominantly by perfectionism, perfectionism may account for most (if not all) of the important differences between individuals with OCD + OCPD versus OCD – OCPD. Further research into this matter may help establish whether an OCD diagnosis warrants evaluation of OCPD pathology or only perfectionism per se.

For something to be perfect means it is completely without flaws, beyond further improvement, and accurate in every detail (Merriam-Webster's online dictionary). Whereas some abstract domains allow for the existence of perfection (e.g., a mathematically perfect sphere), in the realm of human performance in areas such as athletics, academics, or parenting, true perfection does not exist. Indeed, ideas about what approaches perfection may differ dramatically from individual to individual. On the other hand, perfectionism generally is defined as a personality trait involving the intolerance of anything that falls short of absolute perfection (Merriam-Webster's online dictionary).

More specifically, perfectionism is a complex construct that has been conceptualized in diverse ways in the psychological literature. Two measures of perfectionism are Hewitt and

Flett's Multidimensional Perfectionism Scale (HFMPS; Hewitt, Flett, Turnbull-Donovan, & Mikail, 1991) and Frost's Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990). The HFMPS divides perfectionism into different domains depending on the target of perfectionistic striving: self-oriented perfectionism (SOP; the demand for perfection in one's own performance), other-oriented perfectionism (OOP; the demand for perfection in others' performance), and socially prescribed perfectionism (SPP; the perception that others demand perfection of the self). The FMPS divides perfectionism into six domains: concern over mistakes (CM), doubts about actions (DA), organization (O), the presence of high personal standards (PS), the perception of high parental criticism (PC), and the perception of high parental expectations (PE).

Factor analyses have supported a four- or five-factor structure that collapses parental criticism with parental expectations and doubts about actions with concerns about mistakes (Khawaja & Armstrong, 2005; Stallman & Hurst, 2011; Stober, 1998). However, a factor analysis of both the HFMPS and FMPS found a simpler, two-factor solution (Frost, Heimberg, Holt, Mattia, & Neubauer, 1993). The first factor was described as positive striving and consisted of the SOP scale from the HFMPS as well as the O and PS scales from the FMPS. The second factor was described as maladaptive evaluation concerns and consisted of the SPP scale from the HFMPS as well as the CM, DA, PE, and PC scales from the FMPS (Frost et al., 1993). Thus, although more complex conceptualizations of perfectionism exist, there is some evidence for a more parsimonious definition. Indeed, as early as 1978, Hamachek distinguished between two main types of perfectionism. The first was "neurotic" perfectionism, in which individuals strive persistently for perfection but never feel like they have done well enough to feel satisfied. The second was "normal" perfectionism, in which individuals derive pleasure and satisfaction from

detailed, meticulous work. Importantly, Hamachek described the latter as feeling "free to be less precise as the situation permits" (Hamachek, 1978, p. 27).

When considering psychopathology, maladaptive perfectionism may broadly be characterized as the tendency to set rigid and unreasonably high standards for performance and to display an intolerance for imperfection. Slade and Owens (1998) describe the consequences of this negative perfectionism, stating that the negative perfectionist, in avoiding failure, will find failure to be catastrophic and will experience anxiety about the possibility of failure and a number of negative emotions (e.g., dysphoria, reduction in self-esteem, eventual depression) upon the actuality of failure. However, success will not have as much of an impact for these individuals because no amount of success can ensure the future avoidance of failure.

With this in mind, it is perhaps not surprising that perfectionism has emerged as a personality trait relevant to multiple forms of psychopathology, including depression (Frost et al., 1990; Grzegorek et al., 2004; McGrath et al., 2010; Rice et al., 2006), stress (Rice et al., 2006), alcohol use (Rice & Van Arsdale, 2010) and negative affectivity (Frost et al., 1990). If perfectionism is indeed transdiagnostic in nature, it can likely account for some of the comorbidity found among both Axis I and Axis II pathology. Given the high prevalence of comorbidity, it is important to go beyond reporting comorbidity rates toward the ultimate goal of identifying mechanisms driving the overlap between disorders. Such efforts will help to clarify relations between disorders, which will not only improve current understanding of psychopathology but also may help to guide treatment decisions. This review considers that perfectionism may be one of these important variables.

Perfectionism and OCPD

Across studies examining the role of various OCPD traits in the diagnosis and prognosis of OCPD, elements of perfectionism such as rigidity and preoccupation with detail consistently have been identified as central. Sanislow et al. (2002) used data from the Collaborative Longitudinal Personality Disorders Study (CLPS) to examine the validity of four DSM-IV-TR PDs (obsessive-compulsive, avoidant, schizotypal, and borderline). They submitted the criteria for all four disorders to confirmatory factor analysis (CFA), testing the fit of three models: a unidimensional model of personality pathology, a three-factor model matching the cluster classification from the DSM-IV-TR, and a four-factor model matching the individual disorder classification. They found that a four-factor model provided the best fit, supporting the relative distinctions among these four diagnoses. Importantly, the three symptoms that loaded most heavily onto the factor identified as OCPD were reluctance to delegate tasks, perfectionism, and preoccupation with rules, order, and lists (loadings from .61-.71). This suggests that these symptoms are most central to the latent construct. Other traits loaded more modestly, including miserliness (.32), being a pack rat (.40), and workaholism (.43).

Hummelen et al. (2008) conducted an exploratory factor analysis (EFA) of all DSM-IV-TR PD criteria (assessed with the SCID-II) and found that a two-factor model of OCPD provided the best fit. The first factor, which accounted for the most variance, comprised primarily perfectionism and orderliness and showed stronger associations with OCD. The second factor was characterized as aggression and largely comprised rigidity, stubbornness, and symptoms from other PDs; this factor did not show a significant association with OCD. In addition, they

examined a variety of psychometric properties of the OCPD criteria, including correlations between the criteria and presence of a PD diagnosis; inter-item correlations; and the sensitivity, specificity, and positive/negative predictive value of the individual criteria. To the extent that a measure of an individual criterion performs well with respect to these psychometric properties, it suggests that the criterion is closely and specifically associated with the presence or absence of the full clinical disorder. Again perfectionism and orderliness consistently were among the best performing criteria, supporting the findings by Sanislow et al. (2002) in suggesting that perfectionism and orderliness are central components of OCPD.

Using the CLPS data, Morey et al. (2004) examined how well changes in individual criteria correlated with overall changes in personality disorders. For OCPD, most criteria demonstrated moderate correlations with overall changes (correlations from .35-.51); reluctance to delegate and perfectionism had the highest correlations (.51 and .49, respectively).

Finally, the DSM-5 lists an alternative dimensional classification for PDs, in which rigid perfectionism is listed as one of four pathological personality traits relevant to OCPD, along with perseveration, intimacy avoidance, and restricted affectivity (APA, 2013). Although three out of four traits are necessary for diagnosis of OCPD under this model, it is specified that one of these traits must be rigid perfectionism. In the dimensional model, the trait of rigid perfectionism is placed under the broader domain of extreme Conscientiousness and is characterized by an insistence on flawlessness and an inability to tolerate errors or faults in performance, whether one's own or others'. This may lead to delays in finishing tasks or meeting goals due to an inability to meet rigid, excessively high standards for performance. Such individuals likely believe in one right way of doing things and find it difficult to change their approach, even when

necessary to meet changing task demands. Furthermore, in entirely unfamiliar situations they may find it difficult to take action. They may also pay excessive attention to details, order, and organization. The second pathological personality trait is perseveration, as an aspect of Negative Affectivity, in which the individual will continue behaviors or tasks even when it is no longer useful to do so (e.g., despite continued failures). Finally, the last two traits, intimacy avoidance and restricted affectivity, are both listed as aspects of Detachment. They are characterized respectively by the avoidance of intimate interpersonal relationships or attachments and the expression of a severely restricted range of emotions, such that the individual appears aloof, cold, and indifferent. Interestingly, other highly performing criteria for OCPD such as attention to detail, lists, order, and organization collapsed into the concept of rigid perfectionism. However, attention to detail is commonly described alongside perfectionism, and some conceptualizations of perfectionism also include organization as a related domain (Frost et al., 1990).

Taken together, the available data converge to suggest that perfectionism is one of the central traits of OCPD; it loads highly in factor analyses examining OCPD criteria and is among the best performing criteria with respect to sensitivity, specificity, and ability to predict diagnostic status. In addition, the OCPD criterion reflecting rigid perfectionism correlates highly with changes in OCPD severity over time, and an evidence-based dimensional model in the DSM-5 continues to identify it as an essential, primary trait in the presentation of OCPD.

Perfectionism and OCD

Perfectionism also has a conceptual relation with OCD, reflected in that the Obsessive Beliefs Questionnaire (OBQ; OCCWG, 2001) includes a scale measuring perfectionism as one of the core cognitive factors in OCD. Further, several studies have been conducted to explore relations between perfectionism and OCD, both in nonclinical and clinical OCD samples. This review will begin by addressing the former.

Using the OBQ, Wu and Cortesi (2009) found that perfectionism and certainty beliefs correlated positively with self-reported OC symptoms in a college sample, including after controlling for depression symptoms and OBQ responsibility/threat estimation (β = .33). As the authors note, this finding is particularly noteworthy given that OBQ responsibility/threat estimation had a strong correlation with OBQ perfectionism/certainty (r = .71). Using the FMPS, they replicated these results, finding that maladaptive perfectionism correlated significantly positive with OCD symptoms, including after controlling for depression symptoms (β = .39).

In addition to positive findings using self-report measures of OC symptoms, experimental studies also have found that perfectionism seems to be associated with OC-relevant behaviors and beliefs. Yiend et al. (2011) conducted a two-part study to determine how perfectionism affects OC behaviors by comparing individuals low and high on perfectionism (as measured by the Dysfunctional Attitudes Scale) on a number of tasks. On a bead sorting task, they found that when provided the opportunity to check their accuracy and correct errors after the task, significantly more individuals in the high perfectionism group chose to check compared to the low perfectionism group (75% vs. 30%). Of those who decided to check, high perfectionists also

spent a significantly longer time checking (d = .79). In a "jumping to conclusions" task (in which participants must determine which bead color is dominant in a bag with a 70/30 ratio), although individuals high in perfectionism took longer, the finding did not reach significance (p = .14; d = .36). There was also a trend toward high-level perfectionists taking out more beads (p = .05; d = .54). It is noteworthy that both comparisons were characterized by moderate effect sizes; this suggests the failure to reach significance may have been due to small sample sizes (both ns = 20). Finally, high perfectionists took significantly longer to complete a copying task (d = 1.43), and their performance was rated as superior by two blind raters (d = 1.83). On the control task of clearing the workstation, there were no significant differences.

In the second part of the study, they tested how a perfectionism manipulation would influence performance on the bead sorting task, which allows for a more direct investigation of the causal role of perfectionism in OC behavior. To manipulate perfectionistic biases, participants read statements that describe imperfect performance in a variety of domains (e.g., academic, social), followed by a word-completion task that pulled for either a positive (non-perfectionistic) or negative (perfectionistic) evaluation (e.g., "You think the job you have done is... p-o-" [poor]). Afterward, participants answered a question about the adequacy of the outcome; those in the perfectionistic induction were required to answer that it was not adequate (those in the non-perfectionistic induction answered that it was). Both before and after the induction, participants completed the bead sorting task. Participants who were trained to make non-perfectionistic interpretations more frequently reduced their time spent checking after the induction (d = 1.05), but the authors found no significant increase in checking for the perfectionistic group. Taken together, these studies demonstrate that high levels of innate

perfectionism are associated with increases in OC-relevant behaviors and that interventions designed to reduce perfectionism may also reduce OC behaviors.

In another study designed to examine how perfectionism influences checking behavior, Kobori and Tanno (2008) selected for high and low perfectionism in a sample of undergraduate students using the HFMPS Self-Oriented Perfectionism Scale. Individuals who scored above the 75th percentile represented the high perfectionism group, and those who scored below the 25th percentile represented the low perfectionism group. Participants then completed an ambiguous decision-making task, similar to the "jumping to conclusions" task used by Yiend et al. (2011). Using a computer interface, participants were asked to decide what color of bead predominated in a jar with a 60/40 ratio, after drawing up to 10 beads to inform their decision. This task was repeated a total of five times, and high and low perfectionism groups were then compared on time taken on the task as well as total beads drawn across trials. The results paralleled those found by Yiend et al. (2011) in that individuals high in perfectionism did not take longer on the task; however, they did draw significantly more beads than individuals in the low perfectionism group (d = .80). Kobori and Tanno suggested that perfectionism may influence how OCD sufferers make decisions about how to terminate information-seeking behavior (e.g., checking behavior).

Finally, perfectionism also appears to be associated with increased feelings of responsibility. In a study examining how perfectionism influences OC behaviors in the context of increased responsibility beliefs, Bouchard, Rheaume, and Ladouceur (1999) compared students with moderate and high levels of perfectionism on a pill-sorting task. Perfectionism was measured by the perfectionistic tendencies subscale of the Perfectionism Questionnaire; scores

below the 40th percentile or above the 90th percentile defined each group, respectively. Responsibility beliefs were manipulated by having participants complete the pill-sorting task twice; participants were informed that the first trial was for practice (the low responsibility condition) but that the second trial may affect the design of an important medicine that was to be distributed in disadvantaged areas (the high responsibility condition). After completing the task, highly perfectionistic participants in the high responsibility condition perceived greater influence over (d = 1.19) and responsibility for (d = .61) negative consequences than moderately perfectionistic participants. However, although the responsibility manipulation led to increased OC behaviors (e.g., checking, hesitations), no significant differences emerged between the moderately and highly perfectionistic groups. So, whereas perfectionism may have played a role in the perception of responsibility for a task (which is thought to be a major cognitive component of OCD), it did not appear to influence behavior. The authors speculated that their manipulation was too effective, such that both groups maximally increased their checking and hesitation to a degree that did not allow for a distinction between perfectionistic groups. Another potential reason for these findings might be inadequate distinction between the moderate and high perfectionism groups. The authors noted that the moderate perfectionists demonstrated relatively high scores on the PQ subscale measuring how much dysfunction they experience as a result of their perfectionism.

The above studies demonstrate that not only does perfectionism correlate with self-report measures of OC symptoms in nonclinical samples but that higher levels of perfectionism may be associated with more OC-relevant behaviors such as checking, hesitations, and information seeking, as well as OC-relevant beliefs, such as an inflated sense of responsibility. However, it is

important to go beyond nonclinical samples and investigate whether perfectionism also shows relations to OC symptoms in a samples meeting full DSM-IV-TR OCD criteria.

Halmi et al. (2005) investigated relations among perfectionism, OCD, and OCPD in a sample of individuals with eating disorders or a history of eating disorder. Despite the high levels of perfectionism that are typical among individuals with a history of eating disorder, diagnoses of either OCD or OCPD were still characterized by elevated perfectionism scores on the FMPS, compared to individuals who did not meet criteria for either disorder. The highest levels of perfectionism were found for those in the comorbid OCD + OCPD group. They also found significant relationships between OCD diagnosis and the parental expectations subscale of the FMPS, indicating individuals with OCD perceived their parents as having high expectations for performance.

To test perfectionism's relationship to specific OCD experiences, Lee et al. (2009) assessed perfectionism using the FMPS in individuals meeting DSM-IV-TR OCD criteria versus nonclinical controls who did not endorse any OCD screening questions on the SCID-I/P. They found that individuals with OCD scored significantly higher on the total perfectionism score (*d* = .53), as well as on the CM, DA, and PC subscales (*ds* = .56-1.05). They also looked at the association of perfectionism with different sensory phenomena that have been associated with OCD (e.g., "just right" experiences, feelings of incompleteness). Participants (both OCD and nonclinical) reporting issues with incompleteness also reported significantly higher scores on almost all of the perfectionism subscales, except for the PC subscale (*ds* > .80). Another group experiencing various forms of "just right" experiences also had significantly higher scores on DA, PS and O, as well as total score (*ds* = .50-.89). One limitation of this study is that by

comparing individuals with OCD vs. non-clinical controls, it did not establish specificity of perfectionism to OCD. Perfectionism looks to be a transdiagnostic phenomenon that is likely to be elevated in several clinical populations. However, a strength of this study is that they demonstrated an association between specific subscales of perfectionism and specific sensory phenomena experienced by individuals with OCD. This helps support the assertion that perfectionism significantly influences the severity and type of OCD experiences, particularly "just right" experiences, and issues with incompleteness.

However, perfectionism may not be equally important to all OCD symptoms. Whereas perfectionism influences OC behaviors such as checking and information seeking in nonclinical groups, perfectionism may have less relevance for contamination and washing-based obsessions and compulsions. Jones and Menzies (1997) used a behavioral task to determine whether cognitive variables such as perfectionism and danger expectancies influenced washing behavior following exposure to an aversive stimulus. Individuals who met DSM-IV criteria for OCD and who presented with primarily contamination/washing symptoms were asked to submerge their hands for as long as possible (up to five minutes) in an aversive stimulus composed of hair, dirt, food scraps, and raw meat. Time spent in contact with the stimulus was recorded, along with the time spent washing afterward. Perfectionism did not correlate with the other cognitive variables (e.g., expectations of becoming ill, responsibility for outcome) nor with duration spent washing after the exposure.

Finally, perfectionism appears to be related to overall symptom severity and treatment outcome in individuals who meet DSM-IV-TR diagnosis for OCD. Chik, Whittal, and O'Neill (2008) conducted a study looking at the association between high levels of perfectionism (as

measured by the FMPS) and pretreatment OCD severity, as well as treatment response (as measured by the clinician-administered YBOCS). They found that after controlling for baseline group differences (e.g., medication status, treatment confidence), as well as for multiple comparisons, the DA subscale of the FMPS correlated significantly with OCD severity, specifically YBOCS compulsions (r = .38), as well as the YBOCS total score (r = .39). Depression (measured by the BDI) also correlated with the CM and DA subscales, as well as YBOCS obsessions, and YBOCS total score (rs = .39-.41).

When considering treatment outcome, they found that higher scores on the DA subscale were associated with higher YBOCS total score and YBOCS compulsions after treatment, as reflected by lower change scores from pre- to posttreatment (βs = -.22-.27). Furthermore, examining cognitive therapy and exposure and response prevention separately, the interaction of the CM and DA scales (CMDA) predicted worse treatment outcome across all three YBOCS measures in individuals receiving ERP (βs = -.33-.37), and DA predicted worse outcome in the YBOCS total score and YBOCS compulsions (βs = -.29), with a trend toward worse outcome for YBOCS obsessions (β = -.28). However, in cognitive therapy, high scores in DA predicted worse scores only in YBOCS compulsions (β = -.26), with no significant effects for CMDA. The authors suggest that perfectionism may be important to assess in individuals with OCD, and for those with higher perfectionism scores, cognitive therapy or elements of cognitive therapy may improve outcome. Interestingly, perfectionism levels themselves did not significantly change across treatment, and the authors speculated that this may be because it was not targeted specifically. Thus, although perfectionism may be a vulnerability factor for OCD, it does not appear to be sufficient for the development of a clinical syndrome. At the same time, the

possibility remains that lingering perfectionistic beliefs may increase the risk of relapse. A strength of this study is that they were able to use a larger sample of individuals with OCD to directly examine correlations between OCD severity and perfectionism instead of relying on mean score differences between OCD and non-OCD or nonclinical samples. In addition, they used a clinician-administered measure of OCD symptoms (the YBOCS) as opposed to a self-report measure.

Thus, the relations between perfectionism and OCD shown in nonclinical samples also extend to samples meeting DSM-IV-TR criteria for OCD. Higher levels of perfectionism are found for individuals with OCD, both compared to nonclinical controls and in samples where all participants also met criteria for an eating disorder. Furthermore, high levels of perfectionism appear to predict certain OC-type cognitive experiences in individuals with OCD, such as feelings of incompleteness and "just right experiences," although perfectionism may be less relevant to other OC experiences such as contamination and washing symptoms. Finally, high levels of perfectionism correlate with increased symptom severity, and are associated with worse outcome following both ERP and cognitive therapy.

Neuropsychological Functioning

In addition to perfectionism, another area of comparison that has not been thoroughly explored in the investigation of OCD and OCPD relations is that of neuropsychological functioning. In general, the literature suggests that some forms of executive functioning are impaired in OCD, although specific findings are somewhat inconsistent. In contrast, there is a

scarcity of research on the neuropsychological functioning in OCPD, although a few studies are discussed below, which suggest OCPD may potentially present with cognitive disorganization (Aycicegi-Dinn, Dinn, & Caldwell-Harris, 2009), poor divergent thinking (Aycicegi, Dinn, & Harris, 2002), and an increased focus on detail over global and contextual cues (Yovel, Revelle, & Mineka, 2005). Given the evidence for potential neuropsychological dysfunction in both disorders, and the interest in relations between these two disorders, a specific comparison of neuropsychological functioning between these groups is warranted. Such an investigation would help to further inform the field on the potential relations between these disorders. Further, to the extent that a shared trait such as perfectionism helps to account for overlap in neuropsychological functioning deficits, it may indicate that this transdiagnostic personality trait is important to assess when investigating neuropsychological functioning.

Although many executive functions have been postulated in the literature, Miyake et al. (2000) proposed a model of executive functioning that consists of three related but separable functions: shifting, updating, and inhibition. Shifting is defined as the ability to switch between different tasks or mental sets. Updating refers to the ability to track and update the contents of working memory. Finally, inhibition involves the ability to inhibit or override a prepotent response. As the authors note, these three functions have been among those most frequently identified and discussed in the literature and represent relatively low-level abilities which may contribute to other, more complex executive functions that have been posed in the literature (e.g., planning). Although they can be distinguished from each other, they are nonetheless related in that each is necessary for broad executive functioning.

Neuropsychological Functioning and OCD

Various neuropsychological correlates of OCD have been studied, although findings in this area are somewhat inconsistent. This may be for a variety of reasons. First, many studies use healthy controls as comparison groups against samples of people with OCD, leaving unanswered the question of whether neuropsychological findings are better attributed to general psychopathology or to OCD specifically. Second, whereas most studies do control for some important confounds (e.g., anxiety, education), important confounds such as depression are sometimes not addressed. In addition, methods for accounting for confounds vary and are hard to compare. Some studies statistically control for confounds or determine that they do not independently correlate with task performance. Others use groups matched on various confounds or demonstrate that group differences are minimal (e.g., that depression in the OCD group is minimal). Finally, many studies do not examine neuropsychological functioning separately for OCD symptom dimensions. This is a problem given the heterogeneity of OCD and literature suggesting that different OC symptom dimensions are associated with different comorbidity patterns as well as emerging evidence for differences in neuropsychological functioning and patterns of brain activity associated with differences in functioning (Leckman et al., 2010).

Harris and Dinn (2003) administered a battery of neuropsychological tests to a group of community controls and individuals meeting DSM-IV-TR OCD criteria; groups did not significantly differ on age or years of education. They found that individuals with OCD produced fewer words than community controls in a fluency test ($\omega^2 = .18$) and fewer alternate uses for an object in a divergent thinking task ($\omega^2 = .09$). Then, in response to their prior findings that

schizotypal traits seemed to explain some of the cognitive performance of individuals diagnosed with OCD, they considered only those individuals who had "primary OCD," defined as OCD without significant schizotypal personality. Individuals with so called "primary OCD" performed worse than community controls on color naming in a Stroop color-word naming test (ω^2s = .24-.27), a go/no-go discrimination task (ω^2 = .23-.25), and an object alternation test (ω^2 = .74). Another study found individuals with OCD demonstrated deficits in response inhibition (*d*s = .98-1.18), delayed memory (*d* = 1.87), learning alternating rules or patterns (*d*s = .53-.68), and the ability to create unique visuospatial designs relative to healthy controls (*d* = .82; Aycicegi, Dinn, Harris, & Erkmen, 2003).

A more rigorous study by Chamberlain et al. (2007) found that individuals who met DSM-IV-TR OCD criteria (with primary washing/checking symptoms) demonstrated impaired set-shifting (*d* = .92) and motor inhibition (*d* = .83) compared to healthy controls with no family history of OCD and matched on age, gender, and verbal IQ. Similar deficits also were found for unaffected first-degree relatives of individuals with OCD compared to healthy controls without a family history of OCD. The performance of OCD relatives and individuals with OCD did not significantly differ on either task. In addition, they also found that individuals with OCD endorsed more OCPD traits than relatives of individuals with OCD (*d* = .76), who endorsed significantly more OCPD traits than non-relatives (*d* = 1.15).

Gu et al. (2008) found evidence for different patterns of brain activity which correlate with impaired task switching on a stimulus discrimination task. For this task, each trial is preceded by a cue indicating the relevant dimension (color or object) for discrimination. Gu et al. examined the performance of 21 individuals meeting DSM-IV-TR OCD criteria compared to 21

healthy controls who were matched on age, IQ, and sex. They found that individuals with OCD committed more errors during task-switching trials (d = .67) and that activation in the orbitofrontal cortex correlated with error rates in healthy controls (r = .63) as well as task-switching costs in individuals with OCD (r = -.53). In addition, orbitofrontal activation was correlated with activation in the anterior cingulate cortex (r = .53) for the OCD group.

Finally, Lawrence et al. (2006) found that in individuals meeting DSM-IV-TR OCD criteria, more severe symmetry and ordering symptoms were correlated with set-shifting deficits on the WCST. Those with more severe symmetry and ordering symptoms completed fewer categories (β = -.38) and made more perseverative errors (β = .36). Potential confounds, such as depression, age, education, estimated verbal IQ, state anxiety, and symptom severity, did not correlate with performance on these measures, suggesting that they were not the driving reason for these findings. Thus, some evidence exists for impaired executive functioning in individuals with OCD, specifically with respect to set-shifting.

In general, OCD symptoms seem to show correlations with executive functioning deficits, such as set-shifting deficits; however, the magnitude of these associations seems to be a matter of debate. Harris and Dinn (2003) speculate some of the inconsistency in the literature may be due to the effect of comorbid conditions on the neuropsychological functioning of individuals with OCD. In addition, Leckman et al. (2010) observed that symptom dimensions have historically not been explored in relation to neuropsychological functioning. Thus, to the extent that different dimensions have different relations with neuropsychological functioning, the inconsistency is perhaps unsurprising.

Neuropsychological Functioning and OCPD

Compared to OCD, neuropsychological functioning in OCPD has been less thoroughly explored in the literature. However, it is an important issue to consider in this debate for a variety of reasons. First, because neuropsychological deficits in OCD could possibly be due to comorbid conditions (Aycicegi et al., 2003; Harris & Dinn, 2003), it is worth exploring whether comorbid OCPD could be contributing to the neuropsychological profile of OCD and, if so, through what mechanism. Perfectionism, one of the major characterizing traits of OCPD (Hummelen et al., 2008; Morey et al., 2004; Sanislow et al., 2002), also influences OCD symptom presentation (Bouchard et al., 1999; Kobori & Tanno, 2008; Yiend et al., 2011) and may potentially contribute to some of the deficits (e.g., in set-shifting) seen in OCD. If there is overlap in neuropsychological functioning between OCD and OCPD, this may suggest a driving role of perfectionism in neuropsychological performance between these two disorders. Similar neuropsychological functioning may even point to shared etiological factors, particularly for similar behavioral symptoms (e.g., symmetry/ordering in OCD vs. preference for orderliness in OCPD). On the other hand, if there is no specific overlap between the neuropsychological profiles of those with OCD symptoms and those with obsessive-compulsive personality traits (OCPTs), that will provide another domain which distinguishes these two disorders, as well as a better understanding of how traits associated with OCPD, such as rigidity, attention to details, and perfectionism, might influence performance. For instance, rigid perfectionism and attention to details may lead individuals to focus on task-irrelevant features; to slow their responses out of

an overconcern about mistakes; and to engage in tasks in a rigid, inflexible manner -- all of which could impair task performance.

Only a few studies looking at neuropsychological functioning of individuals with OCPTs were found at the time of this writing. For instance, a PsycINFO search using the terms *cognitive ability, cognitive impairment*, or *neuropsychological assessment* combined with the term *OCPD* resulted in only three English-language results. One study found that elevated OCPTs in college students correlated with poorer cognitive organization and poorer delayed memory as measured using the copy organization and recall accuracy measures of the Rey-Osterrieth Complex Figure Task (Rey & Osterrieth, 1993). During this task, participants were asked to copy a complex figure and then reproduce the figure from memory after a 1-minute delay. Individuals with elevated OCPTs showed no differences in copy accuracy; however, after controlling for OCD symptoms, individuals with elevated OCPTs had poorer delayed recall of the figure (d = .57). In addition, after controlling for both OCD symptoms and depressive symptoms, individuals with OCPTs still demonstrated poorer copy organization, as measured by how many basic elements of the figure were reproduced as an unfragmented whole (d = .60; Aycicegi-Dinn et al., 2009).

Another study looked at OCPTs, schizotypal personality traits (SPTs) and neuropsychological functioning and found that OCPTs and SPTs in clinically referred individuals meeting OCD criteria were associated with worse performance on a trail-making task (d = .92), which requires participants to rapidly draw a line connecting randomly placed letters and numbers in an ascending and alternating pattern (e.g., 1-A-2-B-3-C), and on a divergent thinking task (d = .84). The results with the divergent thinking task parallel Harris and Dinn's (2003) finding that individuals with OCD demonstrated poor divergent thinking. However, in

contrast to the findings with OCD, OCPT/SPTs correlated with increased performance on the object alternation task (d = 1.08; Aycicegi et al., 2002).

Finally, Yovel et al. (2005) showed that OCPTs are significantly correlated with an orientation to detail. Participants completed a decision-making task in which they responded to the letter indicated either by the overall shape of the figure (global characteristics) or by the smaller letters that made up the overall figure (local characteristics). Congruent trials had target letters matching (e.g., a T made up of smaller Ts), neutral trials had a rectangular O shape at the unattended level (e.g., a T made up of Os or an O made up of smaller Ts), and conflicting trials included conflicting target letters at both levels (e.g., a T made up of smaller Hs). In most cases, research with this task demonstrates a bias towards global characteristics, shown both by quicker reaction times to trials asking participants to attend to the global level and by a slowing of response during local-level trials when the unattended global level conflicted with the local characteristics. However, Yovel et al. found that OCPTs correlate with a stronger local interference effect than normal. That is, when the local level was the unattended level and contained targets that conflicted with the attended global level, OCPTs predicted increased response times (r = .33; Yovel et al., 2005).

Based on this review, it is clear that both OCD and OCPD show some deficits that reflect issues with cognitive flexibility, rigidity, and attention to detail. Thus, this study intends to raise the question of whether perfectionism might be a common mechanism for some of the cognitive deficits seen in OCD and OCPD and in the potential relations between these disorders. It may be that perfectionism reflects a cognitive style that includes a preoccupation with flaws, details, and

order in the service of reaching for perfection. This may bias perfectionists' attention as well as use up valuable cognitive resources, which could lead to a slowing on cognitive tasks.

The Current Study

The current study looks to shed light on the continuing debate between OCD and OCPD in a couple of different ways. First, it seeks to examine how perfectionism, a primary criterion of OCPD and a potentially transdiagnostic trait relevant to OCD and other pathology, could contribute to the understanding of comorbidity across OCD symptoms and OCPD traits. If the comorbidity between these disorders is best characterized by shared perfectionism, that may point to the need for targeted perfectionism assessment in OCD rather than an assessment of the broader construct of OCPD.

Whereas some studies have found different clinical presentations for individuals with OCD + OCPD relative to those with OCD – OCPD, there is evidence to suggest that some of these differences may be attributable to overlapping criteria (e.g., OC ordering symptoms with OCPD preoccupation with orderliness) or possibly to a shared vulnerability factor, such as perfectionism. For instance, a study of treatment response in individuals with OCD + OCPD found that the OCPD criterion reflecting rigid perfectionism correlated as strongly with post-treatment symptom severity as the overall number of OCPD traits endorsed; another study found perfectionism significantly correlated with worse treatment outcome in individuals with OCD. By examining the relations among perfectionism, OCD symptoms, and OCPD traits at different levels of specificity, this study hopes to add to the literature by more clearly determining whether

OCPD traits remain significantly associated with OCD symptoms even after accounting for the shared third variable of perfectionism.

Another way this study seeks to contribute to the literature is by comparing patterns of associations between neuropsychological functioning and both OCD symptoms and OCPD traits. Neuropsychological functioning has been a topic of interest in individuals with OCD, and whereas results are somewhat inconsistent, there is evidence to suggest impairment in visuospatial abilities, executive functioning, and motor speed (Tükel et al., 2012). Meanwhile, neuropsychological functioning has been less studied in OCPD, but there is some evidence to suggest individuals diagnosed with OCPD may show excessive attention to detail, cognitive disorganization in figure-copying tasks, and impairments on a trail-making task and a test of divergent thinking (Aycicegi et al., 2002; Aycicegi-Dinn et al., 2009; Yovel et al., 2005). Thus, given that there is some evidence for what may be conceptualized as neuropsychological dysfunction in both disorders, a specific comparison of neuropsychological performance between OCD symptoms and OCPD traits is warranted and may provide more evidence regarding potential relations between these disorders. Furthermore, given perfectionism's relations to both disorders, as well as theoretical associations with rigidity, inflexibility, and other task orientations that may impair performance, the potential impact of trait perfectionism on neuropsychological functioning warrants investigation.

The current study examines these questions by first assessing for OCD symptoms, OCPD traits, and perfectionism and then assessing neuropsychological performance. This study based measurement of neuropsychological functioning on the three executive functions proposed by Miyake et al. (2000). There are a number of reasons for this. First, this model specifically

includes the primary function of interest, set-shifting. Second, it offers the breadth necessary for assessing broader executive functioning and its relation to symptoms or traits of either condition. Third, as noted above, these executive functions are well studied and frequently identified in the literature; by assessing for stable and broad executive functions, rather than the more circumscribed or complex functions (e.g., error monitoring, planning), a broad assessment of executive functioning can be completed while remaining feasible for a study of this scope. As such, the battery includes tests of task switching, working memory (i.e., updating), and inhibition. Because neuropsychological functioning is complex, most neuropsychological tasks involve more than one area of functioning. Assessment of working memory and inhibition allowed for the examination of functioning in these domains for both groups, as well as the ability to control for possible confounds in set-shifting performance.

Hypotheses

H1: OC symptoms will correlate positively with perfectionism. This is based on empirical evidence of relations between perfectionism and OC symptoms.

H2: Non-perfectionism OCPD traits will correlate positively with perfectionism. Since perfectionism is a formal criterion of OCPD, perfectionism content will be eliminated from OCPD assessment in order to reduce the potential impact of criterion contamination.

H3: OC symptoms will correlate positively with OCPD traits. This is based on reported comorbidity rates and overlap between specific OC symptom dimensions and OCPD traits.

H3a: The OCD-OCPD relationship will be strongest for OC symmetry and ordering symptoms. This is based on literature supporting increased OC symmetry and ordering symptoms in individuals with comorbid OCD and OCPD.

H4: Perfectionism will partially account for relations between OC symptoms and OCPD traits. This is based on treatment-outcome studies supporting perfectionism's critical role in predicting treatment response for OCD in individuals with comorbid OCPD traits.

H5: OC symptoms will correlate negatively with performance on set-shifting tasks. This is based on empirical evidence supporting set-shifting deficits in individuals meeting diagnostic criteria for OCD.

Exploratory Hypotheses

H6 and H7: Both OCPD traits and perfectionism will show a negative correlation with performance on the cognitive flexibility tasks. These hypotheses are based on the theory underlying perfectionism and its connection to rigidity and inflexibility, as well as on the few studies that investigated neuropsychological functioning in OCPD.

CHAPTER 2

METHOD

Participants

Psychology undergraduates at Northern Illinois University were recruited to participate in the IRB-approved study in partial fulfillment of a class research exposure requirement. Of 134 total participants, 28 were excluded prior to analyses for one or more of the following reasons: (a) diagnosis of a neuropsychological condition (n = 11); (b) speaking English as a second language (n = 1); (c) age over 25 (n = 3); (d) left-handedness (n = 3); (e) color blindness (as color perception is necessary for both WCST and CWI; n = 3); (f) missing age (as age is necessary to calculate standard scores on tasks; n = 8). During data cleaning, one additional participant was excluded due to extreme scores on three out of five of the EF measures. The final sample consisted of 105 participants, with a mean age of 19.4 years (SD = 1.6). Fifty-two percent were female; 45% were Caucasian, 19% African American, 18% Hispanic, 9% Asian American, and 9% multi-racial or "other." This racial diversity generally is consistent with the university's broader student body.

Measures

Demographic Characteristics

The Demographics Questionnaire was 20 items long and assessed for basic descriptive statistics (e.g., race) as well as key variables that may have an impact on neuropsychological performance (e.g., years of education, age). Two variables in particular are worth mentioning. The first is handedness. On timed tasks requiring a motor response (i.e., computer-based responses, writing), normative data are often based on a primarily right-handed sample. Left-handedness may impact the ease of computer-based responses or alter the difficulty in responding to visual arrays designed for responses from right-handed examinees. As such, left-handed participants were excluded from analyses. The second involves comorbid neuropsychological disorders (e.g., ADHD, seizure disorders). Given the broad impact of these disorders on neuropsychological functioning, and their potential to confound analyses, individuals who endorsed a prior neuropsychological diagnosis were excluded from analyses. See Appendix A for the full measure.

OCD Symptoms

The Obsessive-Compulsive Inventory, revised (OCI-R; Foa et al., 2002) is an 18-item self-report OCD symptom questionnaire. Items fall into one of six 3-item subscales: Washing, Checking, Ordering, Obsessing, Hoarding, and Neutralizing. The items can also be summed to

obtain a total score, although the DSM-5's inclusion of a distinct Hoarding Disorder (APA, 2013) suggests the Hoarding subscale should be omitted from the OCI-R total score. Respondents are asked to report how much they have been bothered by specific experiences or symptoms on a 5-point scale ranging from 0 (*Not at all*) to 4 (*Extremely*). The OCI-R subscales obtained coefficient alphas ranging from .76 to .89 across two large student samples (Wu & Carter, 2008). The OCI-R also shows good convergent validity; the OCI-R total score correlated strongly positively with other measures of OCD symptoms including the Y-BOCS (r = .53), the GOCS (r = .66) and the MOCI (r = .85; Foa et al., 2002). However, it did not show strong discriminant validity, as seen by high correlations with depression symptoms as measured by the HRSD (r = .58) and the BDI (r = .70). In this study, the OCI-R will provide a means of measuring OCD symptom dimensions and overall symptom severity. In addition, the use of the OCI-R anchors this study to a large body of literature which has also used the OCI-R to examine OC symptoms in nonclinical and student samples.

OCPD Traits

The Schedule for Nonadaptive and Adaptive Personality (SNAP-2; Clark et al., in press) is a 390-item self-report questionnaire designed to assess personality traits and general affect. The SNAP-2 includes 15 trait and temperament scales (e.g., Disinhibition, Entitlement, Propriety) as well as 12 diagnostic scales which allow for the assessment of PD criteria for DSM-IV-TR. Of note, the formal PD model and criteria did not change in the DSM-5 (APA, 2013); as such, the SNAP-2 can also be considered an assessment for DSM-5 PDs. Individual

criteria are generally assessed with two to five items, with the criterion considered met if respondents endorse a predetermined number of the relevant items. This allows for the calculation of a dimensional score for the disorder (a sum of the endorsed items relevant to that disorder), a criterion count (how many diagnostic criteria were met for each disorder), or a categorical diagnosis (whether they met sufficient criteria for each disorder). Finally, there are also six validity scales that look at responding across content-paired items to check for problematic response patterns such as careless, socially desirable, or defensive responding. For the diagnostic scales of the SNAP-2, coefficient alphas ranged from .69 to .87, with the coefficient for OCPD anchoring the low end with an alpha of .69. The SNAP-2 also converged with interview-based PD assessment; using dimensional scoring for both, correlations ranged from .42 to .76 (the correlation coefficient for OCPD was .62). Regarding divergent validity, correlations were almost universally highest between corresponding diagnostic scales; exceptions were the SNAP schizotypal and passive-aggressive scales, both of which obtained higher correlations with interview-based assessment of borderline PD than their corresponding scales. Although not directly relevant to the current study, Clark et al. (in press) reported adequate retest reliability, with median values ranging from .83 to .88 across intervals ranging from one week to six months (values for the OCPD scale ranged from .75 to .84).

Perfectionism

The Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) is a 35-item self-report questionnaire designed to assess the personality trait of perfectionism. These items

make up six scales, supported by factor analysis: Concern over Mistakes, Organization, Parental Criticism, Personal Standards, Doubting, and Parental Expectations. Each item asks respondents to read a statement relevant to perfectionistic concerns and indicate how strongly they agree on a 5-point scale ranging from "strongly disagree" to "strongly agree." It can also be scored to give measures of adaptive perfectionism and maladaptive perfectionism. The FMPS shows good internal consistency, with alpha coefficients ranging from .77 to .93 and a coefficient alpha of .90 for the overall scale. With the exception of the Organization subscale, other FMPS subscales show strongly positive correlations with other measures of perfectionism and low to moderately positive correlations with a measure of psychopathology (the Brief Symptom Inventory; *r*s ranging from .01 to .61) and measures of depression (*r*s ranging from .03 to .61). Although evidence exists for stable four- and five- factor solutions for the FMPS, this study is primarily concerned with the negative impacts of perfectionism and will aim to use the more parsimonious two-factor solution implied by Frost et al. (1993). This two-factor solution splits perfectionism into factors representing positive striving and maladaptive evaluative concerns. Both factors demonstrated good internal consistency in a student sample, with alpha coefficients of .81 for positive striving and .92 for maladaptive evaluative concerns (Wu & Cortesi, 2009).

Depression Symptoms

The Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report questionnaire designed to assess the presence and severity of depressive symptoms. Each item represents a symptom (e.g., *self-dislike*), and the respondent is asked to indicate which of

four statements they agree with, where the statements range from endorsing low or absent symptomatology (e.g., *I feel the same about myself as ever*, scored as 0) to high symptomatology (e.g., *I dislike myself*, scored as 3). These answers can then be summed to give a total score, with higher scores indicating more severe depressive symptoms. The BDI-II shows excellent reliability, with coefficient alphas of .92 and .93 in outpatient and student samples, respectively. Test-retest correlations after a week were also excellent, with r = .93. The BDI-II also correlates highly with other measures of depression, including a correlation of .93 with the original BDI. The BDI will provide a way of measuring depression so that its impact on neuropsychological functioning can be controlled for in analyses.

Anxiety Symptoms

The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) is a 21-item self-report questionnaire designed to assess symptoms of anxiety by asking respondents to indicate how much they've been bothered by specific symptoms, on a scale from 0 (*Not at all*) to 3 (*Severely - I could barely stand it*). Item scores are then summed to give a total score ranging from 0 to 63. This scale shows high internal consistency, with an alpha coefficient of .92. Test-retest correlations were .75 after one week. The BAI also correlates well with other measures of anxiety and is capable of distinguishing anxious patients from non-anxious patients. One threat to discriminant validity is that the BAI does correlate moderately with the BDI (r = .48); however, this is within the range of correlations typically found between the BDI and other measures of anxiety (Beck et al., 1988). For the purposes of this study, distinctions between

depression and anxiety are not crucial; both will be used as controls in analyses involving neuropsychological functioning.

Set-Shifting

The Wisconsin Card Sorting Test (WCST; Heaton, Chelune, Talley, Kay, & Curtiss, 1993) is a computerized task designed to measure executive functioning. More specifically, it taps into the ability to reason abstractly and the ability to shift cognitive sets, or change cognitive strategies in response to changing reinforcement. For this study, it is being used as a second measure of set-shifting. Examinees are presented with 64 response cards that display figures that vary in number, form, and color. They are then asked to match these cards with one of four initial stimulus cards. A correct response varies depending on whether the current rule is to match cards by number, form, or color, although these rules are not disclosed to examinees. Instead, examinees are only informed after each card whether or not they sorted the card correctly. After a predetermined number of correct responses, the sorting rule changes without warning; the examinee must then attempt to figure out the new rule based on the feedback. Based on response patterns, several performance scores can be calculated to assess how effectively the examinee shifted strategies in response to shifting rules. This measure shows excellent reliability, with inter-scorer agreement across the outcome scores ranging from .88 to .93 in experienced administrators and .75 to .97 in inexperienced administrators. Intra-scorer reliability was also high, with correlation coefficients ranging from .91 to .96. Performance on the WCST has been

shown to be sensitive in identifying frontal lobe injury and correlates with various other measures of neuropsychological functioning (Heaton et al., 1993).

The Trail Making Test (TMT; Delis, Kaplan, & Kramer, 2001) is a paper-and-pencil subtest from the Delis-Kaplan Executive Functioning System (D-KEFS) and measures informational processing as well as set-shifting ability (e.g., Rohlf et al., 2012); in this study, it is used as one of two measures of set-shifting. This test includes four baseline trials that assess for deficits in more basic cognitive skills (e.g., sequencing, motor control). For the main trial of the Trail Making test, examinees are given a sheet of paper with randomly placed circles containing numbers 1-16 and letters A-P. They are then asked to draw lines to connect the numbers and letters as quickly as possible in ascending and alternating order (i.e., 1-A-2-B-3-C). This requires examinees to alternate between sequencing numbers and sequencing letters, and time taken to complete this task is considered an indicator of set-shifting performance. The TMT has been shown to be sensitive to deficits associated with fetal alcohol syndrome (FAS); children with FAS obtained similar scores on baseline trials but significantly lower scores on the main trial (Letter-Number Switching condition; Delis et al., 2001).

Working Memory

The Letter Number Sequencing Test (LNS; Wechsler, 2008) is a verbally administered subtest from the Wechsler Adult Intelligence Scale (WAIS) and is used as one of two measures of working memory. In this test, examinees listen to a sequence of numbers and letters which is read aloud by the experimenter. They are then asked to repeat these back to the experimenter,

listing the numbers in numerical order, followed by the letters in alphabetical order. Trials begin with one letter and one number each and gradually increase in number of items. The LNS obtained an average split-half reliability coefficient of .88 across a large normative sample and test-retest reliability coefficient of .76 for examinees ages 16-29. The LNS shows good convergent validity, correlating .56 and .69 with other working memory subtests from the WAIS. It also showed adequate discriminant validity, as demonstrated by lower overall correlations with unrelated subtests of the WAIS (*r*s = .36 to .48; Wechsler, 2008).

The N-Back Task is a computerized task also measuring working memory ability (e.g., Vuontela et al., 2013). In this task, individuals are asked to pay attention to a changing visuospatial or auditory stimulus. In the 1-back task, the examinee is asked to indicate when the current stimulus matches the one that immediately preceded it (e.g., in the sequence 1, 2, 4, 4, individuals would respond to the second 4). In the 2-back task, the examinee is asked to indicate when the stimulus matches the one that came two instances before it (e.g., in the sequence 1, 2, 4, 2, examinees would respond to the second 2). As the number increases, so does the load on working memory, as individuals must compare the current stimuli to information in working memory as well as store the current stimuli for later comparison. Jaeggi, Buschkuehl, Perrig, & Meier (2010) noted that the status of the N-Back Task as a pure measure of WM is under debate. However, they also cited research demonstrating that practice on the N-Back Task improves performance on simple measures of working memory (e.g., digit span). Jaeggi et al. also hypothesize that the N-Back Task's failure to correlate with more complex forms of working memory (e.g., a reading span task, in which participants must recall the last words of a series of sentences) may be due to differences in the memory processes required by each task (i.e.,

recognition vs. active recall). They also note that the straightforward manipulation of cognitive load in the N-Back Task and its relationship with measures of fluid intelligence both make the N-Back Task a useful experimental measure for WM processes. Furthermore, a principal components analysis on several neuropsychological tests indicated that *d'* (Hit Rate - False Alarms) on a 2-back task loaded .63 on a factor that also included letter-number sequencing and digit span, both of which are classic measures of WM (Haatveit et al., 2010). The 2-back *d'* value obtained loadings of less than .3 on other factors.

Inhibition

The Color-Word Interference Task (Delis, Kaplan, & Kramer, 2001) is a paper-and-pencil subtest from the D-KEFS measuring cognitive flexibility and the ability to inhibit a prepotent response (e.g., Cothran & Larsen, 2008); for this study, it is used as the operational definition of inhibition. This task essentially replicates the procedure for the well-known Stroop task (Golden, 1978; Stroop, 1935). In the main trial for this task, displays consist of printed color words displayed in different colors of ink. Examinees are asked to either read the color word or to indicate the color of ink in which the word is printed. When the color word and the ink color are incongruent, this requires the examinee to inhibit the irrelevant response. Because reading is an over-learned behavior, successful performance on the CWI task requires the ability to inhibit the more automatic reflex of reading in order to name an ink color which is incongruent with the printed color word. The CWI obtained an average test-retest coefficient of .75 in a large normative sample. The classic Stroop task, which the CWI is modeled after, has obtained test-

retest coefficients ranging from .67 to .88 for the color, word, and interference scores (Franzen, Tishelman, Sharp, and Friedman, 1987; Jensen, 1965), and a broader review article by MacLeod (1991) characterized the Stroop task as possessing reasonable reliability.

Procedure

Interested participants signed up for this study using an online study management system called SONA. On SONA, students are able to view details about the study, and if they are interested, they may sign up to participate. Sessions were in person and one-on-one, each lasting approximately two hours. Following initial informed consent, participants completed questionnaires and neuropsychological tasks. Order (questionnaire first or neuropsychological tasks first) was counterbalanced. A mandatory break of 5-10 minutes was provided between the questionnaires and neuropsychological tasks to counteract participant fatigue. At the end of the study, participants were given a debriefing statement and provided a chance to ask questions about their experience of the study.

CHAPTER 3

RESULTS

Prior to the main analyses, all variables were examined through various IBM SPSS programs. Cognitive variables were first examined for accuracy of data entry by spot checking the entry of several cases and checking the mean and range of obtained values. Next, variables were examined for the proportion and distribution of missing values. Prior to handling missing data, Little's MCAR test was conducted and was non-significant ($p > .99$), suggesting the data were missing completely at random (MCAR). For neuropsychological tasks, a single missing value on the TMT and three missing values on the WCST were replaced by their corresponding means. For the N-Back Task, 10 cases (9.4%) did not obtain a valid score and were treated as missing. As such, multiple imputation was used to impute these 10 values. For questionnaires, a total of 203 values (1.6%) were imputed across the OCI-R (2 values; 0.1% missing), the SNAP-OCPD (37 values; 1.4% missing), FMPS (112 values; 3% missing), BAI (10 values; 0.4% missing), and BDI (42 values; 1.9% missing). Missing values on individual questionnaire items were imputed using IBM SPSS multiple imputation; this protected the integrity of the data by allowing for existing data to contribute to both (1) prediction of missing data and (2) calculation of questionnaire scales and total scores. A total of five imputations were performed.

Following multiple imputation of questionnaire items and the N-Back Task, questionnaire totals were calculated, and all variables were then screened for the fit between their

distributions and the assumptions necessary for multivariate analyses (i.e., multiple regression) used to test main hypotheses (e.g., multivariate normality). Among neuropsychological variables, TMT, CWI, and LNS were all significantly skewed (negative for TMT and CWI, positive for LNS) and leptokurtotic. Violations of normality were confirmed for TMT through a visual inspection of the frequency distribution; in contrast, a visual examination of frequency distributions for CWI and LNS suggested normality assumptions were affected by significant outliers. One case with extremely low *z*-scores on three variables (*z*s < -3.0; WCST perseverative errors, TMT, and CWI) was found to be a univariate outlier on three of five neuropsychological variables and was deleted from further analysis. Another case with an extremely high *z*-score on LNS ($z = 4.28$) was found to be a univariate outlier. In order to preserve data while reducing the influence of this outlier, the value was transformed to be one unit higher than the nearest non-outlier. This allows deviant scores to remain deviant while still reducing their influence on analyses (Tabachnick & Fidell, 2012). The resulting distribution for the LNS was no longer skewed but remained leptokurtotic. The resulting distribution of the CWI remained negatively skewed and leptokurtotic. To improve pairwise linearity and to reduce extreme negative skewness and leptokurtosis, both CWI and TMT were reflected, square-root transformed, and reflected again. Both resulting distributions were no longer skewed but remained leptokurtotic.

Among questionnaire variables, and as would be expected in a student sample, the OCI-R total score, OCI-R subscales, BDI, and BAI were all negatively skewed, and all except the OCI-R Ordering subscale and BAI were leptokurtotic. All scores were square-root transformed, which was sufficient to normalize all variables except for OCI-R Washing and Neutralizing subscales, which retained moderate positive skewness. Stronger transformations (i.e., log transformations)

for the OCI-R total score and subscales required all total scores to be greater than zero. Given that the original item-level range is from 0 to 4, all items were shifted up one point to provide a 1 to 5 scale, with minimum possible subscale scores of 3, total score of 18. However, following these adjustments, log transformations were no more effective than square-root transformations on the original scores; as such, analyses were run only using the square-root transformed variables.

Most of the scales used in this study demonstrated acceptable internal consistency (operationalized as alphas > .70, considering their length). Generally, coefficient alphas were impacted modestly, if at all, by imputation of missing scores (i.e., at most .01). However, the SNAP-OCPD scale was affected more substantially, with a coefficient alpha of .71 pre-imputation and .74 post-imputation. When three items were removed from the SNAP-OCPD scale in order to address potential collinearity surrounding perfectionism in analyses involving both the SNAP-OCPD scale and the FMPS, the alpha coefficient for the resulting non-perfectionism OCPD scale (NP-OCPD) was only .66 pre-imputation, as contrasted with .71 post-imputation. Whereas both thus demonstrated acceptable internal consistency post-imputation, it is notable that both demonstrated low average inter-item correlations (both .10). Regarding the increase in reliability following multiple imputation, two possibilities are worth considering. First, multiple imputation utilizes linear relationships between variables when imputing missing values. As a result, shared variance between individual scale items and other variables in the data set may have been incorporated into imputed values, artificially bolstering the alpha value for the scale post-imputation. Second, the imputation of missing values allowed for 18 additional

participants to be included in calculating Cronbach's alpha; this may have helped to increase the reliability coefficient in the imputed dataset.

It is also noteworthy that problems with skew are evident for the OCI-R, BDI, and BAI through sizeable discrepancies between the mean and median for these scales. Thus, although there was generally a broad range of scores obtained on each of these measures, most scores clustered toward the low end of the distribution. Leptokurtosis is similarly evident in three out of five of the EF tasks, particularly when examining the lower, middle, and higher quartiles for the distribution. Again, although a broad range of scores was obtained (e.g., scaled scores from 3 to 16 on the CWI task), most of these clustered at the center of the distribution (e.g., lower quartile of 10 and upper quartile of 12 for the CWI). Questionnaire and EF task descriptive statistics can be found in Tables 1 and 2, respectively.

Table 1

Questionnaire Descriptive Statistics

Variable	*M*	*SD*	Median	Possible Range	Obtained Range	A	AIC
Obsessive-Compulsive Inventory – Revised[1] (15 items)	10.2	9.3	7	0-60	0-49	.91	.40
Washing (3 items)	1.6	2.3	1	0-12	0-11	.81	.59
Checking (3 items)	2.0	2.3	1	0-12	0-10	.77	.54
Ordering (3 items)	3.1	2.8	2	0-12	0-11	.89	.74
Obsessing (3 items)	2.2	2.6	2	0-12	0-12	.85	.65
Neutralizing (3 items)	1.2	2.0	0	0-12	0-10	.76	.52
SNAP-OCPD Scale (25 items)	12.6	4.4	13	0-25	1-21	.74	.10
Non-Perfectionism OCPD[2] (22 items)	10.9	3.9	11	0-22	1-19	.71	.10
Frost Multidimensional Perfectionism Scale[3] (29 items)	84.9	18.3	84	29-145	42-133	.92	.29
Positive Perfectionism (7 items)	24.7	5.0	25	7-35	11-35	.82	.39
Negative Perfectionism (22 items)	60.2	15.3	59	22-110	26-102	.92	.34
Beck Depression Inventory (21 items)	11.1	10.0	9	0-63	0-51	.93	.38
Beck Anxiety Inventory (21 items)	13.2	11.9	10	0-63	0-54	.93	.40

Note. $N = 105$. [1]Total score omits Hoarding subscale. [2]Modified SNAP-OCPD, which omits three perfectionism items. [3]Total score omits Organization subscale. A = Coefficient Alpha. AIC = Average Inter-item Correlation. SNAP = Schedule for Nonadaptive and Adaptive Personality. OCPD = Obsessive-Compulsive Personality Disorder.

Table 2

Task Performance

Variable	*M*	*SD*	Range	Percentiles		
				25th	50th	75th
Wisconsin Card Sorting Test, Perseverative Errors	115.6	14.0	78-146	109	115	124
Trail Making Test	10.1	2.4	1-14	9	11	12
Color Word Interference - Inhibition	10.8	2.4	3-16	10	11	12
Letter Number Sequencing	9.6	1.8	4-15	8	10	10
N-Back Task	2.8	0.7	1-5	2	3	3

Note. $N = 105$. N-Back Task score reflects the maximum n-back level reached within 10 trials. All other task scores represent standard / scaled scores.

Correlations Between OCD Symptoms, OCPD Traits, and Perfectionism

Zero-order correlations were computed next in order to test Hypotheses 1-3. As hypothesized, the FMPS was significantly positively correlated with both the OCI-R (r = .41; p < .001) and NP-OCPD (r = .53; p < .001). Likewise, the OCI-R correlated positively with the full SNAP-OCPD (r = .43; p < .001). When examined separately, both FMPS subscales correlated significantly and positively with other measures of psychopathology, with FMPS Negative generally obtaining slightly stronger correlations than FMPS Positive, including a statistically significant difference for the BDI (rs = .27 vs. .51; p = .003) and a trending difference for the BAI (rs =.28 vs. .40; p = .07). The SNAP-OCPD scale was an exception in that it trended toward correlating more strongly with positive perfectionism (r = .54) than negative perfectionism (r = .42; p = .07). Finally, predicted relationships between the SNAP-OCPD and OCI-R subscales were partially supported. Correlations were compared using the z-test recommended by Meng, Rosenthal, and Rubin (1992); the SNAP-OCPD obtained stronger correlations with OCI-R ordering (r = .45) than three out of four other OCI-R subscales (r = .23 to .26; ps ≤ .02), with the exception being OCI-R washing (r = .35; p = .11). Thus, the expected interrelations among perfectionism, OCD symptoms, and OCPD traits were supported. The full correlation matrix is displayed in Table 3.

Table 3

Zero-Order Correlation Matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. OCI-R[1]	-																
2. Wash	.78*	-															
3. Check	.69*	.44*	-														
4. Order	.84*	.57*	.50*	-													
5. Obsess	.78*	.61*	.36*	.53*	-												
6. Neutral	.72*	.51*	.45*	.53*	.50*	-											
7. SNAP	.43*	.35*	.23†	.45*	.24†	.26*	-										
8. SNAP-NP	.43*	.35*	.23†	.44*	.26*	.28*	.98*	-									
9. FMPS[2]	.41*	.34*	.27*	.31*	.34*	.34*	.50*	.53*	-								
10. FMPS Pos	.34*	.29*	.17	.30*	.20†	.24†	.54*	.54*	.70*	-							
11. FMPS Neg	.38*	.31*	.27*	.28*	.35*	.33*	.42*	.46*	.97*	.51*	-						
12. BDI	.49*	.40*	.32*	.36*	.49*	.26*	.27*	.30*	.50*	.27*	.51*	-					
13. BAI	.42*	.37*	.26*	.31*	.43*	.24†	.30*	.34*	.42*	.28*	.41*	.60*	-				
14. WCST	.23†	.17	.13	.21†	.13	.13	.17	.17	-.01	.14	-.06	.00	-.01	-			
15. TMT	.00	-.01	.07	.01	-.07	-.02	-.01	-.03	-.02	.07	-.04	-.07	-.15	.28*	-		
16. CWI	-.05	-.08	.09	-.01	-.14	-.12	-.16	-.15	-.11	-.08	-.11	-.04	-.05	.15	.42*	-	
17. LNS	.01	.04	.06	-.01	-.07	.06	-.02	-.02	-.08	.06	-.12	-.20†	-.21†	.22†	.24†	.18	-
18. N-Back	.04	.01	.01	.09	-.03	.10	-.03	-.02	.02	.13	-.02	-.13	.03	.39*	.34†	.33*	.19

Note. $N = 105$. [1]Total score omits Hoarding subscale. [2]Total score omits Organization subscale. *$p < .01$; †$p < .05$. OCI-R = Obsessive-Compulsive Inventory—Revised Total Score; SNAP = Schedule for Nonadaptive and Adaptive Personality Obsessive-Compulsive Personality Disorder; SNAP-NP = Non-Perfectionism OCPD (modified SNAP-OCPD scale which removes three perfectionism items); FMPS = Frost Multidimensional Perfectionism Scale; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; WCST = Wisconsin Card Sorting Test; TMT = Trail Making Test; CWI = Color Word Interference; LNS = Letter Number Sequencing.

Hierarchical Regressions Testing Perfectionism's Role in Predicting OCD Symptoms

Next, hierarchical regressions were conducted to test Hypothesis 4, that perfectionism can account for correlations between OCD symptoms and OCPD traits. Both subscales of the FMPS were entered first, followed by the modified NP-OCPD scale. Results were that both FMPS Negative and the NP-OCPD scale contributed significantly to the prediction of the OCI-R total score (βs = .210 and .299; ps < .05 and .01, respectively; see Table 4). Change in R^2 was significant for the second step of the analysis, demonstrating that the NP-OCPD scale added significant incremental validity in the prediction of OCI-R total scores, above and beyond the FMPS subscales.

Table 4

Hierarchical Regressions Predicting Obsessive-Compulsive Inventory—Revised[1] Control Variables Excluded

Variable	*B*	*SE(B)*	β	ΔR^2
Step 1				.175*
FMPS Positive	0.059	0.032	.194	
FMPS Negative	0.029	0.010	.285*	
Step 2				.059*
FMPS Positive	0.022	0.034	.072	
FMPS Negative	0.021	0.010	.210†	
NP-OCPD	0.117	0.042	.299*	

Note. N = 105. [1]Score omits hoarding subscale. *p < .01; †p < .05. NP-OCPD = Non-Perfectionism OCPD (modified SNAP-OCPD scale which removes three perfectionism items); FMPS = Frost Multidimensional Perfectionism Scale.

Following this, a more stringent test was applied, wherein scores on the BDI and BAI were entered as a first step to control for the potential confounds of depressive and anxious symptoms. Only the BDI and NP-OCPD predicted the OCI-R total score (βs = .310 and .247; $p <$ .01 and .05 respectively; see Table 5). Standardized beta weights for the BAI and both subscales of the FMPS were nonsignificant. These analyses support a positive relationship between non-perfectionism OCPD traits and OCD symptoms, contrary to Hypothesis 4. Although negative perfectionism explained variance above and beyond non-perfectionism OCPD traits, this relationship was no longer significant in a model including symptoms of depression and anxiety.

Table 5

Hierarchical Regressions Predicting Obsessive-Compulsive Inventory--Revised[1] Control Variables Included

Variable	*B*	*SE(B)*	β	ΔR^2
Step 1				.264*
BDI	0.371	0.108	.367*	
BAI	0.170	0.091	.201	
Step 2				.040
BDI	0.314	0.114	.311*	
BAI	0.132	0.091	.155	
FMPS Positive	0.054	0.030	.175	
FMPS Negative	0.007	0.011	.072	
Step 3				.040†
BDI	0.313	0.112	.310*	
BAI	0.101	0.089	.119	
FMPS Positive	0.024	0.032	.078	
FMPS Negative	0.002	0.011	.024	
NP-OCPD	0.097	0.040	.247†	

Note. $N = 105$. [1]Score omits hoarding subscale. *$p < .01$; †$p < .05$. BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory; NP-OCPD = Non-Perfectionism OCPD (modified SNAP-OCPD scale which removes three perfectionism items); FMPS = Frost Multidimensional Perfectionism Scale.

Correlations Between Psychopathology and Executive Functioning

Both zero-order correlations and hierarchical regressions were computed in order to examine hypotheses involving executive functioning (EF; Hypotheses 5-7).

First, reviewing zero-order correlations within EF tasks, it is noteworthy that correlations were generally weak to moderate (*r*s = .15 to .42). Convergent correlations for set-shifting (WCST perseverative errors [standard scores] and TMT, $r = .28$, $p < .01$) and working memory (LNS and N-Back, $r = .19$, $p = .09$) were generally lower than correlations representing shared method variance in the form of computer-administered tasks (WCST perseverative errors and N-Back, $r = .39$, $p < .001$) and time-based scaled scores for the D-KEFS (TMT and CWI, $r = .42$, $p < .001$). It is possible that these correlations were attenuated by range restriction, as reflected by the leptokurtosis observed for the TMT, CWI, and LNS. Furthermore, other divergent correlations (e.g., between TMT and N-Back, $r = .34$, $p = .01$) were numerically higher than convergent correlations. Altogether, these findings suggest that there may be power concerns, validity concerns, or both regarding assessment of EF functioning.

Next examining zero-order correlations between EF and psychopathology variables, WCST perseverative errors were significantly correlated with the OCI-R total score ($r = .23$; $p = .02$) and OCI-R ordering subscale ($r = .21$; $p = .03$); however, the direction of the relationship was opposite from what was predicted. That is, increased OCI-R total scores and increased OCI-R ordering subscale scores were associated with fewer perseverative errors. The only other significant correlations were between the LNS and both the BDI ($r = -.20$; $p = .05$) and BAI ($r = -.21$; $p = .04$).

Finally, hierarchical regressions were conducted to examine how well each of the three main psychopathology variables predicted WCST perseverative errors. All of the other executive functioning tasks, except for the TMT, were entered in Step 1 to account for their impact on performance; next, the OCI-R total score, NP-OCPD, and subscales of the FMPS were entered in the second step across three separate regression analyses. Results are displayed in Table 6.

Across all three hierarchical regressions, the N-Back Task emerged as a significant predictor of WCST perseverative errors, both before and after psychopathology variables were added (β = .368 after Step 1, and βs = .347 to .369 across separate Step 2s; all *p*s < .01). In the second step of analyses, both the OCI-R total and NP-OCPD significantly predicted variance in WCST perseverative errors, but to a lesser degree than the N-Back Task (βs = .210 and .189, respectively; both *p*s < .05). Thus, predictions regarding the relationship between EF tasks and psychopathology variables generally were not supported.

Table 6

Hierarchical Regressions Predicting WCST Perseverative Errors (Standard Score)

Variable	*B*	*SE(B)*	*β*	Δ R^2
Step 1				.177*
CWI	-0.037	2.549	-.001	
LNS	1.114	0.718	.147	
N-Back	6.914	1.934	.368*	
Step 2				.046†
CWI	0.391	2.498	.015	
LNS	1.089	0.702	.143	
N-Back	6.652	1.891	.354*	
OCI-R[1]	1.928	0.818	.210†	
Step 2				.042†
CWI	0.783	2.539	.030	
LNS	1.110	0.707	.146	
N-Back	6.840	1.912	.364*	
NP-OCPD	0.599	0.291	.189†	
Step 2				.017
CWI	0.195	2.566	.007	
LNS	0.969	0.724	.128	
N-Back	6.525	1.959	.347*	
FMPS Positive	0.419	0.302	.149	
FMPS Negative	-0.106	0.098	-.115	

Note. $N = 105$. [1]Score omits Hoarding subscale. *$p < .01$; †$p < .05$. WCST = Wisconsin Card Sorting Test; CWI = Color Word Interference; LNS = Letter Number Sequencing; OCI-R = Obsessive-Compulsive Inventory—Revised; NP-OCPD = Non-Perfectionism OCPD (modified SNAP-OCPD scale which removes three perfectionism items); FMPS = Frost Multidimensional Perfectionism Scale.

CHAPTER 4

DISCUSSION

This study supports extant empirical findings that suggest a relationship between OCD symptoms and OCPD traits. The DSM-5 notes that individuals meeting diagnosis for classic anxiety disorders (i.e., including OCD) may be at increased risk for meeting criteria for OCPD, but it still affirms that the majority of individuals with OCD do not meet criteria for OCPD (APA, 2013). These findings may be a result of superficial overlap in the domains assessed by both self-report measures; that is, items may be worded in a way such that individuals who endorse OC ordering symptoms are more likely to endorse OCPD items reflecting a preoccupation with order and vice versa, even when the underlying mechanisms and contextual features of these behaviors are considered distinct by professionals. However, this would not necessarily account for the comorbidity rates observed in the literature.

It is also possible that the positive relationship between OCD symptoms and OCPD traits is the result of the impact of a shared third variable, whether perfectionism or a broader trait such as conscientiousness. Notably, this study did not support the notion that perfectionism can fully account for overlap between these conditions, particularly when more general forms of psychopathology such as depression are included in the model. This was true even when considering positive and negative perfectionism separately. Indeed, symptoms of depression emerged as the best predictor of OCD symptomatology in these models. It is perhaps surprising that anxiety symptoms did not significantly predict OCD symptoms, particularly given that OCD

has classically been characterized as an anxiety disorder. However, this is likely an artifact of measurement which can be understood in two ways. First, depression and OCD have demonstrated high comorbidity rates (Richter, Cox, & Direnfeld, 1994), and in that sense, it is not surprising that the BDI was a significant predictor of OCD symptoms. Second, it is worth distinguishing between the emotional or cognitive symptoms of anxiety which may be more characteristic of OCD and the physiological arousal that may serve as a better marker for other anxiety disorders such as panic disorder. The BAI is known for being a better marker of physiological arousal and may have not have captured other legitimate aspects of anxiety that would associate more strongly with OCD symptoms (Leyfer, Ruberg, & Woodruff-Borden, 2006).

Considering perfectionism more closely, positive and negative perfectionism demonstrated some interesting differences in their associations with other measures of psychopathology; in particular, negative perfectionism correlated more strongly with depression, and there was a trend towards a stronger relationship with anxiety as well. Furthermore, although the difference did not reach statistical significance, both the full and modified OCPD scales obtained numerically higher correlations with positive perfectionism than negative perfectionism; this is a noteworthy reversal of negative perfectionism's typically stronger relations with psychopathology. This provides some support for meaningful distinctions between these two aspects of perfectionism (e.g., the potential for differential associations with positive affect) but calls into question whether either aspect can be considered "positive" or "adaptive."

This study supported ample literature regarding the association between perfectionism and both OCD symptoms and OCPD traits. This was expected and is consistent with available

empirical data and theoretical models that highlight perfectionism's importance in each of these conditions. However, it is quite notable that whereas perfectionism obtained moderately high correlations with non-perfectionism OCPD traits, the removal of three perfectionism items from the OCPD scale did not have much impact on the modified scale's correlations with other variables. In fact, the largest difference between the original and modified OCPD scales was found in their correlations with the BDI, which differed by .04 (*r*s = .30 and .34, respectively). Additionally, the modified NP-OCPD scale correlated as high as .98 with the original SNAP-OCPD scale. Although this is not entirely a surprise, given that both scales share 22 items in common, it is incongruent with empirical support for perfectionism as one of the core and unifying elements of OCPD. As another way of examining the importance of individual traits, coefficient alphas were examined before and after the removal of items measuring each trait. The largest impact on the coefficient alpha was obtained when items measuring rigidity and stubbornness were removed (decrease of .06). Removal of items measuring perfectionism, workaholism, or reluctance to delegate resulted in slightly less pronounced reductions (.03 to .04). Interestingly, the removal of traits with less empirical support, namely reluctance to discard items and miserliness, either had no impact or even improved the coefficient alpha.

The relative equivalence of the original SNAP-OCPD and the modified NP-OCPD in these analyses highlights dual issues regarding the current conceptualization and assessment of OCPD. First, the model originally included in the DSM-IV-TR (and more recently reproduced in the DSM-5) involves a great deal of heterogeneity. The DSM-5 lists non-perfectionism OCPD traits such as miserliness and a reluctance to discard items that may better be accounted for by another diagnosis (e.g., Hoarding Disorder) and that do not perform particularly well in studies

of OCPD criteria. Second, other traits such as a reluctance to delegate and a tendency to be rigid and stubborn are both reflective of rigid perfectionism but also include other aspects (e.g., anger, irritability, arrogance) that may not be central to OCPD. To further explore the issue of heterogeneity in OCPD traits, a maximum likelihood factor analysis was done on the full OCPD scale, specifying a theoretically based one-factor solution. The Kaiser-Meyer-Olkin measure indicated a mediocre sampling adequacy for the analysis, KMO = .62, and KMO values for three items were under .5. These included both items measuring the hoarding criterion and one of four items measuring the rigidity and stubbornness criterion. The resulting one-factor solution explained only 12% of the total variance, although 16 of 25 items obtained loadings above .30 on this factor. Extracted communalities were generally low, with only four items surpassing a liberal threshold of .20. Unsurprisingly, the overall fit of this solution was poor; 64% of the residuals between observed and reproduced correlation matrices had absolute values above .05. It is worth noting again that these findings are post hoc; nonetheless they call into question DSM-5's formal conceptualization of OCPD and whether it truly represents a unitary construct.

More recent empirical models of OCPD, such as the dimensional model included for further research in the DSM-5, have reconceptualized OCPD in a way that emphasizes the importance of rigid perfectionism, removing other traits which have proven less central to the concept of OCPD. Thus, although the evidence suggests the formal diagnostic model in the DSM-5 comprises a disparate collection of traits, other conceptualizations have been proposed which simplify and focus the construct of OCPD. Indeed, the fact that the SNAP-OCPD scale only had three items of twenty-five (12%) assessing perfectionism emphasizes the differential

importance placed on this central and unifying trait in the formal DSM-5 model compared to other research-based and empirically supported models.

In contrast to findings of set-shifting deficits in individuals diagnosed with OCD, these data suggest that in a nonclinical population, individuals endorsing subclinical OCD symptomatology may perform better on set-shifting tasks, compared to individuals endorsing few or no symptoms. This may be understood when considering OCD symptomatology as existing on a spectrum; in some ways, it may be as atypical to exhibit no distress or concern within prototypical OCD symptom domains as it is to endorse symptoms to a clinical level. The endorsement of some symptoms may reflect a general tendency to feel responsible and act accordingly; this may be more adaptive than the absolute lack of these concerns. Such tendencies may be linked to adaptive personality features such as conscientiousness; given perfectionism's theoretical role in OCD symptomatology and the DSM-5's characterization of perfectionism as a trait within the domain of conscientiousness, this explanation may be the most parsimonious. Furthermore, given the negative skew of many of the psychopathology measures, it is possible that these findings reflect a curvilinear relationship between symptomatology and set-shifting performance. In other words, although moderate symptoms appear to lead to improved performance, these findings may still be consistent with the literature on set-shifting deficits in individuals with clinical levels of symptomatology and impairment. Interestingly, OCPD traits evidenced a similar pattern, in which increased symptomatology correlated with improved set-shifting on the WCST. This provides limited evidence for an association between these conditions. Again, the involvement of a broad trait such as conscientiousness remains a probable explanation.

To examine for distinctions between these conditions in a different way, analog diagnostic groups were created. For OCD, 23 participants were identified as meeting a cut-off of 4 for the obsessions subscale; this was identified as the optimal criterion for distinguishing between individuals with an OCD diagnosis and non-anxious controls (i.e., college students; Foa et al., 2002). For OCPD traits, the DSM diagnostic criteria of endorsing five of eight traits identified only six participants, three of whom also met the OCD cut-off; the resultant diagnostic groups would be too unequal for any meaningful analysis. As such, a reduced cut-off of four traits was used, with the explicit understanding that it was likely to increase the Type I error rate if formal diagnoses were the desired outcome. This allowed a comparison of analog OCD only (n = 17), analog OCPD only (n = 8), and analog OCD + OCPD (n = 6) on perfectionism and EF tasks. No significant differences were found between groups on these measures.

Finally, across both conditions, it is also possible that the selected battery of EF tasks was not effective. It is possible that for a university student sample the WCST did not present enough of a challenge for deficits to be observed. The WCST does not have time limits, and only final card sorts are recorded. If individuals were to ruminate on or otherwise struggle with making decisions about how to sort individual cards, those data would not be available for analysis, nor would the structure of the task limit these activities. More broadly, the use of a public university sample may have limited the range of functioning observed. University students are more likely to have possessed the learned skills and raw ability to succeed in prior schooling and to have received high-quality, enriched educations; as such, they are less likely to present with pronounced EF deficits compared to the broader population. It is perhaps unsurprising that three out of five EF tasks presented with violations of normality, particularly leptokurtosis. The

distributions for these tasks were appropriately centered on qualitatively average performance, but range restrictions in the majority of scores obtained likely impacted the power of these analyses to find significant results. Not only would this limit zero-order relationships with EF functions, but their utility in controlling for confounds is notably diminished. This may even have led to suppression effects, in that deficits in working memory or inhibition may have broadly obscured relationships between psychopathology variables and set-shifting performance. At the same time, it is unlikely that this explanation could fully account for the unexpected reversal of predicted findings.

Study Strengths and Limitations

This study had some notable strengths; in particular, behavioral measures were used to examine EF tasks, as opposed to self-report measures. Given that EF includes various abilities, a direct measure of performance on validated tasks is likely to provide a more reliable measure of these abilities versus self-report, which is vulnerable to limitations in insight and to desires to manage impressions. Also, a relatively large sample size was collected, compared to studies using clinical samples. This allowed for analyses of OCD symptoms and OCPD traits that went beyond mean-level comparisons between diagnostic groups into correlational analyses that more directly examined interrelationships between targeted concepts.

However, a number of limitations must be noted. First, it used only a nonclinical student sample; this may have limited the severity of symptoms and range of traits observed and therefore limited the power to find significant relationships which may otherwise exist across a

broader range of scores. In particular, this may account for leptokurtic distributions of several of the EF variables. These distributions limit variability and therefore limit the ability of statistical testing to find significance. Although the specific EF tasks were selected in view of prior research in clinical samples, it is possible that they were not sensitive enough to identify more mild EF deficits that might be characteristic of a nonclinical population. This is particularly worth considering given the potential differences in educational quality, wealth, and upbringing between individuals who pursue secondary education and other members of society who may drop out of the educational system before graduating high school or who may finish at their high school diploma.

Second, this study utilized only self-report data when assessing for psychopathology. As such, some of the hypothesized relations between psychopathology variables (e.g., between OCPD and OCD) may have been artificially bolstered as a result of method variance. Also worth noting, the validity of symptom scores depends in part on how participants read and interpret items; to the extent that their understanding of the item does not accurately reflect the construct being assessed, their endorsement or lack thereof may introduce error variance. This is a particular concern for this study, in which there are a number of superficial similarities between symptom presentations of the relevant disorders (that we believe nonetheless present with distinct mechanisms underlying seemingly alike behaviors). Therefore, it was important that the current participants read the items quite carefully and made the effort to consider subtle differences among the items' content; whether this consistently occurred is unknown.

Another limitation regards the assessment of EF tasks. As noted above, the use of a non-clinical sample may have resulted in range restrictions on a number of the EF tasks. Specifically,

three out of five EF tasks showed leptokurtic distributions; in other words, variability was more limited, with the majority of scores falling in the middle of the distribution. Furthermore, intercorrelations among EF variables suggested that the three targeted EF domains were not consistently operationalized by performance tasks. Although EF domains are theorized to be interrelated, correlations between tasks purportedly measuring the same EF domains were often lower than between tasks which shared method variance (e.g., time-based scores on the D-KEFS, computer-administered tasks). This only serves to highlight the difficulty in studying executive functions. Miyake et al. (2000) noted that the "impurity" of executive functioning measures can make their interpretation difficult. In other words, measures of executive functioning necessarily invoke other cognitive processes, such as language ability and visuospatial processing. Because performance on any single executive functioning task can be, in part, a product of deficits in these other abilities, the interpretation of performance on a single executive functioning task can be complicated. Confounds of EF and language disorders were partially addressed in the present study through the exclusion of individuals with diagnosed neurocognitive disorders (e.g., ADHD, learning disorders). Nonetheless, this solution depends on participants' awareness and accurate recall of these deficits, as well as their willingness to disclose this potentially sensitive information.

Implications and Future Directions

First, the present analyses should be replicated in a large clinical sample—or at the very least, a broader community sample—in order to allow for greater ranges of symptomatology,

traits, and executive functioning. Also, given the observed positive relationships between moderate symptomatology and EF, and the possibility that this modest endorsement was reflective of adaptive traits such as conscientiousness, future studies may consider controlling for conscientiousness and other personality traits as potential confounds.

Second, analyses examining relations between OCD symptoms and EF may benefit from the use of behavioral analogs as measures of OCD symptom presentation. This may help to provide a closer measure of behavioral impairment and compulsive activity in a controlled setting. In other words, it provides a more objective assessment of symptoms without relying on the participants' psychological mindedness, their ability and desire to report on symptoms, their reading level and accurate interpretation of questions, and their attention to what can often be lengthy questionnaires that may be of limited interest to them. Particularly for non-clinical samples, who often lack personal experience with item content, these factors may obscure the relationship between endorsed items and overall impairment.

Third, analyses of EF across these conditions should be replicated with the support of neurological imagining techniques. By directly measuring activity in brain areas hypothetically correlated with different executive functions, it is possible to bypass the inevitable impurity inherent in measures of performance on these different tasks. A direct examination of brain activity also ensures that a given EF ability can be more cleanly assessed without as much need to extensively control for other abilities and executive functions; in practical terms, this means the inclusion of fewer covariates, thereby preserving the power of analyses. A less attractive but more practically accessible solution may be to control for both nontargeted executive functions (as all aspects of EF often play a role to some degree in task performance) as well as for

additional skill sets which are required for adequate performance on target EF tasks (e.g., language ability, attentional capacity).

Finally, it is strongly recommended that robust self-report measures be developed to assess for conceptualizations of OCPD that are more congruent with evidence-based models in the literature. Future research should work to re-examine the broader nomological net surrounding OCPD traits, given the significant departure recent evidence-based models present compared to the formal diagnostic models in the DSM-IV-TR and DSM-5. This includes replication of analyses examining associations between OCD and other PDs as well as comorbidity rates between OCPD and other disorders. Given perfectionism's potential as a transdiagnostic trait and its central role in current OCPD models, it will be important to clearly distinguish between OCPD and other conditions that may characterized by maladaptive perfectionism (e.g., depression, eating disorders).

Conclusions

In a nonclinical sample, OCD symptoms and OCPD traits correlated positively with each other; this relationship persisted after controlling for perfectionism and symptoms of depression and anxiety. Thus, in contrast with expectations, perfectionism was not able to fully account for the relationship between OCD symptoms and OCPD traits. In fact, in a model including symptoms of depression and anxiety, depression predicted significant variance in OCD symptoms, with perfectionism no longer predicting unique variance.

Regarding relations with EF, it was found that subclinical symptoms of OCD and traits of OCPD were both positively associated with increased performance on a set-shifting task. Perfectionism did not significantly relate to performance on any EF tasks. At the same time, these findings must be considered within the context of significantly limited variance within three of the five EF tasks.

Finally, it is possible that some of these findings relate to the evolving conceptualization of OCPD. Although the formal DSM-5 conceptualization underlying the selected measure defines OCPD as consisting of at least five of eight specific traits, more recent models centralize perfectionism as a core aspect of OCPD. Further research will be needed to determine whether OCPD is synonymous with or distinct from pathological perfectionism and to re-assess how OCPD relates to other constructs.

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APPENDIX A

DEMOGRAPHICS QUESTIONNAIRE

Instructions: Please answer the following questions by choosing the letter that corresponds to your choice.

1. What is your sex?
   a. Male
   b. Female

2. What is your current age in years? _____

3. What is your **current** marital status?
   a. Never married
   b. Married
   c. Widowed
   d. Divorced
   e. Separated

4. Do you have a job other than school?
   a. Yes, full-time job
   b. Yes, part-time job
   c. No

5. With what racial background do you primarily identify?
   a. Asian or Asian-American
   b. Black or African-American
   c. Native American
   d. White/Caucasian
   e. Multi-racial
   f. Other
   g. Prefer not to answer

6. Do you self-identify as Hispanic or Latino/Latina?
   a. Yes
   b. No

7. What is your religion?
   a. Buddhist
   b. Hindu
   c. Jewish
   d. Mormon
   e. Muslim
   f. Protestant
   g. Catholic
   h. Other (please specify: _____)
   i. None

8. Please circle the highest level of education your primary caretaker obtained, and specify their relationship to you: _____
   a. Some highschool
   b. Highschool graduate or obtained GED
   c. Some college
   d. Obtained a 2-year Associate's degree
   e. Obtained a 4-year Bachelor's degree
   f. Obtained a Master's degree
   g. Obtained a Doctoral degree
   h. Do not know

9. Please circle the highest level of education any other caretaker obtained, and specify their relationship to you: _____
   a. Some highschool
   b. Highschool graduate or obtained GED
   c. Some college
   d. Obtained a 2-year Associate's degree
   e. Obtained a 4-year Bachelor's degree
   f. Obtained a Master's degree
   g. Obtained a Doctoral degree
   h. Do not know
   i. My primary caretaker raised me on their own

10. Please estimate the income of your household growing up:
    a. less than $12,500 per year
    b. $12,500 - $25,000 per year
    c. $25,000 - $50,000 per year
    d. $50,000 - $75,000 per year
    e. $75,000 - $100,000 per year
    f. $100,000 - $200,000 per year
    g. over $200,000 per year

11. Have you ever been arrested for anything other than a motor vehicle violation?
    a. Yes
    b. No

12. Have you ever been treated by a psychologist or psychiatrist for an emotional problem?
    a. Yes
    b. No

13. Have you ever been diagnosed with a psychological or neurodevelopmental problem (e.g. OCD, ADHD, Autism/Aspergers, seizures)?
    a. Yes (please specify: _____)
    b. No
    c. Prefer not to answer

14. Are you currently in psychological or psychiatric treatment?
    a. Yes
    b. No

15. Has anyone in your immediate or extended family been diagnosed with a psychological or neurodevelopmental problem (e.g., OCD, ADHD, Autism/Aspergers, seizures)
    a. Yes (please specify relationship(s) and diagnosis: _____)
    b. No
    c. Prefer not to answer

16. Please choose the statement that best describes your **tobacco** use (circle whichever apply):
    a. I currently smoke cigarettes (please estimate # of packs a week: _____)
    b. I used to smoke cigarettes but quit within the last year
    c. I used to smoke cigarettes but quit more than a year ago
    d. I chew tobacco (either in addition to or instead of smoking cigarettes)
    e. I have never smoked cigarettes or chewed tobacco

17. Please choose the statement that best describes your **alcohol** use:
    a. I have never used alcohol.
    b. I used to drink but do not drink now.
    c. I drink socially but never to excess.
    d. I sometimes drink to the point of feeling "high."
    e. I usually drink moderately but will often drink more than I should.
    f. I often use alcohol to excess.
    g. I have had serious problems with my drinking.
    h. I consider myself an alcoholic.

18. Have you ever been treated for alcohol-related problems?
    a. Yes
    b. No

19. Please choose the statement that best describes your **drug** use (any drug other than alcohol):
    a. I have never used drugs such as marijuana, cocaine, or barbiturates.
    b. I have used such drugs, but they have never been a problem for me.
    c. I have had problems with my use of such drugs.

20. Have you ever been treated for drug problems?
    a. Yes
    b. No

APPENDIX B

STUDY DESCRIPTION

Descriptive/Recruitment Text for SONA Systems Website

This study will ask you to answer demographic questions, as well as questions relating to your beliefs, feelings, thoughts, and experiences. In addition, this study will involve the completion of both computerized and paper-and-pencil tasks. The major point of this study is to learn about how personality influences problem solving and cognitive performance. Participation is open to male and female students in PSYC 102 (18-25 years old). Due to the nature of cognitive tasks involved, participants must be right-handed, and must speak English as their first language. Participation will require approximately two hours. If you are interested in participating, please sign up for one of the available timeslots. New times are posted weekly.

APPENDIX C

CONSENT FORMS

INFORMED CONSENT FORM

I agree to participate in the research project titled "Personality and Problem Solving" being conducted by Sara Wyman, a graduate student at Northern Illinois University (NIU), under the supervision of Dr. Kevin Wu, a faculty member at NIU. I confirm that I am at least 18 years old. I have been informed that the purpose of this study is to examine the relationship between personality traits and performance on a variety of problem-solving tasks.

I understand that if I agree to participate in this study, I will be asked to complete a number of questionnaires that ask for information related to demographics, personality, and my personal feelings and experiences. I understand that for these questions there are no right or wrong answers. I also will be asked to complete a number of computer tasks, which will require my full attention and concentration. Altogether, this study should require approximately two hours of my time.

I have been informed that the potential risks and/or discomforts I may experience during this study include questionnaire items which ask about sensitive information, and cognitive tasks which may be perceived as mildly stressful. Also, it is possible a breach of confidentiality may inadvertently occur. As such, while I am encouraged to answer all questions, I understand I may omit any items that I do not wish to answer. Likewise, I may refuse to complete any tasks in which I do not want to participate. Also, once course credit for PSYC 102 has been assigned, the data will be rendered anonymous, in that it will not contain any identifying information (e.g., Z-ID, birthdate) that could be traced back to me. All data will be stored in a locked research lab to which only the research team will have access, and the data will only be reported in a group-level format.

I am aware that my participation is voluntary and may be withdrawn at any time for any reason, without penalty or prejudice. If I have additional questions concerning this study, I may contact Sara Wyman at (507) 250-3872, or Dr. Wu at (815) 753-1605. I understand that if I would like to learn more about my rights as a research participant, I may contact the NIU Office of Research Compliance at (815) 753-8588.

I understand that while I am not expected to benefit directly from participating in this research, the information learned from this study will help to expand current knowledge about personality and cognitive functioning. I also understand that my consent to participate in this project does not constitute a waiver of any legal rights or redress I might have as a result of my participation, and I acknowledge a copy of this consent form will be provided upon request.

_____

Signature Date

_____

Printed Name

APPENDIX D

DEBRIEFING FORMS

Debriefing for "Personality and Problem Solving"

Your participation in this study is now complete. Thank you for your time and effort! You were informed that this study examines the relationship between personality and cognitive performance. That is true, but in addition, we also wanted to know how personality and cognitive performance were related to the symptoms of different psychological disorders. Specifically, there has been research on the relationship between obsessive-compulsive disorder (OCD) and obsessive-compulsive personality disorder (OCPD). From an outside perspective, individuals with either disorder may engage in some behaviors in a superficially similar way (e.g., in a specific and rigid manner), though the actual behaviors and their reasons for them may be very different. Previous research has found that personality traits relevant to OCPD (e.g., perfectionism) may affect the course of OCD. Other studies have found a relationship between OCD and certain patterns of cognitive performance. This study examines personality traits and cognitive performance in relation to symptoms of both these disorders, in order to better understand what factors may distinguish or unite the experiences of individuals with OCD or OCPD. It is very important to understand that saying yes to a few or even many of these items may not suggest that you have any problems with OCD, OCPD, or are even at risk for these disorders. Typically only people who endorse these items at very high levels are at risk. We also collected information from you about other personal characteristics and experiences, in case those variables may better explain any differences found in this study. Our main goal is to better understand the development and maintenance of OCD and OCPD, so that they may be better identified and treated.

If you are interested in learning more about this area of research, the three journal articles listed below are available via the NIU Library or from Sara Wyman (see below for contact information).

Pinto, A., Liebowitz, M. R., Foa, E. B., & Simpson, H. B. (2011). Obsessive compulsive personality disorder as a predictor of exposure and ritual prevention outcome for obsessive compulsive disorder. *Behaviour Research and Therapy, 49*, 453-458.

Tükel, R., Gürvit, H., Ertekin, B. A., Oflaz, S., Ertekin, E., Baran, B., . . . Atalay, F. (2012). Neuropsychological function in obsessive-compulsive disorder. *Comprehensive Psychiatry, 53*, 167-175.

Wu, K. D., Clark, L. A., & Watson, D. (2006). Relations between obsessive-compulsive disorder and personality: Beyond Axis I-Axis II comorbidity. *Anxiety Disorders, 20*, 695-717.

Please do not discuss your experiences in this study with other students in PSYC 102, as we want all potential participants to come in equally prepared for the activities involved in this study. If you would like to contact the study's principal investigator, her e-mail address is svwyman@yahoo.com, and her phone number is (507) 250-3872. If any aspect of this study upset you, please feel free to contact us with questions or concerns. Also, a copy of counseling resources in the DeKalb area will be provided upon request, or can be found at the following web address:

http://www.niu.edu/orci/human_research/applications/counseling_resources.pdf

Thank you very much for your cooperation!

This document confirms that _____ completed the above-named study

Participant's name

and earned 4 credits for her/his participation toward the PSYC 102 research exposure requirement.

_____

Proctor's signature Date