

**DISCOVERING DIMENSIONALITY: FACTOR
ANALYSIS OF PERSONALITY DISORDER SPECTRA
SCALES FOR THE MMPI-2**

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ABSTRACT

A longstanding debate within the field of psychological assessment centers on whether personality disorders (PDs) are better classified by categorical (i.e., syndrome) or dimensional models. In fact, the most recent version of the Diagnostic and Statistical Manual for Mental Disorders (*DSM-5*) includes an optional, dimensional model, the Alternative Model for Personality Disorders (AMPD). The current studies examined the underlying factor structure of the MMPI-2 PD Spectra Scales developed by Mulay et al. (2018) to determine whether the Scales were more reflective of a dimensional or categorical model for PDs. Study 1 consisted of exploratory factor and bifactor analyses of the entire Spectra Scales item pool (220 items), tested on a sample of 1,030 outpatients seen at a university community clinic. Results supported an exploratory factor model made up of six factors and an exploratory bifactor model made up of a general factor and five specific factors, both of which were fit to a 53-item subset of the original 220 PD Spectra Scales items following item deletion procedures. Study 2 sought to confirm the factor structures resulting from the Study 1 analyses using confirmatory factor and confirmatory bifactor analyses. Criterion validity (based on MCMI-II Clinical Scales) and reliability analyses of the final bifactor model were also completed in Study 2. Participants were 539 inpatients and outpatients seen at a military clinic. Results supported the bifactor model over the factor model. The final bifactor model demonstrated good criterion validity and excellent internal consistency for the model as a whole. The bifactor model is interpreted in the context of preexisting dimensional models for PDs, and potential clinical utility and recommendations for future research are discussed.

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CHAPTER ONE: INTRODUCTION AND GENERAL INFORMATION

It is estimated that approximately 10% of individuals in the general U.S. population (Paris, 2015) and 40% of individuals in community health patient populations (Newton-Howes et al., 2010) meet criteria for a personality disorder (PD). Not only are PDs highly prevalent, but treatment can prove costly. For example, the cost of treatment as usual for an individual diagnosed with borderline personality disorder (BPD) has been estimated at \$52,563 annually (Bateman & Fonagy, 2003).

The prevalence rates for PDs are substantially influenced by diagnostic factors. PD diagnostic criteria have gone through a number of revisions since the publication of the first edition of the Diagnostic and Statistical Manual for Mental Disorders (*DSM*; American Psychiatric Association, 1952). Despite changes to the specific criteria for PDs, all published versions of the *DSM* have retained the description of PDs as the inflexible over-application of personality traits across contexts, to the detriment of the individual's interpersonal relationships and overall functioning. The same has been true for the International Statistical Classification of Diseases and Health Related Problems (*ICD*), Psychodynamic Diagnostic Manual (*PDM*), and psychodynamic and psychobiological conceptualizations of PD.

For decades, clinical psychologists have debated whether to continue to utilize categorical modeling of PD criteria or to shift toward a dimensional model. This debate has come to a head with the inclusion in the current version of the Diagnostic and Statistical Manual of Mental Disorders (*DSM-5*; American Psychiatric Association, 2013) of an alternative model for diagnosing PDs that is dimensional in nature. As most preexisting PD measurement instruments follow the categorical model for PDs, the introduction of a formalized dimensional model creates a call for measurements that can translate between the two models of PD. The

current studies were conducted based on a set of PD Spectra scales developed from preexisting Minnesota Multiphasic Personality Inventory, second edition (MMPI-2; Butcher et al., 2001) items by Mulay and colleagues (2018), and examined whether the underlying factor structure of the scales could provide a bridge between categorical and dimensional models of PDs.

CHAPTER TWO: LITERATURE REVIEW

A Brief History of the Conceptualization of PDs

In 192 AD, Galen attributed aspects of character pathology to the Hippocratic theory of four primary humours: *chole* (bile), *melanchole* (black bile), *sanguis* (blood), and *flegma* (phlegm; Stelmack & Stalikas, 1991). Aside from one optimal temperament, defined by a perfect balance between the two humourous axes of cold-hot and moist-dry, Galen identified eight undesirable temperaments based on an excess of any of the four poles or two poles in excess at once. Although Galen was fragmentary in his explanation of the aspects of character that related to each of the eight undesirable temperaments, his conceptualization is the earliest known mention of what is now termed personality pathology.

Nicholas Culpeper was the next theorist to expand upon Galen's theory, when in 1652 he elaborated on the character descriptions for each of Galen's temperaments (Stelmack & Stalikas, 1991). In the 18th century, Immanuel Kant and Wilhelm Wundt elaborated further upon the theory, when each conceptualized temperament as psychological in nature and composed of two axes (feeling-activity and strength of emotions-changeability). Thomas Octavius Prichard was arguably the first theorist to introduce a conceptualization of personality pathology that is somewhat commensurate with current PD conceptualization; in 1837, he used the term *moral insanity* to describe a disorder characterized by disturbance in social functioning but absent of impaired mental status (Livesley, Schroeder, Jackson, & Jang, 1994). Prichard's work marked the beginning of the understanding of PDs as separate from mental state disorders. In the 18th and 19th centuries, Philippe Pinel, Bénédict Augustin Morel, and Emil Kraepelin took a more biological stance when they theorized that personality pathology was caused by neurodegenerative disorders (Livesley et al., 1994; Tyrer, Reed, & Crawford, 2015). However,

their contemporary, Julius Koch argued that mental state disorders and PDs were distinct with his introduction of the term *psychopathic* (Livesley et al., 1994). Koch's work set the stage for the first formal classification of PDs.

In 1923, PDs were formally classified when Kurt Schneider described nine personality types, which he then termed *psychopathic personalities* (Tyrer et al., 2015). Schneider's psychopathic personalities were informed by his clinical experiences, and many aspects of his classification system are reflected in the categorical conceptualizations of PDs found in the International Classification of Diseases (*ICD*, since version 6) and the Diagnostic and Statistical Manual for Mental Disorders (*DSM*, all editions). Schneider wrote, "Those with personality disorders suffer because of their disorders and also cause society to suffer" (1923), a description that echoes the core of current PD conceptualization: the inability to form and maintain satisfactory relationships. Then, in 1925, Ernst Kretschmer postulated that mental state disorders and PDs exist on a continuum ranging from schizothyme to schizoid to schizophrenic (Livesley et al., 1994). Today, debate continues around whether PDs are a discrete class of disorders and how to most accurately conceptualize PDs. However, both categorical classification of PDs and the idea that PDs fundamentally differ from mental state disorders have largely been retained in formal classification systems (e.g., *DSM*, *ICD*, *PDM*). The following review of categorical classification systems will be limited to the *DSM* because its most current edition (*DSM-5*; American Psychiatric Association, 2013) includes the first formal, albeit tentative, dimensional model for PDs.

Categorical Modeling of PDs in the *DSM*

The *DSM* has traditionally presented PD criteria using a categorical, or syndrome, model. Categorical modeling is based on the identification of groupings of symptoms that are believed

to stem from a common cause (i.e., the syndrome in question; Zapolski, Guller, & Smith, 2012). Criteria often include heterogeneous symptoms, and individuals who meet criteria for the syndrome may not have the same symptoms (Zapolski et al., 2012). The presentation of categorical PDs in each version of the *DSM* is described below.

The first version of the *DSM* described PD as “those cases in which the personality utilizes primarily a pattern of action or behavior in its adjustment struggle, rather than symptoms in the mental, somatic, or emotional spheres” (American Psychiatric Association, 1952, p. 13). PDs were further described as generally lifelong, treatment resistant, and ego dystonic. *DSM-I* categorized 12 specific PDs into three groups, as follows: personality pattern disturbance (inadequate, schizoid, cyclothymic, and paranoid personality), personality trait disturbance (emotionally unavailable, passive-aggressive, and compulsive personality; personality trait disturbance, other), and sociopathic personality disturbance (antisocial, dyssocial [*sic*], and sexual deviation; addiction). Personality pattern disturbances involved the highest levels of impairment and were considered the most deep-seated, whereas those diagnosed with personality trait and sociopathic personality disturbances were generally higher functioning but could regress to a lower level of functioning under stress. A fourth group, special symptom reactions, was included “for flexibility in diagnosis” (American Psychiatric Association, 1952, p. 34) and allowed clinicians to specify a symptom thought to be caused by PD that was not included elsewhere in the diagnostic scheme (e.g., enuresis).

DSM-II (American Psychiatric Association, 1969) again described PDs as lifelong, ingrained maladaptive patterns of behavior. However, the classification system for PDs was revised to include 10 specific PDs (paranoid, cyclothymic, schizoid, explosive, obsessive compulsive, hysterical, asthenic, antisocial, passive-aggressive, and inadequate) along with

“other” PD and “unspecified” PD. A lack of diagnostic reliability observed with the *DSM-I* and *DSM-II* criteria inspired a more concrete approach to classifying PDs in *DSM-III* (Widiger, Livesley, & Clark, 2009).

The third version of the *DSM* (*DSM-III*; American Psychiatric Association, 1980) was the first to include the multiaxial diagnostic system, wherein Axis II was devoted to PDs and specific developmental disorders, because these were conceptualized as more stable than the Axis I disorders. The diagnostic section on PDs delineated the differences between personality traits and PDs and mentioned the high prevalence of depression and anxiety symptoms in individuals with PDs. Whereas previous versions instructed clinicians to choose the “most prominent” PD when criteria for more than one PD were met, *DSM-III* stated that multiple PDs often co-occur in the same person. The 11 specific PDs included in *DSM-III* were: paranoid, schizoid, schizotypal, histrionic, narcissistic, antisocial, borderline, avoidant, dependent, compulsive, and passive-aggressive. Notably, patients were required to exhibit all symptoms of a PD in order to meet criteria for diagnosis. This choice to pursue a clinical syndrome model was an attempt to develop homogenous diagnostic units (Widiger et al., 2009; see the next section for more discussion of the heterogeneity of other categorical models of PD). PD presentations that did not fit the specific PD categories could be diagnosed under atypical (PD is thought to be present, but there is insufficient information available), mixed (features of more than one PD are present, but full criteria is not met for any PD), or other (a specific PD not included in the classification scheme) PD.

The *DSM-III-R* (American Psychiatric Association, 1987) largely retained the PD criteria from *DSM-III*, but categorized PDs into three formal clusters (Cluster A: eccentric, Cluster B: dramatic, and Cluster C: anxious) based on patterns of behavior. Additionally, compulsive PD

was renamed obsessive-compulsive PD in this *DSM* version. Also, because many individuals who clearly displayed PD pathology did not meet criteria for the *DSM-III* categorical PDs due to the requirement of homogenous symptom presentation, this diagnostic model was not retained. Instead, a polythetic criterion set model was instated, wherein individuals must exhibit a *certain number* of the possible symptoms in order to meet criteria for the disorder in question. This was in essence a surrender to the heterogeneity of categorical modeling of PDs (Widiger et al., 2009) and constituted a “neo-Kraepelin” movement away from psychosocial and psychodynamic viewpoints. In other words, the polythetic criterion set model was supported and instated by psychologists who generally opposed the psychodynamic approach, championed the importance of classification, and were highly interested in research (Blashfield, 1984). The change was also made in an attempt to increase inter-clinician reliability of PD diagnosis, yet *DSM-III/DSM-III-R* PD classification performed poorly in this area (Blashfield, 1984).

The fourth version of the *DSM* (*DSM-IV*; American Psychiatric Association, 1994) dropped passive-aggressive PD, but retained the other 10 *DSM-III-TR* specific PDs. Additionally, the *DSM-III/DSM-III-R* options for diagnosing PD when (1) criteria were not fully met for a specific PD or (2) a specific PD other than the 10 listed was present were collapsed under the diagnosis of PD not otherwise specified (PD-NOS). Mention of childhood disorders that could result in later PDs was also dropped. Notably, mention was made in *DSM-IV* that a dimensional model for PDs may be warranted, but the manual fell short of supporting any such models and stated, “the relationship of the various [potential] dimensional models to the Personality Disorder diagnostic categories...remains under active investigation” (American Psychiatric Association, 1994, p. 634). The text revision of the fourth edition (*DSM-IV-TR*; American Psychiatric Association, 2000) did not include changes to PD criteria. The most

current version of the *DSM* (*DSM-5*; American Psychiatric Association, 2013) retained the *DSM-IV/DSM-IV-TR* criteria for PDs for Section II (Diagnostic Criteria and Codes), but added an optional, alternative PD conceptualization in Section III (Emerging Measures and Models).¹ The *DSM-5* Section III model is discussed in the next section. Notably, *DSM-5* did away with the multiaxial diagnostic metastructure, in an attempt to stop insurance companies from denying coverage of Axis II disorders and as a nod to the potential instability of PDs (see next subsection for more information; Wakefield, 2013).

Thus, there is an extensive, and nearly exclusive, tradition of modeling PDs categorically in the clinical psychological sciences. Categorical modeling of PDs theoretically allows for simpler diagnostics and provides a straightforward way of communicating patients' clinical presentations and symptomology to other providers. However, there is a plethora of literature detailing the disadvantages of categorical modeling of PDs that suggests the costs of retaining a categorical conceptualization of PDs may outweigh the benefits of this approach.

Criticisms of the Categorical Model for PDs

Over the last century, researchers and theoreticians have called into question the validity and utility of a categorical conceptualization of PDs (e.g., Schneider, 1923; Livesley et al., 1994; Millon, 1994; Widiger & Trull, 2007; Widiger et al., 2009; Kotov et al., 2017). The most common criticisms of the categorical model for PDs are (1) the problem of comorbidity with Axis I disorders and multiple PDs, (2) poor temporal stability of diagnostic presentations, (3) potential gender bias in certain specific PD criteria, and (4) insufficient descriptive utility reflected in specific PD criteria. Each criticism is explained further below.

¹ Also, PD-NOS was renamed other specified PD (OSPD) in *DSM-5*.

Comorbidity. Recent research examining comorbidity between PDs and what were previously known as Axis I disorders find clinical sample comorbidity rates ranging from 22-89% (Friborg, Martinussen, Kaiser, Øvergård, & Rosenvinge, 2013; Newton-Howes et al., 2010; Pagura et al., 2010; Sjøstad, Gråwe, & Egeland, 2012; Verheul & Widiger, 2004; Wetterborg, Långström, Andersson, & Enebrink, 2015). Anxiety and depressive disorders are most commonly comorbid with PDs (Erkens et al., 2018), but comorbidity with PTSD (Pagura et al., 2010), substance use disorders (Hasin, Stinson, Ogburn, & Grant, 2007) and eating disorders (Ramklint, Jeansson, Holmgren, & Ghaderi, 2010) is also common in clinical populations. Some have argued that comorbidity rates may be inflated when assessment method and timing of assessment are not taken into account (Clark, 2006; Ramklint et al., 2010). However, a recent study found a comorbidity rate of 37% for eating disorders and PD in a female clinical population, even after controlling for assessment method and timing of assessment (Ramklint et al., 2010). Furthermore, certain personality traits (e.g., neuroticism, disinhibition) and latent transdiagnostic features (i.e., internalizing-externalizing) have been shown to account for much of observed comorbidity patterns (Krueger & Markon, 2006; Rodriguez-Seijas, Eaton, & Krueger, 2015), indicating personality is implicated in psychopathology.

Comorbidity amongst PDs is also a common issue in PD diagnosis. A study of PD comorbidity using *DSM-III-TR* criteria found that 48% of participants met criteria for more than one PD (Ekselius, Lindström, von Knorring, Bodlund, & Kullgren, 1994). Another study compared Axis II comorbidity rates of a clinical sample of individuals diagnosed with borderline PD (BPD) to a clinical sample of individuals who met criteria for another PD using *DSM-III-TR* PD criteria (Zanarini et al., 1998). Results showed that, in the BPD group, 31.4% also met criteria for an odd cluster PD, 72.6% met criteria for an anxious cluster PD, and 40.1% met

criteria for another dramatic cluster PD. In the other PD group, 10.4% also met criteria for an odd cluster PD, 47.2% met criteria for an anxious cluster PD, and 30.4% met criteria for a dramatic cluster PD. These results illustrate the lack of specificity of categorical PDs, which is elaborated upon further below (see the “descriptive utility” subsection). In addition, the findings point to a particular lack of specificity for BPD, a common criticism of the disorder that has led to arguments that BPD may actually measure general distress in interpersonal functioning and identity instability rather than qualifying as a specific PD (Sharp et al., 2015).

Temporal instability. PD has been described in all versions of the *DSM* as enduring and stable, even with psychological treatment. However, research findings from major studies have called into question the stability of PDs. For example, the Collaborative Longitudinal Personality Disorders Study (CLPS) reported significant changes in PD symptomology over a two-year period in a mixed in- and outpatient population, and found no significant treatment effects (Grilo et al., 2004; Shea et al., 2002). One year after initial assessment, 20% of participants had met less than two PD criteria throughout the past year, with remission rates ranging from 20-40% at year two. Even more strikingly, only 44% of participants met criteria for a PD every month during year one.

A number of other studies have also found evidence for temporal instability in categorical PDs. All accounted for potential treatment effects. Durbin and Klein (2006) found poor to fair stability of categorical PD diagnoses in a clinical population over 10 years. Lenzenweger, Johnson, and Willett (2004) found statistically significant variation in PD features in an undergraduate population over a four year period using growth curve analysis. Zanarini and colleagues (2005) observed remission of BPD in 74% of a clinical sample after six years. However, one opposing argument to these findings is that, at follow up time points, study

interviewers may have over-applied normative standards when they judged whether particular traits were stable and enduring, such that the reported levels of PD stability were underestimated because PD symptoms were wrongly judged to be normative personality traits (Clark, 2006). Notably, results of the CLPS showed that PD dysfunction was more stable than PD traits (Skodol et al., 2005; Tyrer, Seivewright, & Johnson, 2004), which is supportive of efforts to focus PD conceptualization on dysfunction rather than abnormality (see the following section on dimensional modeling of PDs for elaboration).

Gender bias. The concern that existing PD criteria may unfairly characterize stereotypically feminine or masculine characteristics as pathological is another much echoed criticism of the categorical model for PDs (Clark, 2006). One way of testing gender bias involves comparing men and women's self-reports of PD symptomology. Item analyses of *DSM-IV-TR* PD criteria revealed moderate gender biased responding to three antisocial PD criteria (biased toward men), one paranoid PD criterion (biased toward men), and two schizoid PD criteria (biased toward women; Jane, Oltmanns, South, & Turkheimer, 2007). Narcissistic (Lindsay & Widiger, 1995) and borderline (Hoertel, Peyre, Wall, Limosin, & Blanco, 2014) PD criteria have also been critiqued for containing gender bias. However, studies of gender bias in PD criteria at the disorder level have found little to no overall effect on diagnosis (K. G. Anderson, Sankis, & Widiger, 2001; Morey, Warner, & Boggs, 2002). Still, perceived gender stereotypes for PDs (e.g., antisocial as masculine and histrionic as feminine) have been shown to have societal implications, such as increased stigmatization (Boysen, Ebersole, Casner, & Coston, 2014).

It is also possible that clinicians show gender bias when they diagnose PD, regardless of whether gender bias exists in the criteria. Although there is very little published research on this

topic, one study found that clinicians were more likely to diagnose borderline PD in women and narcissistic PD in men when given case presentations that were identical except for the patient's gender (Braamhorst et al., 2015). Widiger (2000) posited that a move toward gender-neutral criteria--rather than, for example, "feminizing" antisocial PD and "masculinizing" dependent PD--is the best approach to correcting potential gender biases in conceptualizations and clinician applications of PD criteria.

Descriptive utility. A meta-analysis of PD not otherwise specified (PD-NOS, or other specified personality disorder [OSPD] in *DSM-5*) found that the disorder is diagnosed in 8-13% of patient samples, and makes up 21-49% of all PD diagnoses (Verheul & Widiger, 2004). Verheul and Widiger (2004) proposed that either (1) individuals diagnosed with PD-NOS do not have enough symptoms to meet the specific PD criteria cutoffs or (2) "the complexity of personality pathology seen clinically is difficult to categorize...with our current *DSM* system" (p. 907). Other researchers have echoed these critiques (Clark, 2006 offers a review; see Vinnars & Barber, 2008 for a case study). In fact, attempts to categorically model any form of psychopathology inevitably result in a loss of specificity (Zapolski et al., 2012). Categorical PDs specifically have been criticized for providing a collection of heterogeneous maladaptive personality traits, wherein two individuals can meet criteria for the same PD but not share any symptoms in common (Widiger et al., 2009; Widiger & Trull, 2007).

Additionally, Verheul and Widiger (2004) found no significant differences in psychosocial functioning and suicide attempts or behaviors between those diagnosed with PD-NOS and specific PDs. This suggests that PD-NOS is not a "lesser" diagnosis in terms of impairment. All of these criticisms constitute a clear lack of descriptive utility and specificity in current PD criteria, which therefore decreases the categorical model's potential to facilitate

communication between providers and inform treatment planning (see Mullins-Sweatt & Widiger, 2009 for their useful operationalization of clinical utility).

Paradigm Shift: From Categorical to Dimensional Modeling of PDs

In contrast to a categorical model, a dimensional model for psychiatric disorder involves rating individuals based on homogeneous dimensions (Zapolski et al., 2012). In the case of PDs, a dimensional model is composed of a rating system for an individual's severity levels on multiple dimensions of personality (Zapolski et al., 2012). Benefits of the dimensional approach include (1) clearer meaning of disorder dimensions, (2) opportunities to validate the dimensions, and (3) clearer descriptions of patients (Eaton, Krueger, South, Simms, & Clark, 2011; Zapolski et al., 2012). Additionally, dimensional models of PD allow for integration of the normal and abnormal models of personality description and thereby characterize PDs as maladaptive variants of the personality characteristics of all individuals (which could positively affect the stigma surrounding the disorders; Widiger et al., 2009). Because PDs are variable and complex in their presentation, sensitive to and sometimes reflective of cultural and social values, and etiologically diverse, the nuance inherent in dimensional modeling grants it the potential for being a preferred mode of PD classification (Kendler, 2012; Kendler, Zachar, & Craver, 2011). Furthermore, the implementation of a dimensional model for PDs may mitigate many of the criticisms of the existing categorical model described above.

The push to move from a categorical to a dimensional model for PDs is not new. Allen Frances, chair of the *DSM-IV* Task Force, conceded 26 years ago that a dimensional model for PDs was “not whether, but when and which” (Frances, 1993, p. 110). Clark (2006) reviewed relevant PD assessment and diagnostic systems and called for a dimensional model that included measurement of general personality dysfunction and personality traits. Many other personality

pathology experts have similarly argued for a shift to a dimensional model (a small sampling: Livesley et al., 1994; Millon, 1994; Livesley, 1998; Widiger & Trull, 2007; Widiger et al., 2009; Kendler et al., 2011; Kendler, 2012; Krueger, Derringer, Markon, Watson, & Skodol, 2012). However, the *DSM-5* is the first edition of the *DSM* to include a dimensional-hybrid model for PDs. The model is included in Section III and titled “The Alternative *DSM-5* Model for Personality Disorders” (AMPD). In the AMPD, individuals are first rated dimensionally on personality functioning and identity development and then assigned specific, maladaptive personality traits. The Section III model does away with the PD-NOS/OSPD diagnosis and allows for a detailed description of the specific traits of individuals who meet criteria for PD. Diagnoses of six specific PDs are included, along with a diagnosis of personality disorder-trait specified (PD-TS) for presentations that do not fit any of the specific disorders.

Criterion A, level of personality functioning, requires clinicians to rate the patient’s level of impairment in two domains: self (broken up into identity and self-direction dimensions) and interpersonal (empathy and intimacy dimensions). Ratings range from 0 (little or no impairment) to 4 (extreme impairment). Criterion B is made up of 25 pathological personality traits that are organized into five categories: negative affectivity, detachment, antagonism, disinhibition, and psychoticism. These categories represent maladaptive variants of the Five Factor Model of Personality², and are closely linked to the domains of the Personality Psychopathology Five scales (PSY-5; American Psychiatric Association, 2013). Criteria C and D require that the impairments in personality functioning and pathological personality traits be relatively pervasive

² The Five Factor Model (FFM; McCrae & Costa, 1987) is the most widely studied and agreed upon model of personality. The model’s five personality dimensions of neuroticism, extraversion, openness, agreeableness, and conscientiousness are thought to represent all meaningful dimensions of an individual’s personality constellation.

and stable. Criteria E, F, and G require that clinicians consider potential differential diagnoses before making a PD diagnosis.

The specific PDs included in the AMPD are antisocial, avoidant, borderline, narcissistic, obsessive-compulsive, and schizotypal. Each is described qualitatively and then disorder criteria are listed. The diagnoses all require moderate or greater impairment in personality functioning (Criterion A) and a collection of pathological personality traits (Criterion B). The remaining Section II-specific PDs of paranoid, schizoid, histrionic, and dependent “are represented also by the diagnosis of PD-TS...and can be specified by the relevant pathological personality trait combinations” (American Psychiatric Association, 2013, p. 771), but they are not mentioned overtly in the AMPD. The specific PDs were chosen based on empirical data on prevalence, level of impairment, and diagnostic uniqueness from other PDs (American Psychiatric Association, 2013).

Notably, although some members of the *DSM-5* Task Force on PDs argued for the replacement of the categorical model for PDs with the AMPD in the main section of *DSM-5* (Zachar, Krueger, & Kendler, 2016), both the Section II and Section III models for PDs were included in the final version. This was reportedly done “to preserve continuity with current clinical practice, while also introducing a new approach that aims to address numerous shortcomings of the current approach to personality disorders” (American Psychiatric Association, 2013, p. 761). The Personality Inventory for the *DSM-5* (PID-5; Krueger et al., 2012) was developed based on the AMPD and has provided a standardized method for testing the dimensional conceptualization of PD. Research to date has supported the psychometric properties of the PID-5 and therefore the AMPD (Crego & Widiger, 2016; Finn, Arbisi, Erbes, Polusny, & Thuras, 2014; Hopwood, Good, & Morey, 2018). For instance, Anderson et al.

(2014) tested correlations between SCID-II (First, 1997) PD scales and those of the PID-5 (Krueger, Derringer, Markon, Watson, & Skodol, 2013) to examine validity of the AMPD. Results supported global convergent and divergent validity for the new model.

Research has also supported the clinical utility of the AMPD. Fowler and colleagues (2018) found that the PID-5 displayed adequate specificity and sensitivity as a screening tool for BPD. Morey, Skodol, and Oldham (2014) asked clinicians to perform PD assessments on their patients using both the *DSM-IV-TR* and AMPD criteria and then evaluate the clinical utility of each model. Although some clinicians have expressed resistance to learning a new classification system for PDs, Morey et al. found that clinicians rated the AMPD as equally or more useful than *DSM-IV-TR* in all areas tested (i.e., professional communication, comprehensiveness, descriptiveness, ease of use, communication with patients, and utility for treatment planning; also, see Waugh et al., 2017 for a review of the AMPD's clinical utility and validity). Furthermore, as Kotov et al. (2017) pointed out, dimensional measurements (e.g., MMPI, PAI) have been frequently used in clinical contexts for decades and dimensional models for other psychological disorders (e.g., intellectual disabilities, autism spectrum disorders) are already in place.

A number of PD measurement instruments exist, most of which have been based on categorical modeling of PDs (i.e., the Millon scales, SWAP, PAI). However, there may be opportunities to adapt these preexisting PD measures to reflect a more dimensional conceptualization of PD, rather than creating completely new versions of measures. The Minnesota Multiphasic Personality Inventory, second edition (MMPI-2; Butcher et al., 2001) is one measure that may be amenable to a dimensional measurement of PDs.

History of the Minnesota Multiphasic Personality Inventory

The first version of the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1942) was developed in 1940 by Starke R. Hathaway, a clinical psychologist, and J. Charnley McKinley, a neuropsychiatrist. Their intention was to create an omnibus measure of psychopathology that would provide a broader, more structured array of personality descriptions (Hathaway & McKinley, 1942; Meehl, 1945). The MMPI was developed using the empirical approach to scale construction, wherein scale items were based on differential responding between those diagnosed with the disorder in question and “normals” (Drayton, 2009). In other words, scale items were decided upon based on clinical prevalence, rather than by clinicians’ judgments of what a particular disorder or trait should “look like” on a questionnaire. By the late 1950s, the MMPI had become the most widely used objective measure of psychopathology and personality (Dahlstrom, 1992).

Calls to revise the MMPI grew loud by the 1970s, as items were criticized for being outdated and the original norms were no longer representative of the U.S. population (University of Minnesota Press, 2011). A committee was formed at the University of Minnesota to re-standardize the test, while maintaining as much of the original structure as possible (University of Minnesota Press, 2011). This re-standardized version, The Minnesota Multiphasic Personality Inventory, second edition (MMPI-2; Hathaway, 1989) was published in 1989. The MMPI-2 was validated on a sample of 2,600 adults, and there are over 10,000 published manuscripts on research using the instrument (Drayton, 2009).

The MMPI-2 was revised in 2008, spurred by criticism that the MMPI-2 was useful for determining whether psychopathology was present but poor at measuring the content of the psychopathology (Groth-Marnat, 2009). Revisions were based on factor analysis of the MMPI-2

items, resulting in the reduced (388 items) MMPI-2-Restructured Form (MMPI-2-RF; Ben-Porath, 2008). The factor analysis was first used to determine a general demoralization score (RCd/Demoralization), and items that loaded heavily onto RCd were removed from the clinical scales. The clinical scales were then refined further, resulting in a set of Restructured Clinical (RC) scales. Another addition to the MMPI-2-RF was the Personality Psychopathology Five (PSY-5) scales; these were developed through work with a group of laypeople on the development of five easily understandable, distinctive, and relevant personality constructs (Groth-Marnat, 2009). Because it is a condensed version of the MMPI-2, the MMPI-2-RF can be scored from a MMPI-2 administration. Therefore, the RC and PSY-5 scales are now available for the MMPI-2.

Despite their vast clinical utility, all existing versions of the MMPI lack distinct personality disorder diagnostic scales. Such scales are of great potential use for clinicians, especially given the relative difficulty of diagnosing PDs. The following subsection describes past attempts to develop PD scales for the MMPI.

PD Scale Development for the MMPI/MMPI-2

Several attempts have been made to develop sound PD scales using existing MMPI/MMPI-2 items (i.e., Morey, Waugh, & Blashfield, 1985; Raskin & Novacek, 1989; Wink & Gough, 1990; Levitt & Gotts, 1995; Somwaru & Ben-Porath, 1995; Mulay et al., 2018). These scales and their psychometric properties are described below. The final scales described, Mulay et al.'s (2018) PD Spectra scales, are the focus of the current studies.

Morey, Waugh, and Blashfield (1985) published the first set of PD scales for the MMPI, based on *DSM-III* (American Psychiatric Association, 1980) criteria for PDs. They employed a combined rational-empirical strategy to develop the scales, wherein four clinical psychologists

reviewed the MMPI for items representative of the PD criteria. Then, the scale items were narrowed down by iterative empirical item-analyses and final scales were tested through correlational analyses. The final result was 11 PD scales: paranoid, schizoid, borderline, compulsive, passive-aggressive, narcissistic, antisocial, histrionic, schizotypal, dependent, and avoidant. Intercorrelations between the scales mirrored expected relationships based on *DSM-III* PD criteria. A follow up study supported external validity of the scales by comparing responses between controls and individuals diagnosed with PDs. However, as Morey et al. (1988) stated, “the difficulty in identifying rigorously defined criterion groups in personality disorder makes all diagnostic validation research in this area somewhat preliminary” (p. 50).

Due to the release of new versions of the *DSM* and MMPI, Somwaru and Ben-Porath (1995) developed an alternative set of PD scales (11 scales: antisocial, avoidant, borderline, dependent, histrionic, narcissistic, obsessive compulsive, paranoid, schizoid, schizotypal). The scales were made up of items from the MMPI-2 (Hathaway, 1989) and used *DSM-IV* (American Psychiatric Association, 1994) PD criteria as a guide. Subsequent study of the scales’ construct validity showed similar patterns of validity to the Morey et al. (1985) scales. Additionally, items on the Somwaru and Ben-Porath (1995) schizoid, antisocial, and borderline PD scales demonstrated higher correlations with corresponding scales on other PD measures (i.e., PDQ-4; Hyler, 1994; and MCMI-III; Millon, Millon, & Davis, 1994) compared to the Morey et al. (1985) scales.

In an attempt to update and validate the work of Morey et al. (1985), Levitt and Gotts (1995) used the *DSM-III-R* (American Psychiatric Association, 1987) criteria to mine the MMPI and MMPI-2 to develop yet another updated set of 11 PD scales (paranoid, schizoid, borderline, compulsive, passive-aggressive, narcissistic, antisocial, histrionic, schizotypal, dependent, and

avoidant). Jones (2005) compared the incremental validity of the Levitt and Gotts (1995) scales to that of the Morey et al. (1985) and Somwaru and Ben-Porath (1995) scales. After comparing all three scale sets to the MCMI-II (Millon, Millon, & Davis, 1987), results showed that the Levitt and Gotts (1995) and Somwaru and Ben-Porath (1995) scales arguably demonstrated incremental validity over the Morey et al. (1985) scales. Additionally, the Somwaru and Ben-Porath (1995) scales demonstrated the best internal consistency overall, with all scale alphas ranging from good to excellent. However, the attenuation paradox (i.e., when redundancy of item content inflates scale reliability to the detriment of its validity; Loevinger, 1954) and overreliance on alpha statistics (Streiner, 2003) call the conclusions that accompanied these findings into question.

Additional efforts have been made to develop narcissism scales from MMPI items. Raskin and Novacek (1989) developed one narcissism scale by correlating undergraduate participants' responses on the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979) with MMPI response items. The scale items converged with the Morey et al. (1985) narcissism scale. Wink and Gough (1990) also created an MMPI narcissism scale, using *DSM-III* (American Psychiatric Association, 1980) criteria. This scale, too, correlated as expected with the NPI and the Morey et al. (1985) narcissism scale. However, conceptualizations of narcissistic PD have broadened since the creation of these scales; there has been a shift away from focusing only on grandiosity to include consideration of underlying narcissistic vulnerability (Manley, Roberts, Beattie, & Woodman, 2018). Therefore, the Raskin and Novacek (1989) and Wink and Gough (1990) narcissism scales may not reflect current conceptualizations of narcissism despite their previously demonstrated reliability and validity.

PD Spectra Scales for the MMPI-2

The introduction of the *DSM-5* (American Psychiatric Association, 2013) and the previously discussed momentum toward classifying a dimensional model for PDs inspired a renewed attempt to develop PD scales for the MMPI-2. Mulay et al. (2018) pooled the items from the scales described above to develop a set of PD Spectra scales for the MMPI-2 (Hathaway, 1989) with consideration given to the *DSM-5*'s Sections II and III, *ICD-10* (World Health Organization, 1993), and *PDM-2* (Alliances of Psychoanalytic Organizations, 2017) models for PDs. The authors' aim was to create scales that could provide a bridge between the two models, or a "dimensionalized-categorical" model.³

Six individuals with expertise in PD assessment (five psychologists and one advanced doctoral student) rated each previously existing PD scale item on its direct content validity for the PD in question and its "performative validity" (i.e., whether an individual with the PD in question would be likely to endorse the item; Johnson, 2004). They were instructed to consider the PD conceptualizations included in *ICD-10*, *PDM-2*, and Sections II and III of *DSM-5*. Raters scored items on each of the 16 PDs under investigation (antisocial, avoidant, borderline, dependent, depressive, histrionic, narcissistic-depleted/vulnerable, narcissistic-grandiose, obsessive-compulsive, paranoid, passive-aggressive, sadistic, schizoid, schizotypal, self-defeating, and somatizing) using the following metric: 0 = "*not relevant*," 1 = "*somewhat relevant*," 2 = "*quite relevant*," and 3 = "*highly relevant*." Two-way, random, single-rater agreement intra-class correlation coefficients (ICC; Shrout & Fleiss, 1979) were then calculated for each PD scale, along with content validity ratios (CVR). CVRs were computed via the following formula, wherein *N* represents the total number of experts and *E* is the number of experts who rated the item as essential (i.e., a score of 2-3; Lawshe, 1975; Lynn, 1986):

³ Similar scales have been developed and preliminarily validated for the MMPI-2-RF (Sellbom, Waugh, & Hopwood, 2018).

$$\text{CVR} = (E - N/2) / (N - 2)$$

Items with CVRs $\geq .67$ were retained and overlapping items were retained only on the scale with the higher CVR. All scales were required to have at least 10 items.⁴ Rater discussion of theoretical considerations informed retention of some items with modest CVRs (i.e., .33) and overlapping items with equivalent CVRs on multiple scales. The result was 12 PD Spectra scales that demonstrated strong CVRs and non-overlapping items: antisocial, avoidant, borderline, dependent, depressive, histrionic, narcissistic grandiose, obsessive compulsive, paranoid, schizoid, schizotypal, and somatizing.

The 12 scales were then tested on a sample of clinical outpatients ($N = 1,030$). Cronbach's alpha and corrected item-total correlations were examined for each scale and item. Items with item-total correlations below .20 were excluded, and revisions to the 12 scales were made based on the following item-based criteria: item-total correlation $\geq .20$ and lack of a higher significant correlation ($p < .01$, 2-tailed) with a non-parent PD scale. One hundred items demonstrated a higher correlation to another PD scale (versus the parent scale); two members of the research team used theory as a guide to determine whether the items should be moved to a new scale, retained on their parent scale, or removed from further analyses.⁵

The clinical sample was then split into two subsamples (a development sample [$N = 614$] and a replication sample [$N = 416$]) and the item-analytic procedure was repeated on the development sample. After item deletions based on the aforementioned criteria, analyses were repeated a third time on the replication sample and scales were finalized. See Appendix 1 for final scale items (although items have been altered in compliance with copyright laws).

⁴ After final analyses, the schizoid PD Spectra scale had 9 items, but demonstrated adequate psychometric properties to be retained. See Mulay et al. (2018) for details.

⁵ After agreement was reached on 90/100 items, a third member of the research team evaluated the remaining 10 items and scale membership was determined based on majority rule.

Results of the MMPI-2 item analyses for the Mulay et al. (2018) PD Spectra scales revealed good psychometric properties, with scale-wise Cronbach's alphas ranging from .56 to .94 and item-total correlations ranging from .29 to .50. Additionally, the scales correlated in expected directions with MMPI-2 validity, clinical, and PSY-5 scales. Added benefits of these newly developed PD Spectra scales over prior PD scales are the lack of item overlap between scales and the promotion of cross-model connection between categorical and dimensional conceptualizations of PDs. However, the underlying factor structure of the PD Spectra Scales is so far unknown. Examination of the factor structure of the PD Spectra scales is needed to provide further evidence of the psychometric properties of the scales and to test their clinical utility as measures of PD pathology. The current studies aim to fill these gaps by performing exploratory and confirmatory factor analyses of the items corresponding to the PD Spectra scales and examining the criterion validity and clinical utility statistics of the factors emerging from these analyses. Although the PD Spectra Scales are organized into specific PD categories, it was predicted that results of the factor analyses would reveal an underlying dimensional-hybrid model of PD classification in the Spectra Scales item pool.

CHAPTER THREE: STUDY 1

Study 1 consisted of exploratory analyses to determine the item-level factor structure of the Mulay et al. (2018) PD Spectra scales (hereafter referred to as the PD Spectra scales), in a first step toward ascertaining whether their underlying structure reflects a dimensional model of PDs. Bifactor analysis was the analytic method chosen to answer this question, as it allowed PD scale items to load on a large general factor that encapsulated the variance shared across the item pool, with additional specific factors that captured unique domains of the items.

It was hypothesized that the factor structure of the scales would reveal a dimensional item configuration reflective of the *DSM-5* AMPD. Therefore, it was predicted that an exploratory bifactor model would fit the PD Spectra scales sample data well, with one general factor representing overall distress in the areas of interpersonal relationships and identity, to mirror Criterion A of the AMPD. Other PD measurements developed based on the AMPD have supported a one-factor or bifactor structure reflective of a general distress factor (J. L. Anderson et al., 2013; Busch, Morey, & Hopwood, 2017; Hentschel & Livesley, 2013), and evidence exists that clinical severity is the most important indicator of personality pathology (Hopwood et al., 2011).

In addition, it was hypothesized that five specific factors would emerge in the exploratory bifactor model, with each factor representing one of the five maladaptive personality trait subgroupings provided by Criterion B of the AMPD: negative affectivity, detachment, antagonism, disinhibition, and psychoticism. This specific (or second-order) factor structure has been identified in similar studies of PD measurement development inspired by the AMPD (J. L. Anderson et al., 2013; Busch et al., 2017), and is conceptually linked to the Five-Factor Model of Personality (FFM). However, item-level factor analysis of the entire MMPI-2 by Leonelli,

Chang, Bock, and Schilling (2000) resulted in a 10-factor solution with factors representing distrust, self-doubt, fitness, serenity, rebelliousness, instrumentality, irritability, artistry, sociability, and self-reliance. These findings inspired a flexible and exploratory mindset in determining the specific factor structure of the PD Spectra scale item pool, although Leonelli et al. found some of these factors may be agreeable to FFM concepts (e.g., distrust and neuroticism).

Methods

Participants

Participants were 1,030 individuals presenting to a university-based psychological clinic for psychological evaluation and/or treatment. The demographic makeup of participants was generally consistent with individuals presenting to a community-based clinic in the Southeastern United States. Participants had the following demographic characteristics: 52.5% female ($n = 541$), 47.5% male ($n = 489$); mean age of 31.63 years ($SD = 11.63$); mean years of education 14.38 ($SD = 2.57$); 53.7% never married, 25.8% currently married. Racial data was only available for 820 (79.6%) of the participants, but for those whose racial makeup was known, 73.3% identified as Caucasian, 3.2% as African-American, 1.3% as East/South Asian or Pacific Islander, 1.2% as multiracial, 0.3% as Native American, and 0.3% selected “other race”. Type of service sought was identified for 865 (84.0%) of participants. Of those for whom service sought was known, 38.7% sought individual psychotherapy; 26.0% sought psychoeducational evaluation; 6.7% sought psychological evaluation; 4.6% sought couples, family, or group therapy; 4.0% sought court-ordered child custody evaluation; 1.1% sought social security or disability evaluation; and 1.0% each sought vocational rehabilitation evaluation, fitness for duty evaluation, and parenting fitness evaluation.

Procedure

Data were collected from a de-identified, archival sample of clinical patients who completed the MMPI-2 as part of clinic intake procedures between 2005 and 2015. The clinic was a university psychological clinic associated with a clinical psychology doctoral program. Fees were determined on a sliding scale and the clinic primarily served individuals from the local community. Referrals to the clinic were commonly received from local mental health practitioners, nearby universities, the court system, primary care offices, other community members, and nearby outpatient mental health centers and crisis care centers. All participants signed a waiver before testing authorizing the use of their test results for research purposes. Participants completed the measures using pencil and paper and the MMPI-2 was scored using computer software.

Measures

MMPI-2. The Minnesota Multiphasic Personality Inventory, Second Edition (MMPI-2; Butcher et al., 2001) is an oft-used, empirically developed measure of adult personality structure and clinical symptomology. The MMPI-2 is a self-report measure that consists of 567 true/false items composed at a 5th grade reading level. Normative statistics were based on a nationally representative community sample of adult men and women between the ages of 18 and 80 (1,462 females and 1,138 males; Butcher et al., 2001). Validity of MMPI-2 scale norms has been established for adults over the age of 20 and across occupations and income levels (Weiner & Greene, 2008). Test-retest correlations average .74 for the clinical scales and .85 for the content scales, meaning that an individual's true scores fall within the standard error of measurement about two thirds of the time (Butcher et al., 2001). For this study, MMPI-2 data were extracted from a digital scoring program database. Records were included in this study only if the profiles

met the following validity criteria: Cannot Say ≤ 30 , VRIN $\leq 80T$, F and FBS $\leq 110T$, F(p) $\leq 100T$, L $\leq 80T$, K $\leq 75T$, and S $\leq 75T$ (Archer, Fontaine, & McCrae, 1998; Archer, Handel, & Couvadelli, 2004; Butcher et al., 2001; Rothke et al., 2000).

PD Spectra scales item pool. 220 items from the MMPI-2 constitute the PD Spectra scales item pool that was used in the present study. Items were determined based on the results of a scale development study conducted by Mulay et al. (2018; see literature review for more information). The PD Spectra are made up of the following scales (Cronbach's alpha statistics are in parentheses following each scale, and represent the range of reliability observed for three samples in Mulay et al., 2018): antisocial ($\alpha = .77-.86$), avoidant ($\alpha = .82-.88$), borderline ($\alpha = .82-.90$), dependent ($\alpha = .67-.84$), depressive ($\alpha = .85-.94$), histrionic ($\alpha = .74-.80$), narcissistic grandiose ($\alpha = .67-.83$), obsessive compulsive ($\alpha = .56-.75$), paranoid ($\alpha = .76-.87$), schizoid ($\alpha = .63-.80$), schizotypal ($\alpha = .67-.87$), and somatizing ($\alpha = .67-.85$).

Demographics. Participant demographics were collected both from the MMPI-2 protocols (i.e., age, gender, date of intake, marital status) and patient paper files from clinic archives (i.e., race and purpose of assessment). Trained undergraduate research assistants extracted data from paper files and entered the information into a digital database for analysis.

Data Analytic Plan

To address the aim of Study 1, items corresponding to the 12 PD Spectra scales were subjected to exploratory factor and bifactor analyses (EFA and EBFA). Although higher-order modeling is often used in the examination of psychological phenomena, bifactor models have been shown to best fit data for multidimensional measures such as the WAIS-III (Brunner, Nagy, & Wilhelm, 2012), WISC-V (Dombrowski, Canivez, Watkins, & Beaujean, 2015), Outcome Questionnaire-45 (OQ-45; Bludworth, Tracey, & Glidden-Tracey, 2010), Observer Alexithymia

Scale (OAS; Reise, Moore, & Haviland, 2010), HEXACO Personality Inventory (Anglim et al., 2017), and the 50-item International Personality Inventory Pool (IPIP; Biderman, Nguyen, Cunningham, & Ghorbani, 2011). Once the underlying factor structure of the PD Spectra Scales was determined through EFA, bifactor modeling provided a method for further examining the Scales that is congruent with the conceptualization of PD dimensionality described above.

Bifactor modeling allows for latent variables of interest and group factors to compete to explain item variance and avoids placing factors “higher” or “lower” than one another as in higher-order modeling. Specifically, in a bifactor model each item loads onto a general factor, which represents individual differences in the target variable of most interest (e.g., interpersonal dysfunction and identity disturbance). The specific or nuisance factors represent common factors that explain additional item variance that is not accounted for by the general factor (e.g., PD trait groupings). Thus, bifactor modeling aligns with the conceptual model for the AMPD, as the general dysfunction criterion (Criterion A) is conceptualized as separate from the specific trait factors (Criterion B), yet Criterion A is the most descriptive of overall PD pathology. See Figure 1 for sample figural representations of a correlated factors model and a bifactor model.

First, the underlying factor structure of the PD Spectra Scales item pool was determined using exploratory factor analysis (EFA). In the context of an initial EFA, possible factor constellations that fell outside of the hypothesized five-factor model were examined. Empirical factor extraction criteria (Gorsuch, 1983) and factor interpretability and compliance with simple structure (Thurstone, 1931) informed factor extraction. Specifically, eigenvalues > 1 (Kaiser, 1960) and the scree test (Cattell, 1966) were examined to identify the appropriate range of factors to further explore in modeling the data. As recommended by Muthén (personal communication), due to the unfeasibility of running WLSMV estimation on a large, dichotomous

item pool, an EFA was first run with unweighted least squares multivariate (ULSMV) estimation on all 220 items to estimate an initial factor structure. Items were retained if they loaded $\geq .40$ on any one factor and $< .30$ on any other factor (McDonald, 1999). If items loaded $< .40$ on any one factor or if item cross-loadings onto more than one factor exceeded $.30$, the items were removed and the EFA repeated. Once the item pool was reduced such that all items met these initial criteria, EFA was run with weighted least squares multivariate (WLSMV) estimation. WLSMV is recommended for modeling categorical data due to its robustness and because it does not assume normality of variable distribution, which is particularly important in applied research (Brown, 2014). Missing data were handled using pairwise deletion, as this is the only option for WLSMV estimation of dichotomous variables.

Factor interpretability, factor correlations, and model fit indices informed the choice of a final EFA model. Specifically, model fit was determined through the use of three goodness-of-fit indices: Comparative Fit Index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residuals (SRMR). As recommended by Marsh, Hau, and Wen (2004), the criteria to establish acceptable model fit were: $CFI \geq 0.90$, $RMSEA < 0.08$, and $SRMR < 0.08$. Of note, AIC and BIC model fit statistics were not considered because they are not available for WLSMV estimation.

Next, EBFA was run on the resulting item pool with factors rotated using the bifactor target rotation, or bi-geomin, method (Reise, Moore, & Maydeu-Olivares, 2011). Scree plot and factor interpretability informed the range of factor solutions explored in this stage of analysis. The final EBFA factor structure was determined based on factor interpretability, proportion of item cross-loadings onto multiple specific factors, and model fit indices (i.e., CFI, RMSEA, and

SRMR). See below for background information on exploratory bifactor parameter estimation methods and justification of the use of the bifactor target rotation method.

There are two common approaches to parameter estimation in exploratory bifactor modeling: the Schmid-Leiman orthogonalization (SL; Schmid & Leiman, 1957) and the bifactor target rotation method (Reise et al., 2011). The SL is a re-parameterization of higher-order modeling that reveals how the measured variables are related to the second-order factor and versions of the first-order factors that have been residualized (Dombrowski et al., 2015). Problematically, the SL overestimates general factor loadings and underestimates specific factor loadings in the presence of non-zero cross-loadings (Reise, 2012). In addition, the SL method introduces an issue of proportionality constraints, wherein it is assumed that the ratio of the general to specific factor loadings are equivalent for all items (Yung, Thissen, & McLeod, 1999). Proportionality is highly unlikely in population data and, therefore, assuming proportionality greatly limits understanding of the true relationships between general and specific factors.

Alternatively, the bifactor target rotation method requires *a priori* specification of a factor pattern matrix, including specified and unspecified elements (Reise, 2012). The factor pattern matrix is constructed based on theory or preliminary data analyses. This method has created models that (1) correctly estimated solutions even when items cross-loaded onto multiple group factors and (2) matched well with true population parameters (Reise et al., 2011). The bifactor target rotation method was chosen for use in this study due to the likelihood the specific factors would be correlated. Therefore, PD Spectra scale items were likely to cross-load onto multiple factors, making application of the Schmid-Leiman orthogonalization to bifactor modeling problematic.

All EBFA was conducted using weighted least squares multivariate (WLSMV) estimation. This method is appropriate to use when factor determinants are dichotomous (Muthén & Muthén, 2017). All EFA and EBFA were conducted using *Mplus* version 8.1 (Muthén & Muthén, 2017). *Mplus* EBFA procedures account for dichotomous items, so polychoric matrix computation was not necessary in these analyses. Additionally, all exploratory analyses were run with oblique group factors to allow for correlation amongst factors.⁶

Results

Exploratory Factor Analysis

Table 1 displays frequencies for all PD Spectra Scale items (all tables and figures are located in Appendix 2). Across 220 variables, the average proportion of missing data was 0.2% (range: 0-2.6%). EFA was run with ULSMV estimation on all 220 items to determine initial factor structure. Figure 2 displays a scree plot of an initial exploratory bifactor analysis, and Table 2 presents the corresponding eigenvalues. The scree plot showed a dominant first factor, and eigenvalues were greater than 1.00 for 60 factors (44.04-1.02). The ratio of the first to second factor eigenvalue was 44.04 to 17.40, indicating a common variance underlying the homogeneity and internal consistency across the 220 items. Slight bends in the scree plot emerged at 3, 6, and 10 factors. Reasoning about the potential interpretability of the number of factors led to final examination of 1-15 factor models. Interpretability analysis of the specific factor structures that emerged led to further examination of 5-13 factors (i.e., factor structures for 1-4 and 14-15 factors included factors that encompassed multiple concepts or were otherwise not

⁶ Oblique factor rotation was chosen because the belief that personality factors (e.g., FFM, Big Five) are uncorrelated has been called into question by findings of moderate intercorrelations amongst specific personality factors, which have arguably been missed in studies that tested orthogonal models (Digman, 1997; Musek, 2007). For instance, meta-analysis conducted by Van der Linden et al. (2010) obtained a mean absolute correlation of .23 amongst the Big Five.

interpretable based on item content). For factor models with 5-13 factors, items were retained if they loaded $\geq .40$ on any 1 factor and $< .30$ on any other factor for any model. Sixty-five of the original 220 items did not meet these criteria (i.e., displayed significant cross-loading or poor loading on a single factor in all models) and were deleted.

EFA was then run with WLSMV estimation on 155 items for 5-13 factors. Model fit was good for all models (e.g., $CFI \geq 0.90$, $RMSEA < 0.08$, and $SRMR < 0.08$), but interpretability favored a model with 5 or 6 factors. Specifically, models with more than 6 factors included factors wherein no items loaded $\geq .40$ on the factor and/or factors were not interpretable based on item content. Nine rounds of item deletion were conducted using the same item deletion criteria until a final factor model could be fit to the data. Items had to load poorly on all factor structures still under consideration in order to be deleted at each round. Following the final round of item deletion, a 6-factor EFA model comprised of 53 items offered the cleanest solution. Model fit was good for the final 6-factor solution ($\chi^2 = 1825.11$ (1122), $RMSEA = .03$, $CFI = .96$, $SRMR = .05$).

The first factor was defined by somatization items (e.g., “frequent stomach aches,” “tenderness atop head”), suggesting a clear dimension of somatization in the personality measurement of the overall scale. The second factor loaded onto antisocial and paranoid PD Spectra Scale items, and included one obsessive-compulsive PD item (“[I am] just as good as experts”). Thus, this factor was determined to measure a personality domain of antagonistic suspiciousness, rather than reflecting a particular PD. Factor 3 included histrionic PD scale items (e.g., “worries melt in a lively crowd”) and revealed negative loadings for one avoidant (“more likely to be a wallflower at a party”) and two schizoid (“happiest alone” and “avoids crowds”) PD items. Therefore, this factor was interpreted as reflecting the personality domain of

extraversion. The fourth factor loaded onto depressive PD items (e.g., “empty/meaningless life”), as well as one borderline item (“frequent suicidal thoughts”) and a negatively loading narcissistic item (“feel important”). Given the item content, this factor seemed to best reflect depression symptomology. Factor 5 included dependent PD items (e.g., “easily defeated in arguments”), one borderline item (“it is easy to make me cry”) and one avoidant item (“easily embarrassed”). Given the emphasis on bowing to others and the absence of eliciting caretaking by others, this factor was thought to reflect the personality domain of passivity, rather than dependent PD. Finally, factor 6 was made up of borderline PD items centering on angry affect (e.g., “hotheaded”). Therefore, this factor represented tendency toward anger rather than borderline PD. The following factor names were assigned to the final 6-factor model: somatizing (factor 1, 10 items), antagonistic suspiciousness (factor 2, 10 items), extraversion (factor 3, 10 items), depression (factor 4, 9 items), passivity (factor 5, 8 items), and anger (factor 6, 7 items). See Table 3 for factor loadings and item content.

Table 4 includes factor correlations for the EFA model. All factors exhibited significant ($p < .05$) correlations with at least one other factor. Somatizing (F1) correlated positively with antagonistic suspiciousness (F2; $r = .21$), depression (F4; $r = .29$), passivity (F5; $r = .12$), and anger (F6; $r = .27$). In other words, individuals who endorsed somatizing were more likely to also endorse antagonistic suspiciousness, depression, passivity, and anger. Somatizing (F1) correlated negatively with extraversion (F3; $r = -.14$), indicating individuals who endorsed somatizing were less likely to also endorse extraversion. Antagonistic suspiciousness (F2) was positively correlated with depression (F4; $r = .21$), passivity (F5; $r = .19$), and anger (F6; $r = .32$). Thus, those who endorsed antagonistic suspiciousness were more likely to also endorse depression, passivity, and anger. Extraversion (F3) was negatively correlated with depression

(F4; $r = -.34$) and passivity (F5; $r = -.23$), meaning individuals who reported extraversion were less likely to report depression and passivity. Depression (F4) correlated positively with passivity (F5; $r = .32$) and anger (F6; $r = .22$), suggesting those who self-reported depressive symptoms were more likely to also endorse passivity and angry affect. Finally, passivity (F5) correlated positively with anger (F6; $r = .20$), meaning those who endorsed passivity were more likely to endorse anger. Correlations between antagonistic suspiciousness (F2) and extraversion (F3), and extraversion (F3) and anger (F6) were not significant.

Exploratory Bifactor Analysis

Next, EBFA with WLSMV estimation, oblique bi-geomin rotation, and theta parameterization was run on the 53 items from the final EFA model. Figure 3 displays a scree plot for the 53-item pool, and Table 5 presents the corresponding eigenvalues. The scree plot shows a dominant first factor, and eigenvalues were greater than 1.00 for 13 factors (11.27-1.00). The ratio of the first to second factor eigenvalue was 11.27 to 5.69, indicating a common variance underlying the homogeneity and internal consistency across the remaining 53 items. Slight bends in the scree plot emerged at 3 and 8 factors. Models with 3 and 4 factors exhibited mediocre to poor model fit ($\chi^2 = 4050.75$ (1272), RMSEA = .05, CFI = .83, SRMR = .09 and $\chi^2 = 3125.62$ (1221), RMSEA = .04, CFI = .89, SRMR = .08, respectively), and therefore were discarded. The EBFA models with 8-13 factors were discarded due to lack of interpretability of the factors. Models with 5 and 7 factors exhibited significant cross-loadings of items on multiple specific factors. Therefore, the 6-factor EBFA model provided the cleanest solution and indicated the fewest number of item cross-loadings. The 6-factor EBFA model fit was good ($\chi^2 = 1825.11$ (1122), RMSEA = .03, CFI = .96, SRMR = .05). It was not possible to compare EFA and EBFA model fit statistics because the models were not nested within one another. Instead,

the models are compared qualitatively in the discussion section. See Table 6 for model fit indices for EFA and EBFA analyses.

All but three items from the 53-item pool demonstrated statistically significant loadings onto the general factor. Items that did not load significantly on the general factor were: “like loud, fun parties” (item 86), “enjoy flirting” (item 189), and “like being friends with pranksters” (item 231). The 48 items that demonstrated moderate to high loadings (i.e., $\geq .30$) onto the general factor included items from the somatizing (9 items), depressive (7 items), borderline (7 items), paranoid (6 items), dependent (6 items), histrionic (5 items), antisocial (3 items), avoidant (2 items), schizoid (2 items), and narcissistic (1 item) PD Spectra Scales. Due to the expansiveness of the item content included in the general factor, the factor was thought to reflect overall psychological distress/psychopathology. The five specific factors matched with somatizing (F1), extraversion (F3), depression (F4), passivity (F5), and anger (F6) from the EFA, with identical item content. Only antagonistic suspiciousness (F2) was missing in the EBFA model, as the variance for those items was accounted for by the general factor. Therefore, the following EBFA model specific factor names were assigned: somatizing (specific factor 1, 10 items), extraversion (specific factor 2, 10 items), depression (specific factor 3, 9 items), passivity (specific factor 4, 8 items), and anger (specific factor 5, 7 items). See Table 7 for factor loadings and item content.

Table 8 includes EBFA factor correlations. As expected, extraction of a general factor in the bifactor analysis resulted in fewer significant ($p < .05$) correlations amongst the specific factors, and weaker correlations for those that were significant. Somatizing (S1) was positively correlated with depression (S3; $r = .18$) and anger (S5; $r = .14$), indicating participants who endorsed somatizing were more likely to also endorse depression and anger. Somatizing (S1)

was negatively correlated with extraversion (S2; $r = -.09$), meaning individuals who reported somatizing were less likely to endorse extraversion. Extraversion (S2) negatively correlated with depression (S3; $r = -.31$) and passivity (S4; $r = -.19$), meaning individuals who endorsed extraversion were less likely to endorse depression and passivity. Finally, depression (S3) was correlated with passivity (S4; $r = .23$). In other words, those who self-reported depression symptoms were more likely to also endorse passivity. Correlations between somatizing (S1) and passivity (S4), extraversion (S2) and anger (S5), depression (S3) and anger (S5), and passivity (S4) and anger (S5) were not significant.

CHAPTER FOUR: STUDY 2

Study 2 sought to confirm the exploratory bifactor model using a second clinical sample provided by Jones (2005; Aim 1) and utilized data from the Millon Clinical Multiaxial Inventory, second edition (MCMI-II; Millon et al., 1987) to establish criterion-related validity (Aim 2). It was hypothesized that Aim 1 confirmatory bifactor analysis performed on the Study 2 sample would support the factor structure identified in the exploratory analyses described in Study 1 and demonstrate superior model fit to a correlated factors model. To address Aim 2, correlational and regression analyses were performed to examine associations between the PD Spectra item pool general and specific factors and the MCMI-II personality scale scores (schizoid, avoidant, dependent, histrionic, narcissistic, antisocial, aggressive-sadistic, compulsive, passive-aggressive, self-defeating, schizotypal, borderline, and paranoid). Results of the criterion validity analyses served as benchmarks for interpreting the confirmatory analysis results.

Third, model-based internal consistency reliability statistics were examined for the confirmatory bifactor model (Aim 3). Attention to these often unreported statistics provided additional information on the psychometric properties of the general and specific factors confirmed in Aim 1. Reliability statistics also shed light on the potential clinical utility of the underlying factor structure of the PD Spectra Scale items. Finally, these analyses revealed whether the factor structure could be used to develop a clinically useful alternative scoring scheme for the PD Spectra Scales item pool.

Methods

Participants

Study participants were 539 individuals presenting to military services branches of an Army medical center for inpatient or outpatient psychological evaluation and/or treatment.

Participants included retired and active duty military service members and their family members. The sample included 373 inpatient and 135 outpatient individuals. Participants had the following demographic characteristics: 29.9% female ($n = 161$), 70.1% male ($n = 378$); mean age of 29.57 years ($SD = 9.71$); mean years of education 13.45 ($SD = 2.33$); 65.5% White, 23.4% African American, 4.8% Hispanic, 2.6% Asian American, 0.6% American Indian, and 2.2% indicated another race.

Procedure

Inpatient participants were administered the MMPI-2 and MCMI-II as part of a diagnostic evaluation that occurred during their hospitalization. Most of the outpatient participants completed the measures as part of evaluations intended to answer diagnostic questions posed by other professionals (e.g., psychiatry, neurology) or guide treatment planning. Some outpatients may have completed the measures as part of fitness for duty, security clearance, or special duties selection evaluations. All participants signed a waiver before testing authorizing that their test results could be used for research purposes. Participants completed the measures using pencil and paper and measures were scored using computer software.

Measures

MMPI-2. See the Study 1 Methods section for a description of the MMPI-2 and record inclusion criteria.

PD Spectra scales item pool. See the Study 1 Methods section for a description of the MMPI-2 item pool used for this study.

MCMI-II. The Millon Clinical Multiaxial Inventory, second edition (MCMI-II; Millon et al., 1987) is a 175-item, true/false, self-report questionnaire that measures clinical symptoms and personality disorders as conceptualized by the *DSM-III-R*. The MCMI is a frequently used

test in clinical practice (Piotrowski & Zalewski, 1993) that utilizes base rate scores rather than *T* scores. The optimal base rate scale scores were determined using a sample of 1,292 clinical patients with a variety of presenting problems (Groth-Marnat, 2009). Factor analyses of the scales have generally supported their organization, and reliability and validity have been well established (Groth-Marnat, 2009). Finally, study of the comparative validity of MMPI-2 and MCMI-II scales found acceptable convergent and discriminant validity between the scales of the two measures (Wise, 1996). MCMI-II records were included in this study only if participants omitted ten or fewer items and did not endorse any of the invalidity items.

Data Analytic Plan

Aim 1

As Study 1 resulted in well-fitting EFA and EBFA models, confirmatory factor (CFA) and confirmatory bifactor analyses (CBFA) were performed on the Study 2 sample based on the models identified in Study 1. CBFA allows each item to load onto a general factor and only one specific factor. The fixed factor identification method was used, which sets the scale of each latent variance to 1.0 to obtain standardized estimates (Little, Slegers, & Card, 2006). All specific factors were specified as orthogonal, meaning all other specific factor cross-loadings were restrained to zero. As Reise (2012) has recommended, CBFA was performed only after a careful EBFA to prevent inattention to the potentially distorting effects of restraining small cross-loadings to zero.

The criteria to establish acceptable model fit were: $CFI \geq 0.90$ and $RMSEA < 0.08$. SRMR values are not available for confirmatory factor analyses in *Mplus* version 8.1, so they were not used to establish model fit. Modification indices informed changes to the CFA and CBFA factor structures if the changes suggested were deemed theoretically sound. In addition,

the DIFFTEST function was used to determine if adding an additional parameter (e.g., cross loading, correlated residual) resulted in a significant drop in chi-square. All CFA and CBFA analyses were conducted using *Mplus* version 8.1 (Muthén & Muthén, 2017) using weighted least squares multivariate (WLSMV) estimation. To account for the fact that all MMPI-2 items are dichotomous, CBFA models were estimated using theta parameterization, and *Mplus* automatically estimated probit regressions for the factor indicators regressed on the factors (Muthén & Muthén, 2017). As in Study 1, missing data was handled using the pairwise deletion procedure.

Aim 2

Next, criterion validity was examined by estimating correlations between the MCMI-II Clinical Scales and each CFA and CBFA factor. Second, to further parse the criterion validity of the factors, the MCMI-II Clinical Scales were regressed onto the factors identified in the CFA and CBFA. All of these analyses were incorporated into the confirmatory factor models, in order to increase power and decrease parameter estimation bias. Correlation and regression results were interpreted in the context of personality disorder theory and existing categorical and dimensional conceptualizations of PD (i.e., *DSM-5*'s Sections II and III models). Results reported on criterion-based validity information about the factors gleaned through these analyses.

Aim 3

Lastly, additional psychometrics of the final CBFA model were examined by observing the *omega total* (ω) and *omega hierarchical* (ω_h) model-based reliability indices (Canivez, 2016). These statistics can only be computed for bifactor models. The *omega total* coefficient is the latent variable proxy to coefficient alpha, as it communicates the proportion of variance in the total score that can be attributed to the total sources of common variance (Rodriguez, Reise,

& Haviland, 2016). The *omega hierarchical* coefficient measures the variance attributable to one latent variable at a time. The *omega hierarchical* coefficient, therefore, reveals the percentage of systematic variance in unit-weighted total scores attributable to individual differences on the general factor. Therefore, observation of the *omega total* and *omega hierarchical* coefficients enabled understanding of the multidimensionality of the PD Spectra Scale item pool. Overall, these analyses shed light on the potential clinical utility of establishing an alternative scoring method for the PD Spectra scales item pool that reflects a dimensional-hybrid model. *Omega* statistics were computed using the *Omega* program for Mac OS (Watkins, 2013).

Results

Aim 1

Confirmatory Factor Analysis. Table 9 displays frequencies for the 53 MMPI-2 items in the final item pool. Across 53 variables, the average proportion of missing data was 0.2% (range: 0-1.1%). CFA with WLSMV estimation was run on the 6-factor model identified in the Study 1 EFA analysis. Model fit was good ($\chi^2 = 2402.60$ (1362), RMSEA = .04, CFI = .93⁷). However, modification indices showed a 100.35 improvement in chi-square was possible if item 86 (“like loud, fun parties”) from the extraversion factor (F3) was allowed to cross-load on antagonistic suspiciousness (F2). This change also made theoretical sense based on the preponderance of antisocial PD items included in the factor, as sensation-seeking behavior commonly coincides with antisocial presentations (Mann et al., 2017). As such, item 86 was allowed to cross-load on antagonistic suspiciousness (F2), and the resulting CFA model fit statistics showed statistically significant ($p < .01$) improvement over the first model ($\chi^2 =$

⁷ As noted above, SRMR is not computed for confirmatory factor analyses in *Mplus* 8.1.

2308.19 (1361), RMSEA = .04, CFI = .94; $\Delta\chi^2 = 52.50$, $\Delta df = 1$). Modification indices for the revised CFA model did not suggest additional alterations that would result in a significant change in chi-square. Thus, a model with a single cross-loaded item was deemed the final CFA model (see Table 10 for factor loadings).

Table 11 includes factor correlations for the final CFA model. Correlations between factors were substantially higher in the CFA model compared to the EFA model. All factors were significantly correlated with one another. Somatizing (F1) correlated positively with antagonistic suspiciousness (F2; $r = .61$), depression (F4; $r = .59$), passivity (F5; $r = .63$), and anger (F6; $r = .58$). In other words, individuals who endorsed somatizing were more likely to endorse antagonistic suspiciousness, depression, passivity, and anger. Somatizing (F1) was negatively correlated with extraversion (F3; $r = -.41$), meaning those who reported somatizing were less likely to endorse extraversion. Antagonistic suspiciousness (F2) was positively correlated with depression (F4; $r = .61$), passivity (F5; $r = .61$), and anger (F6; $r = .62$). Therefore, participants who self-reported antagonistic suspiciousness were more likely to self-report depression, passivity, and anger. Antagonistic suspiciousness (F2) correlated negatively with extraversion (F3; $r = -.45$), indicating individuals who endorsed antagonistic suspiciousness were less likely to endorse extraversion. Extraversion (F3) correlated negatively with depression (F4; $r = -.56$), passivity (F5; $r = -.58$), and anger (F6; $r = -.26$). In other words, individuals who reported extraversion were less likely to report depression, passivity, and anger. Depression (F4) was positively associated with passivity (F5; $r = .64$) and anger (F6; $r = .55$), meaning those who endorsed depression were more likely to also endorse passivity and anger. Passivity (F5) correlated positively with anger (F6; $r = .47$), indicating those who reported passivity were more likely to report anger. As in the EFA, correlations amongst factors were expected due to the fact

that the factors measured aspects of personality/affective experience (e.g., antagonistic suspiciousness, extraversion, passivity, and anger) and internalizing psychopathology (e.g., somatizing and depression), and these concepts tend to be interrelated. Additionally, the ability to fit a bifactor model to the data was indicative of high correlations between factors (i.e., common variance among items is pulled up into the general factor), and correlations among factors are often stronger in CFA because latent constructs are free of measurement error. It is possible as well that strong correlations between factors were influenced by characteristics of the Study 2 sample, particularly given that the sample included military inpatients. These individuals may have reported greater severity of symptoms overall, along with higher comorbidity that could account for factor inter-correlations.

Confirmatory Bifactor Analysis. Next, CBFA with WLSMV estimation and theta parameterization was run on the model that resulted from the Study 1 EBFA analysis. Model fit was good ($\chi^2 = 2343.43$ (1333), RMSEA = .04, CFI = .93). Modification indices showed that correlating the residual for item 110 (“Most people will act unfairly to get ahead”) with that of 81 (“Most people would lie to do better than others”) and the residual for 138 (“People are plotting against me”) with that of 99 (“Someone is out to get me”) would decrease chi-square by 116.41 and 120.58 points, respectively. However, reasoning based on the true item content (as content has been altered in this manuscript in accordance with copyright laws) did not support making these changes. Modification indices did not suggest any other alterations to the model that would result in a significant change in chi-square. Thus, the original CBFA model was accepted as the final CBFA model (see Table 12 for factor loadings). Unfortunately, it was not possible to quantitatively compare CFA and CBFA model fit statistics because the models included different numbers of latent factors (e.g., six correlated factors and five specific factors),

and therefore were not nested within one another. All CFA and CBFA model fit statistics (including those of the Aim 2 models, described below) are included in Table 13.

Aim 2

Confirmatory Factor Analysis correlational analyses. Correlations between the 6 latent factors and the MCMI-II Clinical Scales (schizoid, avoidant, dependent, narcissistic, antisocial, histrionic, aggressive, compulsive, passive-aggressive, self-defeating, schizotypal, borderline, and paranoid) were added to the CFA model. See Table 14 for MCMI-II Clinical Scale score descriptives and Table 15 for scale correlations. The MCMI-II Clinical Scale scores were z-transformed prior to being added to the CFA model, due to a convergence issue related to large numerical values associated with scale variances (the same was true for the CBFA criterion validity analyses, described below). The resulting model fit for the CFA model was good ($\chi^2 = 3493.90$ (1985), RMSEA = .04, CFI = .91).

Table 16 includes CFA correlation statistics. A significant, positive association was observed between self-reported somatizing and MCMI-II passive-aggressive ($r = .41$), avoidant ($r = .40$), schizotypal ($r = .38$), self-defeating ($r = .37$), borderline ($r = .35$), schizoid, ($r = .29$), paranoid ($r = .22$), antisocial ($r = .17$), and aggressive/sadistic ($r = .12$) PD scale scores. In other words, individuals who endorsed somatizing scored higher on the avoidant, schizoid, passive-aggressive, self-defeating, schizotypal, aggressive/sadistic, borderline, antisocial, and paranoid PD scales. Somatizing was negatively associated with compulsive ($r = -.18$) and histrionic ($r = -.17$) PD scale scores, such that individuals who endorsed somatizing scored lower on the histrionic and compulsive scales.

Antagonistic suspiciousness (F2) was positively associated with passive-aggressive ($r = .51$), schizotypal ($r = .50$), avoidant ($r = .46$), borderline ($r = .43$), self-defeating ($r = .43$),

antisocial ($r = .34$), and paranoid ($r = .34$) PD scale scores. In other words, those who self-reported antagonistic suspiciousness self-reported higher passive-aggressive, avoidant, self-defeating, schizotypal, antisocial, paranoid, and borderline PD scale scores. Antagonistic suspiciousness was not negatively associated with any of the MCMI-II Clinical Scales.

Extraversion (F3) was negatively correlated with schizoid ($r = -.65$), avoidant ($r = -.59$), schizotypal ($r = -.53$), self-defeating ($r = -.36$), passive-aggressive ($r = -.29$), borderline ($r = -.22$), and paranoid ($r = -.10$) PD scale scores, such that individuals who endorsed extraversion scored lower on the schizoid, avoidant, self-defeating, passive-aggressive, borderline, paranoid, and schizotypal scales. Extraversion was positively correlated with histrionic ($r = .58$) and narcissistic ($r = .29$) PD scale scores, meaning those who reported extraversion scored higher on the histrionic and narcissistic scales.

Depression (F4) was positively association with avoidant ($r = .53$), self-defeating ($r = .49$), schizotypal ($r = .46$), borderline ($r = .45$), passive-aggressive ($r = .45$), and schizoid ($r = .44$) PD scale score. In other words, participants who endorsed depression scored higher on the schizoid, avoidant, passive-aggressive, self-defeating, schizotypal, and borderlines scales. In addition, depression was negatively associated with compulsive ($r = -.33$), histrionic ($r = -.33$), and narcissistic ($r = -.19$) PD scale scores, such that those who reported depression scored lower on the histrionic, narcissistic, and compulsive scales.

Passivity (F5) was positively correlated with avoidant ($r = .62$), self-defeating ($r = .61$), schizotypal ($r = .55$), schizoid ($r = .44$), passive-aggressive ($r = .43$), dependent ($r = .41$), and borderline ($r = .41$) MCMI-II scale scores. Therefore, individuals who reported passivity scored higher on the schizoid, avoidant, dependent, passive-aggressive, self-defeating, schizotypal, and borderline scales. Passivity correlated negatively with the narcissistic ($r = -.29$), histrionic ($r = -$

.28), compulsive ($r = -.20$), and aggressive/sadistic ($r = -.11$) scales, such that those who endorsed passivity scored lower on the narcissistic, aggressive/sadistic, and compulsive scales.

Finally, anger (F6) was positively correlated with passive-aggressive ($r = .71$), borderline ($r = .61$), antisocial ($r = .56$), aggressive/sadistic ($r = .52$), self-defeating ($r = .44$), paranoid ($r = .42$), avoidant ($r = .39$), schizotypal ($r = .38$), narcissistic ($r = .31$), and schizoid ($r = .12$) PD scale scores. In other words, participants who endorsed anger scored higher on the schizoid, avoidant, narcissistic, antisocial, aggressive/sadistic, passive-aggressive, self-defeating, schizotypal, borderline, and paranoid scales. In addition, anger was negatively associated with compulsive ($r = -.37$), dependent ($r = -.26$), and histrionic ($r = -.12$) PD scale score, such that those who endorsed anger scored lower on the dependent, histrionic, and compulsive scales.

Confirmatory Factor Analysis regression analyses. Next, regression analysis was used to examine whether the 6 latent CFA factors were uniquely associated with MCMI-II Clinical Scales. Overall model fit was good ($\chi^2 = 3493.90$ (1985), RMSEA = .04, CFI = .91). See Table 17 for CFA model results. The 6 CFA factors explained 44.9% of the overall variance in the MCMI-II schizoid scale ($R^2 = .45$, $F(6,539) = 72.25$, $p < .01$). The schizoid scale was positively associated with depression (F4; $\beta = .146$, $p < .05$), such that individuals who scored higher on the schizoid scale also scored higher on depression. Schizoid scale score was negatively associated with extraversion (F3; $\beta = -.55$, $p < .05$) and anger (F6; $\beta = -.17$, $p < .05$). In other words, individuals who scored higher on the schizoid scale endorsed less extraversion and anger.

The 6 CFA factors explained 48.4% of the overall variance in the avoidant scale ($R^2 = .48$, $F(6,539) = 83.17$, $p < .01$). The avoidant scale was positively associated with depression (F4; $\beta = .11$, $p < .05$), passivity (F5; $\beta = .35$, $p < .05$) and anger (F6; $\beta = .12$, $p < .05$), meaning those who scored highly on the avoidant scale also scored highly on depression, passivity, and

anger. Additionally, avoidant scale score was negatively associated with extraversion (F3; $\beta = -.33$, $p < .05$), such that individuals who endorsed higher levels of avoidant pathology endorsed lower levels of extraversion.

The 6 CFA factors explained 51.4% of the overall variance in the dependent scale ($R^2 = .51$, $F(6,539) = 93.78$, $p < .01$). Dependent scale score was positively associated with extraversion (F3; $\beta = .28$, $p < .05$) and passivity (F5; $\beta = .94$, $p < .05$), such that participants who scored higher on the dependent scale endorsed more extraversion and passivity. The dependent scale was negatively associated with depression (F4; $\beta = -.16$, $p < .05$) and anger (F6; $\beta = -.52$, $p < .05$), meaning individuals with higher dependent scale scores scored lower on depression and anger.

The 6 CFA factors explained 44.2% of the overall variance in the histrionic scale ($R^2 = .44$, $F(6,539) = 70.23$, $p < .01$). The histrionic scale was positively associated with extraversion (F3; $\beta = .56$, $p < .05$) and anger (F6; $\beta = .40$, $p < .05$), such that individuals who scored higher on the histrionic scale endorsed higher levels of extraversion and anger. Additionally, histrionic scale score was negatively associated with depression (F4; $\beta = -.22$, $p < .05$). In other words, those who scored higher on the histrionic scale scored lower on depression.

The 6 CFA factors explained 41.9% of the overall variance in the narcissistic scale ($R^2 = .42$, $F(6,539) = 63.94$, $p < .01$). The narcissistic scale was positively associated with antagonistic suspiciousness (F2; $\beta = .28$, $p < .05$), extraversion (F3; $\beta = .14$, $p < .05$), and anger (F6; $\beta = .55$, $p < .05$), meaning participants who scored highly on the narcissistic scale also scored highly on antagonistic suspiciousness, extraversion, and anger. Narcissistic scale score was negatively associated with depression (F4; $\beta = -.28$, $p < .05$) and passivity (F5; $\beta = -.44$, $p < .05$), such that individuals who scored highly on the narcissistic scale scored lower on depression and passivity.

The 6 CFA factors explained 38.8% of the overall variance in the antisocial scale ($R^2 = .39$, $F(6,539) = 56.21$, $p < .01$). Antisocial scale score was positively associated with antagonistic suspiciousness ($F2$; $\beta = .20$, $p < .05$) and anger ($F6$; $\beta = .65$, $p < .05$), indicating participants who scored higher on the antisocial scale also scored highly on antagonistic suspiciousness and anger. The antisocial scale was negatively associated with passivity ($F5$; $\beta = -.25$, $p < .05$), such that those who scored highly on the antisocial scale endorsed less passivity.

The 6 CFA factors explained 44.1% of the overall variance in the aggressive/sadistic scale ($R^2 = .44$, $F(6,539) = 69.95$, $p < .01$). Aggressive/sadistic scale score was positively associated with anger ($F6$; $\beta = .73$, $p < .05$), such that participants who scored higher on the aggressive/sadistic scale also scored higher on anger. The aggressive/sadistic scale was negatively associated with passivity ($F5$; $\beta = -.49$, $p < .05$), meaning individuals who scored higher on the aggressive/sadistic scale scored lower on passivity.

The CFA factors explained 20.2% of the overall variance in the compulsive scale ($R^2 = .20$, $F(6,539) = 22.44$, $p < .01$). Compulsive scale score was positively associated with somatizing ($F1$; $\beta = .14$, $p < .05$), such that individuals who scored highly on the compulsive scale also endorsed high levels of somatizing. The compulsive scale was negatively associated with extraversion ($F3$; $\beta = -.23$, $p < .05$), depression ($F4$; $\beta = -.32$, $p < .05$), and anger ($F6$; $\beta = -.28$, $p < .05$), meaning those who scored highly on the compulsive scale endorsed less extraversion, depression, and anger.

The 6 CFA factors explained 53.0% of the overall variance in the passive-aggressive scale ($R^2 = .53$, $F(6,539) = 99.99$, $p < .01$). Passive-aggressive scale score was positively associated with anger ($F6$; $\beta = .65$, $p < .05$). In other words, participants who scored higher on the passive-aggressive scale also scored higher on anger.

The 6 CFA factors explained 42.1% of the overall variance in the self-defeating scale ($R^2 = .42$, $F(6,539) = 64.47$, $p < .01$). The self-defeating scale was positively associated with depression (F4; $\beta = .13$, $p < .05$), passivity (F5; $\beta = .53$, $p < .05$), and anger (F6; $\beta = .22$, $p < .05$), meaning individuals who scored higher on the self-defeating scale also scored higher on depression, passivity, and anger. Self-defeating scale score was negatively associated with somatizing (F1; $\beta = -.15$, $p < .05$), such that individuals who scored higher on the self-defeating scale endorsed lower levels of somatizing.

The 6 CFA factors explained 40.6% of the overall variance in the schizotypal scale ($R^2 = .41$, $F(6,539) = 60.60$, $p < .01$). Schizotypal scale score was positively associated with antagonistic suspiciousness (F2; $\beta = .20$, $p < .05$) and passivity (F5; $\beta = .26$, $p < .05$), such that participants who scored higher on the schizotypal scale also scored higher on antagonistic suspiciousness and passivity. The schizotypal scale was negatively associated with extraversion (F3; $\beta = -.30$, $p < .05$), meaning those who scored highly on the schizotypal scale scored lower on extraversion.

The 6 CFA factors explained 41.1% of the overall variance in the borderline scale ($R^2 = .41$, $F(6,539) = 61.87$, $p < .01$). The borderline scale was positively associated with depression (F4; $\beta = .16$, $p < .05$), passivity (F5; $\beta = .17$, $p < .05$), and anger (F6; $\beta = .54$, $p < .05$), such that participants who scored higher on the borderline scale endorsed higher levels of depression, passivity, and anger. Borderline scale score was negatively associated with somatizing (F1; $\beta = -.14$, $p < .05$), meaning individuals who scored higher on the borderline scale endorsed lower levels of somatizing.

The 6 CFA factors explained 25.5% of the overall variance in the paranoid scale ($R^2 = .26$, $F(6,539) = 30.35$, $p < .01$). Paranoid scale score was positively associated with antagonistic

suspiciousness (F_2 ; $\beta = .29$, $p < .05$) and anger (F_6 ; $\beta = .43$, $p < .05$), meaning individuals who scored higher on the paranoid scale also scored higher on suspiciousness and anger. The paranoid scale was negatively associated with depression (F_4 ; $\beta = -.30$, $p < .05$) and passivity (F_5 ; $\beta = -.16$, $p < .05$), such that participants who scored higher on the paranoid scale endorsed lower levels of depression and passivity.

Confirmatory Bifactor Analysis correlational analyses. Correlations between the CBFA factors (i.e., the general and specific factors) and the MCMI-II Clinical Scales were estimated in the context of a CBFA. Resulting model fit was good ($\chi^2 = 3335.85$ (1957), RMSEA = .04, CFI = .91). Table 18 includes latent factor correlations from the CBFA analysis. The general factor (overall psychological distress/psychopathology) was positively correlated with passive-aggressive ($r = .60$), schizotypal ($r = .58$), avoidant ($r = .55$), borderline ($r = .51$), self-defeating ($r = .50$), antisocial ($r = .41$), schizoid ($r = .39$), paranoid ($r = .38$), aggressive/sadistic ($r = .28$), and narcissistic ($r = .11$) PD scales. In other words, individuals who endorsed overall psychological distress/psychopathology scored higher on the avoidant, schizoid, narcissistic, antisocial, aggressive/sadistic, passive-aggressive, self-defeating, schizotypal, borderline, and paranoid MCMI-II scales. In addition, the general factor was negatively correlated with the compulsive ($r = -.31$) and histrionic ($r = -.15$) PD scales, meaning those who endorsed overall psychological distress scored lower on the histrionic and compulsive scales.

Somatizing (S1) was not positively correlated with any of the MCMI-II Clinical Scales. However, the factor was negatively correlated with the antisocial ($r = -.22$), narcissistic ($r = -.20$), and aggressive/sadistic ($r = -.16$) PD scales. In other words, individuals who endorsed somatizing scored lower on the narcissistic, antisocial, and aggressive/sadistic scales.

Extraversion (S2) was positively correlated with the histrionic ($r = .62$), narcissistic ($r = .46$), antisocial ($r = .32$), aggressive/sadistic ($r = .27$), paranoid ($r = .19$), schizotypal ($r = .14$), borderline ($r = .14$), and passive-aggressive ($r = .12$) PD scales. In other words, participants who endorsed extraversion scored higher on the histrionic, narcissistic, antisocial, aggressive/sadistic, passive-aggressive, schizotypal, borderline, and paranoid scales. Extraversion was negatively associated with the schizoid ($r = -.51$), avoidant ($r = -.30$), and compulsive ($r = -.23$) scales, such that participants who reported extraversion scored lower on the schizoid, avoidant, and compulsive scales.

Depression (S3) was positively correlated with the schizoid ($r = .21$), avoidant ($r = .17$), and self-defeating ($r = .15$) MCMI-II Clinical Scales. Therefore, individuals who reported depression scored higher on the schizoid, avoidant, and self-defeating scales. Depression was negatively correlated with the narcissistic ($r = -.45$), paranoid ($r = -.36$), histrionic ($r = -.34$), aggressive/sadistic ($r = -.23$), antisocial ($r = -.20$), and compulsive ($r = -.14$) scales, such that those who endorsed depression scored lower on the histrionic, narcissistic, antisocial, aggressive/sadistic, compulsive, and paranoid scales.

Passivity (S4) was positively correlated with the dependent ($r = .69$), self-defeating ($r = .35$), avoidant ($r = .31$), and schizoid ($r = .20$) PD scales, such that individuals who self-reported passivity scored higher on the schizoid, avoidant, dependent, and self-defeating scales. Passivity was negatively associated with the narcissistic ($r = -.59$), aggressive/sadistic ($r = -.54$), antisocial ($r = -.42$), paranoid ($r = -.31$), and histrionic ($r = -.25$) scales. In other words, participants who endorsed passivity scored lower on the histrionic, narcissistic, antisocial, aggressive/sadistic, and paranoid scales.

Finally, anger (S5) was positively associated with the aggressive/sadistic ($r = .45$), passive-aggressive ($r = .41$), antisocial ($r = .39$), schizotypal ($r = .36$), borderline ($r = .36$), narcissistic ($r = .35$), histrionic ($r = .32$), paranoid ($r = .23$), and self-defeating ($r = .14$) scales. Therefore, participants who reported anger scored higher on the histrionic, narcissistic, antisocial, aggressive/sadistic, passive-aggressive, schizotypal, and borderline PD scales. Anger was negatively associated with the dependent ($r = -.32$), schizoid ($r = -.19$), and compulsive ($r = -.19$) scales, such that those who endorsed anger scored lower on the schizoid, dependent, and compulsive scales.

Confirmatory Bifactor Analysis regression analyses. Regression analysis was used to examine whether the CBFA factors were uniquely associated with MCMI-II Clinical Scales. The resulting model fit was good ($\chi^2 = 3335.85$ (1957), RMSEA = .04, CFI = .91). See Table 19 for CBFA multiple regression statistics. The 6 CBFA factors explained 53.8% of the overall variance in the MCMI-II schizoid scale ($R^2 = .54$, $F(6,539) = 103.25$, $p < .01$). Schizoid scale score was positively associated with overall psychological distress/psychopathology (G; $\beta = .39$, $p < .05$), depression (S3; $\beta = .21$, $p < .05$), and passivity (S4; $\beta = .20$, $p < .05$), such that individuals who scored higher on the schizoid scale also scored higher on overall psychological distress/psychopathology, depression, and passivity. The schizoid scale was negatively associated with extraversion (S2; $\beta = -.51$, $p < .05$) and anger (S5; $\beta = -.19$, $p < .05$). In other words, participants who scored higher on the schizoid scale endorsed lower levels of extraversion and anger.

The 6 CBFA factors explained 51.6% of the overall variance in the avoidant scale ($R^2 = .52$, $F(6,539) = 94.53$, $p < .01$). The avoidant scale was positively associated with overall psychological distress/psychopathology (G; $\beta = .55$, $p < .05$), depression (S3; $\beta = .17$, $p < .05$),

and passivity (S4; $\beta = .31, p < .05$). Therefore, participants who scored higher on the avoidant scale endorsed higher levels of overall psychological distress/psychopathology, depression, and passivity. Avoidant scale score was negatively associated with extraversion (S2; $\beta = -.30, p < .05$), such that individuals who scored higher on the avoidant scale scored lower on extraversion.

The 6 CBFA factors explained 58.0% of the overall variance in the dependent scale ($R^2 = .58, F(6,539) = 122.44, p < .01$). The dependent scale was positively associated with passivity (S4; $\beta = .69, p < .05$), such that participants who scored highly on the dependent scale endorsed higher levels of passivity. Dependent scale score was negatively associated with anger (S5; $\beta = -.32, p < .05$). In other words, individuals who scored higher on the dependent scale scored lower on anger.

The 6 CBFA factors explained 69.4% of the overall variance in the histrionic scale ($R^2 = .69, F(6,539) = 201.09, p < .01$). Histrionic scale score was positively associated with extraversion (S2; $\beta = .62, p < .05$) and anger (S5; $\beta = .39, p < .05$). Therefore, individuals who scored higher on the histrionic scale also scored higher on extraversion and anger. The histrionic scale was negatively associated with overall psychological distress/psychopathology (G; $\beta = -.15, p < .05$), depression (S3; $\beta = -.34, p < .05$), and passivity (S4; $\beta = -.25, p < .05$), such that those who scored higher on the histrionic scale scored lower on overall psychological distress/psychopathology, depression, and passivity.

The 6 CBFA factors explained 94.2% of the overall variance in the narcissistic scale ($R^2 = .94, F(6,539) = 1440.07, p < .01$). The narcissistic scale was positively associated with overall psychological distress/psychopathology (G; $\beta = .11, p < .05$), extraversion (S2; $\beta = .46, p < .05$), and anger (S5; $\beta = .35, p < .05$), meaning that individuals who scored highly on the narcissistic scale also scored highly on overall psychological distress/psychopathology, extraversion, and

anger. Narcissistic scale score was negatively associated with somatizing (S1; $\beta = -.20, p < .05$), depression (S3; $\beta = -.45, p < .05$), and passivity (S4; $\beta = -.59, p < .05$), such that participants who scored highly on the narcissistic scale scored lower on somatizing, depression, and passivity.

The 6 CBFA factors explained 68.7% of the overall variance in the antisocial scale ($R^2 = .69, F(6,539) = 194.61, p < .01$). The antisocial scale was positively associated with overall psychological distress/psychopathology (G; $\beta = .41, p < .05$), extraversion (S2; $\beta = .32, p < .05$), and anger (S5; $\beta = .39, p < .05$), meaning individuals who scored higher on the antisocial scale also scored higher on overall psychological distress/psychopathology, extraversion, and anger. Antisocial scale score was negatively associated with somatizing (S1; $\beta = -.22, p < .05$), depression (S3; $\beta = -.20, p < .05$), and passivity (S4; $\beta = -.42, p < .05$). In other words, participants who scored higher on the antisocial scale endorsed lower levels of somatizing, depression, and passivity.

The 6 CBFA factors explained 72.4% of the overall variance in the aggressive/sadistic scale ($R^2 = .72, F(6,539) = 232.59, p < .01$). Aggressive/sadistic scale score was positively associated with overall psychological distress/psychopathology (G; $\beta = .28, p < .05$), extraversion (S2; $\beta = .27, p < .05$), and anger (S5; $\beta = .45, p < .05$), meaning individuals who scored higher on the aggressive/sadistic scale also scored higher on overall psychological distress/psychopathology, extraversion, and anger. The aggressive/sadistic scale was negatively associated with somatizing (S1; $\beta = -.15, p < .05$), depression (S3; $\beta = -.23, p < .05$), and passivity (S4; $\beta = -.54, p < .05$). In other words, participants who scored higher on the aggressive/sadistic scale endorsed lower levels of somatizing, depression, and passivity.

The 6 CBFA factors explained 21.7% of the overall variance in the compulsive scale ($R^2 = .22, F(6,539) = 24.57, p < .01$). Compulsive scale score was negatively associated with overall

psychological distress/psychopathology (G ; $\beta = -.31, p < .05$), extraversion ($S2$; $\beta = -.23, p < .05$), depression ($S3$; $\beta = -.14, p < .05$), and anger ($S5$; $\beta = -.19, p < .05$). Therefore, individuals who scored higher on the compulsive scale also endorsed lower levels of overall psychological distress/psychopathology, extraversion, depression, and anger.

The 6 CBFA factors explained 55.4% of the overall variance in the passive-aggressive scale ($R^2 = .55, F(6,539) = 110.14, p < .01$). Passive-aggressive scale score was positively associated with overall psychological distress/psychopathology (G ; $\beta = .60, p < .05$), extraversion ($S2$; $\beta = .12, p < .05$), and anger ($S5$; $\beta = .41, p < .05$). In other words, participants who scored higher on the passive-aggressive scale also scored higher on overall psychological distress/psychopathology, extraversion, and anger.

The 6 CBFA factors explained 41.8% of the overall variance in the self-defeating scale ($R^2 = .42, F(6,539) = 63.68, p < .01$). The self-defeating scale was positively associated with overall psychological distress/psychopathology (G ; $\beta = .50, p < .05$), depression ($S3$; $\beta = .15, p < .05$), passivity ($S4$; $\beta = .35, p < .05$), and anger ($S5$; $\beta = .14, p < .05$). In other words, those who scored higher on the self-defeating scale also scored higher on overall psychological distress/psychopathology, depression, passivity, and anger.

The 6 CBFA factors explained 40.7% of the overall variance in the schizotypal scale ($R^2 = .41, F(6,539) = 60.86, p < .01$). The schizotypal scale was positively associated with overall psychological distress/psychopathology (G ; $\beta = .58, p < .05$) and passivity ($S4$; $\beta = .16, p < .05$), such that individuals who scored higher on the schizotypal scale endorsed higher levels of overall psychological distress/psychopathology and passivity. Schizotypal scale score was negatively associated with somatizing ($S1$; $\beta = -.09, p < .05$) and extraversion ($S2$; $\beta = -.20, p < .05$).

.05), meaning those who scored higher on the schizotypal scale scored lower on somatizing and extraversion.

The 6 CBFA factors explained 41.9% of the overall variance in the borderline scale ($R^2 = .42$, $F(6,539) = 63.94$, $p < .01$). The borderline scale was positively associated with overall psychological distress/psychopathology (G; $\beta = .51$, $p < .05$), extraversion (S2; $\beta = .14$, $p < .05$), and anger (S5; $\beta = .36$, $p < .05$). In other words, participants who scored higher on the borderline scale endorsed higher levels of overall psychological distress/psychopathology, extraversion, and anger.

The 6 CBFA factors explained 47.8% of the overall variance in the paranoid scale ($R^2 = .48$, $F(6,539) = 81.19$, $p < .01$). The paranoid scale was positively associated with overall psychological distress/psychopathology (G; $\beta = .38$, $p < .05$), extraversion (S2; $\beta = .19$, $p < .05$), and anger (S5; $\beta = .23$, $p < .05$), meaning those who scored higher on the paranoid scale also scored higher on overall psychological distress/psychopathology, extraversion, and anger. Paranoid scale score was negatively associated with depression (S3; $\beta = -.36$, $p < .05$) and passivity (S4; $\beta = -.31$, $p < .05$), such that participants who scored highly on the paranoid scale scored lower on depression and passivity.

Aim 3

Omega statistics were computed based on factor loadings for the final CBFA model. Results are displayed in Table 20. *Omega total* statistics indicated acceptable internal consistency reliability for the general factor (G; $\omega = .96$), somatizing (S1; $\omega = .89$), extraversion (S2; $\omega = .64$), depression (S3; $\omega = .93$), passivity (S4; $\omega = .89$), and anger (S5; $\omega = .83$). As the general factor encompassed all items in the final item pool, its *omega total* also represents the internal consistency for the measure. The extraversion factor (S2) demonstrated the lowest

omega total, and therefore may be the weakest factor in terms of clinical utility. *Omega hierarchical* statistics indicated that extraversion (S2; $\omega_h = .64$) and anger (S5; $\omega_h = .51$) accounted for more of the variance in individual participant scores on the general factor than somatizing (S1; $\omega_h = .39$), depression (S3; $\omega_h = .36$), and passivity (S4; $\omega_h = .35$).

CHAPTER FIVE: DISCUSSION

The current studies aimed to establish and confirm the underlying, item-level factor structure of the PD Spectra Scales. Study 1 consisted of exploratory factor and bifactor analysis of the PD Spectra Scales item pool based on a sample of 1,030 outpatients seen at a university community clinic. Study 2 included confirmatory factor and bifactor analysis of the exploratory models established in Study 1. In addition, Study 2 examined criterion validity of the confirmatory factor models based on the MCMI-II Clinical Scales and reliability of the confirmatory bifactor model. Study 2 participants were 539 inpatients and outpatients seen at a military clinic.

Study 1 results showed it was possible to fit both an exploratory 6-factor model and a 6-factor bifactor model to a reduced item pool of MMPI-2 items included in the PD Spectra Scales. Study 2 analyses confirmed both factor structures, indicating both models were applicable across diverse clinical settings. Additionally, both models demonstrated good criterion validity, and the confirmatory bifactor model demonstrated good overall internal consistency.

These findings suggest the resulting 53-item PD Spectra Scales subset may provide a “bridge” between traditional categorical models and dimensional models, at least for some aspects of psychopathology and personality functioning. It is important to note, however, that neither the correlated factors nor the bifactor model supported a categorical approach to PD measurement. Both models lacked factors that measured *DSM-5* Section II categorical PDs, and instead included factors that measured personality *characteristics* and affective experiences (i.e., passivity, extraversion, and anger) and psychological symptomology (i.e., depression and somatizing). The following subsections focus on a qualitative comparison of the correlated factors and bifactor models, interpretation of the bifactor model, and further discussion of the

bifactor model's likeness to preexisting dimensional approaches to PD measurement. Last, strengths and limitations of the current studies are discussed.

The Correlated Factors Model Versus the Bifactor Model

Although both a correlated factors and a bifactor model fit the data well, the emergence of a dominant first factor in both the initial item pool and the final item pool supports the bifactor model. The antagonistic suspiciousness factor (F2) in the EFA was subsumed within the general factor in the EBFA. This indicates self-report of antagonistic suspiciousness may be better represented within a measure of overall psychological distress than as a separate construct. Additionally, correlations between factors decreased significantly in the exploratory stage when a bifactor model was applied, indicating the variance shared between factors is better accounted for by a general factor.

Both the correlated factors and bifactor models were replicated on the Study 2 sample and demonstrated good model fit. This is notable, especially given the differences in patient populations between the two study samples (i.e., a university community clinical sample and a military clinical sample). However, it should be noted that one item was allowed to cross-load onto a second factor to improve model fit in the CFA, a change that was not recommended in the CBFA model. In fact, modification indices reported in the CBFA model suggested no theoretically sound changes that would result in improved model fit.

Criterion validity analyses produced similar patterns of significant correlations and regression weights for the CFA and CBFA factors. However, the CBFA factors explained more of the variance in MCMI-II Clinical Scales scores for all scales except one (i.e., the self-defeating scale), and the general factor displayed significant regression weights for all but one

scale regression (i.e., the dependent scale). These results further support the validity of the bifactor model over the correlated factors model.

Finally, reliability (i.e., *omega*) statistics indicated the factors that emerged from the bifactor model were highly internally consistent overall. In addition, the somatizing, depression, passivity, and anger factors all demonstrated high internal consistency, with internal consistency for the extraversion factor falling in the acceptable range. For all of the reasons listed above, the remainder of this manuscript will focus on interpretations and potential applications of the bifactor model.

Interpreting the Bifactor Model

The emergence of a general factor suggests an overarching dimension of psychological distress/pathology explained the majority of the variance in the item pool. The general factor was characterized by a collection of depressive, paranoid, and somatizing symptomology, along with interpersonal problems. All but four items in the EBFA (“like loud, fun parties,” “enjoy flirting,” “like being friends with pranksters,” and “worries melt in a lively crowd”) and two items in the CBFA (“enjoy flirting” and “like being friends with pranksters”) loaded significantly onto the general factor. Items loaded highly onto the general factor from 10 PD Spectra Scales, indicating the factor represented a broadband measure of psychological distress/pathology. Criterion validity analyses also supported this notion, as the general factor demonstrated large, significant correlations with the MCMI-II’s avoidant, passive-aggressive, self-defeating, schizotypal, and borderline Clinical Scales, and significant, unique associations with scores on the schizoid, avoidant, histrionic, narcissistic, antisocial, aggressive/sadistic, compulsive, passive-aggressive, self-defeating, schizotypal, borderline, and paranoid scales.

The idea that an overarching, multifaceted measure of psychopathology is present in individual responses on psychological measurements is not new. Other researchers have identified a general factor for psychopathology, or a *p* factor, through factor analysis (Caspi et al., 2014; Lahey, Hulle, Singh, Waldman, & Rathouz, 2011). The *p* factor encompasses elements of all psychological disorders and might explain why psychology and medicine have struggled to identify precise, homogeneous causes, biomarkers, and treatments for most mental disorders.

The specific factors that emerged in the bifactor model reflected dimensions of somatizing (S1), extraversion (S2), depression (S3), passivity (S4), and anger (S5). Interestingly, the factors represented a mixture of psychological symptoms (i.e., somatizing and depression) and personality characteristics/affective experiences (i.e., extraversion, passivity, and anger). Criterion validity analyses indicated the somatizing factor was not closely related to any of the MCMI-II Clinical Scales, which was expected given that the Clinical Scales do not include a somatizing scale.

Alternatively, extraversion correlated highly with the histrionic scale and proved to be a unique predictor of histrionic, narcissistic, and antisocial MCMI-II Clinical Scale scores. The externalizing nature of these Cluster B PDs supports the validity of this finding. Notably, the regression of the borderline scale on the CBFA factors revealed that the general factor accounted for the vast majority of the variance in borderline scale score, rather than the extraversion factor; this finding is supportive of arguments that borderline PD is better characterized as a measure of overall distress and maladaptive personality functioning rather than as a discrete disorder (Sharp et al., 2015). As would be expected theoretically, extraversion was most inversely related to schizoid and avoidant scale scores.

Criterion validity analyses revealed weaker correlations and smaller regression weights for MCMI-II Clinical Scales for the depression factor compared to the extraversion factor. Depression was positively associated with and uniquely predicted schizoid and avoidant scale scores, and was inversely related to paranoid, aggressive/sadistic, antisocial, narcissistic, and histrionic scores. These findings support the validity of the factor for the following reasons: depression is characterized as an internalized form of psychopathology (Gorka, Burkhouse, Afshar, & Phan, 2017), avoidant PD is associated with internalizing symptomology (Harford et al., 2013), and antisocial and histrionic PDs are often comorbid with externalizing disorders rather than internalizing disorders (Harford et al., 2013).

The passivity factor displayed similar patterns of criterion validity to the depression factor, likely due to the shared element of internalization in the two constructs. However, passivity was also highly, positively related to MCMI-II dependent scale score. This finding reflects the unique interpersonal orientation of passivity that is not shared with depression. Whereas passivity is characterized by a view of others as more competent than oneself and the tendency to defer to others (Gore, Presnall, Miller, Lynam, & Widiger, 2012), depression is associated with isolation from interpersonal interactions (American Psychiatric Association, 2013).

Finally, anger was positively related to aggressive/sadistic and passive-aggressive MCMI-II Clinical Scale scores, and uniquely predicted histrionic, narcissistic, antisocial, and borderline scale scores. These findings are congruent with the externalizing element of anger expression. Additionally, anger was a negative predictor of dependent scale score, which further supports this notion.

Overlap with the MMPI-2 Restructured Clinical (RC) Scales

Comparison between the CBFA structure and the MMPI-2 Restructured Clinical (RC) Scales is warranted in interpreting the bifactor model, given that the RC Scales are the product of factor analysis on the entire MMPI-2 item pool (Ben-Porath, 2008). In addition, the constructs reflected in the CBFA model matched that of some of the RC Scales. The RC scales are: demoralization (RCd), somatic complaints (RC1), low positive emotions (RC2), cynicism (RC3), antisocial behavior (RC4), ideas of persecution (RC6), dysfunctional negative emotions (RC7), aberrant experiences (RC8), and hypomanic activation (RC9). At first glance, the conceptual underpinnings of the somatic complaints (RC1), low positive emotions (RC2), and ideas of persecution (RC6) scales seemed particularly reflective of scale constructs and item content present in the CBFA. However, when item overlap was computed between the CBFA factors and all RC scales, 36 out of 54 (66.7%) of the item membership comparisons showed no item overlap (see Tables 21 and 22). Items that loaded at least .30 onto the general factor overlapped just 2% (1 item) with demoralization (RCd; “numbness on skin”), low positive emotions (RC2; “burning/tingling sensation all over”), and cynicism (RC3; “someone is out to get me”); 4% (2 items) with somatic complaints (RC1; “frequent stomach aches” and “feeling of a tight band around head”) and ideas of persecution (RC6; “uncaring about what happens to me” and “most people will act unfairly to get ahead”); and 6% (3 items) with dysfunctional negative emotions (RC7; “it is easy to make me cry”, “easily embarrassed”, and “frequent suicidal thoughts”) and hypomanic activation (RC9; “feel important” loaded negatively; “fullness in head/nose most of the time” and “more likely to be a wallflower at a party” loaded positively). The content of the overlapping items highlight the elements of negative affectivity, interpersonal mistrust and sensitivity, and somatic symptoms present in the general factor.

Next, the specific factors from the bifactor model were compared to the RC Scales. Items that loaded onto the somatizing factor overlapped 20% (2 items) with somatic complaints (RC1; “frequent stomach aches” and “feeling of a tight band around head”) and hypomanic activation (RC9; “fullness in head/nose most of the time” and “no hay fever/asthma”), and 10% (1 item) with demoralization (RCd; “numbness on skin”) and low positive emotions (RC2; “burning/tingling sensation all over”). This indicates that the somatizing factor tapped constructs also included within somatic complaints, hypomanic activation, demoralization, and low positive emotions. However, item content all reflected somatic symptoms and therefore support the conceptual validity of the somatizing factor.

The extraversion factor items overlapped 20% (2 items) with hypomanic activation (RC9; “like being friends with pranksters” and “more like a wallflower at a party”) and 10% (1 item) with somatic complaints (RC1; “enjoy flirting”), indicating some shared construct tapping. However, “enjoy flirting” loaded positively onto the extraversion factor and negatively on somatic complaints (RC1). This suggests the *absence* of somatic complaints is reflected in the extraversion factor.

The depression factor items overlapped 11% with ideas of persecution (RC6), dysfunctional negative emotions (RC7), and hypomanic activation (RC9; 1 item each). Construct overlap for depression is unsurprising for the first two RC scales, given the conceptual similarity between depression, ideas of persecution, and dysfunctional negative emotions. The item content (i.e., “uncaring about what happens to me” and “frequent suicidal thoughts”) is also supportive of the construct of depression. The item shared between the depression factor and hypomanic activation (RC9; “feel important”) loaded negatively onto the depression factor and positively on hypomanic activation (RC9), which matches with the conceptual differences

between low self regard seen commonly in depressed individuals and high self regard seen in hypomanic individuals (American Psychiatric Association, 2013).

The passivity factor demonstrated the highest proportion of item overlap with an RC Scale: 25% (2 items) with dysfunctional negative emotions (RC7). The two items shared between the passivity factor and dysfunctional negative emotions (RC7; “it is easy to make me cry” and “easily embarrassed”) highlight sensitivity to the interpersonal environment. Conversely, only one anger factor item (14% of the factor items) overlapped with an RC Scale; the shared item was found on cynicism (RC3). The item (“anger easily but calm down quickly”) highlighted the angry element that is found in cynicism (RC3), but represented more fully in the anger factor.

Therefore, consideration of conceptual and item overlap between the general and specific factors from the bifactor model and the RC Scales supports the bifactor structure’s conceptual uniqueness from the RC Scales. Although item overlap was observed between the factors and individual RC Scales, large conceptual differences between the RC Scales and the factors remained. Additionally, item overlap was minimal between the bifactor model factors and the RC Scales.

Comparing the Bifactor Model to Other Dimensional Models of PD

As elucidated in the introduction to the current studies, past research has advocated for the use of dimensional models to classify PDs. Given that the results of the current studies supported a dimensional structure for the reduced PD Spectra Scales item pool, comparison to existing dimensional models is warranted. As such, the following subsections compare the bifactor model to two existing dimensional models of PD: the AMPD and HiTOP Model.

The Bifactor Model and the AMPD. *DSM-5's* AMPD Criterion A consists of dimensional ratings of an individual's level of impairment in two domains: self (broken up into identity and self-direction dimensions) and interpersonal (empathy and intimacy dimensions; American Psychiatric Association, 2013). Criterion B allows for assignment of maladaptive personality traits (American Psychiatric Association, 2013). The bifactor model showed some conceptual similarities to the AMPD, but the shared conceptual grounding of the two models was not as complete as was hypothesized.

First, the general factor that emerged in the bifactor model showed some similarities to AMPD Criterion A. In regard to the self domain of Criterion A, concepts of emotion regulation ability and stability of self-esteem from the identity dimension were reflected in items that loaded well onto the general factor (i.e., "difficult to anger," "intense anger," "never lose self control," "feel important," "changeable opinions," "vulnerable to criticism," "nervous about important decisions," "easily embarrassed," "easily defeated in arguments"). However, the general factor did not include any items that tapped concepts found in the AMPD's self-direction dimension.

Alternatively, both dimensions of the interpersonal domain of Criterion A, empathy and intimacy, were reflected in the general factor. Specifically, items that tapped tolerance of differing perspectives (i.e., "frequent serious arguments with close others"), comprehension of others' experiences and motivations (i.e., "people are plotting against me," "most people will act unfairly to get ahead," "someone is out to get me," "people dislike helping others," "people are unkind"), and capacity for closeness (i.e., "happiest alone," "enjoy just being with other people," "avoid crowds") were all present in items that loaded highly onto the general factor. However, although multiple dimensions of AMPD Criterion A were found in the general factor, items

tapping somatic concerns and depressive symptomology also loaded highly onto the general factor, and these concepts are not included in Criterion A.

Criterion B of the AMPD consists of assignment of any number of the 25 listed maladaptive personality traits. The personality traits are organized into five categories: negative affectivity, detachment, antagonism, disinhibition, and psychoticism. Consideration of AMPD Criterion B and the specific factors in the bifactor model revealed some conceptual overlap. The depression factor was related to the Criterion B domain of negative affectivity, as were the anger and passivity factors. Specifically, the trait facets of emotional lability, submissiveness, hostility, and depressivity were present in the aforementioned factors. Additionally, the detachment domain was mirrored by the extraversion factor, as detachment and extraversion represent opposite poles of the same personality domain. However, the antagonism, disinhibition, and psychoticism domains were not reflected in the specific factors. Additionally, as mentioned above, the somatizing factor was not conceptually related to Criterion B. The lack of conceptual overlap between the Criterion B categories and the bifactor model factors further indicates that the bifactor model reflects only portions of the AMPD. Therefore, it is necessary to consider other dimensional models in interpreting the bifactor structure of the PD Spectra Scales.

Considering the HiTOP Model. Another dimensional model of psychopathology, the Hierarchical Taxonomy of Psychopathology (HiTOP Model; Kotov et al., 2017), deserves mention given its conceptual similarities with the bifactor structure that emerged in the current study. The HiTOP Model was developed by a group of personality researchers through review of quantitative research and organization of factor analytic findings into “superspectra”, spectra, and their underlying subfactors, syndromes/disorders, components/traits, and symptoms. The

superspectra domain represents a higher-order dimension, known as a p factor (mentioned above in the interpretation of the current studies' general factor), as the six underlying spectra are positively correlated with one another. The six spectra included in the HiTOP Model are: somatoform, internalizing, thought disorder, disinhibited externalizing, antagonistic externalizing, and detachment.

First, the p factor from the HiTOP model shares conceptual similarities with the general factor that emerged in the current study, as both account for the correlations amongst the underlying factors/spectra and represent a range of psychopathology and personality characteristics. Second, the relationships between the HiTOP spectra and the current studies' specific factors were mixed. The somatizing factor was conceptually related to the somatoform spectrum, as the following HiTOP components were represented in the somatizing factor: conversion, somatization, malaise, head pain, and gastrointestinal issues. The only component of the somatoform spectrum that was not represented within the 53 PD Spectra Scale items was the cognitive component.

Additionally, the extraversion factor shares conceptual underpinnings with the HiTOP detachment spectrum. Specifically, the following detachment traits were reflected in the extraversion factor: disaffiliativeness, withdrawal, and attention seeking. The detachment traits of anhedonia, depressivity, intimacy avoidance, suspiciousness, and interpersonal passivity were not present in the extraversion factor, although some elements of these could be found in the depression (i.e., anhedonia, depressivity) and passivity (i.e., interpersonal passivity) factors and in the general factor (i.e., suspiciousness).

Lastly, the depression factor showed conceptual similarities to the HiTOP internalizing spectrum. Specifically, items that loaded onto the depression factor tapped the internalizing

distress components of anhedonia, suicidality, and numbing. However, this leaves a number of internalizing spectrum distress components and all fear components and traits untapped by the PD Spectra Scales items.

The thought disorder, disinhibited externalizing, and antagonistic externalizing HiTOP spectra were not tapped by any of the 53 PD Spectra Scale items. In sum, while it does not match perfectly with the bifactor model, the conceptual similarities shared between the HiTOP Model and the bifactor model fill in some of the differences observed between the bifactor model and the AMPD (i.e., elements of the general factor, the somatizing factor). In fact, the PD Spectra Scale bifactor model seems to represent a “mash up” of parts of the AMPD and HiTOP.

Strengths and Limitations of the Current Studies

The present studies were strengthened by the confirmation of the exploratory factor structures established in Study 1 on a separate sample from a military clinical setting in Study 2. The success of the Study 2 confirmatory analyses suggests that the resulting bifactor model may be generalizable across different clinical settings. Another strength of the current studies was the inclusion of criterion validity analyses based on the MCMI-II Clinical Scales and reliability analyses, both of which provided support for the bifactor model. Third, an important benefit of the current studies is that the bifactor structure can be applied to a standard administration of the MMPI-2 by utilizing the database export function and rescoring the 53 items included in the bifactor structure accordingly. Thus, any clinician or researcher with access to the MMPI-2 can utilize the bifactor model in their work.

An important limitation of the current study is its sole basis on self-report data of personality and psychological functioning. It is possible that study participants provided a biased report of their symptomology, as personality disorder symptoms are often argued to be ego-

syntonic (Alliances of Psychoanalytic Organizations, 2017). However, a prior study by Samuel et al. (2011) indicated that self-reported PD symptoms show higher temporal stability compared to those assessed by an interviewer, suggesting self-report may be a valid report form for PD symptoms.

Another limitation of the current studies is that the PD Spectra Scale item pool was significantly reduced in the course of the factor analytic procedure (i.e., from 220 to just 53 items), resulting in a 75.5% loss of items. Such a significant loss of items from the initial item pool indicates the original PD Spectra Scales were not robust when subjected to factor analysis. The resulting bifactor model is still theoretically interesting and offers clinical utility, but linking the resulting model back to the original PD Spectra Scales is difficult given the substantial loss of items. However, the factor structure that emerged fit the data well and the factors were associated in the expected directions with other measurements of PD symptomology (i.e., MCMI-II Clinical Scales). Still, although a level of criterion validity was established using the MCMI-II, further study is needed to expand the criterion validity and determine the construct validity of the bifactor model. Future studies would be well advised to compare the bifactor structure to more modern, dimensional measures of PD, such as the PID-5.

Caution should be taken when interpreting the results of the current studies, as only one measure (the MMPI-2) was considered, and thorough PD diagnosis should be comprehensive. Clinical observation and judgment are often touted as important contributions to competent PD diagnosis (e.g., Alliances of Psychoanalytic Organizations, 2017; American Psychiatric Association, 2013; Hopwood et al., 2011; Morey et al., 2014), and interviewing individuals close to the patient can be helpful when symptoms are ego-syntonic. Use of performance-based measures is also recommended in conjunction with self-reports and clinician

interviews/observations to account for the lack of insight often present in those with PDs (Bornstein, 2014). In other words, real-world diagnosis of PDs should look different from the methodology of the current studies, as the present research was focused on just one element of PD diagnosis.

Relatedly, despite the improved clinical and diagnostic utility of the dimensional approach, even a dimensional model for PDs cannot adequately capture the diversity of human experience and psychological presentation. All such models will leave clinicians who engage in depth work with their patients wanting. Nancy McWilliams and Jonathan Shedler describe the dilemma well in the PDM-2 (Alliances of Psychoanalytic Organizations, 2017, p. 27), so they are given the last word on the matter:

There are many ways to distinguish psychologically between one person and another. All of them are, of course, oversimplifications. Any clinician who gets to know a patient intimately finds that over time, that person no longer seems to fit a clear-cut diagnostic construct; the person's individuality eventually becomes more salient...[P]ersonality syndromes are "fuzzy sets" or continua lacking clear-cut boundaries, and the degree to which any personality syndrome applies is always a dimension ranging from inapplicable or irrelevant to highly applicable.

CHAPTER SIX: CONCLUSIONS AND FUTURE DIRECTIONS

Conclusions

The results of the current studies offer a dimensional measurement of psychopathology and personality functioning based on a bifactor model made up of 53 existing MMPI-2 items. The model consists of a general factor that measures overall psychological distress/psychopathology and five specific factors measuring the psychological syndromes/personality dimensions of somatizing, extraversion, depression, passivity, and anger. The bifactor structure proved reliable and its criterion validity was supported. As such, scoring MMPI-2 responses using the bifactor model offered here may prove clinically useful to clinicians in understanding the personality functioning of their patients.

Perhaps most importantly, the results of the current studies support a dimensional conceptualization of personality over a categorical approach. Dimensional modeling encourages mental health professionals to approach their patients more compassionately and has the potential to decrease the overall stigmatization of PDs. In fact, use of the AMPD and other dimensional models for PDs arguably constitutes a humanitarian and mental health advocacy approach to diagnosis and treatment, because use of dimensions affirms that there is no clear line between normality and abnormality when it comes to personality. Work in this area should continue if as psychologists we are to fulfill our ethical duty to the individuals who allow us to bear witness to their suffering, their triumphs, and everything in between.

Future Directions

Future research should expand upon the criterion validity analyses conducted in Study 2 and establish construct validity for the bifactor model. Comparison of the PD Spectra Scales bifactor model to other dimensional measures of PD (e.g., the PID-5) will be particularly

informative in further understanding the validity of the bifactor structure. Construct validity should be established using other report sources, such as clinician rating systems (e.g., the SCORS-G, Hilsenroth, Stein, & Pinsker, 2007) and projective measures (e.g., R-PAS, Meyer, 2011; TAT, Murray, 1943). These analyses will hopefully shed more light on interpretation of the PD Spectra Scales bifactor model in the context of other dimensional models for PD. In addition, the bifactor model should be tested on other clinical and normative populations. Continued study of the model's generalizability to different populations will further determine its potential clinical utility and could lead to development of norms for the bifactor measurement of psychopathology and personality functioning.

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APPENDICES

Appendix 1: PD Spectra Scales Items

Paranoid Scale

- 42 Others have prevented my success (T)
- 99 Others are after me (T)
- 124 Suspicious of kindness (T)
- 138 People are plotting against me (T)
- 225 Actions are misunderstood by others (T)
- 241 Trusting others is dangerous (T)
- 259 People are talking about me (T)
- 286 People dislike helping others (T)
- 314 No enemies (F)
- 315 Friendliness is suspicious (T)
- 333 People insult me (T)
- 358 Jealous of my ideas (T)
- 403 People think I'm out to get them when I'm trying to help (T)
- 445 My managers have stepped on their subordinates to get ahead (T)
- 484 People are unkind (T)
- 549 Always being tested (T)

Schizotypal Scale

- 32 Strange experiences (T)
- 72 Soul leaves body (T)
- 168 Derealization (T)

- 198 Hear voices (T)
- 298 Strange smells (T)
- 307 Hear too well (T)
- 311 Unreality (T)
- 316 Strange thoughts (T)
- 319 Strange sounds (T)
- 361 Mind control (T)
- 427 No visions (F)
- 448 Secret imaginary life (T)
- 466 Telepathy of others (T)
- 508 Telepathy of self (T)
- 551 Hear thoughts out loud (T)

Avoidant Scale

- 46 Avoid talking to old friends (T)
- 79 Teasing doesn't bother me (F)
- 161 Often try to hide embarrassment (T)
- 167 Difficulty talking to new people (T)
- 178 Sweat when embarrassed (T)
- 185 Wish less shy (T)
- 243 Difficulty choosing topic in group of people (T)
- 262 Would not be embarrassed to state opinion in a group (F)
- 265 Others speak to me first (T)

- 275 Difficulty talking in class (T)
- 289 Easily embarrassed (T)
- 310 Cross streets to avoid people (T)
- 321 Comfortable entering a room of people (F)
- 335 Not self-conscious (F)
- 337 More likely to be a wallflower at a party (T)
- 342 Speak with strangers on public transit (F)
- 360 Like meeting new people (F)
- 375 Personal questions are nerve-wracking (T)
- 446 Difficulty standing up for self (T)

Dependent Scale

- 70 Easily defeated in arguments (T)
- 127 Hurt by critique (T)
- 129 Model behavior after that of others (T)
- 348 Wish to be a child (T)
- 368 Avoid dealing with difficulties (T)
- 421 Vulnerable to criticism (T)
- 457 Changeable opinions (T)
- 491 Helpless making decisions (T)
- 503 Passive/follower (T)
- 509 Nervous about important decisions (T)
- 514 Difficult time saying no (T)

Depressive Scale

- 9 Interesting things in life (F)
- 22 Misunderstood (T)
- 38 Unable to get going on tasks (T)
- 52 Life lived wrongly (T)
- 56 Wish to be happy as others (T)
- 75 Life is usually worthwhile (F)
- 92 Uncaring about what happens to me (T)
- 130 Uselessness (T)
- 148 Never felt better (F)
- 196 Often worries (T)
- 273 Often straining (T)
- 301 Near constant anxiety (T)
- 303 Most of the time I wish I were dead (T)
- 317 Anxious/upset to leave home (T)
- 339 Problems pile up (T)
- 364 Gives up quickly (T)
- 377 Unhappy with self (T)
- 388 Infrequently sad (F)
- 400 Uncaring (T)
- 408 Difficulty letting go of disappointment (T)
- 411 Self is no good (T)
- 415 Worries things will go wrong (T)

- 450 Unable to do things well (T)
- 454 Hopeless future (T)
- 485 Not as good as others (T)
- 516 Empty/meaningless life (T)
- 517 Difficulty keeping jobs (T)
- 539 Loss of desire to make things better (T)
- 546 Thoughts of death and afterlife (T)
- 556 Financial worries (T)

Histrionic Scale

- 86 Like loud, fun parties (T)
- 112 Enjoy drama (T)
- 153 Like knowing important people (T)
- 158 Uncomfortable pulling stunts at parties (F)
- 169 Creates excitement when bored (T)
- 189 Enjoy flirting (T)
- 207 Wants multiple club memberships (T)
- 231 Like being friends with pranksters (T)
- 242 Excitable (T)
- 244 Excitement improves mood (T)
- 340 Enjoy dances (T)
- 353 Enjoy just being with other people (T)
- 359 Find crowds exciting (T)

- 363 Worries melt in a lively crowd (T)
- 370 Enjoy parties (T)
- 456 Want pricey clothes (T)
- 552 Trust will always be cared for (T)

Antisocial Scale

- 27 Payback when wronged (T)
- 35 History of stealing (T)
- 41 Lying (T)
- 66 Don't like laws (T)
- 81 Most people would lie to do better than others (T)
- 84 History of school suspension (T)
- 100 Don't take risks for fun (F)
- 105 Sometimes sent to principal (T)
- 110 Most people will act unfairly to get ahead (T)
- 123 Would sneak into a movie (T)
- 134 Wants to start physical fights (T)
- 240 Can't resist stealing (T)
- 250 Entertained by others' criminal activities (T)
- 266 No illegal activity (F)
- 269 Best to come up with a story if caught (T)
- 284 People lie to get out of things (T)
- 324 Scares others for fun (T)

- 344 Likes gambling (T)
- 412 History of school truancy (T)
- 418 Bending laws is okay (T)
- 429 No history of illicit drug use (F)
- 431 Bad grades in school (T)
- 432 Selective truth telling to protect self (T)
- 540 Broken things when drunk (T)
- 548 Physically attacked others when drunk (T)

Somatizing Scale

- 3 Wake up rested (F)
- 28 Frequent stomach aches (T)
- 33 Infrequent health worries (F)
- 39 Sleeps poorly (T)
- 45 As healthy as friends (F)
- 53 Burning/tingling sensation all over body (T)
- 57 Never feel pain in back of neck (F)
- 91 No muscle twitching (F)
- 97 Fullness in head/nose most of the time (T)
- 101 Feeling of a tight band around head (T)
- 111 Frequent stomach trouble (T)
- 118 Not worried about germs (F)
- 141 Mostly well for past few years (F)

- 149 Tenderness atop head (T)
- 165 Okay memory (F)
- 177 No clumsiness in hands (F)
- 181 No hay fever/asthma (F)
- 208 Infrequent heart/lung symptoms (F)
- 247 Numbness on skin (T)
- 295 No paralysis/muscle weakness (F)
- 536 Upset leads to headache (T)

Borderline Scale

- 23 Uncontrollable crying and laughing (T)
- 37 Feel like breaking things (T)
- 63 Thick-skinned (F)
- 82 Often regret actions (T)
- 116 Unexplainable irritability (T)
- 146 It is easy to make me cry (T)
- 213 Anger easily but calm down quickly (T)
- 215 Frequent brooding (T)
- 256 Hate family at times (T)
- 271 Intense feelings (T)
- 285 Heightened sensitivity (T)
- 288 Relatives find fault with me (T)
- 302 Lose patience (T)

- 328 Unpleasant thoughts linger (T)
- 372 Difficult to anger (F)
- 382 Frequent serious arguments with close others (T)
- 386 Physically removed self to avoid regret (T)
- 389 Hotheaded (T)
- 405 Generally calm (F)
- 430 Regret being irritated often (T)
- 442 Unreasonable worries (T)
- 444 High-strung (T)
- 502 Harmful habits (T)
- 513 All-encompassing anger (T)
- 520 Recent suicidal thoughts (T)
- 530 Self injury (T)
- 542 Intense anger (T)
- 564 Never lose self control (F)

Obsessive Compulsive Scale

- 55 Perseverate (T)
- 87 Unable to make up mind - too many options (T)
- 135 Unable to make up mind - lost opportunities (T)
- 136 Impatient when interrupted (T)
- 212 Principled (T)
- 309 Overly thoughtful (T)

- 313 Obsessive counting (T)
- 346 Just as good as experts (T)
- 356 Hard to set aside projects (T)
- 410 Verbally address small social faux pas (T)
- 423 Persistent to win arguments (T)
- 461 Don't like to be rushed (T)
- 535 Angry when others take too long (T)
- 547 Hoarding (T)

Narcissistic Scale

- 61 Feel important (T)
- 73 Lack confidence (F)
- 109 As good as others (T)
- 120 Stand up for morals (T)
- 157 Not concerned with others' opinions (T)
- 239 Completely confident (T)
- 318 Expect to succeed (T)
- 326 History of giving up when not good at something (F)
- 345 Could help the world a lot (T)
- 350 Would be a good leader (T)
- 365 Want others to know where I stand (T)
- 437 Directly correct others (T)
- 452 Defensive of opinions (T)

- 460 Last one to give up (T)
521 Enjoys leading and delegating (T)

Schizoid Scale

- 12 Satisfactory sex life (F)
49 Very social (F)
280 Makes friends easily (F)
281 Dislike being around others (T)
349 Happiest alone (T)
367 Avoid crowds (T)
391 Unable to open up to others (T)
479 Difficult to get to know (T)
480 Spend most time alone (T)

Appendix 2: Tables and Figures

Table 1

Study 1 PD Spectra Scale Items Frequencies (N = 1,030)

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
3	690	67.0	339	32.9	1	0.1
9	420	40.8	607	58.9	3	0.3
12	489	47.5	522	50.7	19	1.8
22	347	33.7	679	65.9	4	0.4
23	252	24.5	776	75.3	2	0.2
27	228	22.1	801	77.8	1	0.1
28	291	28.3	739	71.7	0	0.0
32	355	34.5	673	65.3	2	0.2
33	603	58.5	427	41.5	0	0.0
35	360	35.0	669	65.0	1	0.1
37	377	36.6	653	63.4	0	0.0
38	581	56.4	448	43.5	1	0.1
39	373	36.2	652	63.3	5	0.5
41	592	57.5	434	42.1	4	0.4
42	71	6.9	958	93.0	1	0.1
45	341	33.1	688	66.8	1	0.1
46	452	43.9	578	56.1	0	0.0
49	389	37.8	637	61.8	4	0.4
52	315	30.6	710	68.9	5	0.5
53	301	29.2	727	70.6	2	0.2
55	449	43.6	576	55.9	5	0.5
56	656	63.7	373	36.2	1	0.1
57	455	44.2	574	55.7	1	0.1
61	603	58.5	422	41.0	5	0.5
63	652	63.3	376	36.5	2	0.2
66	67	6.5	960	93.2	3	0.3
70	305	29.6	720	69.9	5	0.5
72	47	4.6	980	95.1	3	0.3
73	459	44.6	569	55.2	2	0.2
75	188	18.3	840	81.6	2	0.2
79	618	60.0	410	39.8	2	0.2
81	663	64.4	366	35.5	1	0.1
82	370	35.9	659	64.0	1	0.1
84	220	21.4	809	78.5	1	0.1
86	469	45.5	559	54.3	2	0.2
87	672	65.2	352	34.2	6	0.6
91	290	28.2	737	71.6	3	0.3
92	195	18.9	833	80.9	2	0.2
97	173	16.8	850	82.5	7	0.7
99	111	10.8	917	89.0	2	0.2
100	689	66.9	341	33.1	0	0.0

Table 1. Continued.

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
101	114	11.1	915	88.8	1	0.1
105	287	27.9	743	72.1	0	0.0
109	826	80.2	201	19.5	3	0.3
110	644	62.5	384	37.3	2	0.2
111	214	20.8	816	79.2	0	0.0
112	234	22.7	788	76.5	8	0.8
116	517	50.2	513	49.8	0	0.0
118	547	53.1	483	46.9	0	0.0
120	807	78.3	219	21.3	4	0.4
123	327	31.7	698	67.8	5	0.5
124	469	45.5	555	53.9	6	0.6
127	520	50.5	507	49.2	3	0.3
129	318	30.9	708	68.7	4	0.4
130	619	60.1	408	39.6	3	0.3
134	193	18.7	834	81.0	3	0.3
135	522	50.7	505	49.0	3	0.3
136	437	42.4	587	57.0	6	0.6
138	68	6.6	955	92.7	7	0.7
141	287	27.9	739	71.7	4	0.4
146	402	39.0	627	60.9	1	0.1
148	791	76.8	236	22.9	3	0.3
149	124	12.0	906	88.0	0	0.0
153	434	42.1	594	57.7	2	0.2
157	286	27.8	741	71.9	3	0.3
158	432	41.9	584	56.7	14	1.4
161	333	32.3	691	67.1	6	0.6
165	363	35.2	666	64.7	1	0.1
167	410	39.8	620	60.2	0	0.0
168	196	19.0	831	80.7	3	0.3
169	361	35.0	668	64.9	1	0.1
177	238	23.1	792	76.9	0	0.0
178	352	34.2	677	65.7	1	0.1
181	322	31.3	708	68.7	0	0.0
185	454	44.1	574	55.7	2	0.2
189	644	62.5	383	37.2	3	0.3
196	790	76.7	240	23.3	0	0.0
198	27	2.6	1002	97.3	1	0.1
207	387	37.6	642	62.3	1	0.1
208	452	43.9	576	55.9	2	0.2
212	300	29.1	724	70.3	6	0.6
213	461	44.8	569	55.2	0	0.0
215	365	35.4	638	61.9	27	2.6
225	484	47.0	546	53.0	0	0.0
231	421	40.9	608	59.0	1	0.1

Table 1. Continued.

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
239	235	22.8	795	77.2	0	0.0
240	59	5.7	971	94.3	0	0.0
241	357	34.7	672	65.2	1	0.1
242	457	44.4	572	55.5	1	0.1
243	470	45.6	560	54.4	0	0.0
244	571	55.4	459	44.6	0	0.0
247	125	12.1	904	87.8	1	0.1
250	283	27.5	745	72.3	2	0.2
256	298	28.9	731	71.0	1	0.1
259	338	32.8	689	66.9	3	0.3
262	295	28.6	735	71.4	0	0.0
265	457	44.4	573	55.6	0	0.0
266	351	34.1	678	65.8	1	0.1
269	269	26.1	759	73.7	2	0.2
271	572	55.5	454	44.1	4	0.4
273	452	43.9	576	55.9	2	0.2
275	544	52.8	485	47.1	1	0.1
280	356	34.6	671	65.1	3	0.3
281	134	13.0	894	86.8	2	0.2
284	578	56.1	450	43.7	2	0.2
285	590	57.3	439	42.6	1	0.1
286	369	35.8	658	63.9	3	0.3
288	268	26.0	761	73.9	1	0.1
289	453	44.0	577	56.0	0	0.0
295	213	20.7	816	79.2	1	0.1
298	167	16.2	862	83.7	1	0.1
301	577	56.0	451	43.8	2	0.2
302	496	48.2	532	51.7	2	0.2
303	84	8.2	943	91.6	3	0.3
307	159	15.4	871	85.6	0	0.0
309	474	46.0	556	54.0	0	0.0
310	183	17.8	846	82.1	1	0.1
311	124	12.0	905	87.9	1	0.1
313	245	23.8	784	76.1	1	0.1
314	173	16.8	856	83.1	1	0.1
315	522	50.7	508	49.3	0	0.0
316	334	32.4	696	67.6	0	0.0
317	121	11.7	909	88.3	0	0.0
318	824	80.0	206	20.0	0	0.0
319	56	5.4	974	94.6	0	0.0
321	433	42.0	596	57.9	1	0.1
324	73	7.1	957	92.9	0	0.0
326	550	53.4	479	46.5	1	0.1
328	442	42.9	588	57.1	0	0.0

Table 1. Continued.

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
333	161	15.6	869	84.4	0	0.0
335	543	52.7	480	46.6	7	0.7
337	505	49.0	525	51.0	0	0.0
339	704	68.3	325	31.6	1	0.1
340	401	38.9	626	60.8	3	0.3
342	669	65.0	359	34.9	2	0.2
344	316	30.7	712	69.1	2	0.2
345	802	77.9	224	21.7	4	0.4
346	475	46.1	553	53.7	2	0.2
348	430	41.7	599	58.2	1	0.1
349	129	12.5	898	87.2	3	0.3
350	603	58.5	421	40.9	6	0.6
353	698	67.8	327	31.7	5	0.5
356	373	36.2	654	63.5	3	0.3
358	165	16.0	863	83.8	2	0.2
359	597	58.0	432	41.9	1	0.1
360	237	23.0	792	76.9	1	0.1
361	42	4.1	987	95.8	1	0.1
363	556	54.0	471	45.7	3	0.3
364	419	40.7	610	59.2	1	0.1
365	762	74.0	265	25.7	3	0.3
367	376	36.5	653	63.4	1	0.1
368	345	33.5	683	66.3	2	0.2
370	677	65.7	350	34.0	3	0.3
372	382	37.1	647	62.8	1	0.1
375	414	40.2	614	59.6	2	0.2
377	574	55.7	454	44.1	2	0.2
382	299	29.0	731	71.0	0	0.0
386	545	52.9	485	47.1	0	0.0
388	625	60.7	404	39.2	1	0.1
389	243	23.6	786	76.3	1	0.1
391	388	37.7	639	62.0	3	0.3
400	363	35.2	666	64.7	1	0.1
403	524	50.9	504	48.9	2	0.2
405	368	35.7	659	64.0	3	0.3
408	514	49.9	512	49.7	4	0.4
410	301	29.2	727	70.6	2	0.2
411	497	48.3	531	51.6	2	0.2
412	228	22.1	801	77.8	1	0.1
415	528	51.3	499	48.4	3	0.3
418	439	42.6	587	57.0	4	0.4
421	313	30.4	716	69.5	1	0.1
423	422	41.0	605	58.7	3	0.3
427	286	27.8	741	71.9	3	0.3

Table 1. Continued.

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
429	343	33.3	687	66.7	0	0.0
430	492	47.8	538	52.2	0	0.0
431	129	12.5	900	87.4	1	0.1
432	260	25.2	770	74.8	0	0.0
437	628	61.0	401	38.9	1	0.1
442	703	68.3	326	31.7	1	0.1
444	397	38.5	626	60.8	7	0.7
445	378	36.7	647	62.8	5	0.5
446	401	38.9	628	61.0	1	0.1
448	239	23.2	790	76.7	1	0.1
450	107	10.4	922	89.5	1	0.1
452	552	53.6	475	46.1	3	0.3
454	223	21.7	805	78.2	2	0.2
456	549	53.3	477	46.3	4	0.4
457	281	27.3	746	72.4	3	0.3
460	668	64.9	358	34.8	4	0.4
461	662	64.3	367	35.6	1	0.1
466	262	25.4	767	74.5	1	0.1
479	453	44.0	573	55.6	4	0.4
480	521	50.6	505	49.0	4	0.4
484	77	7.5	952	92.4	1	0.1
485	485	47.1	544	52.8	1	0.1
491	395	38.3	630	61.2	5	0.5
502	293	28.4	736	71.5	1	0.1
503	328	31.8	700	68.0	2	0.2
508	117	11.4	913	88.6	0	0.0
509	558	54.2	472	45.8	0	0.0
513	387	37.6	643	62.4	0	0.0
514	681	66.1	349	33.9	0	0.0
516	142	13.8	886	86.0	2	0.2
517	199	19.3	829	80.5	2	0.2
520	85	8.3	944	91.7	1	0.1
521	506	49.1	523	50.8	1	0.1
530	45	4.4	984	95.5	1	0.1
535	617	59.9	411	39.9	2	0.2
536	294	28.5	735	71.4	1	0.1
539	228	22.1	800	77.7	2	0.2
540	99	9.6	930	90.3	1	0.1
542	533	51.7	496	48.2	1	0.1
546	140	13.6	888	86.2	2	0.2
547	514	49.9	516	50.1	0	0.0
548	133	12.9	896	87.0	1	0.1
549	345	33.5	685	66.5	0	0.0
551	127	12.3	902	87.6	1	0.1

Table 1. Continued.

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
552	632	61.4	396	38.4	2	0.2
556	642	62.3	388	37.7	0	0.0
564	357	34.7	671	65.1	2	0.2

Note. Items included in final item pool for Study 1 (i.e., 53 items) are in bold.

Table 2

Eigenvalues greater than 1 for initial item pool (220 items)

Factor	Eigenvalue
1	44.04
2	17.40
3	8.18
4	7.48
5	6.43
6	4.97
7	4.71
8	4.00
9	3.80
10	3.55
11	3.01
12	2.81
13	2.63
14	2.57
15	2.47
16	2.41
17	2.31
18	2.22
19	2.12
20	2.09
21	2.01
22	1.98
23	1.94
24	1.86
25	1.83
26	1.79
27	1.78
28	1.76
29	1.73
30	1.71
31	1.64
32	1.60
33	1.55
34	1.54
35	1.51
36	1.50
37	1.49
38	1.46
39	1.42
40	1.41
41	1.40
42	1.37
43	1.33

Table 2. Continued

Factor	Eigenvalue
44	1.33
45	1.29
46	1.27
47	1.26
48	1.24
49	1.21
50	1.21
51	1.20
52	1.17
53	1.15
54	1.14
55	1.10
56	1.08
57	1.07
58	1.07
59	1.05
60	1.03

Table 3

Factor loadings for 6-factor EFA model (53 items)

Item number	Item content	F1	F2	F3	F4	F5	F6
28	Frequent stomach aches (T)	.861*	-.084	-.084*	.042	.044	-.020
53	Burning/tingling sensation all over body (T)	.519*	.206*	-.072	-.054	.020	.004
57	Never feel pain in back of neck (F)	.523*	.030	-.033	-.049	.013	.027
97	Fullness in head/nose most of the time (T)	.455*	.205*	.082	.049	.016	-.024
101	Feeling of a tight band around head (T)	.593*	.071	.076	.206*	.005	.064
111	Frequent stomach trouble (T)	.959*	-.105	.008	.068	.000	-.100
149	Tenderness atop head (T)	.496*	.110	.035	-.042	-.051	.073
181	No hay fever/asthma (F)	.403*	.017	-.074	-.010	-.085	.004
247	Numbness on skin (T)	.521*	.101	-.012	.007	-.125*	.035
536	Upset leads to headache (T)	.480*	.168*	-.013	-.074	.123*	.070
81	Most people would lie to do better than others (T)	-.055	.743*	-.017	-.078	.081	.044
99	Someone is out to get me (T)	.055	.673*	.142*	.189*	-.048	.070
110	Most people will act unfairly to get ahead (T)	-.011	.838*	-.010	-.087	.032	-.066
138	People are plotting against me (T)	.074	.696*	.142	.087	-.016	-.018
259	People are talking about me (T)	-.023	.473*	-.008	.148*	.126*	.228*
284	People lie to get out of things (T)	-.020	.667*	.004	-.054	.013	-.070
286	People dislike helping others (T)	.031	.652*	.001	.016	-.021	-.025
333	People insult me (T)	.087	.418*	-.046	.060	-.037	.258*
346	Just as good as experts (T)	.020	.420*	-.032	-.073	-.172*	.144*
484	People are unkind (T)	.122	.402*	-.133	.123	.077	.089
86	Like loud, fun parties (T)	-.050	.069*	.866*	.076	.081	.073
189	Enjoy flirting (T)	-.047	.076	.501*	.002	-.069	.105*
231	Like being friends with pranksters (T)	-.010	.086	.492*	.089	-.099*	-.077
337	More likely to be a wallflower at a party (T)	-.039	.049	-.705*	.093*	.128*	.074
349	Happiest alone (T)	-.052	.241*	-.411*	.113	.061	-.050
353	Enjoy just being with other people (T)	.031	-.060	.834*	-.068	.018	-.016
359	Find crowds exciting (T)	-.004	.027	.854*	-.052	.072	-.030
363	Worries melt in a lively crowd (T)	-.076	.111*	.539*	-.125*	-.009	.047
367	Avoid crowds (T)	-.021	.221*	-.781*	.038	.065	.022

Table 3. Continued.

Item number	Item content	F1	F2	F3	F4	F5	F6
370	Enjoy parties (T)	-.020	-.040	.966*	.035	.021	-.001
61	Feel important (T)	-.016	.095*	.174*	-.518*	-.060	.035
75	Life is usually worthwhile (F)	-.062	.004	-.052	.765*	.015	.019
92	Uncaring about what happens to me (T)	-.018	.194*	.016	.668*	-.046	-.048
303	Frequent suicidal thoughts (T)	.028	-.024	.015	.880*	.000	.084
454	Hopeless future (T)	.044	-.023	-.023	.809*	.133*	.029
516	Empty/meaningless life (T)	-.025	.091	-.061	.846*	.071	-.082
520	Recent suicidal thoughts (T)	.025	-.032	-.015	.730*	-.114	.109
539	Loss of desire to make things better (T)	.052	.137*	.036	.545*	.119*	.049
546	Thoughts of death and afterlife (T)	.169*	.049	-.050	.601*	-.062	-.015
70	Easily defeated in arguments (T)	.049	.015	-.029	.027	.666*	-.061
146	It is easy to make me cry (T)	.277*	-.139*	.024	-.002	.426*	.222*
289	Easily embarrassed (T)	.050	.061	-.222*	-.125*	.621*	.141*
421	Vulnerable to criticism (T)	-.023	.210*	-.088	.038	.561*	.003
457	Changeable opinions (T)	-.155*	-.022	.127*	.021	.718*	.014
503	Passive/follower (T)	-.075	.009	-.107*	.049	.683*	-.104*
509	Nervous about important decisions (T)	.117*	-.031	-.021	.051	.673*	.015
514	Difficult time saying no (T)	.146*	.063	.067	-.030	.486*	.006
213	Anger easily but calm down quickly (T)	-.037	.074	.150*	-.056	.087	.605*
372	Difficult to anger (F)	-.026	.025	-.072	.036	-.017	.850*
382	Frequent serious arguments with close others (T)	.005	.252*	-.047	.046	-.018	.437*
389	Hotheaded (T)	.031	-.010	-.044	-.030	-.141*	.855*
444	High-strung (T)	.089	-.084	.048	.033	.114*	.447*
542	Intense anger (T)	.087	.154*	.056	.039	.038	.515*
564	Never lose self control (F)	-.043	-.050	.035	.222*	.054	.528*

Note. Item content was altered to protect MMPI-2 copyright.

* $p < .05$.

Item loadings $\geq .400$ are in bold for increased readability.

Table 4

Factor correlations for 6-factor EFA model

	F1	F2	F3	F4	F5
F1: Somatizing	-	-	-	-	-
F2: Ant. suspiciousness	.214*	-	-	-	-
F3: Extraversion	-.136*	-.050	-	-	-
F4: Depression	.290*	.207*	-.341*	-	-
F5: Passivity	.124*	.192*	-.225*	.316*	-
F6: Anger	.273*	.319*	-.008	.222*	.200*

* $p < .05$.

Table 5
Eigenvalues for final item pool (53 items)

Factor	Eigenvalue
1	11.27
2	5.69
3	3.34
4	3.14
5	2.74
6	2.36
7	1.83
8	1.32
9	1.27
10	1.15
11	1.09
12	1.08
13	1.00
14	0.98
15	0.94
16	0.90
17	0.87
18	0.85
19	0.79
20	0.75
21	0.74
22	0.68
23	0.67
24	0.65
25	0.60
26	0.57
27	0.55
28	0.54
29	0.52
30	0.47
31	0.47
32	0.44
33	0.43
34	0.38
35	0.35
36	0.33
37	0.31
38	0.30
39	0.27
40	0.26
41	0.22
42	0.21
43	0.20

Table 5. Continued.

Factor	Eigenvalue
44	0.17
45	0.16
46	0.13
47	0.09
48	0.08
49	0.05
50	0.03
51	0.00
52	0.00
53	-0.10
54	-0.10

Table 6
Model fit indices for EFA and EBFA

Model	χ^2 (df)	RMSEA (90% CI)	CFI	SRMR
5-factor EFA (155 items)	14261.94 (11170)	.02	.92	.06
6-factor EFA (53 items)	1825.11 (1122)	.03	.96	.05
7-factor EFA (155 items)	12893.20 (10871)	.01	.95	.06
8-factor EFA (155 items)	12375.01 (10723)	.01	.96	.05
9-factor EFA (155 items)	11938.56 (10576)	.01	.96	.05
10-factor EFA (155 items)	11600.02 (10430)	.01	.97	.05
11-factor EFA (155 items)	11321.26 (10285)	.01	.97	.05
12-factor EFA (155 items)	11047.41 (10141)	.01	.98	.05
13-factor EFA (155 items)	10797.46 (9998)	.01	.98	.05
3-factor EBFA (53 items)	4050.75 (1272)	.05	.83	.09
4-factor EBFA (53 items)	3125.62 (1221)	.04	.89	.08
5-factor EBFA (53 items)	2475.32 (1171)	.03	.92	.06
6-factor EBFA (53 items)	1825.11 (1122)	.03	.96	.05
7-factor EBFA (53 items)	1491.21 (1074)	.02	.98	.05
8-factor EBFA (53 items)	1327.30 (1027)	.02	.98	.04
9-factor EBFA (53 items)	1215.24 (981)	.02	.99	.04
10-factor EBFA (53 items)	1124.83 (936)	.01	.99	.04
11-factor EBFA (53 items)	1040.18 (892)	.01	.99	.03
12-factor EBFA (53 items)	953.02 (849)	.01	.99	.03
13-factor EBFA (53 items)	877.92 (807)	.01	1.00	.03

Note. χ^2 = chi-square goodness of fit, *df* = degrees of freedom, RMSEA = root mean square error of approximation, CFI = comparative fit index, SRMR = standardized root mean square residual. Final models are in bold.

Table 7

Factor loadings for 6-factor EBFA model (53 items)

Item number	Item content	G	S1	S2	S3	S4	S5
28	Frequent stomach aches (T)	.253*	.813*	-.081*	.052	.047	-.003
53	Burning/tingling sensation all over body (T)	.371*	.475*	-.059	-.089	.003	-.021
57	Never feel pain in back of neck (F)	.209*	.490*	-.029	-.052	.010	.023
97	Fullness in head/nose most of the time (T)	.353*	.415*	.093	.004	-.003	-.048
101	Feeling of a tight band around head (T)	.380*	.551*	.083	.172*	-.006	.046
111	Frequent stomach trouble (T)	.209*	.908*	.008	.079	.007	-.071
149	Tenderness atop head (T)	.268*	.460*	.042	-.060	-.059	.053
181	No hay fever/asthma (F)	.136*	.379*	-.070	-.012	-.082	.004
247	Numbness on skin (T)	.255*	.486*	-.006	-.013	-.128*	.020
536	Upset leads to headache (T)	.369*	.439*	-.002	-.101	.102*	.042
86	Like loud, fun parties (T)	-.002	-.051	.856*	.052	.063	.053
189	Enjoy flirting (T)	-.001	-.047	.497*	-.014	-.076	.083
231	Like being friends with pranksters (T)	-.035	-.011	.486*	.063	-.103*	-.080
337	More likely to be a wallflower at a party (T)	.272*	-.046	-.689*	.078	.119*	.057
349	Happiest alone (T)	.328*	-.067	-.393*	.059	.041	-.079
353	Enjoy just being with other people (T)	-.219*	.036	.817*	-.054	.018	-.005
359	Find crowds exciting (T)	-.132*	-.003	.841*	-.056	.062	-.030
363	Worries melt in a lively crowd (T)	-.046	-.076	.534*	-.137*	-.020	.028
367	Avoid crowds (T)	.384*	-.037	-.757*	-.004	.048	-.011
370	Enjoy parties (T)	-.185*	-.013	.948*	.035	.016	.004
61	Feel important (T)	-.174*	-.016	.170*	-.488*	-.059	.026
75	Life is usually worthwhile (F)	.338*	-.064	-.044	.694*	.004	.004
92	Uncaring about what happens to me (T)	.429*	-.031	.030	.570*	-.067	-.078
303	Frequent suicidal thoughts (T)	.407*	.021	.022	.804*	-.011	.064
516	Empty/meaningless life (T)	.442*	-.035	-.048	.750*	.050	-.098
520	Recent suicidal thoughts (T)	.311*	.022	-.009	.669*	-.117	.090
539	Loss of desire to make things better (T)	.443*	.034	.048	.468*	.093	.017
454	Hopeless future (T)	.407*	.034	-.014	.737*	.116*	.016

Table 7. Continued.

Item number	Item content	G	S1	S2	S3	S4	S5
546	Thoughts of death and afterlife (T)	.348*	.154*	-.042	.537*	-.070	-.028
70	Easily defeated in arguments (T)	.243*	.032	-.024	.016	.630*	-.059
146	It is easy to make me cry (T)	.205*	.258*	.024	.020	.409*	.214*
289	Easily embarrassed (T)	.334*	.030	-.211*	-.129*	.583*	.116*
421	Vulnerable to criticism (T)	.414*	-.046	-.074	-.009	.514*	-.028
457	Changeable opinions (T)	.162*	-.159*	.128*	.017	.680*	.011
503	Passive/follower (T)	.204*	-.085	-.101*	.038	.647*	-.097*
509	Nervous about important decisions (T)	.269*	.098*	-.016	.046	.638*	.014
514	Difficult time saying no (T)	.252*	.124*	.072	-.044	.454*	-.004
213	Anger easily but calm down quickly (T)	.324*	-.046	.156*	-.066	.065	.524*
372	Difficult to anger (F)	.439*	-.034	-.062	.029	-.033	.746*
382	Frequent serious arguments with close others (T)	.470*	-.015	-.031	-.005	-.045	.352*
389	Hotheaded (T)	.352*	.025	-.036	-.023	-.148*	.758*
444	High-strung (T)	.207*	.083	.049	.045	.106*	.405*
542	Intense anger (T)	.441*	.067	.068	.006	.013	.434*
564	Never lose self control (F)	.297*	-.045	.040	.211*	.043	.469*
81	Most people would lie to do better than others (T)	.707*	-.098	.015	-.211*	.019	-.060
99	Someone is out to get me (T)	.736*	.010	.171*	.044	-.103	-.030
110	Most people will act unfairly to get ahead (T)	.740*	-.061	.025	-.237*	-.034	-.169*
138	People are plotting against me (T)	.690*	.027	.170*	-.053	-.072	-.110
259	People are talking about me (T)	.659*	-.056	.017	.044	.076	.135*
284	People lie to get out of things (T)	.577*	-.059	.031	-.174*	-.038	-.150*
286	People dislike helping others (T)	.621*	-.010	.029	-.108	-.071	-.110
333	People insult me (T)	.572*	.054	-.024	-.023	-.074	.171*
346	Just as good as experts (T)	.391*	-.005	-.014	-.143*	-.197*	.073
484	People are unkind (T)	.570*	.087	-.111	.036	.039	.023

Note. Item content was altered to protect MMPI-2 copyright.

* $p < .05$.

Item loadings $\geq .300$ are in bold for increased readability.

Table 8

Factor correlations for 6-factor EBFA model

	G	S1	S2	S3	S4
General factor	-	-	-	-	-
S1: Somatizing	.000	-	-	-	-
S2: Extraversion	.000	-.094*	-	-	-
S3: Depression	.000	.181*	-.307*	-	-
S4: Passivity	.000	.037	-.185*	.230*	-
S5: Anger	.000	.141*	.067	.047	.078

* $p < .05$.

Table 9

Study 2 PD Spectra Scale Items Frequencies (N = 539)

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
28	153	28.4	386	71.6	0	0.0
53	234	43.4	305	56.6	0	0.0
57	231	42.9	308	57.1	0	0.0
61	321	59.6	216	40.1	2	0.4
70	180	33.4	357	66.2	2	0.4
75	187	34.7	347	64.4	5	0.9
81	348	64.6	189	35.1	2	0.4
86	234	43.4	305	56.6	0	0.0
92	183	34.0	356	66.0	0	0.0
97	142	26.3	391	72.5	6	1.1
99	169	31.4	370	68.6	0	0.0
101	142	26.3	395	73.3	2	0.4
110	359	66.6	179	33.2	1	0.2
111	119	22.1	420	77.9	0	0.0
138	136	25.2	403	74.8	0	0.0
146	200	37.1	338	62.7	1	0.2
149	122	22.6	417	77.4	0	0.0
181	141	26.2	398	73.8	0	0.0
189	274	50.8	265	49.2	0	0.0
213	213	39.5	326	60.5	0	0.0
231	161	29.9	377	69.9	1	0.2
247	116	21.5	423	78.5	0	0.0
259	279	51.8	260	48.2	0	0.0
284	299	55.5	240	44.5	0	0.0
286	266	49.4	269	49.9	4	0.7
289	266	49.4	273	50.6	0	0.0
303	134	24.9	404	75.0	1	0.2
333	166	30.8	372	69.0	1	0.2
337	324	60.1	215	39.9	0	0.0
346	339	62.9	197	36.5	3	0.6
349	133	24.7	405	75.1	1	0.2
353	290	53.8	249	46.2	0	0.0
359	274	50.8	263	48.8	2	0.4
363	253	46.9	285	52.9	1	0.2
367	261	48.4	278	51.6	0	0.0
370	311	57.7	226	41.9	2	0.4
372	221	41.0	317	58.8	1	0.2
382	185	34.3	352	65.3	2	0.4
389	152	28.2	387	71.8	0	0.0
421	184	34.1	353	65.5	2	0.4
444	234	43.4	304	56.4	1	0.2
454	184	34.1	355	65.9	0	0.0
457	153	28.4	384	71.2	2	0.4

Table 9. Continued.

Item number	True (N)	True (%)	False (N)	False (%)	Missing (N)	Missing (%)
484	116	21.5	422	78.3	1	0.2
503	186	34.5	353	65.5	0	0.0
509	249	46.2	290	53.8	0	0.0
514	342	63.5	197	36.5	0	0.0
516	169	31.4	370	68.6	0	0.0
520	167	31.0	370	68.6	2	0.4
536	184	34.1	355	65.9	0	0.0
539	217	40.3	321	59.6	1	0.2
542	289	53.6	249	46.2	1	0.2
546	174	32.3	364	67.5	1	0.2
564	220	40.8	318	59.0	1	0.2

Table 10

Standardized factor loadings for 6-factor CFA model (53 items)

Item number	Item content	F1	F2	F3	F4	F5	F6
28	Frequent stomach aches (T)	.803*					
53	Burning/tingling sensation all over body (T)	.800*					
57	Never feel pain in back of neck (F)	.601*					
97	Fullness in head/nose most of the time (T)	.730*					
101	Feeling of a tight band around head (T)	.830*					
111	Frequent stomach trouble (T)	.779*					
149	Tenderness atop head (T)	.608*					
181	No hay fever/asthma (F)	.205*					
247	Numbness on skin (T)	.616*					
536	Upset leads to headache (T)	.690*					
81	Most people would lie to do better than others (T)		.665*				
99	Someone is out to get me (T)		.859*				
110	Most people will act unfairly to get ahead (T)		.677*				
138	People are plotting against me (T)		.890*				
259	People are talking about me (T)		.836*				
284	People lie to get out of things (T)		.444*				
286	People dislike helping others (T)		.683*				
333	People insult me (T)		.726*				
346	Just as good as experts (T)		.317*				
484	People are unkind (T)		.886*				
86	Like loud, fun parties (T)		.448*	.916*			
189	Enjoy flirting (T)			.288*			
231	Like being friends with pranksters (T)			.194*			
337	More likely to be a wallflower at a party (T)			-.804*			
349	Happiest alone (T)			-.712*			
353	Enjoy just being with other people (T)			.839*			
359	Find crowds exciting (T)			.726*			
363	Worries melt in a lively crowd (T)			.565*			
367	Avoid crowds (T)			-.891*			

Table 10. Continued.

Item number	Item content	F1	F2	F3	F4	F5	F6
370	Enjoy parties (T)			.890*			
61	Feel important (T)				-.696*		
75	Life is usually worthwhile (F)				.819*		
92	Uncaring about what happens to me (T)				.793*		
303	Frequent suicidal thoughts (T)				.893*		
454	Hopeless future (T)				.909*		
516	Empty/meaningless life (T)				.889*		
520	Recent suicidal thoughts (T)				.743*		
539	Loss of desire to make things better (T)				.865*		
546	Thoughts of death and afterlife (T)				.831*		
70	Easily defeated in arguments (T)					.731*	
146	It is easy to make me cry (T)					.635*	
289	Easily embarrassed (T)					.703*	
421	Vulnerable to criticism (T)					.738*	
457	Changeable opinions (T)					.701*	
503	Passive/follower (T)					.759*	
509	Nervous about important decisions (T)					.827*	
514	Difficult time saying no (T)					.506*	
213	Anger easily but calm down quickly (T)						.373*
372	Difficult to anger (F)						.723*
382	Frequent serious arguments with close others (T)						.704*
389	Hotheaded (T)						.564*
444	High-strung (T)						.384*
542	Intense anger (T)						.746*
564	Never lose self control (F)						.742*

Note. Item content was altered to protect MMPI-2 copyright.

* $p < .05$.

Table 11

Factor correlations for 6-factor CFA model

	F1	F2	F3	F4	F5
F1: Somatizing	-	-	-	-	-
F2: Ant. suspiciousness	.609*	-	-	-	-
F3: Extraversion	-.414*	-.447*	-	-	-
F4: Depression	.594*	.607*	-.556*	-	-
F5: Passivity	.628*	.606*	-.578*	.641*	-
F6: Anger	.577*	.623*	-.264*	.545*	.477*

* $p < .05$.

Table 12

Standardized factor loadings for 6-factor CBFA model (53 items)

Item number	Item content	G	S1	S2	S3	S4	S5
28	Frequent stomach aches (T)	.528*	.686*				
53	Burning/tingling sensation all over body (T)	.634*	.374*				
57	Never feel pain in back of neck (F)	.443*	.427*				
97	Fullness in head/nose most of the time (T)	.595*	.274*				
101	Feeling of a tight band around head (T)	.659*	.383*				
111	Frequent stomach trouble (T)	.472*	.823*				
149	Tenderness atop head (T)	.460*	.380*				
181	No hay fever/asthma (F)	.115	.291*				
247	Numbness on skin (T)	.471*	.361*				
536	Upset leads to headache (T)	.545*	.340*				
86	Like loud, fun parties (T)	-.132*		.813*			
189	Enjoy flirting (T)	-.059		.499*			
231	Like being friends with pranksters (T)	-.034		.361*			
337	More likely to be a wallflower at a party (T)	.532*		-.532*			
349	Happiest alone (T)	.541*		-.282*			
353	Enjoy just being with other people (T)	-.510*		.658*			
359	Find crowds exciting (T)	-.364*		.719*			
363	Worries melt in a lively crowd (T)	-.340*		.451*			
367	Avoid crowds (T)	.597*		-.594*			
370	Enjoy parties (T)	-.480*		.822*			
61	Feel important (T)	-.520*			-.493*		
75	Life is usually worthwhile (F)	.611*			.578*		
92	Uncaring about what happens to me (T)	.633*			.449*		
303	Frequent suicidal thoughts (T)	.671*			.612*		
454	Hopeless future (T)	.723*			.531*		
516	Empty/meaningless life (T)	.697*			.546*		
520	Recent suicidal thoughts (T)	.535*			.585*		
539	Loss of desire to make things better (T)	.712*			.436*		

Table 12. Continued.

Item number	Item content	G	S1	S2	S3	S4	S5
546	Thoughts of death and afterlife (T)	.653*			.510*		
70	Easily defeated in arguments (T)	.552*				.554*	
146	It is easy to make me cry (T)	.519*				.294*	
289	Easily embarrassed (T)	.546*				.452*	
421	Vulnerable to criticism (T)	.582*				.455*	
457	Changeable opinions (T)	.525*				.603*	
503	Passive/follower (T)	.617*				.363*	
509	Nervous about important decisions (T)	.676*				.360*	
514	Difficult time saying no (T)	.380*				.448*	
213	Anger easily but calm down quickly (T)	.192*					.546*
372	Difficult to anger (F)	.480*					.596*
382	Frequent serious arguments with close others (T)	.494*					.363*
389	Hotheaded (T)	.327*					.699*
444	High-strung (T)	.214*					.520*
542	Intense anger (T)	.509*					.466*
564	Never lose self control (F)	.542*					.252*
81	Most people would lie to do better than others (T)	.581*					
99	Someone is out to get me (T)	.793*					
110	Most people will act unfairly to get ahead (T)	.591*					
138	People are plotting against me (T)	.825*					
259	People are talking about me (T)	.754*					
284	People lie to get out of things (T)	.380*					
286	People dislike helping others (T)	.609*					
333	People insult me (T)	.652*					
346	Just as good as experts (T)	.263*					
484	People are unkind (T)	.795*					

Note. Item content was altered to protect MMPI-2 copyright.

* $p < .05$.

Table 13

Model fit indices for CFA and CBFA (53 items)

Model	χ^2 (df)	RMSEA (90% CI)	CFI
6-factor CFA	2308.19 (1361)	.04	.94
CFA with MCMI-II correlations	3493.90 (1985)	.04	.91
CFA with MCMI-II regressions	3493.90 (1985)	.04	.91
6-factor CBFA	2343.43 (1333)	.04	.93
CBFA with MCMI-II correlations	3335.85 (1957)	.04	.91
CBFA with MCMI-II regressions	3335.85 (1957)	.04	.91

Note. χ^2 = chi-square goodness of fit, *df* = degrees of freedom, RMSEA = root mean square error of approximation, CFI = comparative fit index, SRMR = standardized root mean square residual.

Table 14

MCMI-II Clinical Scale Score Descriptives (N = 539)

Scale	<i>M</i>	<i>SD</i>
Schizoid	70.41	27.38
Avoidant	67.93	32.70
Dependent	63.74	29.75
Narcissistic	56.55	29.52
Antisocial	59.14	28.45
Histrionic	50.85	26.67
Aggressive/sadistic	59.39	29.08
Compulsive	62.35	21.92
Passive-aggressive	58.58	36.84
Self-defeating	63.39	28.26
Schizotypal	65.25	25.52
Borderline	58.15	26.22
Paranoid	58.96	21.30

Note. *M* = mean, *SD* = standard deviation.

Table 15

MCMI-II Clinical Scales Correlations (N = 539)

	SZD	AVD	DEP	NAR	ANT	HIS	AGG	OBC	PAG	SLF	SZT	BOR	PAR
SZD	--												
AVD	.761*	--											
DEP	.276*	.289*	--										
NAR	-.125*	.000	-.222*	--									
ANT	.181*	.380*	-.234*	.716*	--								
HIS	-.391*	-.189*	.047	.698*	.467*	--							
AGG	.130*	.262*	-.318*	.769*	.799*	.440*	--						
OBC	.199*	-.001	.335*	.105*	-.141*	.004	.067	--					
PAG	.407*	.657*	-.043	.441*	.767*	.228*	.678*	-.228*	--				
SLF	.582*	.835*	.413*	.098*	.436*	.059	.293*	-.048	.707*	--			
SZT	.735*	.806*	.302*	.170*	.477*	-.074	.367*	.077	.668*	.751*	--		
BOR	.430*	.690*	.108*	.399*	.699*	.271*	.584*	-.124*	.852*	.799*	.689*	--	
PAR	.299*	.426*	.062	.706*	.694*	.409*	.707*	.289*	.620*	.472*	.573*	.633*	--

Note. SZD = Schizoid, AVD = Avoidant, DEP = Dependent, NAR = Narcissistic, ANT = Antisocial, HIS = Histrionic, AGG = Aggressive/Sadistic, OBC = Compulsive, PAG = Passive-aggressive, SLF = Self-defeating, SZT = Schizotypal, BOR = Borderline, PAR = Paranoid.

* $p < .05$.

Table 16

CFA factor correlations with MCMI-II Clinical Scales

	SZD	AVD	DEP	HIS	NAR	ANT	AGG	OBC	PAG	SLF	SZT	BOR	PAR
F1: Somatizing	.287*	.402*	.027	-.165*	-.046	.171*	.121*	-.179*	.412*	.374*	.383*	.349*	.221*
F2: Ant. susp.	.325*	.461*	.019	-.141*	.106*	.342*	.225*	-.267*	.514*	.426*	.499*	.425*	.342*
F3: Extraversion	-.650*	-.590*	-.026	.578*	.290*	-.023	.018	.019	-.285*	-.361*	-.529*	-.221*	-.099*
F4: Depression	.437*	.534*	-.014	-.325*	-.190*	.196*	.080	-.326*	.453*	.486*	.460*	.450*	.079
F5: Passivity	.435*	.618*	.411*	-.276*	-.291*	.060	-.114*	-.201*	.430*	.611*	.547*	.411*	.102
F6: Anger	.116*	.385*	-.255*	.121*	.309*	.558*	.516*	-.369*	.713*	.444*	.378*	.610*	.416*

Note. SZD = Schizoid, AVD = Avoidant, DEP = Dependent, HIS = Histrionic, NAR = Narcissistic, ANT = Antisocial, AGG = Aggressive/Sadistic, OBC = Compulsive, PAG = Passive-aggressive, SLF = Self-defeating, SZT = Schizotypal, BOR = Borderline, PAR = Paranoid.

* $p < .05$.

Table 17

MCMI-II Clinical Scales regressed on CFA factors

	β	SE	B	SE	95% CI		R^2
					Lower	Upper	
Schizoid							.449
F1: Somatizing	-.016	.050	-.016	.050	-.114	.083	
F2: Ant. susp.	.063	.047	.063	.047	-.028	.155	
F3: Extraversion	-.547	.035	-.547*	.043	-.630	-.463	
F4: Depression	.146	.045	.146*	.045	.057	.235	
F5: Passivity	.077	.054	.077	.054	-.028	.183	
F6: Anger	-.171	.064	-.170*	.064	-.296	-.045	
Avoidant							.484
F1: Somatizing	-.103	.054	-.103	.054	-.208	.003	
F2: Ant. susp.	.033	.043	.032	.043	-.052	.117	
F3: Extraversion	-.325	.044	-.325*	.048	-.420	-.230	
F4: Depression	.105	.046	.105*	.046	.015	.195	
F5: Passivity	.352	.046	.352*	.051	.252	.452	
F6: Anger	.117	.057	.117*	.057	.005	.230	
Dependent							.514
F1: Somatizing	-.081	.077	-.081	.077	-.231	.070	
F2: Ant. susp.	.044	.070	.044	.070	-.137	.182	
F3: Extraversion	.280	.071	.280*	.072	.095	.421	
F4: Depression	-.163	.076	-.163*	.077	-.361	-.012	
F5: Passivity	.945	.084	.944*	.100	.685	1.141	
F6: Anger	-.519	.073	-.518*	.079	-.722	-.363	
Histrionic							.442
F1: Somatizing	-.054	.063	-.054	.063	-.177	.069	
F2: Ant. susp.	.009	.061	.009	.061	-.111	.128	
F3: Extraversion	.557	.056	.557*	.064	.432	.682	
F4: Depression	-.221	.065	-.221*	.066	-.350	-.092	
F5: Passivity	.031	.073	.031	.073	-.113	.174	
F6: Anger	.396	.066	.396*	.070	.259	.533	
Narcissistic							.419
F1: Somatizing	-.031	.076	-.031	.076	-.179	.117	
F2: Ant. susp.	.276	.065	.276*	.067	.145	.407	
F3: Extraversion	.135	.059	.135*	.059	.018	.251	
F4: Depression	-.275	.068	-.275*	.070	-.412	-.138	
F5: Passivity	-.439	.077	-.439*	.080	-.596	-.282	
F6: Anger	.546	.068	.545*	.073	.402	.689	
Antisocial							.388
F1: Somatizing	-.149	.077	-.149	.077	-.299	.002	
F2: Ant. susp.	.195	.060	.195*	.060	.077	.313	
F3: Extraversion	.019	.062	.019	.062	-.102	.141	
F4: Depression	-.014	.072	-.014	.072	-.154	.127	
F5: Passivity	-.250	.080	-.250*	.080	-.407	-.094	
F6: Anger	.653	.064	.652*	.071	.514	.791	

Table 17. Continued

	β	<i>SE</i>	<i>B</i>	<i>SE</i>	95% <i>CI</i>		R^2
					Lower	Upper	
Aggressive/Sadistic							.441
F1: Somatizing	-.037	.078	-.037	.078	-.189	.115	
F2: Ant. susp.	.106	.062	.106	.062	-.107	.228	
F3: Extraversion	-.098	.063	-.098	.063	-.221	.025	
F4: Depression	-.092	.072	-.092	.072	-.233	.049	
F5: Passivity	-.492	.080	-.492*	.081	-.651	-.333	
F6: Anger	.727	.066	.726*	.072	.585	.867	
Compulsive							.202
F1: Somatizing	.143	.072	.143*	.072	.002	.284	
F2: Ant. susp.	-.061	.064	-.061	.064	-.186	.064	
F3: Extraversion	-.228	.060	-.228*	.061	-.347	-.109	
F4: Depression	-.319	.068	-.319*	.070	-.456	-.181	
F5: Passivity	-.052	.075	-.052	.075	-.199	.095	
F6: Anger	-.276	.075	-.276*	.076	-.425	-.126	
Passive-aggressive							.530
F1: Somatizing	-.108	.066	-.108	.066	-.239	.022	
F2: Ant. susp.	.079	.050	.079	.050	-.018	.177	
F3: Extraversion	-.056	.054	-.056	.055	-.163	.051	
F4: Depression	.026	.059	.026	.059	-.090	.142	
F5: Passivity	.095	.062	.095	.062	-.026	.216	
F6: Anger	.653	.058	.652*	.074	.508	.797	
Self-defeating							.421
F1: Somatizing	-.154	.056	-.153*	.056	-.262	-.044	
F2: Ant. susp.	-.011	.046	-.011	.046	-.101	.078	
F3: Extraversion	.006	.055	.006	.055	-.102	.113	
F4: Depression	.127	.049	.127*	.050	.029	.224	
F5: Passivity	.532	.050	.531*	.056	.422	.641	
F6: Anger	.223	.057	.223*	.058	.109	.337	
Schizotypal							.406
F1: Somatizing	-.082	.051	-.081	.051	-.182	.019	
F2: Ant. susp.	.196	.037	.196*	.038	.122	.270	
F3: Extraversion	-.298	.042	-.298*	.044	-.383	-.212	
F4: Depression	.004	.041	.004	.041	-.076	.084	
F5: Passivity	.257	.047	.257*	.047	.164	.350	
F6: Anger	.103	.058	.103	.058	-.009	.216	
Borderline							.411
F1: Somatizing	-.143	.064	-.143*	.064	-.268	-.017	
F2: Ant. susp.	.003	.049	.003	.049	-.093	.098	
F3: Extraversion	.050	.057	.050	.057	-.062	.163	
F4: Depression	.162	.053	.161*	.053	.058	.265	
F5: Passivity	.173	.064	.173*	.065	.046	.300	
F6: Anger	.535	.053	.535*	.059	.418	.651	
Paranoid							.255

Table 17. Continued

	β	<i>SE</i>	<i>B</i>	<i>SE</i>	95% <i>CI</i>		R^2
					Lower	Upper	
F1: Somatizing	.041	.070	.041	.070	-.095	.178	
F2: Ant. susp.	.285	.053	.284*	.053	.180	.389	
F3: Extraversion	-.108	.062	-.108	.062	-.230	.015	
F4: Depression	-.302	.067	-.302*	.067	-.434	-.170	
F5: Passivity	-.164	.080	-.164*	.080	-.321	-.007	
F6: Anger	.429	.061	.428*	.063	.305	.551	

Note. β = standardized beta weight, *SE* = standard error, *B* = unstandardized beta weight, *CI* = confidence interval, R^2 = coefficient of determination.

R^2 value represents the total amount of variance explained in the MCMI-II scale by the 6 factors.

Significant unstandardized beta weights have been bolded to improve readability.

* $p < .05$.

Table 18

CBFA factor correlations with MCMI-II Clinical Scales

	SZD	AVD	DEP	HIS	NAR	ANT	AGG	OBC	PAG	SLF	SZT	BOR	PAR
General factor	.394*	.547*	-.012	-.154*	.110*	.409*	.282*	-.313*	.602*	.504*	.577*	.512*	.383*
S1: Somatizing	-.021	-.017	.057	-.081	-.203*	-.215*	-.159*	.084	-.055	-.006	-.061	-.061	-.106
S2: Extraversion	-.512*	-.304*	-.062	.620*	.463*	.319*	.274*	-.226*	.124*	-.049	.140*	.140*	.188*
S3: Depression	.205*	.168*	-.009	-.339*	-.449*	-.202*	-.230*	-.138*	-.026	.145*	.071	.071	-.364*
S4: Passivity	.203*	.309*	.686*	-.250*	-.594*	-.422*	-.542*	.077	-.066	.348*	.014	.014	-.312*
S5: Anger	-.193*	.028	-.319*	.319*	.347*	.392*	.448*	-.190*	.409*	.141*	.357*	.357*	.234*

Note. SZD = Schizoid, AVD = Avoidant, DEP = Dependent, HIS = Histrionic, NAR = Narcissistic, ANT = Antisocial, AGG = Aggressive/Sadistic, OBC = Compulsive, PAG = Passive-aggressive, SLF = Self-defeating, SZT = Schizotypal, BOR = Borderline, PAR = Paranoid.

* $p < .05$.

Table 19

MCMI-II Clinical Scales regressed on CBFA factors

	β	<i>SE</i>	<i>B</i>	<i>SE</i>	95% <i>CI</i>		R^2
					Lower	Upper	
Schizoid							.538
General factor	.394	.038	.392*	.043	.309	.478	
S1: Somatizing	-.021	.045	-.021	.045	-.109	.068	
S2: Extraversion	-.512	.031	-.511*	.037	-.584	-.438	
S3: Depression	.205	.037	.205*	.038	.130	.279	
S4: Passivity	.203	.044	.203*	.045	.114	.291	
S5: Anger	-.193	.047	-.193*	.048	-.286	-.100	
Avoidant							.516
General factor	.547	.041	.546*	.055	.438	.655	
S1: Somatizing	-.017	.046	-.017	.046	-.106	.072	
S2: Extraversion	-.304	.036	-.303*	.040	-.382	-.225	
S3: Depression	.168	.037	.168*	.038	.093	.243	
S4: Passivity	.309	.037	.308*	.041	.228	.389	
S5: Anger	.028	.044	.028	.044	-.058	.113	
Dependent							.580
General factor	-.012	.047	-.012	.047	-.103	.080	
S1: Somatizing	.057	.057	.057	.057	-.054	.168	
S2: Extraversion	-.062	.054	-.062	.054	-.169	.045	
S3: Depression	-.009	.065	-.009	.064	-.136	.117	
S4: Passivity	.686	.052	.685*	.068	.552	.818	
S5: Anger	-.319	.052	-.319*	.056	-.429	-.208	
Histrionic							.694
General factor	-.154	.045	-.154*	.047	-.245	-.062	
S1: Somatizing	-.081	.055	-.081	.055	-.189	.028	
S2: Extraversion	.620	.041	.619*	.056	.510	.729	
S3: Depression	-.339	.059	-.338*	.063	-.463	-.214	
S4: Passivity	-.250	.062	-.250*	.064	-.375	-.124	
S5: Anger	.392	.047	.319*	.051	.218	.420	
Narcissistic							.942
General factor	.110	.048	.110*	.048	.015	.205	
S1: Somatizing	-.203	.060	-.203*	.061	-.323	-.083	
S2: Extraversion	.463	.052	.462*	.058	.348	.576	
S3: Depression	-.449	.059	-.448*	.066	-.577	-.320	
S4: Passivity	-.594	.063	-.594*	.073	-.736	-.451	
S5: Anger	.347	.048	.347*	.052	.244	.450	
Antisocial							.687
General factor	.409	.045	.408*	.049	.312	.505	
S1: Somatizing	-.215	.056	-.215*	.057	-.328	-.103	
S2: Extraversion	.319	.052	.318*	.054	.213	.424	
S3: Depression	-.202	.061	-.201*	.061	-.322	-.081	
S4: Passivity	-.422	.062	-.421*	.065	-.548	-.294	
S5: Anger	.392	.044	.391*	.047	.299	.484	

Table 19. Continued.

	β	SE	B	SE	95% CI		R^2
					Lower	Upper	
Aggressive/Sadistic							.724
General factor	.282	.045	.281*	.048	.188	.375	
S1: Somatizing	-.150	.057	-.150*	.058	-.263	-.037	
S2: Extraversion	.274	.055	.274*	.057	.163	.385	
S3: Depression	-.230	.060	-.230*	.061	-.349	-.110	
S4: Passivity	-.542	.059	-.542*	.064	-.668	-.415	
S5: Anger	.448	.044	.447*	.049	.351	.543	
Compulsive							.217
General factor	-.313	.044	-.313*	.047	-.404	-.221	
S1: Somatizing	.084	.056	.084	.056	-.026	.194	
S2: Extraversion	-.226	.049	-.225*	.050	-.323	-.128	
S3: Depression	-.138	.054	-.137*	.055	-.244	-.031	
S4: Passivity	.077	.057	.007	.057	-.034	.188	
S5: Anger	-.190	.051	-.190*	.051	-.290	-.089	
Passive-aggressive							.554
General factor	.602	.040	.602*	.059	.486	.718	
S1: Somatizing	-.055	.048	-.055	.048	-.150	.039	
S2: Extraversion	.124	.044	.123*	.045	.036	.211	
S3: Depression	-.026	.047	-.026	.047	-.118	.067	
S4: Passivity	-.066	.051	-.066	.051	-.165	.034	
S5: Anger	.409	.039	.409*	.046	.318	.499	
Self-defeating							.418
General factor	.504	.040	.503*	.049	.408	.599	
S1: Somatizing	-.006	.044	-.006	.044	-.093	.080	
S2: Extraversion	-.049	.042	-.049	.042	-.132	.033	
S3: Depression	.145	.038	.145*	.039	.068	.222	
S4: Passivity	.348	.038	.347*	.041	.266	.428	
S5: Anger	.141	.042	.141*	.043	.057	.225	
Schizotypal							.407
General factor	.577	.033	.576*	.041	.497	.656	
S1: Somatizing	-.090	.041	-.090*	.042	-.171	-.008	
S2: Extraversion	-.202	.036	-.202*	.036	-.273	-.131	
S3: Depression	.012	.033	.011	.033	-.053	.076	
S4: Passivity	.156	.034	.156*	.034	.089	.224	
S5: Anger	.005	.042	.005	.042	-.078	.088	
Borderline							.419
General factor	.512	.041	.512*	.048	.418	.606	
S1: Somatizing	-.061	.048	-.061	.048	-.154	.032	
S2: Extraversion	.140	.044	.140*	.044	.053	.226	
S3: Depression	.071	.043	.071	.043	-.014	.156	
S4: Passivity	.014	.048	.014	.048	-.081	.109	
S5: Anger	.358	.037	.357*	.040	.279	.436	
Paranoid							.478

Table 19. Continued.

	β	<i>SE</i>	<i>B</i>	<i>SE</i>	95% <i>CI</i>		R^2
					Lower	Upper	
General factor	.383	.045	.383*	.047	.292	.474	
S1: Somatizing	-.106	.056	-.106	.056	-.215	.003	
S2: Extraversion	.188	.052	.187*	.052	.085	.290	
S3: Depression	-.364	.054	-.364*	.055	-.472	-.256	
S4: Passivity	-.312	.061	-.312*	.062	-.434	-.190	
S5: Anger	.234	.042	.234*	.043	.150	.318	

Note. β = standardized beta weight, *SE* = standard error, *B* = unstandardized beta weight, *CI* = confidence interval, R^2 = coefficient of determination.

R^2 value represents the total amount of variance explained in the MCMI-II scale by the 6 factors.

Significant unstandardized beta weights have been bolded to improve readability.

* $p < .05$.

Table 20

Omega (reliability) statistics for 6-factor CBFA (53 items)

	Total variance	ECV	ω	ω_h	ω_h/ω	H	PUC
General factor	.291	.576	.955	.848	.888	.965	.846
S1: Somatizing	.037	.074	.886	.390	.440	.800	-
S2: Extraversion	.066	.131	.644	.640	.993	.884	-
S3: Depression	.047	.092	.930	.361	.388	.783	-
S4: Passivity	.030	.060	.891	.349	.392	.685	-
S5: Anger	.034	.067	.831	.506	.609	.737	-
(Unique)	(.494)	-	-	-	-	-	-

Note. ECV = Explained Common Variance index, ω = omega total, ω_h = omega hierarchical, ω_h/ω = Relative Omega, PUC = percentage of uncontaminated correlations.

Table 21

Item overlap between CBFA factors and MMPI-2 Restructured Clinic (RC) Scales (number of items)

	RCd	RC1	RC2	RC3	RC4	RC6	RC7	RC8	RC9
General factor	1	2	1	1	0	2	3	0	3
S1: Somatizing	1	2	1	0	0	0	0	0	2
S2: Extraversion	0	1	0	0	0	0	0	0	2
S3: Depression	0	0	0	0	0	1	1	0	1
S4: Passivity	0	0	0	0	0	0	2	0	0
S5: Anger	0	0	0	1	0	0	0	0	0

Note. Items that loaded $\geq .30$ onto the general factor (47 items) were included in the comparison between G and the RC scales.

RCd = Demoralization, RC1 = Somatic Complaints, RC2 = Low Positive Emotions, RC3 = Cynicism, RC4 = Antisocial Behavior, RC6 = Ideas of Persecution, RC7 = Dysfunctional Negative Emotions, RC8 = Aberrant Experiences, RC9 = Hypomanic Activation.

Table 22

Item overlap between CBFA factors and MMPI-2 Restructured Clinic (RC) Scales (proportion of CBFA factor items)

	RCd	RC1	RC2	RC3	RC4	RC6	RC7	RC8	RC9
General factor	0.02	0.04	0.02	0.02	0	0.04	0.06	0	0.06
S1: Somatizing	0.10	0.20	0.10	0	0	0	0	0	0.20
S2: Extraversion	0	0.10	0	0	0	0	0	0	0.20
S3: Depression	0	0	0	0	0	0.11	0.11	0	0.11
S4: Passivity	0	0	0	0	0	0	0.25	0	0
S5: Anger	0	0	0	0.14	0	0	0	0	0

Note. Items that loaded $\geq .30$ onto the general factor (47 items) were included in the comparison between G and the RC scales.

RCd = Demoralization, RC1 = Somatic Complaints, RC2 = Low Positive Emotions, RC3 = Cynicism, RC4 = Antisocial Behavior, RC6 = Ideas of Persecution, RC7 = Dysfunctional Negative Emotions, RC8 = Aberrant Experiences, RC9 = Hypomanic Activation.

(A)

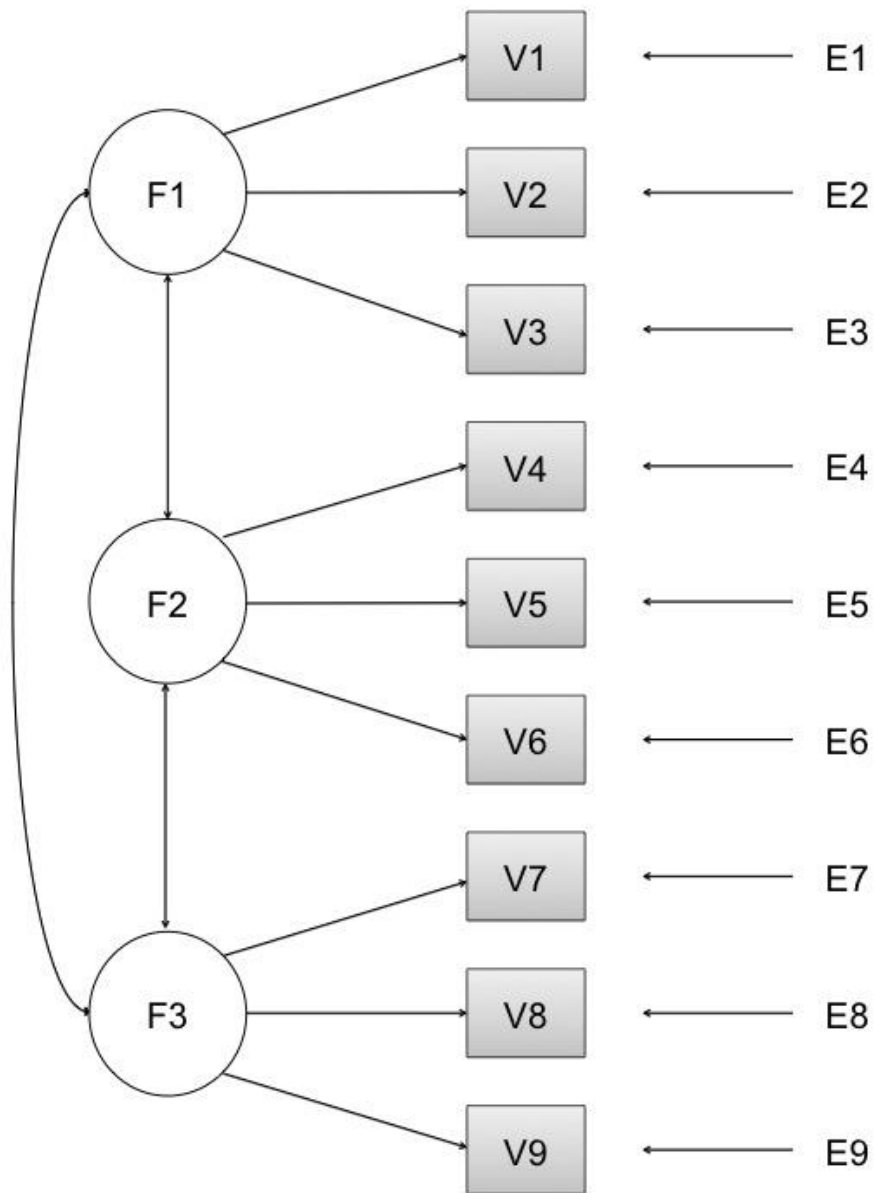


Figure 1. Model A, a correlated factors model; Model B, a bifactor model.

Note. The PD Spectra scale item pool consists of 220 items; these models are for illustrative purposes only and therefore include only nine items. *F* = factor, *V* = variable, *E* = error term, *D* = disturbance term, *G* = general factor, *S* = specific factor.

(B)

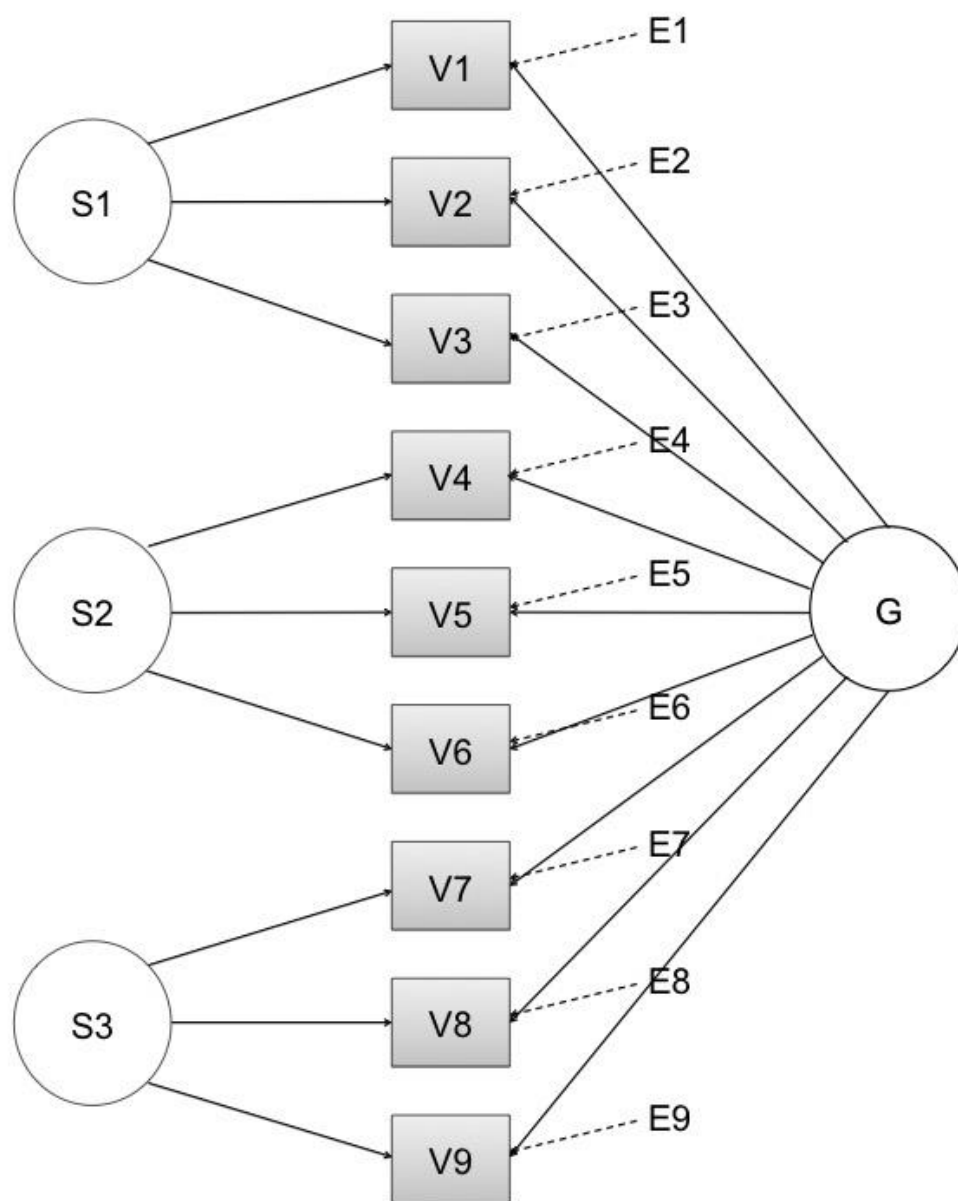


Figure 1. Continued.

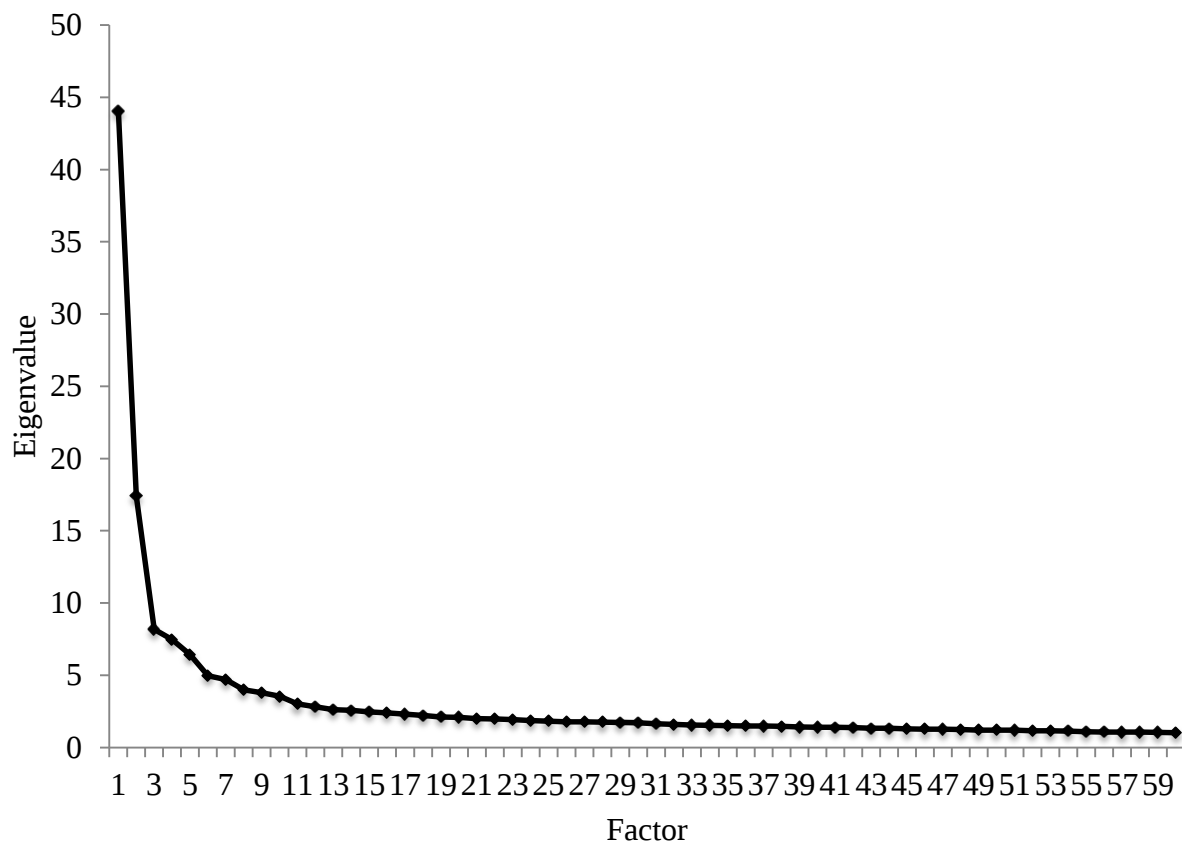


Figure 2. Scree plot of initial item pool (220 items) for eigenvalues greater than 1.

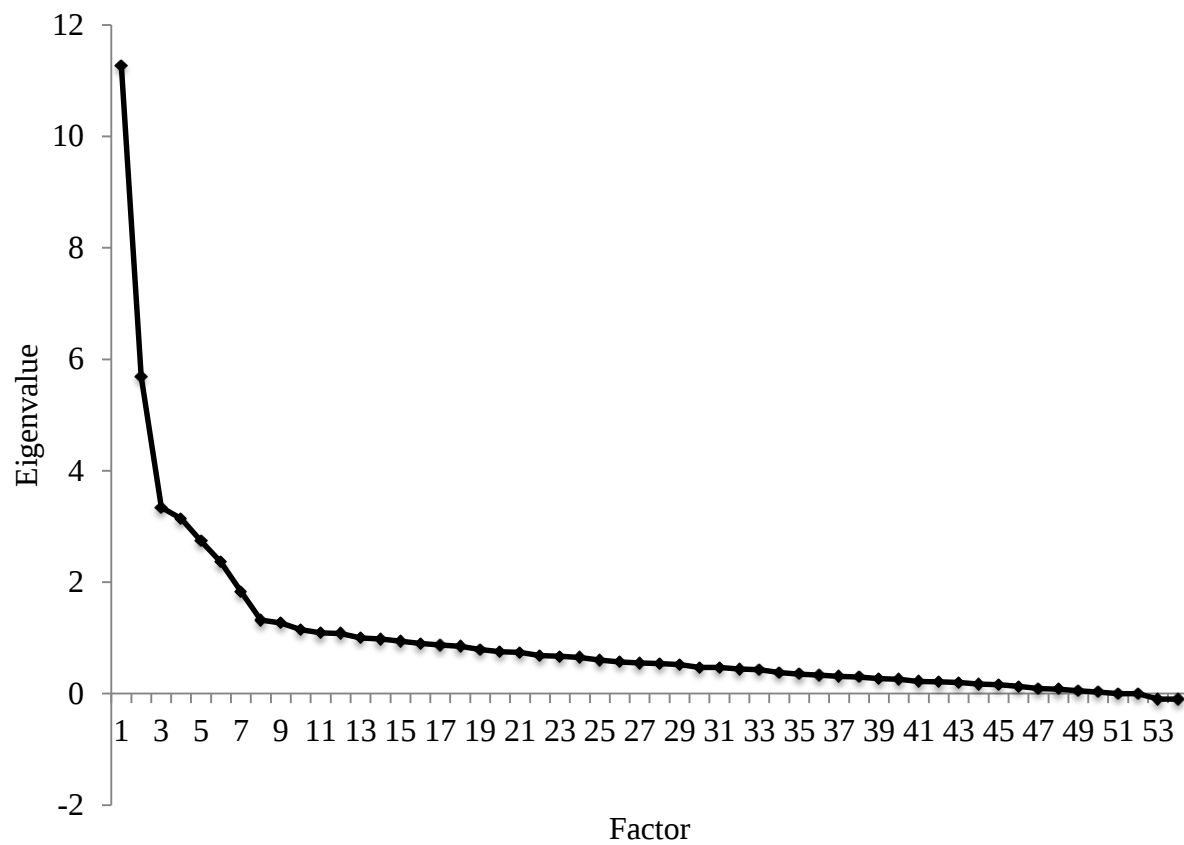


Figure 3. Scree plot of final item pool (53 items).

VITA

Marisa L. Whitley was born in Kingsport, TN. She grew up in St. Paul, MN and earned her Bachelor of Arts degree in English at Grinnell College. Her southern ancestry called her back to Knoxville for graduate school, and The University of Tennessee awarded her a Masters of Arts degree in psychology in 2016. Marisa plans to receive her PhD in clinical psychology from the University of Tennessee in Spring 2020, following her upcoming internship year at Louisiana State University Health Sciences Center in New Orleans, LA. Marisa would like to be remembered for more than her academic and professional achievements, as the process of working toward a doctorate has taught her that thoughtful engagement in meaningful relationships with others is what truly makes her life worthwhile.