A CLINICAL UTILITY STUDY OF PERSONALITY INVENTORIES: CONCORDANCE OF THE MCMI-III, THE MMPI-2, THE MMPI-RC, TWO ALTERNATIVE PERSONALITY DISORDER SCALES, AND AXIS II DISCHARGE DIAGNOSIS IN PSYCHIATRIC INPATIENTS

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DEDICATION

The completion of my academic goals could not have been achieved without the unconditional love and support from my family. To my parents, Ron and Annette Partridge, I will be forever grateful for your inspiration, compassion, and patience. I would have never accomplished all that I have without the perseverance, inquisitiveness, passion, and empathy you have instilled in me. To my siblings, Jason, Corinne, and Brad, your unwavering loyalty and support have carried me through some pretty rough patches and provided me with the strength needed to overcome any obstacle. Lastly, to my two amazing daughters Halle and Chloe, you bring so much beauty, joy, and love to my life. I hope that my accomplishments will someday inspire you both to achieve all your hopes and dreams.

"Don't become a mere recorder of facts, but try to penetrate the mystery of their origin."
Ivan Pavlov

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ABSTRACT

The Millon Clinical Multiaxial Inventory and the Minnesota Multiphasic Personality Inventory

are two of the most common personality inventories used by clinicians for diagnostic purposes.

Discriminant functions of the MMPI-2, MMPI-RC (Restructured Clinical), two alternative MMPI

Personality Disorder Scales, and the MCMI-III were compared in a sample of 371 hospitalized

psychiatric patients with Axis II discharge diagnoses. Participants were grouped by Cluster B

Personality Disorders (93), Cluster C Personality Disorders (38), and participants without an Axis

II diagnosis (240). Diagnostic utility of the instruments was compared in regards to DSM-IV-TR

Axis II diagnoses. Analyses included utilizing discriminant function analysis to evaluate the

diagnostic accuracy of each personality inventory. Further analyses provided information on two

diagnostic validity statistics which included: positive predictive power (PPP) and incremental

validity of positive test diagnoses (IPPP). The diagnostic validity statistics were used to evaluate

which instrument has the most clinical and diagnostic utility in the differentiation of

psychopathology. Analyses indicated that each of the instruments effectively predicted group

membership at a rate better than chance and that no single instrument performed better or worse in

this task. However, the MCMI-III possessed the greatest diagnostic validity as defined by the PPP

and IPPP statistics. Thus, the initial hypothesis that the MCMI-III would have the most clinical

utility in the assessment of personality disorders is partially supported.

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CHAPTER ONE

INTRODUCTION

Background and Purpose

Establishing a diagnosis is one of the first tasks a clinician faces when treating a patient. Valid diagnostic information is vital for the long-term treatment planning and care of psychiatric patients. After all, the purpose of diagnosing is to inform and guide treatment. As Millon (2000) noted, "diagnostic constructs are only reference points that facilitate understanding, against which the individual should be compared and contrasted" (p. 73).

Two general procedures used for gaining understanding of an individual are clinical judgment and mechanical/statistical prediction. Grove, Zald, Lebow, Snitz, and Nelson (2000) describe clinical judgment as "the typical procedure long used by applied psychologists and physicians, in which the judge puts data together using informal, subjective methods" (pg. 19). They describe statistical prediction as actuarial or algorithmic prediction which is well specified and once developed, requires no expert judgment (Grove et al., 2000). A large amount of research has been done on the accuracy of clinical judgment versus statistical prediction (Dawes, Faust, & Meehl, 1989; Garb, 1994; Grove et al., 2000; Grove & Meehl, 1996; Holt, 1970; Marchese, 1992; Sines, 1971; Meehl, 1954; Sawyer, 1966; Wiggins, 1981). The findings of these studies have largely supported the use of statistical prediction over clinical judgment in regards to diagnostic accuracy. Additionally, two extensive meta-analyses have nicely summarized the findings regarding the clinical judgment versus statistical prediction controversy (Egisdottir et al., 2006; Grove et al., 2000).

The Grove et al. (2000) meta-analysis included 136 studies consisting of 617 independent comparisons between clinical judgment and statistical prediction models. Studies which met the

following crieteria were included in the meta-analysis: published in English since 1920, predicted health-related phenomena and/or human behavior, and contained a description of the empirical outcome between predictions made using clinical judgment and predictions made using statistical models (Grove et al., 2000). The predictive criteria ranged from medical and mental health diagnosis to bankruptcy of firms. The clinicians utilized in the many studies analyzed ranged from psychologists and psychiatrists to members of parole boards and admissions committees. Their level of education ranged from less than a High School diploma to credentialed medical subspecialists. The clinicians' experience levels ranged from none to many years of task-specific experience. The statistical models used in the studies analyzed ranged from simplistic single variable models to highly sophisticated methods such as artificial intelligence and pattern recognition software. The data used by clinicians and statistical models for prediction purposes ranged from simple life history facts to refined medical tests (Grove et al., 2000).

In all of the studies included in this meta-anlaysis the clinicians had at least as much information available to them as was included in the statistical models, with the clincians having more available information in many of the studies. Even with this biases towards the clincians, results indicated that of the 136 studies; statistical prediction models outperformed clincial judgment in 64 studies, perfomred equivalently in 64 other studies, and clincial judgment outperformed statistical modeling in just 8 studies (Grove et al., 2000). Of note, the 8 studies which favored clinicians were not focused in any one specific predicitive area, did not represent any specific type of clinician, and did not display and obvious common characteristics. Additional results indicated that clincial experience and professional training made little

difference in predicitive accuracy. However, the type of statistical modeling did appear to make a difference,with weighted linear models showing the highest accuracy.

The next meta-anlaysis which will be summarized was conducted by Egisdottir, White, Spengler, Maugherman, Anderson, Cook, Nichols et al., (2006). While similar studies to that of the Grove et al. (2000) meta-analysis were included in the Egisdottir et al. (2006) meta-analysis, there were methodological differences. The Egisdottir et al. (2006) analysis only included studies that were directly relevant to psychology. The initial search for studies covered the time period between 1940 and 1996. The initial search yielded 156 studies; however, after narrowing the search down based on certain criteria, 67 studies with 92 effect sizes were included in the analysis. The selection criteria used were as follows: (a) a direct comparison was reported between clinical judgment predictions and statistical modeling prediction; (b) a psychological/mental health prediction was made; (c) the clinician and statistical model had access to the same information; (d) the same prediction was made by the clinician and the statistical model; and (e) data had to lend itself to the calculation of effect sizes (Egisdottir et al., 2006). An initial outlier analysis was conducted along with inclusion of only cross-validated studies resulted in a total of 41 studies with 48 effect sizes used for this meta-analysis.

Results indicated an effect size of .12 favoring statistical prediction, suggesting a 13% increase in accuracy when using statistical prediction over clinical judgment (Egisdottir et al., 2006). In addition to an overall effect size, the meta-analysis examined secondary research questions thought to influence the difference between the two types of predictions, such as: type of statistical formula used, amount of information available, information about base rates, availability of statistical formula to the clinician, and clinical expertness. Results regarding the type of statistical formula employed in prediction indicated that almost all types of statistical

formulas outperformed clinical judgment. The only exception was with logically constructed rules, which performed equally as well as clinical judgment (Egisdottir et al., 2006). Evaluation of the amount of information available to the clinician did not lessen the difference in accuracy; in fact, when more information was available to the clinicians, they performed worse (Egisdottir et al., 2006). Similar results were found in regards to the use of base rate information and the availability of statistical formulas to the clinicians in that, whether or not they used this information, statistical prediction was still superior (Egisdottir et al., 2006). An interesting finding resulted in the evaluation of clinical expertise. While statistical prediction was superior to the predictions of experts and novices, experts (effect size of .05) fared better than novices (effect size of .12) in comparison to statistical modeling (Egisdottir et al., 2006).

In addition to the above mentioned studies on clinical judgment versus statistical modeling, there have been a few studies which have evaluated the predictive/differential ability of the instruments used in the current study. Ben-Porath, Butcher, and Graham (1991) found that the content scales of the MMPI-2 added significant incremental validity to the clinical scales in the differentiation prediction of schizophrenia and major depression. Walters and Greene (1988) found that the clinical scales of the MMPI achieved an accuracy rate of 64.5% in the differential diagnosis of schizophrenia and mania, with 14.5% false positives and 21.0% false negatives. Libb, Murray, Thurstin, and Alarcon (1992) in a direct comparison of the MMPI and the MCMI-II found that the MCMI-II performed better in the differential prediction of affective disorders, schizophrenia, substance abuse, and other disorders. The MCMI-II had an overall hit rate of 79% compared to 68% achieved by the MMPI. Individually the MCMI-II correctly classified 82.5% (MMPI, 61.9%) of affective disorders, 80.8% (MMPI, 80.8%) of schizophrenic cases, and 71.4% (MMPI, 71.4%) of substance abuse cases. The aim of the current study is to expand upon

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the existing literature by examining and directly comparing the predictive/differential ability of five widely used personality inventories. This author did not find any previous studies that compared these instruments regarding Axis II differentiation.

This study compared the statistical predictive ability of the original clinical scales of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2), the Minnesota Multiphasic Personality Inventory – Restructured Clinical scales (MMPI-RC), the Ben-Porath Personality Disorder Scales, the Morey Personality Disorder Scales, and the Personality Pattern scales of the Millon Clinical Multiaxial Inventory – 3rd Edition (MCMI-III) in the task of classifying Axis II diagnostic clusters (See Appendix A & B for brief descriptions of the five inventories and the associated scales).

MMPI

The Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1940) has long been used as an aid in the differential diagnosis of psychopathology. In fact, the original version of the MMPI was designed to guide differential diagnosis of common clinical syndromes or disorders (Hathaway, 1964; Hoelzle & Meyer, 2008; Sellbom & Ben-Porath, 2005). In developing the MMPI, Hathaway and McKinley employed a technique called empirical keying with the goal of creating an instrument which could differentiate between psychologically distinctive groups. In order to create a scale, Hathaway and McKinley used a specific criterion group made up of psychiatric inpatients sharing a common diagnosis (e.g., depression, schizophrenia, etc.) and a comparison group of non-psychiatric individuals. Scales were constructed with items that were endorsed in the keyed direction by the psychiatric patients and not by the comparison group. This procedure produced eight primary scales used to guide diagnosis: Scale 1 (Hypochondriasis), 2 (Depression), 3 (Hysteria), 4 (Psychopathic Deviance), 6

(Paranoia), 7 (Psychasthenia), 8 (Schizophrenia), and 9 (Hypomania) (Hoelzle & Meyer, 2008; Tellegen, Ben-Porath, McNulty, Arbisi, Graham, & Kaemmer, 2003). Over the next 40 years, empirical research supported the clinical utility of the MMPI, but it never fully realized its original purpose of differentiating psychopathology and went untouched for over 40 years. This resulted in a need for the instrument to be revised (Sellbom & Ben-Porath, 2005).

Unfortunately, even with the revisions (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) not much changed psychometrically with the instrument. Other than addressing some outdated language issues, the clinical scales went unchanged. The reason the original clinical scales were left intact was due to the 50 years of empirical research supporting the clinical utility of these scales (Sellbom & Ben-Porath, 2005; Tellegen et al., 2003). While the newly updated MMPI-2 provided contemporary norms and additional content and supplementary scales, the clinical scales continued to have psychometric problems due primarily to item overlap and large intercorrelations among the scales (Handel & Archer, 2008; Sellbom & Ben-Porath, 2005; Simms, Casillas, Clark, Watson, & Doebbeling, 2005; Tellegen et al., 2003). These psychometric shortcomings made differential diagnosis difficult due to the lack of discriminant validity. These continued shortcomings once again resulted in more revisions, this time on a much grander scale.

The Restructured Clinical scales were created to address the psychometric issues of previous versions of the MMPI. Several studies had consistently found a common or general factor amongst the clinical scales that was contributing to the high intercorrelations and other psychometric problems (Eichman, 1961; Millimet, 1970; Simms et al., 2005; Tellegen et al., 2003). One of the major reasons for the overhauling of the MMPI was the problems the earlier versions had with discriminative power. Tellegen et al. (2003) undertook the task of correcting

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the inherent problems of the original "basic nine" scales of the MMPI. Sellbom and Ben-Porath

(2005) summarize the four stage test construction as follows:

Stage 1: Creation of a Demoralization scale that accounted for the general factor

Stage 2: Identification of "core" components for each clinical scale that were distinct and

independent from any other scale

Stage 3: Using the "core" components to develop "seed scales" which would serve as the

foundation for the new RC scales

Stage 4: Build upon the "seed scales" using the remaining items from the original MMPI-

2 item pool to finalize the new RC scales.   (pp. 179-180)

What follows is a brief description of each of the four stages of the Restructured Clinical Scales

development. For a more detailed description of the techniques used in the creation of the RC

scales, the reader is referred to the technical manual (Tellegen et al., 2003).

The first stage in the construction of the RC scales was to empirically extract from each

of the clinical scales the general factor, which accounted for a portion of the variance, thus

leading to poor discriminate validity. The items that made up the general factor were extracted

using exploratory factor analysis. These extracted items were then used to create the foundation

of a separate clinical scale. Using Watson's and Tellegen's (1985) model of affect, other items

from the MMPI pool that were consistent with their theory were then used to build upon the

foundation of this new scale. What resulted was the "Demoralization" (Rcd) scale.

The second stage of the development consisted of developing a foundational core for

each of the new RC scales (Nichols, 2006; Tellegen et al., 2003). This was accomplished by

another set of factor analyses. Tellegen et al. factored the items from the newly created

Demoralization scale with the items from each of the nine clinical scales. For each analysis, the

items that loaded higher on the demoralization factor were eliminated from the original scale. The items that remained for each of the scales were determined to be the foundational core for the nine subsequent RC scales. Tellegen et al. (2003) referred to these core scales as "the distinctive substantive core" (Nichols, 2006).

During the third stage of the developmental process, Tellegen et al. utilized items from the original MMPI Clinical Scales to build upon the foundational core for each of the nine new RC scales to create "seed scales". For an item to be included on a seed scale, it had to meet two criteria: (a) the item had to correlate higher with its parent Clinical Scale than with any of the other Clinical Scales and (b) the item could not correlate highly with the Demoralization Scale (Nichols, 2006). In all, a total of 73 items were used to create the "seed scales" (Tellegen et al., 2003).

The final stage consisted of augmenting and refining each of the new RC Scales. Additional items from the original MMPI item pool were analyzed and placed on a "seed scale" if they met certain criteria. These criteria included: (a) convergence criterion, which meant an item had to correlate above a minimum value with a specific "seed scale" and (b) discrimination criterion, which meant an item had to correlate below a maximum value with all of the other "seed scales" (Tellegen et al., 2003). As noted by Nichols (2006), the minimum and maximum correlation values differed for each scale. It should also be pointed out that Scales 5 (Masculine/Feminine) and 0 (Social Introversion) were completely removed from the RC version of the MMPI. A comparison of the Clinical Scales and the RC Scales is provided in Table 1.

Table 1

Item Composition for the Clinical and Restructured Clinical (RC) Scales

Clinical Scales	Length	RC Scales	Length	Seed Items
Scale 1	32	RC1	27	15
Scale 2	57	RC2	17	4
Scale 3	60	RC3	15	5
Scale 4	50	RC4	22	5
Scale 6	40	RC6	17	6
Scale 7	48	RC7	24	7
Scale 8	78	RC8	18	6
Scale 9	46	RC9	28	8
		RCd	24	

Note: Scale 1 = HS - Hypochondriasis; RC1 = Somatic Complaints; Scale 2 = D - Depression; RC2 = Low Positive Emotions; Scale 3 = Hysteria; RC3 = Cynicism; Scale 4 = Pd - Psychopathic Deviate; RC4 = Antisocial Behavior; Scale 6 = Pa - Paranoia; RC6 = Ideas of Persecution; Scale 7 = Pt - Psychasthenia; RC7 = Dysfunctional Negative Emotions; Scale 8 = Sc - Schizophrenia; RC8 = Aberrant Experiences; Scale 9 = Ma - Hypomania; RC9 = Hypomanic Activation.

The psychometric properties of the RC scales have been found to be acceptable by numerous studies such as Handel and Archer (2008); Hoelzle and Meyer (2008); Sellbom, Ben-Porath, and Graham (2006); Sellbom, Ben-Porath, McNulty, Arbisi, and Graham (2006); Sellbom and Ben-Porath (2005); Sellbom, Graham, and Schenk (2006); Simms et al. (2005); Tellegen et al. (2003); and Wallace and Liljequist (2005).

Alternative MMPI Personality Disorder Scales

The introduction of the third edition of the *Diagnostic and Statistical Manual of Mental Disorder* (DSM-III, American Psychiatric Association, 1980) brought about significant changes to the diagnostic and classification process. The DSM-III introduced a multidimensional model of classification in which personality disorders would now be classified on a different axis and separate from clinical syndromes. This change in the diagnostic process brought with it the

introduction of new assessment tools and instruments such as the MCMI. This also informed changes to the MMPI.

The original purpose of the MMPI was to measure pathologic personality conditions or what we now call Axis I syndromes, but it was believed the MMPI contained a rich item pool which could have diagnostic utility for the assessment of personality disorders or the new Axis II classifications (Hicklin & Widiger, 2000; Morey, Waugh, & Blashfield, 1985). In 1985, Leslie Morey, Waugh, and Blashfield (1985) set out to devise reliable and valid personality disorder scales using existing items from the MMPI.

A rational and empirical method was used to devise the scales. The first step in the process was to have four experienced clinical psychologists search the MMPI for items they believed represented the criteria for DSM-III personality disorders. Items were included for a scale if two of the four clinicians had selected that item for a particular scale and items could be included on multiple scales. The second phase included empirical analyses of the scales to establish sound psychometric properties. This included item analysis to examine the discriminative utility of each item. If an item could not statistically discriminate between high and low scores on its scale, it was dropped from the scale. This process continued until each scale achieved stabilization. Ultimately 11 personality disorder scales were created which included: Paranoid (PAR), Schizoid (SZD), Borderline (BDL), Compulsive (CPS), Passive-Aggressive (PAG), Narcissistic (NAR), Antisocial (ANT), Histrionic (HST), Schizotypal (STY), Dependent (DEP), and Avoidant (AVD) (Hicklin & Widiger, 2000; Morey, Waugh, & Blashfield, 1985). The 11 scales were comprised of a total of 265 (164 non-overlap) items with scale length ranging from 14 (Passive-Aggressive) to 38 (Avoidant), with a mean of 24 items per scale.

The personality disorder scales of the MMPI created by Morey et al. (1985) have consistently been shown to have adequate psychometric properties. A full description of the internal consistencies is listed in Table 3. For initial information on the psychometric properties the reader is referred to Morey et al. (1985). Since the creation of these scales in 1985, a significant amount of research has been done to demonstrate the validity of the scales (Dubro & Wetzler, 1989; Hills, 1995; McCann, 1989, 1991; Miller, Streiner, & Parkinson, 1992; Morey & Le Vine, 1988; O'Maille & Fine, 1995; Streiner & Miller, 1988; Trull, 1993; Trull & Larson 1994; Zarrella, Schuerger, & Ritz, 1990).

The publication of the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorder* (DSM-IV, American Psychiatric Association, 1994) created a need for revised personality disorder scales derived from the MMPI. Additionally, since Morey et al. (1985) created the original MMPI personality disorder scales, the MMPI underwent a revision as well. In 1989 the second edition of the inventory (*Minnesota Multiphasic Personality Inventory – 2;* Butcher et al., 1989) was released with revised and updated items.

Somwaru and Ben-Porath (1995) used similar methodology to that of Morey et al. (1985) in the derivation of their MMPI-2 personality disorder scales. They utilized three clinical psychologists who were familiar with the DSM-IV criteria for personality disorders. These three psychologists rationally selected items from the MMPI-2 item pool which they believed represented specific criteria for the diagnosis of personality disorders. Their hand-selected items were then used to create scales representing each of the 10 personality disorders in the DSM-IV. Once the 10 scales were created they were subjected to a series of internal consistency analyses until adequate stabilization was achieved. The 10 scales created by Somwaru and Ben-Porath (1995) included: Paranoid (PAR), Schizoid (SZD), Borderline (BDL), Compulsive (CPS),

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Narcissistic (NAR), Antisocial (ANT), Histrionic (HST), Schizotypal (STY), Dependent (DEP), and Avoidant (AVD) (Hicklin & Widiger, 2000; Jones, 2005). They did not create a Passive-Aggressive scale as this personality disorder was not included in the DSM-IV.

In all they used 292 items (266 non-overlapping) to create the 10 scales. The total number of items used for each scale ranged from 16 (Histrionic and Narcissistic) to 57 (Borderline), with a mean of 29 items per scale. Of the 292 items used, 168 (57.5%) items were unique to their set of scales. Only 51 of the items used by Somwaru and Ben-Porath were not available to Morey et al. (1985) in the original MMPI pool of items (Hicklin & Widiger, 2000).

While the methodology used by Somwaru and Ben-Porath (1995) to create their scales was very similar to that of Morey et al. (1985), there was significant divergence in the items selected to build the scales (Hicklin & Widiger, 2000; Jones, 2005). As previously mentioned, the MMPI was revised prior to the creation of the Somwaru and Ben-Porath personality disorder scales; however, the differences between the two sets of MMPI personality disorder scales cannot be attributed solely to the revision of the inventory (Hicklin & Widiger, 2000; Jones, 2005; Wise, 1996). Only 90 of the original 566 MMPI items were deleted during the revision and of those 90 items, only 7 of the items used by Morey et al. (1985) were deleted (Colligan, Morey, & Oxfford, 1994; Hicklin & Widiger, 2000; Jones, 2005; Wise, 1996). Furthermore, according to Jones (2005), the differences are not related to the different editions of the DSM. Except for the removal of the Passive-Aggressive PD, the basic features of the personality disorders have remained essentially the same across editions of the DSM.

Table 2

Comparison of Morey, Waugh, and Blashfield (1985) and Somwaru and Ben-Porath (1995) MMPI-2 Personality Disorder Scales

Scale	Morey et al. (1985)				Somwaru and Ben-Porath (1995)		
	Shared	*Total*	*Unique*	*Deleted*	*Total*	*Unique*	*New*
Paranoid	9	22	13	0	27	18	0
Schizoid	13	20	7	2	26	13	5
Schizotypal	15	35	20	1	39	24	3
Antisocial	15	23	8	2	28	13	4
Borderline	12	22	10	0	57	45	19
Histrionic	9	20	10	0	16	7	1
Narcissistic	7	31	24	0	16	9	2
Avoidant	21	38	17	0	35	14	5
Dependent	13	20	7	0	29	16	7
Obsessive-Compulsive	10	13	3	2	19	9	5
Total	124	244	119	7	292	168	51

Note: shared = number of items that appear on both the Morey et al. (1985) and Somwaru and Ben-Porath (1995) scales; deleted = number of items deleted in the revision of the MMPI to the MMPI-2; new = number of items that appeared on the MMPI-2 and not the MMPI.

Some of the differences can be attributed to the 107 new items added to the MMPI-2; however, 70% of the unique items used in the Somwaru and Ben-Porath scales were available to Morey et al. (1985). Another major difference between the two sets of scales is in the amount of overlapping items used. The Morey et al. (1985) scales had 101 overlapping items, with only 26 overlapping items in the scales created by Somwaru and Ben-Porath (1995). See Table 2 for a comparison of the items selected by Ben-Porath (1995) and Morey et al. (1985) for their equivalent personality scales. Studies by Jones (2005), Hicklin and Widiger (2010), and Somwaru and Ben-Porath (1995) have shown the psychometric properties of the personality scales to be adequate. A full description of the reliability coefficients are listed in Table 3 for both the Morey and Ben-Porath personality disorder scales.

Table 3

Personality Disorder Scale Reliability Coefficients (Cronbach's α)

Scale	Morey Personality Scales	Ben-Porath Personality Scales
Paranoid	.84	.91
Schizoid	.81	.85
Schizotypal	.90	.92
Antisocial	.66	.70
Histrionic	.78	.79
Narcissistic	.64	.79
Borderline	.68	.93
OCD	.71	.84
Avoidant	.93	.89
Dependent	.82	.90

Note: Morey Personality Scales = More, Waugh, and Blashfield (1985);
Porath Personality Scales = Somwaru and Ben-Porath (1995).

MCMI and MCMI-II

The original MCMI was published in 1977 and later updated (MCMI-II) in 1983. Both versions of the instrument were based on Theodore Millon's theory of personality which at that time was a bio-social learning theory (Millon, 2006). According to his bio-social learning model, one's personality is developed through a biophysical constitutions and past experiences. Millon theorized the basic biophysical constitutions included: child's energy, tempo, drive, activity level, temperament, intelligence, sensory activity, physical strength, and vulnerabilities (Davis, 1999, Millon, 1969, 2006). Each individual uses his/her given capacities and dispositions to interpret and act upon the world. Given a normal environment, individuals will interpret and act upon the world in a suitable manner. Based on these experiences individuals learn what feels good, where these feelings are obtained, and how to behave in order to achieve those feelings again, thus forming a healthy and adaptive personality (Davis, 1999; Millon, 1969).

However, under abnormal environments individuals may succumb to pressures and demands resulting in the formation of negative behavioral patterns and coping strategies that are contrary to their natural dispositions. According to Millon, this process resulted in maladaptive personality styles or personality disorders (Davis, 1999; Millon, 1969). The first and second editions of the MCMI were designed to measure Axis I and Axis II syndromes based on Millon's bio-social learning theory. According to Millon, both play a role in an individual's functional style. Millon theorized that Axis I syndromes accentuate the basic personality style and that evaluating for both Axis I and Axis II syndromes would provide beneficial information for a therapist (Millon, 2006).

The MCMI and MCMI-II consisted of the following scales: Schizoid; Avoidant; Dependent; Histrionic; Narcissistic; Antisocial; Sadistic (Aggressive); Compulsive; Negativistic (Passive-Aggressive); Masochistic (Self-Defeating); Schizotypal; Borderline; Paranoid; Anxiety; Somatoform; Bipolar: Manic; Dysthymia; Alcohol Dependence; Drug Dependence; Thought Disorder; Major Depression; Delusional Disorder; and validity scales. While the MCMI-II is an updated version of the MCMI-I, Craig and Weinberg (1993) in an extensive literature review reported that little, if any differences were found among the two versions.

MCMI-III and MCMI-III Revised

In the early 1990s a decision was made to revise the MCMI-II based on theoretical, professional, and empirical concerns (Millon, 2006). Whereas as the MCMI-I and MCMI-II were based on a bio-social learning theory, Millon's model of personality shifted to one based on evolutionary theory (Davis, 1999). According to Millon, each individual possess a limited set of genes that are passed down from generation to generation and serve as personality trait potentials. Similar to other evolutionary theories outside the field of psychology, Millon

theorized that both phylogenesis and ontogenesis played a role in the formation and expression of one's personality style. In phylogenesis, genes are passed down from generation to generation based on the usefulness they serve to the species. Over successive generations, the proportion and frequency of these genes passed down will likely change based on how well the expressed traits function for the species (Choca, 1999; Davis, 1999; Millon, 1990).

According to Millon, an individual's unique personality is determined by ontogenesis. In ontogenesis, an individual organism (i.e., a child) is born with a limited set of genes or trait potentials. Which traits become prominent and salient is determined by the organism's interaction with its environment. Stable and enduring personality styles are established as underlying personality trait potentials change to expressed styles of perceiving, feeling, thinking, and acting (Choca, 1999; Davis, 1999; Millon, 1990). The development of personality disorders occurs when individuals develop maladaptive styles for interacting with the environment.

Millon describes the human existence as an individual's struggle with pleasure versus pain, an individual's efforts to engage in their environment either passively or actively, and one's strategy to make reproductive investments as either self-focused or other focused (Millon, 1990; Millon & Davis, 1996). The measurement of personality characteristics on the MCMI-III is based on these three polarities. When one's personality style falls to either extreme end of the polarities, a personality disorder is said to be present. Additional details of Millon's taxonomy of personality disorders will be provided later in this paper.

Unlike the MMPI, the MCMI is theoretically based and was constructed to provide correspondence with the *Diagnostic and Statistical Manual – 4th Edition* (DSM-IV). As the DSM-IV was published after the MCMI-II was constructed, the MCMI-III replaced 95 questions from the MCMI-II in order to reflect the current criteria of the DSM-IV. Additionally, two new

scales were added to the instrument, one Clinical Personality Pattern (Depressive) and one

Clinical Syndrome scale (Post-Traumatic Stress Disorder).

The MCMI-III was subjected to a threefold validation model. The first stage was the

theoretical-substantive stage. This stage evaluated how firmly the items of the MCMI-III were

based on the theoretical framework. The second stage was the internal-structural stage. This

stage examined the internal validity and consistency of the items and the scales comprising the

instrument. External-criterion was the third stage. This stage evaluated the external validity of

the instrument including convergent and discriminant validity (Millon et al., 2006). For the

purposes of this paper, the diagnostic validity statistics from two validation studies (Millon,

1994; Millon, Davis, & Millon, 1997) are presented in Table 4. A detailed description of all the

psychometric properties can be found in the MCMI-III technical manual.

Table 4
Average Diagnostic Validity Statistics of Millon's (1994) and
Millon et al.'s (1997) External Validity Studies

Diagnostic Validity Statistics	MCMI-III	
	1997	1994
Sensitivity	.670	.275
Specificity	.968	.860
Positive Predictive Power	.640	.223
IPPP	.608	.109

Note: Each entry in this table is the mean of 24 values (14 from MCMI-III
personality disorder scales; 10 from MCMI-III Axis I disorder scales) of a diagnostic
validity index. MCMI-III = Millon Multiaxial Clinical Inventory III, IPPP =
incremental validity of a positive test diagnosis.

A revised version of the MCMI-III was released in 2008 (Millon, Davis, Millon, &

Grossman, 2009). This revision included updated norms that were consistent with any changes

in the base rates of the various dimensions measured by the instrument. Millon et al. (2009)

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anticipated that there might be an increase in the number of subjects who have elevations on the Major Depression (CC), Bipolar: Manic (N), and Drug Dependence (T) scales, and a potential decrease in the number of patients who display elevation on the Masochistic (8B) scale. Although the original MCMI-III norms were gender specific, the norms derived in 2008 did not distinguish between males and females, similar to the most recent version of the MMPI.

Millon's Theory and DSM-V Personality Disorder Changes

Millon's theory is far too complex for a detailed description in this paper; however, a brief summary follows in order to provide the reader with a rudimentary understanding of how his theory influenced the classification of personality disorders. The classification of personality disorders according to Millon's evolutionary theory are based on three domains or polarities. The three domains are *Aims of Existence* (pleasure-pain polarity), *Modes of Adaptation* (passive-active polarity), and *Strategies of Replication* (self-other polarity) (Choca, 1999; Davis, 1999; Millon, Davis, Millon, Escovar, & Meagher, 2000; Widiger, 1999).

According to Millon, the most important task for any organism is to survive. In order to survive an organism must first achieve existence and then preserve that existence. In a psychological perspective, the aim of existence is the enhancement of life (pleasure) and the aim of preservation is the avoidance of harmful events (pain) (Millon et al., 2000). Within normal personality, an individual devises strategies to achieve balance between pleasure seeking and pain avoiding behaviors. On the other hand, personality disorders can begin to emerge when an individual's behaviors or mind set become too focused on either pleasure seeking or avoiding pain (Davis, 1999).

Once an organism exists, it must take on an accommodating (passive) or modifying (active) strategy in order to differentiate itself from the larger system. In other words, an

individual who adopts a passive approach to life will attempt to merely "fit in" or adapt to the environment around them. Individuals who adopts an active approach to life will seek to change or adapt the environment to fit their needs (Millon et al., 2000). Similar to the first polarity, individuals who achieves balance between active and passive engagement with their surroundings are said to be functioning normally; however, engaging one's environment too actively or passively may result in personality disorders (Davis, 1999).

Lastly according to Millon et al. (2000), an organism must adopt a strategy of reproduction that is either self-predicating (self) or nurturing (other). In biological terms, an organism that is focused on the self will produce as many offspring as possible, while an organism that is other focused has few offspring and expends his/her energy caring for them. In psychological terms, a self-focused individual is said to be egoistic, insensitive, inconsiderate, and uncaring. An other-focused individual is more affiliative, intimate, protective, and solicitous (Davis, 1999; Millon et al., 2000). Once again, a balanced focus between self and other results in healthy functioning, while too much focus on self or other leads to maladaptive functioning (Davis, 1999).

According to Millon's evolutionary and polarity theory, combinations and degrees of each polarity constitute differing personality prototypes (Choca, 1999; Davis, 1999; Millon et al., 2000). For example, the Antisocial Personality Prototype is low on the *pain*, *passive*, and *other* domains, and high on the *active* domain. The Schizoid Personality Prototype is low on the *pleasure, pain, active, and other* domains, and high on the *passive* domain (Choca, 1999). See Figure 1 for a description of each of the personality disorders as they relate to Millon's domains.
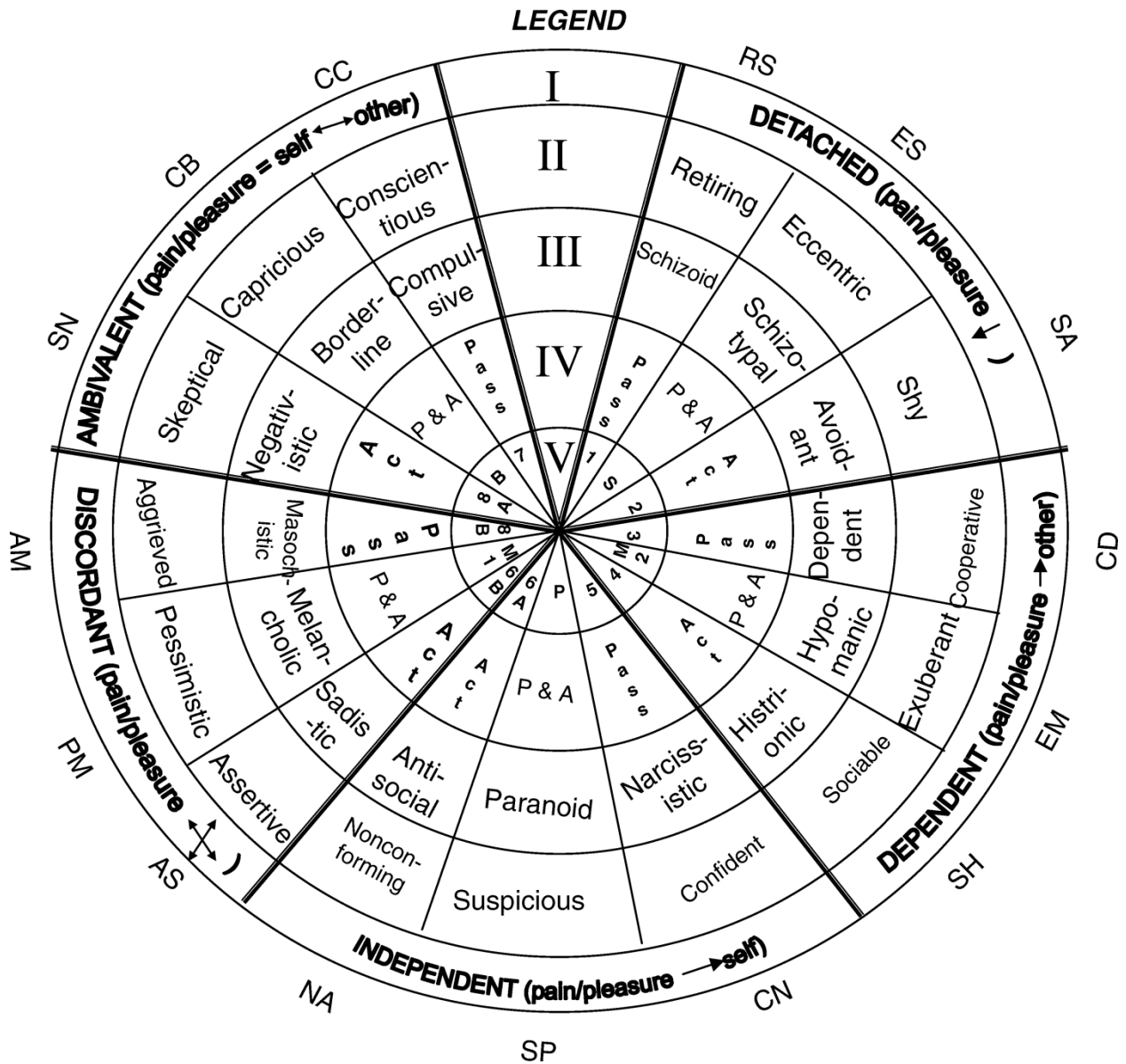
FIGURE 1. Personality Circulargram I: Normal and abnormal personality patterns. Evolutionary foundations of the normal and abnormal extremes of each personality prototype of the 15 spectra. I: Existential orientation; II: Normal prototype; III: Abnormal prototype; IV: Adaptation style; V: MCMI–III scale number/letter. RS = Retiring Schizoid, ES = Eccentric Schizotypal, SA = Shy Avoidant, CD = Cooperative Dependent, EM = Exuberant Hypomanic, SH = Sociable Histrionic, CN = Confident Narcissistic, SP = Suspicious Paranoid, NA = Nonconforming Antisocial, PM = Pessimistic Melancholic, AM = Aggrieved Masochistic, SN = Skeptical Negativistic, CB = Capricious Borderline, CC = Conscientious Compulsive (Strack & Millon, 2007).

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Millon theorizes that individuals can exhibit characteristics of many personality disorders and therefore, individuals cannot be classified in merely a categorical manner. Thus, his personality prototypes take on a categorical and a dimensional nature (Choca, 1999). Using a dimensional approach to the classification of personality disorders allows clinicians to get a more individualized picture of their clients. Millon's theory and personality prototypes have informed the development of the classification criteria for Axis II disorders in the DSM-III, DSM-IV, and DSM-IV-TR (Choca, 1999; Davis, 1999; Widiger, 1999).

While Millon may not have had as much of a direct influence on the DSM-V, the new classification system of Axis II disorders appears to be even more congruent with his theory than in previous editions. In contrast to previous editions, the DSM-V has adopted a dimensional approach regarding the classification of personality disorders. This was done to address the issue of comorbidity and overlapping diagnostic criteria which has been an issue in previous editions of the DSM (American Psychiatric Association, 2012).

The DSM-V will discontinue the categorization of personality disorders, opting rather to describe them in terms of impairing characteristics and levels of severity. The 10 personality disorders that are currently outlined in the DSM-IV-TR will be reduced to 6 personality disorder types. The 6 types of personality disorder types will include: Antisocial, Avoidant, Borderline, Narcissistic, Obsessive/Compulsive, and Schizotypal. The remaining 3 personality disorder classifications, along with "Personality Disorder Not Otherwise Specified (NOS)" will be lumped into a new classification type, referred to as "Personality Disorder Trait Specified (PDTS)". The PDTS classification will also be described by the specific impairing personality trait or characteristic and by the level of severity (American Psychiatric Association, 2012).

This study utilized a hybrid model of the classification systems of the DSM-IV-TR and the DSM-V in order to classify individuals with personality disorders. Rather than solely using categorically specific diagnoses (i.e. Antisocial PD or Borderline PD), this researcher adopted a trait/characteristic approach to classify personality disorders, similar to that of the DSM-V. Personality traits and characteristics were used to classify and group research participants in accordance with the personality disorder clusters (See Appendix C for description of clusters) described in the DSM-IV-TR.

CHAPTER TWO

PURPOSE OF THIS STUDY

The purpose of this study was to conduct an evaluation of the statistical predictive ability of the original Clinical Scales of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2), the Minnesota Multiphasic Personality Inventory – Restructured Clinical scales (MMPI-RC), the Ben-Porath Personality Disorder Scales, the Morey Personality Disorder Scales, and the Personality Pattern scales of the Millon Clinical Multiaxial Inventory – 3rd Edition (MCMI-III) in the task of classifying Axis II diagnostic clusters. Participants with Axis II discharge diagnoses were grouped according to DSM-IV-TR personality disorder clusters and the personality disorder clusters were closely aligned with Millon's grouping of personality disorders.

Additionally, this study sought to contribute to the body of literature in the area of personality assessment. This was accomplished by directly comparing each clinical measure in order to evaluate its usefulness, with the expectation that the MCMI-III will be shown to be the most useful measure for the purposes of Axis II diagnosis. This result was expected based in part on the design of the MCMI-III. Millon theoretically designed the instrument to measure Axis II disorders. Furthermore, the characteristics of the personality disorders and the subsequent personality disorder clusters found in the DSM-IV-TR were influenced by Millon's theory.

Establishing the statistical ability of these instruments to predict Axis II diagnoses will aid clinicians in the diagnostic process. A better understanding of the psychometric properties of personality inventories will help clinicians know how to more effectively utilize these instruments in practice and will ultimately lead to more accurate diagnosing.

CHAPTER THREE

METHOD

Participants and Setting

This sample consisted of 440 inpatients hospitalized in a psychiatric facility in a Midwestern city. MMPI-2 protocols were excluded for nonresponsiveness if omitted items were ≥ 32, TRIN raw scores ≤ 5 or ≥ 13, or Fp T scores > 100. MCMI-III protocols were excluded if 2 or more items on scale V were endorsed (Morgan, Schoenberg, Dorr, & Burke, 2002). Of the 440 individuals, 47.5% were male and 52.5% were female. The sample participants had a mean age of 34 years and 12.8 years of education. The sample was predominately White (88.3%). Other reported ethnicities included African-American (6.1%), Native American (3%), Hispanic (1.6%), Asian (.5%), and "other" (.5%). Diagnoses for this sample are as follows: 60% mood disorders, 8.3% schizophrenic and other psychotic disorders, 6.7% substance abuse disorders, 4.3% anxiety disorders, and 13.8% "other". Additionally, 45% (N = 200) of this sample was given a comorbid Axis II diagnosis. The 200 individuals with Axis II diagnoses were the focus of this study. The additional 240 participants were assigned into a separate group as those without an Axis II diagnosis.

Patient diagnoses were based on DSM-IV-TR criteria and were made at discharge by a multidisciplinary treatment team that was led by a staff psychiatrist. Patient's histories, observations, progress notes, team discussions, and findings from medical procedures were all used in the diagnostic process. This type of diagnostic process is in line with the findings of Kenrick and Funder (1988) which indicated that to accurately evaluate personality, diagnoses should be based on multiple data points and multiple behavioral observations. Subjects were then grouped into three general Axis II categories in accordance with Millon's theory and DSM-

IV-TR Axis II cluster A, cluster B, and cluster C. Due to a small sample size, participants with a Cluster A diagnosis were not included in any analysis.

Measures

Minnesota Multiphasic Personality Inventory-2 (MMPI-2)

The MMPI-2 (Butcher, Graham, Ben-Porath, Tellegen, Dahlstrom, & Kaemmer et al., 2001) is a self-report measure consisting of 567 items designed to measure patterns of personality and psychopathology. Respondents answer the 567 items in a true-false format depending on whether the statement applies to them. Reliability and validity of the MMPI-2 have been empirically supported in countless studies including Butcher and Williams (2000) and Graham (2006). Protocols were scored using NCS and Pearson Assessment's computerized scoring program Microtest-Q which calculates scaled scores reported as T-scores.

Morey (MMPI) Personality Scales

Morey, Waugh, and Blashfield (1985) utilized 265 items of the original 567 MMPI items to create 11 scales purported to measure the 11 personality disorders of the DSM-III. The scales include: Paranoid; Schizoid; Borderline; Compulsive; Passive-Aggressive; Narcissistic; Antisocial; Histrionic; Schizotypal; Dependent; and Avoidant. Reliability coefficients range from .675 (CPS) to .859 (AVD). A full description of the reliability coefficients are listed in Table 3.

Ben-Porath (MMPI) Personality Scales

Somwaru and Porath (1995) utilized 292 items of the original 567 MMPI items to create 10 scales that measured characteristics of the following personality disorders as defined by the DSM-IV-TR, these scales included: Paranoid (PAR), Schizoid (SZD), Borderline (BDL), Compulsive (CPS), Narcissistic (NAR), Antisocial (ANT), Histrionic (HST), Schizotypal (STY),

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Dependent (DEP), and Avoidant (AVD). Reliability coefficients range from .70 (ANT) to .93 (BDL). A full description of the reliability coefficients are listed in Table 3.

Millon Clinical Multiaxial Inventory-Third Edition (MCMI-III)

The MCMI-III (Millon, Millon, Davis, & Grossman, 2006) is a self-report measure consisting of 175 items also designed to measure patterns of personality and psychopathology. Each of the 175 items is answered in a true-false format depending on whether the statement applies to the respondent. Psychometric characteristics of the MCMI-III including reliability and validity can be found in the technical manual (Millon et al., 2006).

All MCMI-III protocols were scored using NCS and Pearson Assessment's computerized scoring program Microtest-Q which calculates scale scores reported as Base Rate (BR) scores. Base Rate scores, as opposed to T-scores, take into account the base rate or prevalence rate of the disorder being measured; thus, accounting for the non-normal distribution of psychopathology in the population.

Procedure

Subjects were administered the MMPI-2 and MCMI-III during their inpatient hospital stay as part of treatment or evaluation. Tests were administered by either a Licensed Psychologist or Psychology Intern who provided both written and verbal instructions to each subject prior to testing. All protocols were scored using NCS and Pearson Assessment's computerized scoring program Microtest-Q by a trained psychometrist. Scores for the Morey personality scales and the Ben-Porath personality scales were obtained using an SPSS scoring system as per criteria established by the authors of the scales.

Analysis

Individual discriminant function models were created for each of the inventories in this study and the predictive ability of the inventories was first evaluated independently of the other inventories. Following an evaluation of each inventory's statistical predictive ability, diagnostic validity statistics were used as secondary analysis. This study evaluated the "positive predictive power (PPP)" and the "incremental validity of positive test diagnoses (IPPP)" of the MCMI-III, the Morey (MMPI) personality scales, and the Ben-Porath (MMPI) personality scales. These three instruments were chosen for secondary analysis as each was specifically designed to measure Axis II pathology.

CHAPTER FOUR

RESULTS

The clinical usefulness of the psychological inventories in this study was evaluated through quantitative analysis. The first step in this evaluation utilized Discriminant Function Analysis (DA) in order to examine the overall ability of each inventory in the classification of personality clusters.

Discriminant Analyses. An analysis was performed with Axis II discharge diagnosis as the grouping variable and the MMPI Clinical scales 1 (Hypochondriasis), 2 (Depression), 3 (Hysteria), 4 (Psychopathic Deviance), 6 (Paranoia), 7 (Psychasthenia), 8 (Schizophrenia), and 9 (Hypomania) of the MMPI-2 as the discriminating variables. The overall Chi-square test was significant (Wilks λ = .794, Chi-square = 84.039, df = 16, Canonical correlation = .373, $p <$ .001); the two functions extracted accounted for approximately 21% of the variance in diagnosis. Table 5 presents the standardized discriminant function coefficients and structure weights. Table 6 shows the two functions at the group centroids. Results displayed in these tables indicate that function one, which includes scales 4, 6, 8, and 9, discriminate Cluster B from the other groups. Function two, which includes scales 2, 7, 1, and 3 discriminate Cluster C from the other groups. Overall the discriminant function successfully predicted outcome for 55.8% of cases. Classification results are displayed in Table 7.

Figure 2 presents a graphic representation of the mean MMPI profiles for the three groups. The Cluster B group displays peaks on scales 2 (Depression) and 8 (Schizophrenia), the Cluster C group shows peaks on scales 2 (Depression) and 3 (Hysteria), and the group without an Axis II diagnosis manifest peaks on scales 2 (Depression) and 3 (Hysteria). While the overall

similarities across the three groups is striking, the clearest difference among the groups appears on scales 2 (Depression) and 8 (Schizophrenia).

The next analysis was performed with Axis II discharge diagnosis as the grouping variable and the Restructured Clinical 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), and RC9 (Hypomanic Activation) of the MMPI-RC as the discriminating variables. The overall Chi-square test was significant (Wilks λ = .801, Chi-square = 80.194, df = 18, Canonical correlation = .368, p < .001); the two functions extracted accounted for approximately 20% of the variance in diagnosis. Table 8 presents the standardized discriminant function coefficients and structure weights. Table 9 shows the two functions at the group centroids. Results displayed in these tables indicate that function one, which includes RC scales 3, 4, 6, 8, and 9, discriminate Cluster B from the other groups. Function two, which includes RC scales d, 2, 7, and 1, discriminate Cluster C from the other groups. Overall the discriminant function successfully predicted outcome for 52.3% of cases. Classification results are displayed in Table 10.

Mean profiles for the three groups on the MMPI-RC scales are presented in Figure 3. There is again little difference among the profiles of the three groups with the Cluster B group showing peaks on the Demoralization and Hypomanic Activation scales, and the Cluster C group displays peaks on the Demoralization and Dysfunctional Negative Emotions scales. The group without an Axis II disorder has the lowest overall scores with peaks on the Demoralization and Hypomanic Activation scales.

The third analysis was performed with Axis II discharge diagnosis as the grouping variable and the following Morey Personality Disorder scales as discriminating variables:

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Antisocial (ANT), Histrionic (HST), Dependent (DEP), Avoidant (AVD), Borderline (BDL), Compulsive (CPS), and Narcissistic (NAR). The overall Chi-square test was significant (Wilks $\lambda = .800$, Chi-square $= 58.333$, df $= 14$, Canonical correlation $= .372$, $p < .001$); the two functions extracted accounted for approximately 20% of the variance in diagnosis. Table 11 presents the standardized discriminant function coefficients and structure weights. Table 12 shows the two functions at the group centroids. Results displayed in these tables indicate that the Antisocial and Borderline scales load on function one, which discriminates Cluster B from the other groups. The Avoidant, Dependent, and Compulsive scales load positively on function two and the Narcissistic and Histrionic scales load negatively on function two, which discriminates Cluster C from the other groups. Overall the discriminant function successfully predicted outcome for 53.2% of cases. Classification results are displayed in Table 13.

Figure 4 graphically depicts the mean profiles for the three groups on the Morey Personality Disorder scales. All three groups manifest its highest peak on the Avoidant scale, with the Cluster C group having the highest mean score, followed by the Cluster B group and the group without a diagnosis. All other scales appear similar among the groups.

A fourth analysis was performed using the following Ben-Porath Personality Disorder scales as discriminating variables: Antisocial (ANT), Histrionic (HST), Dependent (DEP), Avoidant (AVD), Borderline (BDL), Compulsive (CPS), and Narcissistic (NAR). The overall Chi-square test was significant (Wilks $\lambda = .761$, Chi-square $= 71.388$, df $= 14$, Canonical correlation $= .433$, $p < .001$); the two functions extracted accounted for approximately 24% of the variance in diagnosis. Table 14 presents the standardized discriminant function coefficients and structure weights. Table 15 shows the two functions at the group centroids. Results displayed in these tables indicate that the Antisocial and Borderline scales load on function one,

which discriminates Cluster B from the other groups. The Avoidant, Dependent, and Compulsive scales load positively on function two and the Narcissistic and Histrionic scales load negatively on function two, which discriminates Cluster C from the other groups. Overall the discriminant function successfully predicted outcome for 55.4% of cases. Classification results are displayed in Table 16.

The mean profiles for the Ben-Porath Personality Disorder scales are displayed in Figure 5. The profiles of the three groups continue to appear similar with observed separation on the Borderline and Avoidant scales. There also appears to be separation between the Cluster B group and the other two groups on the Antisocial scale and between the group without a diagnosis and the other two groups on the Dependent scale.

The final discriminant analysis was performed using the following Personality Pattern Scales of the MCMI-III as discriminating variables: 2A (Avoidant), 3 (Dependent), 4 (Histrionic), 5 (Narcissistic), 6A (Antisocial), 7 (Compulsive), C (Borderline). The overall Chi-square test was significant (Wilks λ = .806, Chi-square = 78.733, df = 14, Canonical correlation = .366, p < .001); the two functions extracted accounted for approximately 20% of the variance in diagnosis. Table 17 presents the standardized discriminant function coefficients and structure weights. Table 18 shows the two functions at the group centroids. Results displayed in these tables indicate that the Antisocial and Borderline scales load negatively on function one and the Compulsive scale loads positively on function one, which discriminates the group without an Axis II diagnosis from the other groups. The Avoidant and Dependent scales load positively on function two and the Narcissistic and Histrionic scales load negatively on function two, which discriminates Cluster C from the other groups. Overall the discriminant function successfully predicted outcome for 52.0% of cases. Classification results are displayed in Table 19.

A graphical depiction of the mean profiles for the MCMI-III is shown in Figure 6. The MCMI-III profiles reveal the clearest separation among all the groups. Peaks for the Cluster C group appear on the Avoidant and Dependent scales with average scores for this group being higher than the average scores of the other two groups. The average scores for the Cluster B group fall above the average scores for the other two groups on the Antisocial and Borderline scales. The group without an Axis II diagnosis has mean scores which exceed those of the other two groups on the Histrionic, Narcissistic, and Compulsive scales; however, it should be noted that these scores are subclinical, meaning the scores fall below a level in which a clinician would suspect a psychiatric disorder.

Table 5: MMPI Clinical Scales
Standardized Canonical Discriminant Function Coefficients

	Function 1	Function 2
Hypochondriasis	.128	.495
Depression	-.249	.522
Hysteria	-.153	-.358
Psychopathic Deviate	.626	.301
Paranoia	.434	-.210
Psychasthenia	-.639	.709
Schizophrenia	.522	-.610
Hypomania	.238	-.332

Structure Coefficients

	Function 1	Function 2
Psychopathic Deviate	.787	.527
Paranoia	.722	.337
Schizophrenia	.638	.505
Hypomania	.608	-.311
Depression	.180	.866
Psychasthenia	.410	.723
Hypochondriasis	.341	.634
Hysteria	.132	.452

Table 6: MMPI Clinical Scales
Functions at Group Centroids

Axis II Discharge Diagnosis Grouped by Cluster	Function 1	Function 2
No Axis II	-.190	-.164
Cluster B	.678	.100
Cluster C	-.461	.787

Table 7: MMPI Clinical Scales
Classification Results In Percentage and Wilks λ

		Predicted Group Membership		
		No Axis II	Cluster B	Cluster C
Original	No Axis II	50.4	23.8	25.8
	Cluster B	20.4	63.4	16.1
	Cluster C	13.2	15.8	71.1

Note: 55.8% of original grouped cases correctly classified.
Wilks λ = .794.

Table 8: MMPI RC Scales

Standardized Canonical Discriminant Function Coefficients

	Function 1	Function 2
Demoralization	.647	.452
Somatic Complaints	-.052	-.115
Low Positive Emotions	-.244	.265
Cynicism	-.126	-.170
Antisocial Behavior	.483	-.278
Ideas of Persecution	.490	-.407
Dysfunctional Negative Emotions	-.321	.690
Aberrant Experiences	.207	.015
Hypomanic Activation	.224	-.257

Structure Coefficients

	Function 1	Function 2
Antisocial Behavior	.756	-.044
Ideas of Persecution	.683	-.073
Hypomanic Activation	.559	-.224
Aberrant Experiences	.504	.068
Cynicism	.356	.029
Demoralization	.593	.752
Low Positive Emotions	.307	.712
Dysfunctional Negative Emotions	.545	.609
Somatic Complaints	.349	.386

Table 9: MMPI RC Scales

Functions at Group Centroids

Axis II Discharge Diagnosis Grouped by Cluster	Function 1	Function 2
No Axis II	-.224	-.133
Cluster B	.681	.009
Cluster C	-.250	.814

Table 10: MMPI RC Scales

Classification Results In Percentage and Wilks λ

		Predicted Group Membership		
		No Axis II	Cluster B	Cluster C
Original	No Axis II	48.8	23.8	27.5
	Cluster B	18.3	55.9	25.8
	Cluster C	18.4	15.8	65.8

Note: 52.3% of original grouped cases correctly classified.
Wilks λ = .801.

Table 11: Morey PD Scales
Standardized Canonical Discriminant Function Coefficients

	Function	
	1	2
Histrionic	.004	.036
Narcissistic	.422	.027
Borderline	.286	.003
Antisocial	.721	-.680
Avoidant	.472	.919
Dependent	.412	-.002
Morey Compulsive	-.532	.329

Structure Coefficients

	Function	
	1	2
Antisocial	.854	-.195
Borderline	.590	.213
Avoidant	.527	.801
Narcissistic	-.199	-.677
Dependent	.555	.657
Histrionic	-.235	-.648
Compulsive	.333	.526

Table 12: Morey PD Scales
Functions at Group Centroids

Axis II Discharge Diagnosis	Function	
Grouped by Cluster	1	2
No Axis II	-.292	-.108
Cluster B	.612	-.090
Cluster C	-.031	.750

Table 13: Morey PD Scales
Classification Results In Percentage and Wilks λ

		Predicted Group Membership		
		No Axis II	Cluster B	Cluster C
Original	No Axis II	48.7	21.5	29.7
	Cluster B	23.4	59.7	16.9
	Cluster C	18.8	21.9	59.4

Note: 53.2% of original grouped cases correctly classified.
Wilks λ = .800.

Table 14: Ben-Porath PD Scales
Standardized Canonical Discriminant Function Coefficients

	Function	
	1	2
Antisocial	.350	-.636
Borderline	1.102	-.028
Histrionic	.332	.112
Narcissistic	-.201	-.156
Avoidant	.254	.650
Dependent	-.282	.157
Obsessive Compulsive	-.540	.307

Structure Coefficients

	Function	
	1	2
Borderline	.849	.437
Antisocial	.756	-.252
Avoidant	.404	.783
Dependent	.385	.768
Narcissistic	-.471	-.726
Histrionic	-.190	-.624
Obsessive Compulsive	.419	.582

Table 15: Ben-Porath PD Scales
Functions at Group Centroids

Axis II Discharge Diagnosis Grouped by Cluster	Function	
	1	2
No Axis II	-.344	-.108
Cluster B	.739	-.071
Cluster C	-.080	.702

Table 16: Ben-Porath PD Scales
Classification Results In Percentage and Wilks λ

		Predicted Group Membership		
		No Axis II	Cluster B	Cluster C
Original	No Axis II	54.4	20.3	25.3
	Cluster B	19.5	58.4	22.1
	Cluster C	21.9	25.0	53.1

Note: 55.4% of original grouped cases correctly classified.
Wilks λ = .761.

Table 17: MCMI-III Scales
Standardized Canonical Discriminant Function Coefficients

	Function	
	1	2
Avoidant	.192	.296
Dependent	.366	.389
Histrionic	.176	-.334
Narcissistic	.145	-.343
Antisocial	.123	-.155
Compulsive	.775	.448
Borderline	-.516	-.116

Structure Coefficients

	Function	
	1	2
Compulsive	.918	.010
Borderline	-.747	.230
Antisocial	-.517	-.203
Narcissistic	.431	-.803
Avoidant	-.422	.741
Histrionic	.557	-.730
Dependent	-.308	.649

Table 18: MCMI-III Scales
Functions at Group Centroids

Axis II Discharge Diagnosis Grouped by Cluster	Function	
	1	2
No Axis II	.263	-.084
Cluster B	-.657	-.112
Cluster C	-.052	.805

Table 19: MCMI-III Scales
Classification Results In Percentage and Wilks λ

		Predicted Group Membership		
		No Axis II	Cluster B	Cluster C
Original	No Axis II	47.9	25.0	27.1
	Cluster B	21.5	55.9	22.6
	Cluster C	15.8	15.8	68.4

Note: 52.0% of original grouped cases correctly classified.
Wilks λ = .806.

FIGURE 2. Mean MMPI-2 Clinical scale profiles for three groups of patients in the discriminant function analysis. Raw scores presented.

FIGURE 3. Mean MMPI-RC scale profiles for three groups of patients in the discriminant function analysis. Raw scores presented.

FIGURE 4. Mean Morey Personality Disorder scale profiles for three groups of patients in the discriminant function analysis. Raw scores presented.

FIGURE 5. Mean Ben-Porath Personality Disorder scale profiles for three groups of patients in the discriminant function analysis. Raw scores presented.

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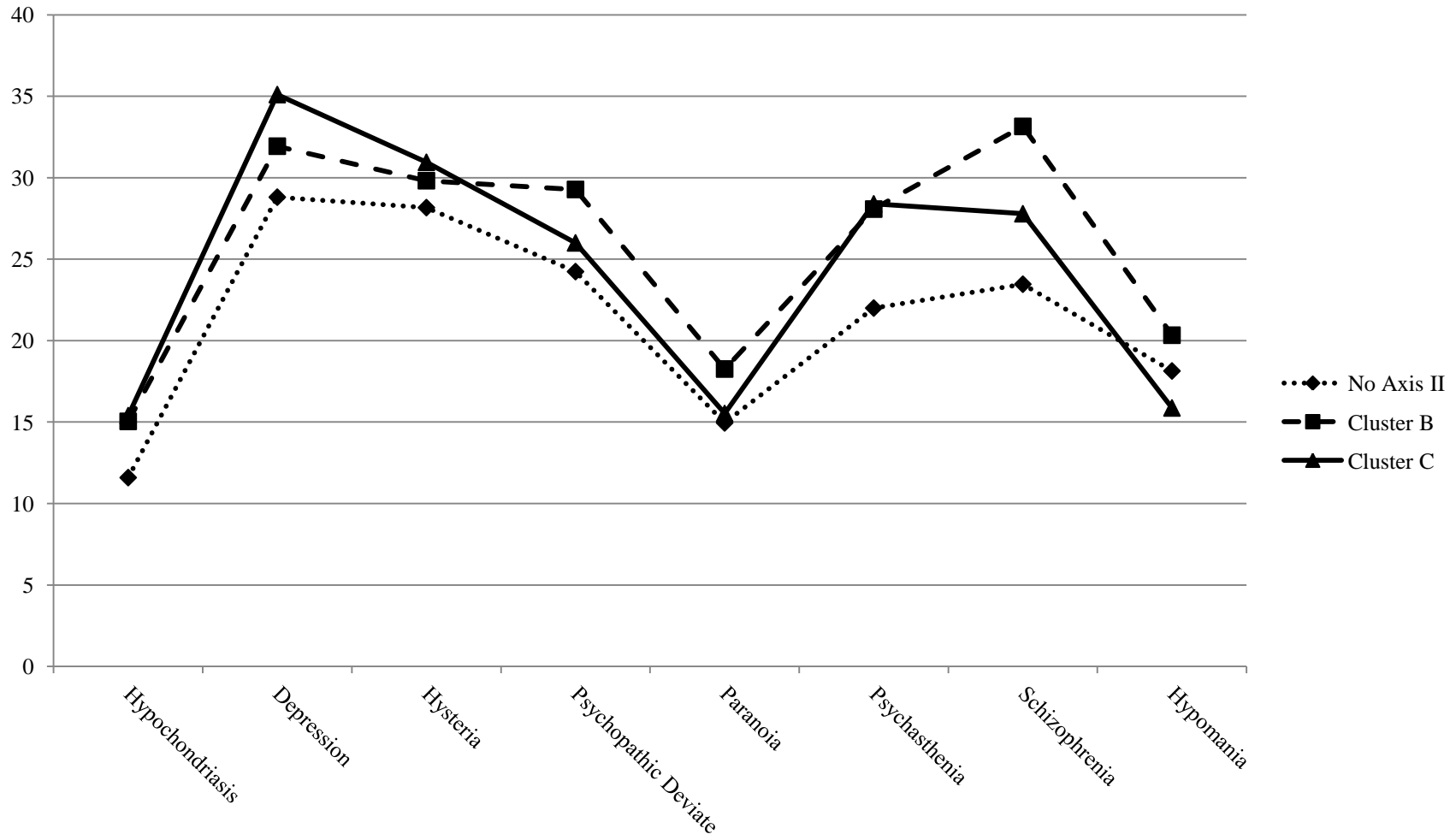*FIGURE 6. Mean MCMI-III profiles for three groups of patients in the discriminant function analysis. BR scores presented.*

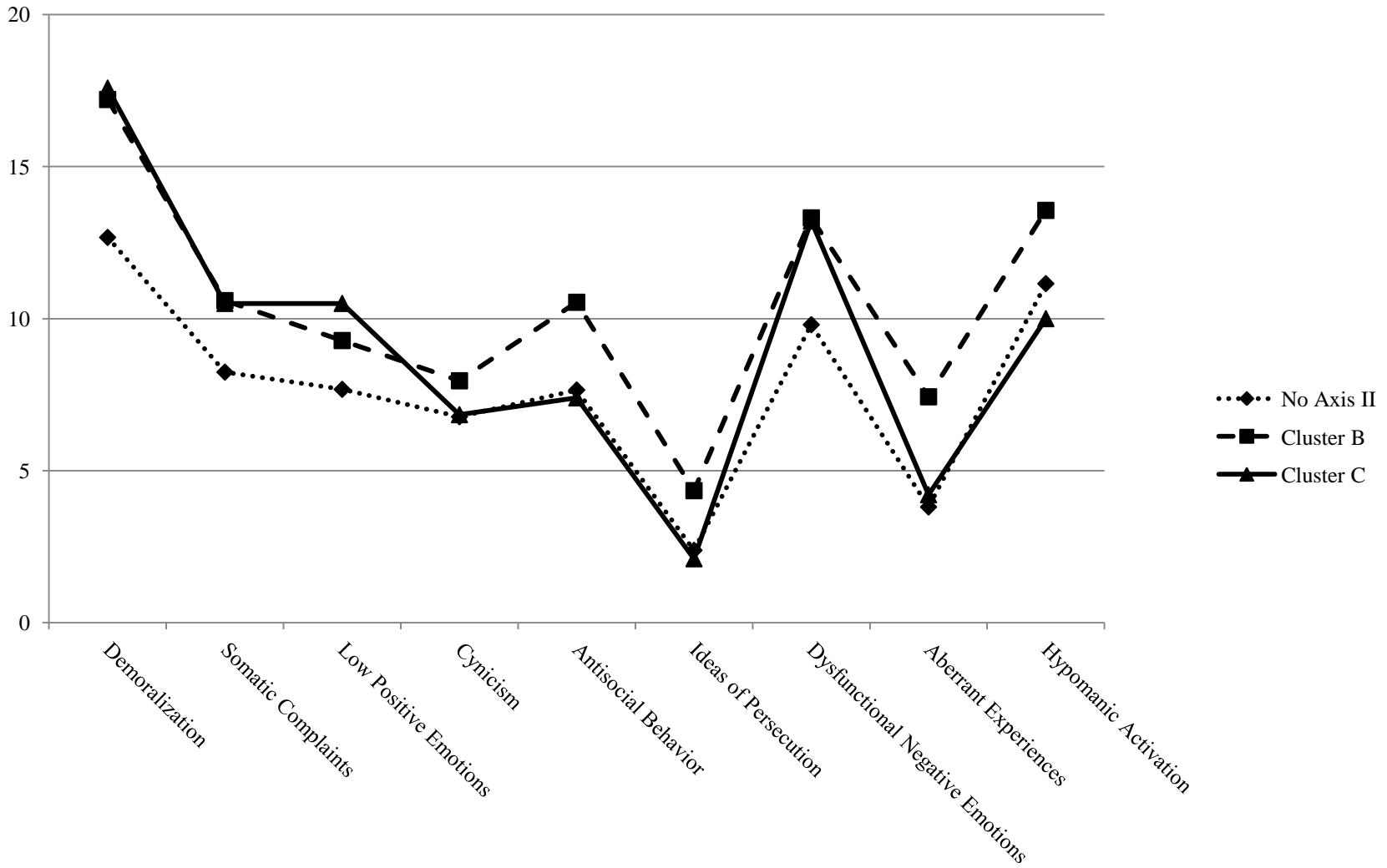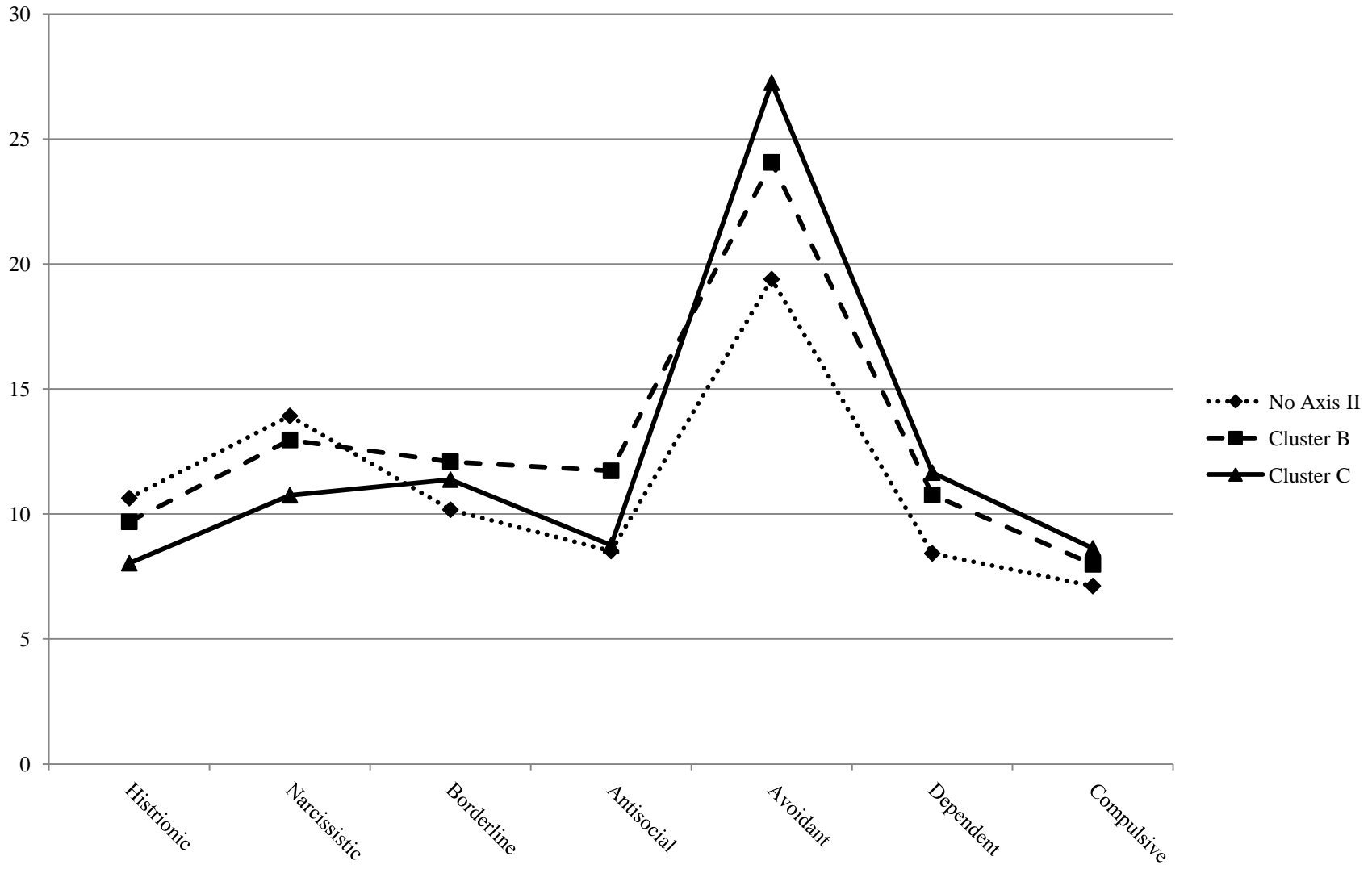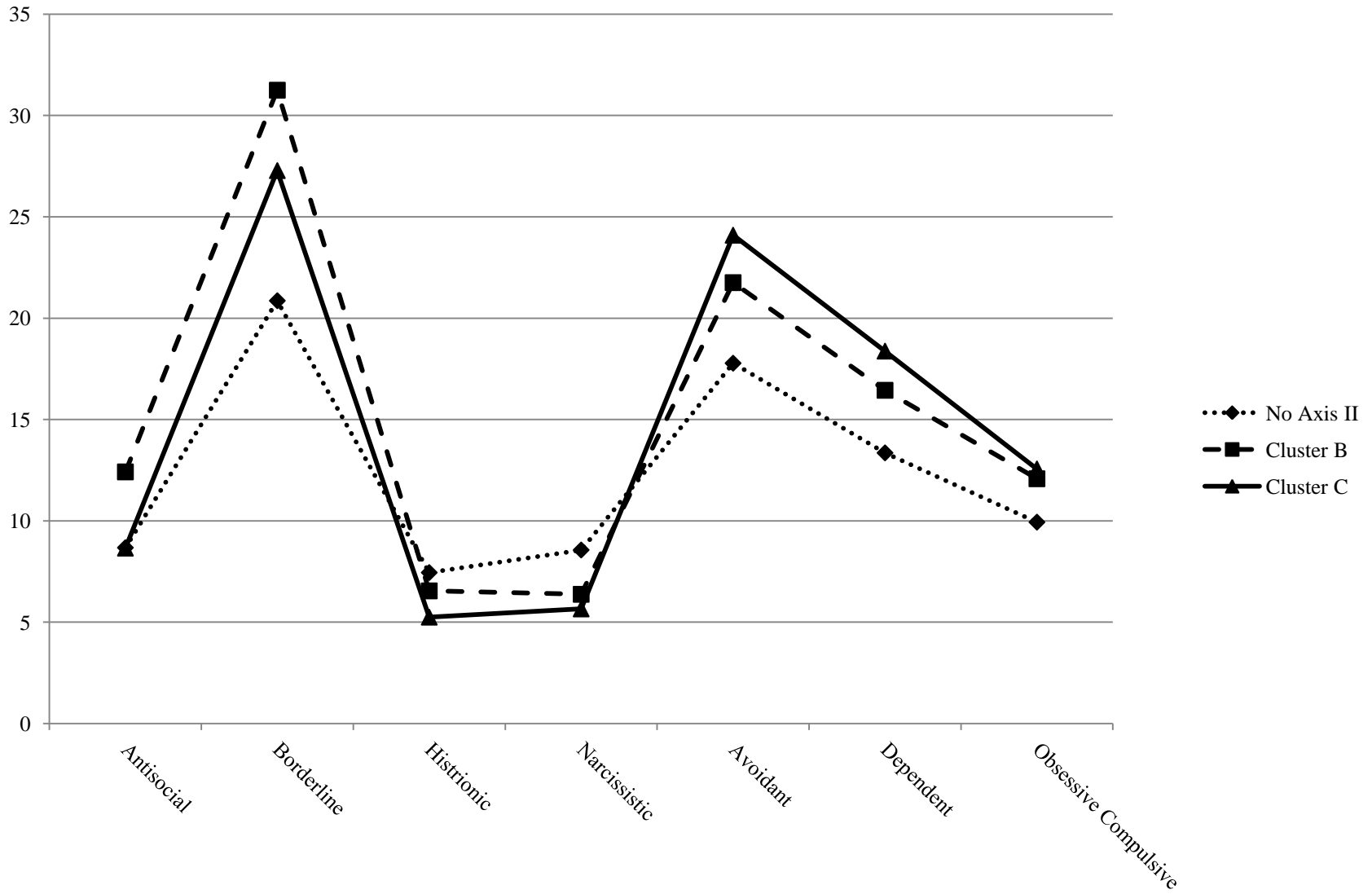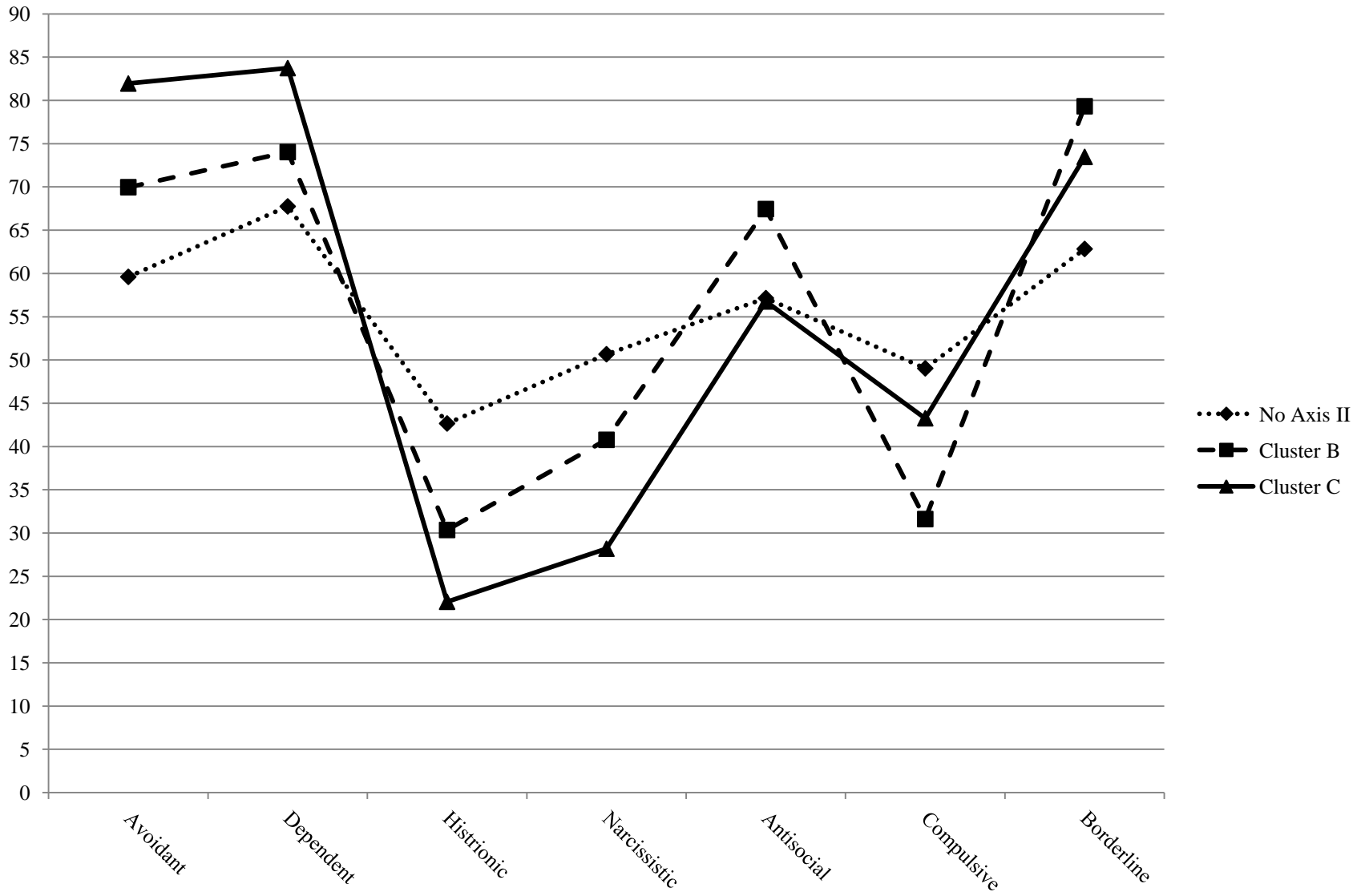*Diagnostic Validity Statistics.* The second type of analysis utilized was diagnostic validity statistics to gain a more granular picture of the clinical usefulness of the instruments specifically designed to measure personality disorders; namely, the Morey Personality Disorder scales, the Ben-Porath Personality Disorder scales, and the Personality Pattern scales from the MCMI-III.

Diagnostic Validity Statistics. This paper used the definition and formula utilized by the Hsu (2002) study.

$$PPP = P(CD+ \mid TD+)$$

Hsu (2002) defines PPP as the conditional probability, where CD+ = actual presence of the disorder, TD+ = test or scale diagnosis of presence of the disorder, and the vertical line within the parentheses means "given that". In other words, PPP indicates the likelihood that an individual truly has a disorder given a positive test.

While PPP is a useful statistic in the evaluation of the psychometric properties of an instrument, it does have shortcomings. One of these shortcomings is the fact that PPP does not account for the prevalence rate of disorders. Therefore, an instrument with a high PPP that does not exceed the prevalence rate of the disorder is essentially meaningless (Hsu, 2002). Thusly, it is important to utilize an additional diagnostic validity statistic that takes into account the prevalence rate of the disorder, namely the incremental validity of positive test diagnoses (IPPP). Hsu (2002) and Gibertini et al. (1986) refer to the difference between a scale's PPP and the prevalence rate of a disorder as the incremental validity of positive test diagnoses. The formula that was used in this paper is the same as that used in the Hsu (2002) study:

$$IPPP = PPP - P(CD+)$$

In this equation, PPP = positive predictive power and P(CD+) = prevalence (base rate) of the

disorder. The IPPP statistic will be used to evaluate the meaningfulness of each instrument's

PPP.

PPPs and IPPPs were calculated for the seven personality disorder scales from the Morey

Personality Disorder scales, the Ben-Porath Personality Disorder scales, and the MCMI-III.

Summary results include PPPs and IPPPs for the Cluster B scales, the Cluster C scales, and an

overall statistic for each instrument. The results of this analysis are displayed in Table 20.

Table 20
Comparison of Average Diagnostic Validity Statistics of
the Morey PD scales, the Ben-Porath PD scales, and the MCMI-III

Diagnostic Validity Statistics	Morey PD scales	Ben-Porath PD scales	MCMI-III
PPP			
Cluster B	0.42	0.38	0.78
Cluster C	0.23	0.26	1.31
Overall	0.34	0.33	0.89
IPPP			
Cluster B	0.22	0.18	0.58
Cluster C	0.13	0.16	1.21
Overall	0.18	0.17	0.73

Note: PPP = Positive predictive power. IPPP = Incremental validity of positive test
diagnoses. Cluster B = mean of 4 values (Histrionic, Narcissistic, Antisocial,
Borderline scales) of a diagnostic validity index. Cluster C = mean of 3 values
(Avoidant, Dependent, Obsessive-Compulsive scales) of a diagnostic validity index.
Overall = mean of 7 values (Cluster B and Cluster C scales) of a diagnostic validity
index.

Results suggest that the Personality Pattern scales of the MCMI-III have the highest diagnostic

validity compared to either the Personality Disorder scales of the Morey or the Ben-Porath

inventories. The MCMI-III produced a PPP of .89 which is interpreted to mean that individuals

for whom a Cluster B or Cluster C disorder was indicated by test protocol, 89% of those

individuals actually were diagnosed with a disorder. The Morey Personality Disorder scales

produced a PPP of .34 indicating that 34% of individuals who were suspected of having a

disorder given the positive test result, in reality, carried an Axis II diagnosis. The Ben-Porath

Personality Disorder scales performed almost identical to the Morey instrument, producing a

PPP of .33, indicating that 33% of individuals who scored higher than the critical value of the

test instrument, were given a diagnosis by the clinician. When the base rates of the disorders

were taken into account, the MCMI-III still produced a conditional probability of valid diagnosis

in73% of the sample as compared to 17% and 18% for the Ben-Porath and Morey instruments,

respectively.

CHAPTER FIVE

DISCUSSION

This research was a predictive validity and diagnostic utility study of the Morey

Personality Disorder scales, the Ben-Porath Personality Disorder scales, the MMPI-2 Clinical

scales, the MMPI-2 Restructured Clinical scales, and of the MCMI-III Personality Pattern scales

with Axis II discharge diagnoses being the criterion variable. The results of this study suggest

that all of the personality instruments possess some ability to predict or discriminate between

patients with Cluster B diagnoses, Cluster C diagnoses, and between those without an Axis II

diagnosis. At first glance, the results appear to be underwhelming as each of the instruments

only correctly classified approximately 50% (Morey PD = 53.2%, Ben-Porath PD = 55.4%,

MMPI-2 Clinical = 55.8%, MMPI-2 RC = 52.3%, MCMI-III = 52.0%) of the participants;

however, the overall classification rate may be misleading. It should be first noted that the level

of chance for correctly classifying a participant in this study is approximately 33%, therefore,

each of the instruments exceeds chance by about 20% which is a statistically significant

difference. Additionally, the Wilks λ for each of the instruments are acceptable and a better

estimation of the clinical utility than classification tables. The Wilks λ for the included

instruments ranged from .761 to .806. Table 21 displays each inventory with its associated

Wilks λ for comparison.

Table 21
Summary Comparison of Wilks λ

Personality Inventory	Wilks λ
MMPI-2 Clinical Scales	.794
MMPI - Restructured Clinical Scales	.801
Morey Personality Disorder Scales	.800
Ben-Porath Personality Disorder Scales	.761
MCMI-III Personality Pattern Scales	.806

In comparison with previous literature, the results of this study are similar. Libb et al. (1992) found that the MCMI-II correctly classified 79.03% and the MMPI correctly classified 68.55% of cases in the differentiation of Affective, Schizophrenic, and Substance Abuse disorders. While the Libb et al. study produced higher classification rates than those of this study, it is noteworthy that their study examined Axis I disorders as opposed to Axis II disorders and that those authors included 15 additional predictor scales from the MCMI in analyses. It is likely that the inclusion of additional predictor scales greatly contributed to the higher accuracy rates. Additionally, Wilks λ was not reported in the Libb et al. study; therefore, no true direct comparisons can be made.

Results from this study fared better when compared to the results of the Schulter, Snibbe, and Buckwalter (1994) project, which is a more directly comparable study. Their study evaluated the ability of the Morey Personality Disorder Scales and the MCMI in the differentiation of specific Axis II diagnoses. In that study the Morey PD scales had an overall accuracy rate of 43.7% and the MCMI correctly classified 39.1% of cases. Additionally, in the Schulter et al. (1994) study the Morey PD scales correctly predicted 29.15% of diagnoses from Cluster C and 46.9% of participants with a specific Cluster B diagnosis. This compares to a hit rate of 59.4% and of 59.7% for Cluster C and Cluster B diagnoses respectively for the Morey PD scales in the current study. Results from the current study for the MCMI-III indicate an accuracy rate of 68.4% for Cluster C and of 55.9% for Cluster B disorders. This compares to rates of 42.1% for diagnoses from Cluster C and of 31.3% for a diagnosis from Cluster B produced in the Schulter et al. (1994) study. Differences in the classification rates of the MCMI may be attributed to the different versions of the instrument used in these studies. Again, a direct comparison was not possible due to the failure of Schulter et al. to report Wilks λ.

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Turning to the initial hypothesis of this study that the MCMI-III would perform better than the other inventories, results of the discriminant function analyses do not support this hypothesis. The MCMI-III actually produced the largest Wilks λ (.806) which is a measure of achieved group separation; however, the Wilks λ produced by the other inventories were comparable ranging from .761 (Ben-Porath inventory) to .801 (Restructured Clinical scales), with no significant difference amongst any of the inventories. In fact, all of the instruments performed comparably pertaining to overall classification rates and classification rates of specific groupings. The only observable difference was in the classification of participants in the Cluster C group in which the rate for the Ben-Porath Personality Disorder scales (53.1%) was much lower than that of the other instruments (MMPI-2 Clinical = 71.1%, MMPI-2 RC = 65.8%, Morey PD = 59.4%, MCMI-III = 68.4%).

Results of the diagnostic validity statistics are more supportive of the hypothesis that the MCMI-III would be the most useful personality inventory. The MCMI-III had the highest positive predictive power, as well as the highest incremental validity of a positive test diagnosis ratings of any of the instruments. The reader is referred to Table 20 to review PPP ratings; however, further discussion of IPPP ratings is warranted. IPPP ratings of .58 (Morey PD = .22, Ben-Porath PD = .18) for Cluster B diagnoses, 1.21 (Morey PD = .13, Ben-Porath = .16) for Cluster C diagnoses, and an overall IPPP of .73 (Morey PD = .18, Ben-Porath = .17) were found for the Personality Pattern scales of the MCMI-III. Interpretation of the IPPP rating for Cluster C diagnoses for the MCMI-III is difficult due to the limited sample size for that group. An IPPP above 1 indicates a greater than 100% probability that an individual has a disorder given a symptom. The author will return to this topic later in the paper.

The overall IPPP rating of .73 is excellent and indicates a 73% probability of a valid diagnosis based on the test, in this case the MCMI-III. This rating is likely artificially inflated due to the issues noted above regarding the Cluster C group; however, even with the influence of that group removed, an overall IPPP rating of .58 is found. This is almost identical to the overall IPPP rating of .608 found in the Millon et al. (1997) study. Unfortunately, no studies were found that included PPP or IPPP ratings for the other instruments included in the current study, therefore, no comparisons can be made.

It is not surprising that the MCMI-III has such good conditional probability values for Axis II diagnoses. After all, the instrument is theoretically constructed from Millon's personality theory and based heavily on DSM-IV diagnostic criteria. What did come as a surprise were the relatively low IPPP values of the Morey Personality Disorder scales (.18) and of the Ben-Porath Personality Disorder scales (.17). It is plausible that these low values are influenced by the design of the MMPI. While these two instruments were specifically designed to measure Axis II pathology, the items included on both instruments were pulled directly from the MMPI pool. Due to the fact the MMPI was designed to measure clinical (Axis I) syndromes, it is possible that its item pool is not proficient at assessing Axis II pathology.

As noted previously, in its basic form this project was designed as a predictive validity study; however, results also lend strong support for the concurrent validity of each of the inventories. Using Axis II discharge diagnoses as the criterion variable, it would be expected that the scales which purportedly measure Cluster B disorders and Cluster C disorders would not only correlate with, but also differentiate between those respective diagnostic clusters. This expected result was found for each of the instruments.

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Looking first at the MCMI-III, the scales which contributed the most to the differentiation of Cluster B and Cluster C disorders were the Narcissistic, Histrionic, Avoidant, and Dependent scales, each of which loaded in the expected direction. The scales from the Ben-Porath inventory and the Morey inventory which differentiated the clusters were the Borderline, Antisocial, Avoidant, Dependent, and Obsessive-Compulsive scales, again loading in the expected direction.

Even though the MMPI-2 Clinical and MMPI-2 RC scales do not have Axis II specific scales, analysis lends support to their ability to differentiate Axis II diagnostic clusters. Results indicated that the scales from the MMPI-2 RC which contributed to the differentiation of the Cluster B disorders were the Antisocial Behavior, Ideas of Persecution, Hypomanic Activation, and Aberrant Experiences scales. The Demoralization, Low Positive Emotions, and Dysfunctional Negative Emotions scales differentiated the Cluster C disorders. Analysis of the MMPI-2 Clinical scales showed that the Psychopathic Deviance, Paranoia, Schizophrenia, and Hypomania scales aligned with Cluster B disorders, while the Depression, Psychasthenia, and Hypochondriasis scales loaded highest on the function that differentiated Cluster C disorders. Based upon the pathological characteristics that each of these scales measure, these results are not surprising and support the use of these instruments in the assessment of Axis II disorders.

Limitations and Future Research

There were several limitations of the present study. The most noticeable limitation is in the inequality of group sizes, and more specifically, the limited sample size for the Cluster C group. As noted previously, this may have played a part in the inflation of the diagnostic validity statistics as they pertain to this group. Additionally, the reader should take caution in the generalizability of the statistical predictive models that resulted from this study due to the issues

of sample size and population characteristics. The participants in this study were all psychiatric

inpatients and would be expected to have higher average scores on personality inventories than

an outpatient population. Future research which included a more diverse population and a larger

sample size would add reliability to the findings of the current project.

Another limitation of the current study is the inherent fallibility of the diagnostic process

itself. As it stands now, diagnoses are made based on a set of categorical criteria outlined in the

DSM-IV-TR and unfortunately, there is a great deal of symptom overlap amongst the personality

disorders. This is not to say that the diagnostic process cannot be accurate or useful. As noted

previously in this paper, Kenrick and Funder (1988) point out that the evaluation of personality

can be highly accurate when based on multiple data points and multiple observations (p. 31).

This study attempted to address the issue of symptom overlap by grouping participants into

diagnostic clusters defined by shared characteristics; however, this creates other problems. The

fact that not all the symptoms are shared by the disorders within the clusters causes statistical

prediction of group membership to become more difficult. This is one possible explanation as to

why the overall accuracy rate of the discriminant function analyses were lower than expected.

Additional research which examines the prediction of specific personality disorders is needed

and would establish important psychometric properties of these inventories. Furthermore, with

the recent release of the fifth edition of the DSM, further research will be needed pertaining to

these inventories and the new diagnostic criteria for personality disorders.

Summary

The purpose of this study was to evaluate the predictive and diagnostic validity of the

MMPI-2 Clinical scales, the MMP-2 Restructured Clinical scales, the Morey Personality

Disorder scales, the Ben-Porath Personality Disorder scales, and the MCMI-III Personality

Pattern scales. Analyses indicated that each of the instruments effectively predicted group

membership at a rate better than chance and that no single instrument performed better or worse

in this task. However, the MCMI-III possessed the greatest diagnostic validity as defined by the

PPP and IPPP statistics. Thus, the initial hypothesis that the MCMI-III would have the most

clinical utility in the assessment of personality disorders is partially supported.

This is not to say that the other instruments included in this study are not proficient in the

assessment of personality. Each performed equally as well in the differentiation of diagnostic

clusters. Furthermore, while not achieving the level of the MCMI-III, the Morey Personality

Disorder scales and the Ben-Porath Personality Disorder scales displayed diagnostic validity

greater than the prevalence of the disorders. Results also lent support for the concurrent validity

of each of the instruments.

So what do these findings suggest regarding the clinical applications of these inventories?

In an ideal situation clinicians would administer the MMPI and the MCMI. One cannot ignore

the plethora of literature supporting the clinical usefulness of both instruments. Furthermore,

additional sources of information would provide a clearer clinical picture of clients. With that

said, there are economic considerations and with the limited reimbursement from insurance

companies, clinicians often must be selective with the assessment tools administered. It is

argued that in circumstances when only one personality assessment inventory can be

administered, the MCMI-III would be the best option. This argument is made for several

reasons. First, the MCMI-III contains far less items than the MMPI. Its completion requires less

time and effort than that of the MMPI. Even in its brevity, the MCMI-III provides valuable

clinical information for the assessment of personality disorders and clinical syndromes. It is the

author's hope that with continued research, better statistical models can be developed to aid in

the diagnostic process. More accurate diagnosing will lead to more effective treatment and

ultimately to better outcomes with the individuals with whom we work.

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APPENDICES

Appendix A: Descriptions of the Five Personality Inventories Used in the Current Study

Minnesota Multiphasic Personality Inventory – Second Edition

The Minnesota Multiphasic Personality Inventory – second edition, known as the MMPI-2, is a revised edition of the original MMPI. This version of the MMPI was revised and extensively renormed to better align with current trends and symptomatology of pathology. The MMPI-2 is a psychological assessment instruments completed by the person being evaluated, and scored and interpreted by the examiner. The clinician evaluates the test taker's personal characteristics by comparing the test taker's answers to those given by various psychiatric and nonpsychiatric comparison groups. By analyzing the test taker's patterns of response to the test items, the examiner is able to draw some tentative conclusions about the client's level of adaptation, behavioral characteristics, and personality traits. The inventory is often used as part of inpatient psychiatric assessments, differential diagnosis, and outpatient evaluations.

Millon Clinical Multiaxial Inventory – Third Edition

The Millon Clinical Multiaxial Inventory – Third edition, known as the MCMI-III is a psychological assessment tool intended to provide information on psychopathology, including specific disorders outlined in the DSM-IV. The MCMI-III is the third revision of Millon's original personality inventory and underwent a renorming process in 2009 to match the current base rates of psychiatric disorders. The MCMI was developed and standardized specifically on clinical populations (i.e. patients in psychiatric hospitals or people with existing mental health problems). The MCMI differs from other personality tests in that it is based on theory and is organized according to a multiaxial format. Much like the MMPI, the MCMI-III is used to draw some tentative conclusions about the client's level of adaptation, behavioral characteristics, and

personality traits and is also often used as part of inpatient psychiatric assessments, differential diagnosis, and outpatient evaluations.

Minnesota Multiphasic Personality Inventory – Restructured Clinical Scales

The Minnesota Multiphasic Personality Inventory – Restructured Clinical Scales, known as the MMPI-RC scales are psychometrically improved versions of the original clinical scales. The original clinical scales were known to contain a high level of interscale correlation, overlapping items, and were confounded by the presence of an overarching factor that has since been extracted and placed in a separate scale (demoralization). The RC scales measure the core constructs of the original clinical scales and were meant to replace those original scales.

Morey Personality Scales

Morey, Waugh, and Blashfield (1985) utilized 265 items of the original 567 MMPI items to create 11 scales purported to measure the 11 personality disorders of the DSM-III. These scales were created to be used in addition to the clinical scales of the MMPI in order to specifically measure personality disorders.

Ben-Porath Personality Scales

Somwaru and Porath (1995) utilized 292 items of the original 567 MMPI items to create 10 scales that measured characteristics of personality disorders as defined by the DSM-IV. These scales, similar to the Morey scales, were meant to be used as an addition to the clinical scales of the MMPI. However, these scales were created to align with the personality disorders found in the DSM-IV.

Appendix B: Scale Descriptions for the Five Personality Inventories Used in the Current Study

MCMI-III

Avoidant (Scale 2A)	Elevated scores indicate vigilance and being always on guard and ready to distance themselves from anxious anticipation of life's painful or negatively reinforcing experiences. Though they desire relationships, they deny these feelings and feel the safest when interpersonally distant.
Dependent (Scale 3)	Elevated scores indicate a tendency to turn to others for support and nurturance, they wait passively for their leadership of other and lack initiation and autonomy as a consequence of parental overprotection.
Histrionic (Scale 4)	Elevated scores indicate maximizing the attention and favors they receive, while avoiding the indifference and disapproval of others. They exhibit an insatiable search for stimulation and affection, but while appearing confident they instead fear autonomy and continually need reassurance through all relationships in which they engage.
Narcissistic (Scale 5)	Elevated scores indicate the experience of primary pleasure by passively being or focusing on themselves. They are identified by their egotistic self-involvement as they have been taught to overvalue their self-worth and expect others to recognize their specialness. Praise from others is desired and encouraged, and little confirmation regarding genuine accomplishments is needed to maintain their superiority.

Antisocial (Scale 6A)	Elevated scores indicate acting to counter the expectation of pain and depredation at the hands of others by engaging in dishonest or illegal behaviors designed to exploit the environment for self-gain. They are skeptical of others' motives, they desire autonomy, and wish revenge for what they perceive as past injustices. They are irresponsible and impulsive and feel these behaviors are justified as others are seen as unreliable and disloyal. Insensitivity and ruthlessness are their only means of avoiding abuse and victimization.
Compulsive (Scale 7)	Elevated scores indicate an ambivalent orientation that coincides with the DSM-IV obsessive compulsive personality disorder. Their prudent, controlled and perfectionistic ways derive from a conflict between hostility towards others and fear of social disapproval. They resolve this ambivalence by suppressing their resentment and by overconforming and placing high demands on themselves and others.
Borderline (Scale C)	Elevated scores indicate experiencing of intense endogenous moods with recurring periods of dejection and apathy often interspersed with spells of anger, anxiety, or euphoria. They exhibit unstable and labile mood; recurring thoughts of self-mutilation and suicide; difficulty maintaining a sense of identity; are preoccupied with securing affection; and a cognitive-affective ambivalence as seen in the conflicting feelings of rage, love, and guilt toward others.

MMPI-2 Clinical Scales

Hypochondriasis
(Scale)

Elevated scores indicate excessive concern about general health. They

present with a variety of somatic complaints with little or no organic basis.

High scores are also indicative of an individual who is preoccupied with

general body issues and have a self-centered focus in their life.

Depression
(Scale 2)

Elevated scores indicate the possible presence of a depressive disorder. This

individual may experience feelings of discouragement, pessimism, and

hopelessness. They may exhibit hyper-responsibility, high personal

standards, intrapunitiveness, psychomotor retardation, physical

malfunctioning, mental dullness, and brooding.

Hysteria
(Scale 3)

Elevated scores indicate experiencing some form of sensory or motor disorder

for which no organic basis could be established. This individual may have

specific physical complaints or troubling disorder, while others may deny

personal problems, shortcomings, or social anxiety.

Psychopathic
Deviance
(Scale 4)

Elevated scores indicate a general disregard for most social and moral

standards. This individual also displays a general disregard for the rights and

feelings of others. They may exhibit familial discord, authority problems,

social imperturbability, social alienation, and self-alienation.

Paranoia (Scale 6)	Elevated scores indicate experiencing some form of paranoid condition or paranoid state. This individual is marked by interpersonal sensitivitie4ws and a tendency to misinterpret the motives and intentions of others. They tend to be self-centered and insecure. They may also exhibit persecutory ideas, poignancy, and naïveté.
Psychasthenia (Scale 7)	Elevated scores indicate experiencing obsessive worries, compulsive rituals, exaggerated fears, or general anxiety and distress. This individual exhibits high moral standards, self-blame for things that go wrong, and rigid efforts to control impulses.
Schizophrenia (Scale 8)	Elevated scores indicate experiencing strange beliefs and/or perceptual disturbances. This individual may also exhibit social alienation, emotional alienation, and bizarre sensory experiences. High scores maybe indicative of some form of psychotic disorder.
Hypomania (Scale 9)	Elevated scores indicate experiencing the beginning stages of a manic episode. This individual maybe overambitious and/or extroverted. High scores are also indicative of amorality, psychomotor acceleration, imperturbability, and ego inflation.

MMPI-Restructured Clinical (RC)

Demoralization
(Scale RCd)

Elevated scores are indicative of overall emotional discomfort and turmoil. This individual may experience poor self-esteem and pessimism. High scores are also indicative of a negative outlook on one's past and future. They may exhibit poor coping strategies and may feel like a failure.

Somatic
Complaints
(Scale RC1)

Elevated scores are indicative of an individual presenting with physical complaints and chronic pain. This individual is preoccupied with bodily functions and tends to develop physical symptoms as a result of psychological or interpersonal difficulties. They typically are resistant to considering psychological factors that may be related to physical symptoms.

Low Positive
Emotions
(Scale RC2)

Elevated scores indicate a lack of positive emotional engagement in life. This individual is likely to be unhappy and demoralized, and have a high risk for the development of depression. High scores are indicative of decreased energy, indecisiveness, hopelessness, helplessness, and pessimism.

Cynicism
(Scale RC3)

Elevated scores are indicative of an individual who exhibits a lack of trust in others. They tend to few others as uncaring, selfish, and exploitive. This scale differs from others in that low scores are also interpreted. Low scores are indicative of an individual who is naïve, gullible, and overly trusting of others.

Antisocial Behavior (Scale RC4)	Elevated scores are indicative of a history of antisocial attitudes and behaviors. This individual finds it difficult to conform to societal norms and expectations. They often have difficulties with the law and are at higher risk for substance abuse. They may exhibit aggressive behavior toward other people and in interpersonal relationships. High scores are also suggestive of an individual who has difficulties in school and maintaining employment. Others tend to view this individual as critical, argumentative, angry, and antagonistic.
Ideas of Persecution (Scale RC6)	Elevated scores are indicative of an individual who feels targeted, controlled, and/or victimized by others. This individual may exhibit persecutory thinking, suspiciousness, and delusional ideation. They also tend to have difficulty forming interpersonal relationships.
Dysfunctional Negative Emotions (Scale RC7)	Elevated scores are indicative of an individual who experiences anxiety and irritability. They may report intrusive and/or unwanted ideations. This individual is insecure and overly sensitive to criticism. High scores are also suggestive of ruminative thought processes and passivity.
Aberrant Experiences (Scale RC8)	Elevated scores are indicative of sensory, perceptual, cognitive, and motor disturbances associated with a psychotic disorder. This individual may report hallucinations, delusions, and bizarre ideations. They may exhibit impaired reality testing.

Hypomanic Activation (Scale RC9)	Elevated scores are indicative of individual who experiences thought racing, high energy levels, heightened mood, and irritability. They may exhibit extraversion, aggressiveness, impulsivity, and substance abuse problems. High scores are also suggestive of an individual who is a sensation seeker or a risk taker.

Morey Personality Scales

Avoidant
(Scale AVD)
Elevated scores indicate vigilance and being always on guard and ready to distance themselves from anxious anticipation of life's painful or negatively reinforcing experiences. Though they desire relationships, they deny these feelings and feel the safest when interpersonally distant.

Dependent
(Scale DEP)
Elevated scores indicate a tendency to turn to others for support and nurturance, they wait passively for their leadership of other and lack initiation and autonomy as a consequence of parental overprotection.

Compulsive
(Scale CPS)
Elevated scores are indicative of an individual who is preoccupied with rules and duties, unable to express warmth and caring, and is highly oriented toward a lifestyle marked by productivity and efficiency. They tend to be temperamentally and emotionally insensitive, and are generally distant from other individuals. Others may describe this individual as self-centered and perfectionistic.

Passive-
Aggressive
(Scale PAG)
Elevated scores are indicative of an essential behavior pattern which is indirectly expressed resistance to social and occupational performance expectations that results in chronic ineffectiveness. The core characteristic of this individual is hostility; however, is not expressed directly which results in double messages to others. They tend to have difficulty maintaining long-term relationships as they are highly skilled at "pushing the buttons" of others.

Narcissistic (Scale NAR)   Elevated scores indicate the experience of primary pleasure by passively being or focusing on themselves. They are identified by their egotistic self-involvement as they have been taught to overvalue their self-worth and expect others to recognize their specialness. Praise from others is desired and encouraged, and little confirmation regarding genuine accomplishments is needed to maintain their superiority.

Antisocial (Scale ANT)   Elevated scores indicate acting to counter the expectation of pain and depredation at the hands of others by engaging in dishonest or illegal behaviors designed to exploit the environment for self-gain. They are skeptical of others' motives, they desire autonomy, and wish revenge for what they perceive as past injustices. They are irresponsible and impulsive and feel these behaviors are justified as others are seen as unreliable and disloyal. Insensitivity and ruthlessness are their only means of avoiding abuse and victimization.

Histrionic (Scale HST)   Elevated scores indicate maximizing the attention and favors they receive, while avoiding the indifference and disapproval of others. They exhibit an insatiable search for stimulation and affection, but while appearing confident they instead fear autonomy and continually need reassurance through all relationships in which they engage.

Borderline   Elevated scores indicate experiencing of intense endogenous moods with
(Scale (BDL)

recurring periods of dejection and apathy often interspersed with spells of

anger, anxiety, or euphoria. They exhibit unstable and labile mood; recurring

thoughts of self-mutilation and suicide; difficulty maintaining a sense of

identity; are preoccupied with securing affection; and a cognitive-affective

ambivalence as seen in the conflicting feelings of rage, love, and guilt toward

others.

Ben-Porath Personality Scales

Avoidant   Elevated scores indicate vigilance and being always on guard and ready to
(Scale AVD)
                  distance themselves from anxious anticipation of life's painful or negatively

                  reinforcing experiences. Though they desire relationships, they deny these

                  feelings and feel the safest when interpersonally distant.

Dependent   Elevated scores indicate a tendency to turn to others for support and nurturance,
(Scale DEP)
                  they wait passively for their leadership of other and lack initiation and

                  autonomy as a consequence of parental overprotection.

Compulsive   Elevated scores are indicative of an individual who is preoccupied with rules
(Scale CPS)
                  and duties, unable to express warmth and caring, and is highly oriented toward

                  a lifestyle marked by productivity and efficiency. They tend to be

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Antisocial (Scale ANT)	Elevated scores indicate acting to counter the expectation of pain and depredation at the hands of others by engaging in dishonest or illegal behaviors designed to exploit the environment for self-gain. They are skeptical of others' motives, they desire autonomy, and wish revenge for what they perceive as past injustices. They are irresponsible and impulsive and feel these behaviors are justified as others are seen as unreliable and disloyal. Insensitivity and ruthlessness are their only means of avoiding abuse and victimization.
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Appendix C: Descriptions of DSM-IV-TR Personality Disorder Clusters

Cluster A: The Odd, Eccentric Cluster (This Cluster was excluded from the current study)

Cluster A includes Paranoid Personality Disorder, Schizoid Personality Disorder, and Schizotypal Personality Disorders. The common features of the personality disorders in this cluster are social awkwardness and social withdrawal.

Cluster B: The Dramatic, Emotional, Erratic Cluster

Cluster B includes Borderline Personality Disorder, Narcissistic Personality Disorder, Histrionic Personality Disorder, and Antisocial Personality Disorder. Disorders in this cluster share problems with impulse control and emotional regulation.

Cluster C: The Anxious, Fearful Cluster

Cluster C includes the Avoidant, Dependent, and Obsessive-Compulsive Personality Disorders. These three personality disorders share a high level of anxiety.