

**Evaluating Taxometric and Dimensional Structure in Self-Report Personality Disorder
Scales**

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ABSTRACT

The argument over whether psychiatric disorders are taxa (i.e., categorical) or are part of a continuous dimension of normal personality functioning is not new. Within the last decade, however, there has been a forceful shift in personality disorder (PD) nosology toward a dimensional view. This coincides with the increasing popularity of the suite of factor analytic procedures. There are a number of false assumptions made about categorical models and factor analyses that may contribute to prematurely closing the metaphorical door on categorical PDs and PD phenomena. In the current study, taxometric analyses, which do not make a priori assumptions about the underlying quantitative structure, were used to examine PD constructs from two PD scale sets (the MMPI-2 PSY-5 [Harkness, McNulty, & Ben-Porath, 1995] and the MMPI-2 PD Spectra [Mulay et al., 2018]) on an outpatient sample ($n = 1,030$) to further assess for the presence of taxa. The PSY-5 and PD Spectra vary in their aims toward representing dimensional constructs; therefore, the theoretical aims of assessment were hypothesized to influence taxonic results. Results indicated the presence of taxa for the Dependent Spectra, Schizoid Spectra, Schizotypal Spectra, Somatizing Spectra, and PSY-5 NEGE. Dimensionality emerged for Paranoid Spectra and PSY-5 PSC. All other scales yielded ambiguous structures. Findings are discussed and compared to extant taxometric findings and dimensional models of PDs. Results provide support for some constructs highlighted in bifactor models of PDs but also suggest that these constructs are not continuous with normal personality functioning. Limitations and directions for future research are discussed.

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CHAPTER I: INTRODUCTION

Personality Disorder: Prevalence and Impact

The *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. ([DSM-5]; American Psychiatric Association [APA], 2013, p.645) defines a personality disorder (PD) as:

An enduring pattern of inner experience and behavior that deviates markedly from the expectations of the individual's culture, is pervasive and inflexible, has an onset in adolescence or early adulthood, is stable over time, and leads to distress or impairment.

Personality disorders are among the most treatment resistant mental health disorders (Newton-Howes, Clark, & Chanen, 2015). Persons diagnosed with PDs are more difficult to treat and have significantly poorer health outcomes (including higher mortality rates) than do those with other psychiatric diagnoses (Clark, 2007; Narud & Dahl, 2002; Tyrer et al., 2015). The factors that contribute to increased treatment resistance are wide-ranging. For example, conflicted interpersonal relationships, a hallmark feature of PDs, affect treatment compliance. Providers may overtreat or fail to fully investigate patient symptoms due to miscommunication, misunderstanding, and/or a generally negative reaction to the patient (Beckwith et al., 2014; Tyrer et al., 2015). Further complicating the clinical picture is the substantial comorbidity of PD's with other psychological disorders (Bastiaansen, De Fruyt, Schotte, & Hofmans, 2013; Clark, et al., 2015; Krueger, Skodol, Livesly, Shrout, & Huang, 2007; Lenzenweger, Lane, Loranger, & Kessler, 2007; Tyrer Crawford, Mulder, et al., 2011).

Personality Disorder Nosology

Current diagnostic systems, including the *DSM-5* (APA, 2013), the *International Classification of Diseases Mental and Behavioral Disorders* ([ICD-11], World Health Organization [WHO], 2019) and the *Psychodynamic Diagnostic Manual, Second Edition* (PDM-

2; Lingardi & McWilliams, 2017), all assume categorical distinctions among the various personality disorders. Pathological personality functioning is delineated by the rigidity and narrowness of response patterns to internal and external stressors. Significant dysfunction is present in most domains of living (e.g., work, romantic relationships, friendships). Despite minor differences, the *DSM-5*, *ICD-11*, and *PDM-2* definitions converge in their conceptualization of PDs as pervasive and inflexible.

For decades, diagnostic systems have utilized categorical models of diagnosis, relying on their simplicity in tying clinical diagnosis directly to a specific treatment (Streiner, Norman, & Cairney, 2015). Early iterations of the DSM required individuals to meet all criteria for a PD (i.e., monothetic criteria sets), which assured homogeneity within the diagnostic group (Cooper, Balsis, Zimmerman, 2010; *DSM-III*; APA, 1980; Widiger et al., 2009). However, many clinicians found that individuals did not fit neatly into this all-or-none approach (Cooper et al., 2010; Widiger, Frances, Spitzer, & Williams, 1988). Beginning with the *DSM-III-R* (American Psychiatric Association, 1987), PD diagnosis moved to a more flexible, polythetic criteria set that allowed for individuals to manifest a select number of criteria. In the *DSM-5*, for example, diagnostic criteria for PDs range from three to five symptoms out of an identified seven to nine symptoms (i.e., individuals must meet between 43-63% of identified criteria; APA, 2013).

Borderline personality disorder (BPD), for example, is defined by nine attributes (e.g., identity disturbance and chronic feelings of emptiness). BPD can be diagnosed as long as a person is observed to have any five of the nine attributes. Though these criteria provide clear distinctions between healthy (fewer than five) and pathological personality (five to nine), the diagnostic criteria place people who appear very different from one another within the same diagnostic category. As a result, two persons diagnosed with BPD may present with remarkably

different symptom constellations due to the 256 possible combinations for meeting BPD S criteria. Furthermore, it is unclear what criteria were used to determine the cutoff number for each syndrome or how closely the cutoff number for each syndrome is related to the prevalence of each PD. A PD with relatively low estimated prevalence such as Dependent PD (0.49-0.6% of the general population; APA, 2013) requires an individual to manifest 63% of symptoms while the more common Borderline PD (1.6-5.9%; APA, 2013) requires a minimum of 55% of symptoms. Of note, research has found that certain criteria are more indicative of PD latent constructs than others, and DSM-5 criteria *are* organized from most to least representative of the disorder (Cooper et al., 2010). Still, this research has not been incorporated into PD diagnosis; nothing prohibits or steers a clinician away from diagnosing a PD using only the lower listed criteria.

In a categorical model like that of the DSM-5, diagnostic criteria differentiate individuals both quantitatively and qualitatively from those without the disorder (Streiner et al., 2015). In practice, however, individuals are often diagnosed with multiple PDs. And, the symptom profiles of individuals diagnosed with any one PD can be quite heterogeneous. Many researchers fault categorically based diagnostic systems for this problem (Clark, 2007; Tyrer et al., 2006; Widiger et al., 2002), contending that despite their built-in assumptions, current diagnostic models of PDs do not meet the requirements of a true categorical model.

Current Trends in PD Nosology

Within the last decade, the number of researchers advocating for dimensional models of personality (wherein personality is conceptualized along a continuum of healthy and pathological *amounts* of a given trait as an alternative to the current diagnostic model) has continued to grow (Kotov et al., 2017). To this end, Section III of the most recent edition of the *DSM* (DSM-5;

APA, 2013) added the *DSM-5* “Alternative Model for Personality Disorders” (AMPD) to reflect the growing interest in dimensional approaches to PD diagnosis. The *DSM-5* Personality and Personality Disorders Work Group (Skodol et al., 2011) developed the AMPD as a hybrid model, combining categorical and dimensional approaches to assessing personality dysfunction. The model assesses both severity (Criterion A) and the presence of pathological personality traits (Criterion B) (APA, 2012). Criterion A, or the Levels of Personality Functioning Scale (LPFS) divides personality functioning into four dimensions (identity, self-direction, empathy, and intimacy). Each is rated along a five-point scale ranging from 0 (Little or no impairment) to 4 (Extreme impairment; APA, 2013).

Overall severity has been shown to be the single best predictor of current and future dysfunction (Bender, Morey, & Skodol, 2011; Hopwood et al., 2011). Additionally, identifying the severity of dysfunction provides a logical through line between normal and abnormal personality (Widiger et al., 2009). It also provides incremental validity in predicting traditional categorical PDs with Criterion B, which reflects personality *style* (Zimmerman, Kerber, Rek, Hopwood, & Krueger, 2019). Criterion B consists of 25 personality characteristics within five trait domains (negative affectivity, detachment, antagonism, disinhibition, and psychoticism; APA, 2013). The five trait domains represent transformations of the Five-Factor Model (FFM, McCrae & Costa, 1987) and are conceptually related to the Minnesota Multiphasic Personality Inventory, second edition (MMPI-2) and the Personality Psychopathology Five Scales (PSY-5; APA, 2013; see also below for a more detailed description). The five trait domains represent broad dimensions of personality, focusing on the more maladaptive pole, though extremes at either end may be less adaptive (APA, 2013). The 25 facets are the specific elements of these

dimensions. For example, facets of the antagonism domain include manipulativeness, deceitfulness, grandiosity, attention seeking, callousness, and hostility (APA, 2013).

The *PDM-2* and the *ICD-11* have also moved to more dimensional diagnostic models. The *PDM-2* emphasizes personality functioning on a continuum, ranging from healthy (personality style) to pathological (personality disorder; *PDM-2*, 2017). While PDs are still presented as categories, each PD describes a continuum of functioning that aligns with Kernberg's model of personality organization (Kernberg & Clarkin, 1995; *PDM-2*, 2017). Similar to the AMPD, the *ICD-11* characterizes PDs by both severity and style. In contrast to the AMPD, the *ICD-11* does not provide for specification of any PD disorder other than Borderline Personality Disorder; replaces psychoticism with anankastia (i.e., focus on orderliness and perfectionism); makes specification of trait domains an option, rather than a requirement; and excludes certain personality facets (Bach & First, 2018; Zimmerman et al., 2019).

Despite numerous revisions of the three primary diagnostic systems (5 revisions of the *DSM*, 11 of the *ICD*, and 2 of the *PDM*), the field continue to grapple with fundamental disagreements about how to best describe personality pathology. Even the most recent revisions of each diagnostic system vary in their conceptualizations of the essential features of PD. In general, though, diagnostic models are moving away from categorical models and toward dimensional models of PDs.

Models of Psychopathology

The essential problem for researchers (and clinicians) is that psychological phenomena are not tangible things that we can pick up and examine. These intangible psychological phenomena, called latent constructs (Cronbach & Meehl, 1955), are described as taking two basic

forms – categories and dimensions. As diagnostic models move from categorical to dimensional models, it becomes important to elucidate the assumptions of each model.

Categorical Models of Psychopathology. In categorical models, individuals are grouped based on whether or not they possess a set of defined attributes. Categorical models assume that each construct is meaningfully separable from other constructs along a set of criteria. In a categorical model, each attribute has its own threshold, but all attributes must be present (Devins, 1993; Streiner et al., 2015). Categories are, thus, mostly homogenous groupings of people sharing particular attributes. Categories also assume that when a particular trait is not present, an individual possesses a different trait and belongs to a different category. The categorical model aims to reduce diagnostic overlap. As such, cases differ both quantitatively and *qualitatively* (Devins, 1993; Streiner et al., 2015). Eye color is one such example. Three primary categories emerge from observations of eye color – blue, green, and brown. A person either has or does not have brown eyes. Furthermore, a person who does not have brown eyes is not absent of eye color, rather she will have either blue or green eyes. Nevertheless, we can also observe that there is some within eye color variation; brown eyes may range from hazel to dark brown, for example.

Categorical models of psychiatric diagnosis most prominently began with Emil Kraepelin's 19th century nosology. His system diagnosed mental disorders in the same way that medical diagnoses were made. He maintained that symptoms are observable signs of a disorder and that it is the disorder, not the symptoms, that should be diagnosed (Boorsboom, 2016; Kraepelin & Dierendorf, 1915). Treatment then follows from the diagnosis. Loevinger (1957) contended that categorical diagnoses are either present or absent with no varying degrees. Devins (1993) further clarified that variation *is* present but *within* a diagnosis along degrees of severity.

Defining categories of psychopathology in this way has proved challenging. As previously mentioned, early editions of the *DSM* aimed for homogeneity with a monothetic criteria set by emphasizing diagnosis of the single most prominent PD (APA, 1952, 1969). However, in a move to reflect clinical conventions rather than theoretical constructs, the *DSM-III* and subsequent editions allowed for diagnoses of more than one personality disorder (APA, 1980) in the same person. The *DSM-III-R* (APA, 1987) introduced heterogeneity into PD diagnoses with the move to polythetic criteria sets. While categorical models allow for variations in severity and are not necessarily contradictory to a polythetic model, the combined impact of multiple PD diagnoses within the polythetic criteria negates categorical assumptions. Specifically, because the *DSM* does not require that individuals have those symptoms most associated with a given personality *and* allows for multiple diagnoses, DSM diagnosis does not emphasize inherent differences between having the disorder and not having the disorder. Instead, this approach privileges commonality between normal and abnormal functioning and among PDs.

Dimensional Models of Psychopathology. In a dimensional model, individual differences fall along a continuum and are measured quantitatively (Devins, 1993; Streiner et al., 2015). Distinctions can be made only along a “somewhat more” or “somewhat less” continuum. As a result, it is more challenging to delineate between having and not having a disorder when the differences between normal and abnormal functioning are only a matter of degrees. Furthermore, individuals can be assigned membership along more than one dimension. The advantages of dimensional models include further elaboration of a single construct and clear links between normal and abnormal functioning. (Eaton, Krueger, South, Simms, & Clark, 2011;

Zapolski et al., 2012). As a result, dimensional models retain more diagnostic information but are less parsimonious than categorical models.

An example of a dimensional construct is height. Height distinctions are measured by increases or decreases in length. While we can categorize people as tall or short along the extremes of the continuum, there is a larger population of people that fit somewhere in-between and to whom ascribing meaningful differences is challenging. Furthermore, a person who is very short is not qualitatively different from a person who is very tall. There are no significant differences in body composition, for example, between short and tall people.

Because dimensions are described as a little more or a little less of an attribute, they are readily studied with psychometric scales such as the well-known Likert scales. In point of fact, dimensional theories of personality are more likely to have a corresponding assessment tool than are categorical models (Blashfield, 1984). Still, dimensional models pose their own challenges to diagnosis. Primarily, if pathology exists on a continuum, cut points along the normal to abnormal range are less clear (Streiner et al., 2015).

Selected Theories on the Developmental Psychopathology of Personality Disorders

If our goal is to set parameters around PDs as a latent construct, we can begin by understanding how personality emerges. It is generally accepted that personality takes shape in the early part of the lifespan through interactions between the organism's genetic inheritance and its environments. Genetic influences include heritable traits like temperament (Cloninger, Svrakic, & Pryzbeck, 1993). The external environment includes, for example, parenting style, access to resources, and exposure to trauma (Bronfenbrenner, 1994). Studying developmental processes increases our understanding of both health and psychopathology (Cicchetti, 1993; Kernberg, Weiner, & Bardenstein, 2000; Shiner, 2009). Studying, "...the origins and course of

individual patterns of behavioral maladaptation” (Sroufe & Rutter, 1984), provides valuable information about setting parameters for PDs.

The most comprehensive theories of PD development have emerged from psychodynamic and psychoanalytic theories in that attempts have been made to incorporate points of view such as attachment theory, object relations theory, interpersonal perspectives, and psychobiological concepts. A key aspect of these models is their articulation of a number of markers of personality dysfunction that can be used to assess the presence of PDs. As exemplars of these approaches, I review Otto Kernberg, Heinz Kohut, and Sidney Blatt. I also briefly discuss cognitive and personological perspectives on PDs which, although less well elaborated, add to our understanding of PDs.

Psychoanalytic Perspectives.

Otto Kernberg. Kernberg was among the first to articulate findings about a group of patients whose level of impairment fell between psychotic (loss of contact with reality) and neurotic (anxious distress, but no loss of contact with reality) (Kernberg, 1967). He coined the term “borderline personality organization” (BPO) to describe this group of “in-between” patients. He delineated three levels of personality organization: psychotic, borderline, and neurotic. Kernberg emphasized that pathology exists on a continuum across these levels of organization (Anderson, 2013). They represent levels of functioning, rather than distinct diagnostic categories. The variations he described among the three levels of functioning are based on identity integration, reality testing, and ego defenses. Identity integration refers to the degree to which one develops a stable, realistic, and nuanced sense of self and of others. Reality testing is defined as the extent to which one can accurately perceive the external world and

evaluate thoughts, feelings, and behaviors according to societal norms. Ego defenses represent the characteristic manner in which persons manage their anxiety.

Individuals within the BPO range typically meet criteria for a personality disorder (Kernberg & Caligor, 1996). BPO is thus a useful proxy for the PD diagnostic groups. As would be suggested by its position between neurotic (NPO) and psychotic personality organization (PPO), individuals with BPO are more impaired in identity integration, reality testing, and ego defenses than are individuals with NPO but less so than individuals with PPO. Individuals with BPO have unstable, unrealistic, and extreme views of self and of others (Kernberg & Caligor, 1996, p. 117), shifting repeatedly from seeing the self and others as either all-good or all-bad but never a mixture of the two. In the BPO range, individuals can distinguish between their inside and outside worlds. However, they have greater difficulty evaluating themselves according to societal norms.

Those within the BPO range are inclined to use splitting and projective identification as their primary defenses. In splitting, intense affective states are kept from polluting one another by organizing experiences into black-and-white/ all good or all bad. Splitting differs from the cognitive behavioral “thinking trap” concept of black-and-white thinking in that an individual’s sense of an experience as “all bad” cannot be challenged. Rather, positive evaluations of the experience are reinterpreted as having been negative all along. Projective identification occurs when an individual unconsciously projects intolerable aspects of himself into another person with whom he is engaged in a dyadic relationship. For example, certain individuals may be incapable of acknowledging their aggression and instead perceive themselves as victims. As a result, they perceive others as always “out to get me,” and do not realize the extent to which they rebuff others and incite frustration.

Kernberg presented his theory within a developmental framework that synthesized the writings of Anna Freud, Erik Erikson, Edith Jacobson, and Melanie Klein (Kernberg, 1984; 2016). He described the conditions (inborn and environmental, failures and achievements) necessary to create each level of personality organization. He detailed the genetic and constitutional factors that shape the way an infant interacts with and integrates her environment, including intellectual capacity and temperament (Kernberg, 1976, 1984, 2016; Kernberg & Caligor, 1996, p. 120). Kernberg emphasized the importance of low intensity affective experiences. These low intensity experiences facilitate the infant's ability to take in and evaluate her surroundings calmly, allowing for broader perceptual awareness than in high intensity affective experiences. This broad perceptual awareness allows for closer attunement to the nuances of reality and less reliance on surface-level details that merely confirm preexisting beliefs.

In high intensity affective states (e.g., love and hate), perceptual experiences narrow. Positive and negative experiences thus become separate via the splitting defense. Theoretically, this occurs as a way for the infant to protect good experiences with the caregiver from the negative experiences created by pressing unmet needs. Though the infant continues to feel as though bad experiences (e.g., hunger) are intolerable, she can project them into the outside world. In this way, she can protect the good experiences from the dangerous ones by splitting them off into separate mental worlds. In contrast, healthy development allows for the infant to tolerate a range of experiences, diminishing the use of splitting as a primary defense. The infant can then imagine that she and others experience a similar range of affect and thoughts.

Heinz Kohut. Whereas Kernberg described a horizontal, developmental structure of personality, Kohut described a vertical, developmental structure (Kohut, 1977). The two poles of

Kohut's "bipolar" self are *mirroring* and *idealizing*. Mirroring consists of reflecting a person back to him/herself in moment-to-moment experiences. For example, a mirroring experience in infancy consists of the caregiver attending to the infant as she wobbles back and forth on two legs, "Look! You're walking!" In this moment of mirroring, the caregiver is reflecting back to the infant an awareness of how the infant is interacting with her world. The caregiver, importantly, also conveys love through visual attention and vocal intonation. As such, mirroring supports attachment and provides reality testing.

Idealizing (similar to Freud's ego ideal concept) represents the wished-for self and creates subjective beliefs about what it means to be a "good" person. The idealizing character forms initially through observations of caregivers and then expands to include observations from the greater world. Emanating from the infant's feelings of being loved and cared for, the infant initially ascribes god-like qualities to her caregivers. These observations then coalesce to form the wished-for self. For example, a young child may wish to be brave and strong like her parent. The two poles (realistic view of oneself through mirroring experiences/internal strivings for betterment through idealizing) form a tension arc that activates an individual's talents and skills (Kohut & Wolf, 1978; Wolf, 2002). This is to say that when an individual has a clear sense (through mirroring) of her place in the world, has people in her life whom she admires, and feels these people like and care about her, she begins to have confidence that she can develop into an admirable person, herself.

Sidney Blatt. Blatt discussed the roles of self-definition and relatedness in forming healthy identity development/personality functioning (Blatt, 2008). Like Kernberg, Blatt was heavily influenced by the work of Erik Erikson. In fact, Blatt derived his model for the development of self-definition directly from Erikson. His addition of interpersonal relatedness to

the identity development process addressed the limitation of Erikson's model (Blatt, 2008; Blatt & Shichman, 1983; Gilligan, 1982; Surrey, 1985). For example, an infant must first establish trust in her caregivers to meet her basic needs. From there, she has a secure base from which she can explore her environment (i.e., autonomy) and develop a sense of initiative (Blatt, 2008, p. 105). By adolescence, interpersonal relatedness and self-definition are no longer distinct elements with separate experiences that spring from one another, rather they come together to form identity.

Individuals with impaired relatedness have difficulty adjusting their level of closeness with others according to context (Lingiardi, McWilliams, & Muzi, 2017). This may range from a person who is formal and distant even with friends and family to a person who is casual and intimate with strangers. Individuals with impaired self-definition have difficulty establishing and maintaining a, "...coherent, realistic, differentiated, and essentially positive sense of self, (p. 13; Lingiardi et al., 2017)." Such individuals tend to see themselves and others in one dimension, often moving between states of *all bad* or *all good*.

Blatt posited that one marker of personality pathology is an inability to maintain stable, mutually satisfying relationships. Another marker is the quality and quantity of relationship models that are internally represented within a person. For example, a person with severe personality pathology often views relationships in terms of submission and dominance.

A Summary of Psychoanalytic Perspectives. Kernberg conceptualized PD development as an interaction between the inborn qualities of the infant and over stimulation created by frequent high intensity affective experiences. Kohut saw PD's as arising from caregiver failures to mirror the infant adequately and/or to support the idealizing transference. Blatt conceptualized PD's as developing from a lack of interpersonal relatedness and impaired self-definition. All

three theories share the view that opportunities for self/other reflection are critical to healthy personality development. The theories differ in the degree of emphasis they place on the failures of the caregivers and the biological qualities of the infant. For instance, Kohut considers infants to be a *tabula rasa* of sorts, where all failures are largely the result of caregiver inadequacy. Kernberg's theory is significantly more transactional. Not only are the infant's temperament and intelligence considered key factors in the development of self-other reflection, but environmental factors expand to include more than the capacities of the caregivers themselves. For example, a caregiver who is mostly anxious and easily upset around an infant will fail to provide the infant with low intensity affective experiences. It is also possible that a caregiver is adequately calm but that the environment may be characteristically stressful and traumatic (e.g., high crime neighborhood/warzone; inadequate food), limiting opportunities for low intensity affective experiences.

Cognitive Perspectives. Cognitive theories posit two paths toward the development of personality disorders. The first path states that individuals inherit specific temperaments that have been shown to have evolutionary advantages (e.g., exhibitionism attracts mates, fearfulness protects against dangers; Beck, Davis, & Freeman, 2015). Personality disorders thus manifest when an environment is sufficiently limited that alternative strategies for obtaining one's needs are neither demanded nor encouraged (Lenzenweger & Clarkin, 2004). An alternative path, promoted by Marsha Linehan's (1987) in her work on Dialectical Behavior Therapy for Borderline Personality Disorder, suggests a deficit model whereby an individual is born with insufficient resources (e.g., affect regulation in BPD) for managing her world. Personality dysfunction arises when the environment does not facilitate the healthy development of these resources nor the development of compensatory strategies (Lenzenweger & Clarkin, 2004). Each

path assumes a categorical structure of PDs where inborn traits *or* deficits lead to qualitative differences in personality.

Cognitive theories of PDs produce a clear link between genetics and the learning environment. They also excel in specifying how early strategies for engaging with the world are reinforced over time and lead to the emergence of persistent patterns of thinking, feeling, and behaving. However, unlike the conflict models of psychoanalytic theory, cognitive theories only describe one side of the coin observed within the intra- and interpersonal dynamics of PDs. For example, a cognitive theory of narcissistic PD suggests that disorder originates in the pathogenic belief that, “I am above the rules. I am better than others.” However, narcissistic individuals tend to experience both inflation *and deflation* in their sense of self, which better explains the role that competitiveness plays for narcissists. If an individual truly believes she is better than others, she will not concern herself with competition because her sense of herself would be stable independent of accomplishments.

Personological Perspectives. Theodore Millon described personology as an evolutionary-based theory of personality disorders (Millon & Grossman, 2005). Like Kernberg and cognitive perspectives, Millon described the formation of PDs as an interaction between temperament and the environment. His work also drew heavily on attachment theory. Millon initially proposed four styles of interpersonal relationships (akin to attachment style): detached, dependent, independent, and ambivalent (Choca, 1999). He then proposed that each style had active and passive variants (perhaps similar to temperament) that differed in their approach to adaptation (Davis, 1999). An active approach seeks to change the environment, whereas a passive approach seeks to accept the existing environment (Choca, 1999).

Multiplying the four interpersonal styles by the two adaptive approaches, Millon postulated eight personality types: avoidant (active detached), schizoid (passive detached), Histrionic (active dependent), Dependent (passive dependent), Antisocial (active independent), Narcissistic (passive independent), Negativistic (active ambivalent), and Compulsive (passive ambivalent) (Choca, 1999). Millon subsequently expanded the eight personality types to include variations of personality pathology based on severity. Finally, he added a survival dimension where individuals seek to either avoid pain or pursue pleasure (Strack & Millon, 2007).

The final model resulted in 15 personality types: Schizoid, Schizotypal, Avoidant, Dependent, Hypomanic, Histrionic, Narcissistic, Paranoid, Antisocial, Sadistic, Melancholic, Self-Defeating, Negativistic, Borderline, and Compulsive (Strack & Millon, 2007). Millon's theory of PDs is, thus, categorical in nature. Like cognitive models, it stresses adaptation to the environment. It also specifies a dialogue between temperament and environment that is shared with both cognitive models and with Kernberg's model. While the active and passive modes can be linked to temperament and interpersonal approaches may represent attachment styles, it is not clear how each type emerges.

Brief Survey of Approaches to Assessment of PDs

A common differentiator between PDs and other mental health disorders (previously distinguished as axis II and axis I disorders, respectively) is the extent to which symptoms are ego syntonic (Alliances of Psychoanalytic Organizations, 2017; Hirschfeld, 1993). Individuals with personality disturbance experience their symptoms as relatively congruent with their self-image, and in fact, externalizing variants of PD may not be "bothered" by their way of interacting with their world. Indeed, a common adage within the psychotherapy community is that persons with PD present to therapy because they believe the world around them is

problematic, rather than presenting to therapy to fix some problematic aspect within themselves. However, a number of research groups have also found support for moderate levels of insight for individuals with PDs (Samuel, et al., 2011; Sleep, Lamkin, Lynman, Campbell, & Miller, 2019). A better differentiator may be the presence of positively correlated external locus of control/negatively correlated internal locus of control in individuals with PDs (Watson, 1998).

The diagnosis of PDs consists chiefly of interview and self-report inventories. While self-report inventories vary in the degree to which items are face-valid, the essential task remains for the respondent to evaluate whether a statement applies or does not apply to herself. As such, self-report inventories are subject to the respondent's subjective appraisals and openness to communicating about herself (Huprich, Bornstein, & Schmitt, 2011; Meyer & Kurtz, 2006). As a result, PD criteria can be difficult to capture in either face-valid self-report items or interview questions (Beauchaine, Klein, Crowell, Debridge, & Gatzke-Kopp, 2009).

This raises a number of questions about how PD assessment should be conducted. What weight should be given to an individual's self-report? Certainly, it would seem that individuals with limited insight may fail to endorse face-valid items that indicate the presence of pathology. Alternately, the responses of an informant (e.g., family member) may provide useful information about the social presentation of an individual. However, they do not shed light on the internal experiences of the examinee. An examiner's brief, albeit expert, observations of and interactions with an individual may be able to approximate both the internal experience and external presentation of the examinee but are not wholly sufficient for diagnosis. Prior research has demonstrated that self, informant, and clinician ratings collectively provide a multidimensional picture of PDs (Cruitt & Oltmanns, 2017; Miller et al., 2014; Ready & Clark, 2002; South, Oltmanns, Johnson, & Turkheimer, 2011).

Performance-based or free response measures, such as the Rorschach Ink Blot Method [(RIM) Rorschach, 1942) and the Thematic Apperception Test [(TAT) Murray, 1943] permit the investigation of how individuals organize relatively ambiguous stimuli, which is thought to reflect personality. Such measures do not reduce pathological personality traits into statements for the respondent to accept or reject. However, the RIM and the TAT have fallen out of favor within clinical psychology training programs and are less commonly used (Groth-Marnat, 2009) than self-report methods. Indeed, self-report inventories remain the most popular measures of personality pathology (e.g., the Millon Clinical Multiaxial Inventory [MCMI] Millon, Grossman, & Millon, 2015; the Minnesota Multiphasic Personality Inventory, Second Edition [MMPI-2], Hathaway, McKinley, Butcher, Dahlstrom, Graham, & Tellegen, 1989; the MMPI-2-Restructured Form [MMPI-2-RF], Ben-Porath & Tellegen, 2008; the Personality Assessment Inventory ([PAI] Morey, 1991; and the Personality Inventory for DSM-5 (PID-5; APA, 2013).

The Minnesota Multiphasic Personality Inventory

The MMPI has strong ties to the categorical modeling of personality disorders. Initially, the MMPI (Hathaway & McKinley, 1942) differed from other self-report measures by the way in which items were scored. Consistent with an empirical approach to scale construction, the items for each scale were chosen in large part for their fidelity to theoretical criteria for personality disturbance and were *scored* based on whether the clinical population answered them differently from the normative sample (Wiggins, 2003). This is to say that although the content of an item may appear to reflect one personality trait (e.g., aggression), it may be included on a scale for a seemingly unrelated personality trait (e.g., depression) because it is typically answered differently by people with depressive traits than it is by the normative sample (Groth-Marnat, 2009). This attribute of the MMPI, in which item inclusion is based on theory but scoring is

based on population response patterns, provides significant benefits in assessing individuals who have limited personal insight but highly idiosyncratic response patterns (Carlson & Oltmanns, 2015). The MMPI was revised in 1989 (The Minnesota Multiphasic Personality Inventory, second edition [MMPI-2; Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989]) to update the standardization sample, which included 2,600 adults from a community sample. Because the MMPI-2 remains the most widely used clinical personality assessment in the US (Butcher, 2005; Groth-Marnat, 2009; Van Der Heijden, Egger, & Derksen, 2010; Wiggins, 2003), the creation of supplemental personality pathology scales within the MMPI-2 series gives researchers clear advantages – larger response pools, greater reach to practicing clinicians, and ease of collaboration with other researchers. Existing assessment tools are one potential source for examining latent constructs of PDs and, thus, have the potential to clarify whether personality pathology manifests primarily categorical or dimensional quantitative structures. Due to the MMPI-2's ease of use, it is a logical selection for preliminary examination.

Study Questions/Aims

I intend to test the latent structure of the MMPI-2 scales of personality pathology. To accomplish this, I will evaluate two sets of existing MMPI-2 supplemental personality pathology scales (PD Spectra and PSY-5) to assess whether they possess dimensional or categorical constructs of PD. I hypothesize: (1) that more of the PSY-5 scales will manifest dimensional structures than will the PD Spectra scales which include categorical descriptions of PDs; (2a) all PSY-5 scales, which are derived from dimensional models of personality, will manifest a dimensional structure; (2b) the PD Spectra, which have been shown to correlate with the PSY-5 and to represent aspects of Criterion A and B of the AMPD, will show a mix of dimensional and

categorical constructs; (3) the Schizoid Spectra scale will manifest a categorical structure; (4) the Borderline Spectra scale will manifest a dimensional structure.

CHAPTER II: METHODS

Participants

Participants were drawn from a de-identified archival data set of patients seen at a university outpatient training clinic. The sample of 1,030 participants had the following demographics: 52.5% females ($n = 541$), a mean age of 31.63 ($SD = 11.63$), mean years of education 14.38 ($SD = 2.57$); and 53.7% never married. Data on the ethnic and racial makeup, as well as the socioeconomic status, of the sample were not consistently reported for the current dataset and, as such, cannot be reported here. Of note, the archival record consisted of MMPI-2 computer files rather than complete clinical case records. Thus, it was not possible to match individual MMPI-2 data with other archival records (if they remained in storage). As the purpose of the data was primarily for individual clinical use, clinicians were more concerned with limiting the amount of personal data (e.g., using initials only) within the large database accessible to clinicians across a decade of cohorts, rather than providing as much information as possible to facilitate clinical research.

The population of clinic patients differs from typical university outpatient clinics by the range of referral sources. While a large portion of evaluations and psychotherapy services are delivered to university students, faculty, and staff; the clinic also receives a number of referrals from the court system, primary care and mental health practitioners, as well as community members. Psychotherapy services for adults include individual and couples' therapy. Testing services include psychoeducational, full psychological, parenting fitness, and custody evaluations.

Procedures

Doctoral-level student clinicians administered the MMPI-2 (Hathaway, McKinley, Butcher, Dahlstrom, Graham, & Tellegen, 1989) to patients from 2005-2015 as part of the clinic's standard intake procedure. The MMPI-2 electronic database included 1,708 records. After re-test, duplicate, and dummy coded (e.g., 12345, 9999) protocols were removed, 1,171 cases remained in the final sample. Final inclusion criteria for MMPI-2 profiles were validity cutoffs set as a standard of practice in MMPI research (Sellbom, Waugh, & Hopwood, 2018). These criteria are: Cannot Say ≤ 30 , VRIN $\leq 80T$, F and FB ≤ 110 , Fp ≤ 100 , L $\leq 80 T$, K $\leq 75T$, and S $\leq 75 T$ and resulted in a final sample of 1,030 records.

Measures

MMPI-2 Spectra Scales. The MMPI-2 Spectra Scales (Mulay et al., 2018) are PD scales for the MMPI-2 developed as an update to three prior MMPI PD scale iterations (Levitt & Gotts, 1995; Morey, Waugh, & Blashfield, 1985; Somwaru & Ben-Porath, 1994). The 12 scales are: Antisocial, Avoidant, Borderline, Dependent, Depressive, Narcissist (grandiose), Obsessive Compulsive, Paranoid, Schizoid, Schizotypal, and Somatizing. Mulay and colleagues (2018) designed the MMPI-2 Spectra Scales to reflect models of personality disorders associated with three prominent diagnostic systems DSM-5 (APA, 2013), (International Classification of Diseases Mental and Behavioral Disorders [ICD-11], World Health Organization [WHO], 2015; *Psychodynamic Diagnostic Manual, Second Edition [PDM-2]*, Lingardi & McWilliams, 2017; *DSM-5, APA, 2013*).

The Spectra research team conducted several external criterion validity checks with the MCMI-III, the MMPI-2 PSY-5, and the PID-5. As supplemental scales to the existing, widely used MMPI-2, the Spectra are accessible and relatively easy to implement. In a traditional

multimethod personality assessment, the clinical utility of the scales hinges on their ability to capture meaningful aspects of personality functioning that provide incremental validity to existing PD assessments.

MMPI-2 PSY-5. The PSY-5 (Harkness & McNulty, 1994; Harkness, McNulty, & Ben-Porath, 1995) are a set of five MMPI-2 scales, assessing the continuum of normal to pathological personality traits. The scales are: Aggressiveness (AGGR), Psychoticism (PSYC), Disconstraint (DISC), Detachment, and Negative Emotionality/Neuroticism (NEGE). The PSY-5 are modeled after the FFM dimensions of personality ([Openness to experience, Conscientiousness, Extraversion-Introversion, Agreeableness, and Neuroticism] McCrae & Costa, 1987) and, thus, have an inherent dimensional aim to assessing personality pathology. While the PSY-5 have an underlying dimensional conceptual framework, the scales are assessed within the MMPI-2 dichotomous response structure. Because respondents may only choose “yes” or “no” to evaluate the extent to which a given MMPI-2 item pertains to them, there is some limitation on respondents’ ability to answer with nuance. Still, examination of response option augmentation (i.e., increasing response options) reveals equivalent convergent validity for dichotomous and Likert scale assessments (Capik & Gozum, 2014; Courrégé & Weed, 2019; Finn, Ben-Porath, & Tellegen, 2015). Furthermore, factor analytic research indicates strong fit with a dimensional model (McNulty & Overstreet, 2014).

CHAPTER III: ANALYSES

There are a number of multivariate analytic procedures for testing the latent structure of a theoretical construct. The primary classes of these procedures are exploratory vs. confirmatory procedures and the nature of the constructs, dimensional vs. categorical. Exploratory analyses impose few assumptions on the data. By contrast, confirmatory analyses test specific theoretical assumptions about the data. Dimensional and categorical analyses can either be exploratory or confirmatory, but both assume an inherent structure within the data. Cluster and factor analyses are appropriate when there is a degree of clarity about the categorical or dimensional structure of a latent construct. However, they are ill-suited when latent structure is unclear or contested. For example, when fit indices for a factor analytic model are poor, we cannot conclude that the latent structure is categorical; we can only conclude that it does not fit the presupposed dimensional model. Taxometric analyses, by contrast, were developed as a way to resolve such conceptual matters because, without *a priori* restrictions, they allow for the data to take its natural shape. Because current diagnostic systems are in a state of flux regarding the latent structure of personality pathology, taxometric analyses of PD scales are the most appropriate method for advancing our understanding of PDs. Taxometric procedures are capable of testing categorical and dimensional models *against* one another.

Taxometric analyses are designed to detect the presence of taxa within a dataset. A taxon is a nonarbitrary group or entity that consists of attributes that hang together, whether or not we describe them first (Hack, 2003; Haslam, Holland, & Kupens, 2012; Kendler et al., 2011; Meehl, 1992; Millon, 1991). Unlike factor and cluster analyses, taxometrics do not impose an *a priori* structure on variables, nor do they use null hypothesis testing. Instead, interpretation of findings is largely based on visual inspection of the data curve (Haslam et al., 2012). While visual

inspection can be subjective and lead to biased interpretations of the data, Ruscio and colleagues have done considerable work in recent years to refine taxometric procedures and reduce error (Ruscio, 2016; Ruscio, Haslam, & Ruscio, 2013; Ruscio, Ruscio, & Carney, 2011).

Data Requirements

Taxometric analyses require $N \geq 300$ in order to maximize identification of latent structures (Meehl, 1995; Ruscio et al., 2011). While categorical structures can be detected with samples of 100, it is more difficult to identify dimensional structures with smaller sample sizes (Ruscio, Walters, Marcus, & Kaczetow, 2010; Ruscio et al., 2011). The current data set of 1,030 was, thus, sufficient for taxometric analyses.

Convention for taxon size is $P \geq .10$ (Meehl, 1995; Ruscio et al., 2011). The DSM-5 provides a range for the base rates of each categorical PD in Section III and ranges are as low as .2 for Antisocial PD and as high as 7.9 for Obsessive Compulsive PD (APA, 2013). Therefore, even the most conservative base rate estimates for a given PD were within the acceptable range for analyses. There must also be a minimum of two indicators ($k \geq 2$) for $N \geq 600$ and $k \geq 3$ for $N \geq 300$ -599 (Ruscio et al., 2011). All PD scales of interest had a minimum of 10 indicators (i.e., items) per scale.

Taxometric Procedures

I conducted all analyses using the *RTaxometrics* package developed by Ruscio and Wang (2017). Researchers commonly use one or more of five types of taxometric procedures: MAMBAC (Mean Above Minus Below A Cut; Meehl, 1995), MAXCOV (Maximum Covariance), MAXEIG (Maximum Eigenvalue), MAXSLOPE (Maximum Slope), and L-Mode (Latent Model; Meehl, 1995), with MAXEIG (Waller & Meehl, 1998) and MAXSLOPE being quite similar to MAXCOV procedures (Haslam et al., 2012; Ruscio et al., 2011). MAMBAC,

requiring $k \geq 2$, procedures plot the number of cases along the x axis and the mean difference of cases falling above and below a cut score along the y axis (Meehl, 1995; Meehl & Yonce, 1994; Ruscio et al., 2011). Categorical data manifests a convex distribution, while dimensional data is concave (Ruscio et al., 2011).

As MAXCOV, MAXEIG, and MAXSLOPE are quite similar, Ruscio and colleagues (2011) recommend only selecting one of the three procedures. The MAXCOV and MAXEIG procedures are virtually identical and require ≥ 3 indicators (Ruscio et al., 2011). MAXCOV uses one indicator to sort cases and calculates the covariance of the data along the remaining indicators, whereas MAXEIG sorts cases along the largest eigenvalue in the covariance matrix. Although similar to MAXCOV and MAXEIG, MAXSLOPE is more appropriate when only two indicators are available. L-Mode, $k \geq 3$, factor analyses indicators uses Bartlett's weighted least squares method and plots the density of the distribution. For the L-Mode procedure, categorical data typically have a bimodal distribution; while dimensional data are usually unimodal (Ruscio et al., 2011).

In a meta-analysis of taxometric studies, Haslam et al. (2012) found that L-Mode was negatively correlated with taxonic findings and MAXSLOPE was positively correlated (though use of MAXSLOPE was rare). The MAXSLOPE procedure was not applicable to either the Spectra of PSY-5 scales, as each scale had a minimum of 10 indicators. Instead, used the MAXCOV procedure both because it is used more often in the existing literature (193 v. 124; Haslam et al., 2012) and because it provides greater accuracy than Monte Carlo simulations (Walters & Ruscio, 2010). In addition, I also ran both the MAMBAC and L-Mode procedures as validity checks.

Because structural findings must be significantly divergent from those resulting from mere randomly generated data, the use of data simulations provides an additional check on the use of visual inspection of the data curve. The comparison curve fit index (CCFI), a form of parallel analysis, compares the fit of the data curve from the dataset to iterations of data simulations (Haslam et al., 2012; Ruscio et al., 2013). When CCFI was used in taxometric analyses, only 20 findings out of a total 311 (177 studies) found evidence of taxa (Haslam et al., 2012). Therefore, CCFI values are a more stringent criterion for taxonic findings. CCFI values closer to 0 ($<.45$) indicate greater fit with a dimensional model, whereas values closer to 1 ($>.55$) are better indicators of a categorical model. Values ranging from .45 to .55 indicate an ambiguous quantitative structure, i.e., neither strongly dimensional nor categorical.

I determined relative model fit using the CCFI mean, which is a composite of the MAXCOV, MAMBAC, and L-Mode values. Still, I considered each value in my interpretation of results, such that I gave less weight to findings with significant heterogeneity among CCFI values. As a supplementary method of determining model fit, two independent raters (trained graduate students) examined the graphical output of all scales. For each taxometric procedure (i.e., MAXCOV, MAMBAC, and L-Mode) the raters judged whether the curve was more closely aligned with (a) the dimensional comparison curve, (b) the categorical comparison curve, or (c) was equivalently aligned with both the categorical and dimensional comparison curves. Raters completed reliability training and were required to achieve Cohen's $\kappa \geq .61$ (actual $\kappa = .98$). Raters were blind to the name and definition of each rated scale.

CHAPTER IV: RESULTS

To examine the latent structure of each personality scale of the MMPI-2 (12 Spectra scales and 5 PSY-5 scales), I submitted each of the 17 scales to 3 taxometric procedures: MAMBAC, MAXEIG, and L-Mode. For each of the three procedures, comparison data prototypical of either categorical or dimensional models (20 sets of comparison data total) were simulated alongside the outpatient results for each individual scale, as can be seen in the attached figures. Scales were labeled as Dimensional, Ambiguous, or Categorical using concurrent validity Procedures. First, the degree of fit between the outpatient sample and each prototype simulation was assessed by visual inspection of the data curve. Two graduate students who were trained to reliably detect data curve alignment performed the visual inspection. However, while the raters achieved Cohen's $\kappa = .98$ during training, the raters were not able to reliably judge Ambiguous graphical outputs. Fit was also assessed quantitatively with MAMBAC, MAXEIG, and L-Mode procedures. Finally, when the three procedures manifested divergent results, I used the CCFI to average the three results. CCFI values are classified as Dimensional ($<.45$), Ambiguous ($.45-.55$), or Categorical ($>.55$). For Categorical results, the base rate of each taxon was also calculated. Base rate estimates range from 0 to 1.

MMPI-2 Spectra Scale Results

Antisocial. For the 24 Antisocial indicators, listwise deletion resulted in retention of 1001 participants (97.2%). Consistent with the design of the MMPI-2 Spectra, the Antisocial scale CCFI comparison values fell in the Ambiguous range ($.45-.55$). The comparison CCFI values were MAMBAC = .56, MAXEIG = .54, and L-Mode = .51. The mean CCFI was also .54. Therefore, the values supported neither a dimensional nor categorical structure.

Avoidant. Listwise deletion of missing data removed 22 participants (97.8% retained). The comparison CCFI values for the 18 Avoidant indicators were MAMBAC = .53, MAXEIG = .57, and L-Mode = .55. The mean CCFI was also .55. While MAXEIG (.57) fell slightly above the minimum for a categorical structure, all other CCFI values were in the ambiguous range. Comparisons of the data curve fit for the categorical and dimensional models also yielded no clear indication of one model over the other. (see Figure 2).

Borderline. After listwise deletion, 980 participants remained (95.1%). The comparison CCFI values for the 27 indicators on the Borderline scale were MAMBAC = .50, MAXEIG = .50, and L-Mode = .48. The mean CCFI was .50. All CCFI values fell within the ambiguous range. This was supported by observation of the data curves in which the data were indistinguishable from their fidelity to either a dimensional or categorical structure. (see Figure 3).

Dependent. After listwise deletion, 1007 participants remained (97.77%). The comparison CCFI values for the Dependent scale (10 indicators) were MAMBAC = .73, MAXEIG = .67, and L-Mode = .57. The mean CCFI was .66. All values skewed toward the categorical range. (see Figure 4). The taxon base rate estimates were MAMBAC = .52, MAXEIG = .62, L-Mode .24, and had a mean of .46.

Depressive. Listwise deletion removed 46 participants, resulting in a final sample of 984 (95.53%). The comparison CCFI values for the Depressive scale (29 indicators) were MAMBAC = .47, MAXEIG = .53, and L-Mode = .51. The mean CCFI was .50. All CCFI values fell into the ambiguous range. (see Figure 5).

Histrionic. After listwise deletion, 989 participants remained (96.01%). The Histrionic scale (16 indicators) comparison CCFI values were MAMBAC = .57, MAXEIG = .58, and L-

Mode = .49. The mean CCFI was .55. Therefore, the values supported neither dimensional nor categorical structures. Visual inspection of the data curve fit for the categorical and dimensional models did not yield clear indication of one model over the other. (see Figure 6).

Narcissistic. For the Narcissistic scale (14 indicators), listwise deletion retained 1001 participants (97.18%). The comparison CCFI values for MAMBAC (.37), MAXEIG (.59), and L-Mode (.66). The mean CCFI was .54. With a mean of .54, there is no general support for either a dimensional or categorical structure to the data. However, it is notable that CCFI values were each firmly in opposing directions: the MAMBAC supported a dimensional structure but the L-Mode supported a categorical one. (see Figure 7).

OCPD. After listwise deletion, 997 participants remained (96.80%). The OCPD (13 indicators) comparison CCFI values were MAMBAC = .64, MAXEIG = .58, and L-Mode = .53. The mean CCFI was .58. The CCFI MAMBAC, MAXEIG, and mean values were consistent with a categorical structure. Only the CCFI L-Mode fell in the ambiguous category for quantitative structures. (see Figure 8).

Paranoid. After listwise deletion, 1000 participants remained (97.10%). Overall, the Paranoid (15 indicators) comparison CCFI values for MAMBAC (.33), MAXEIG (.43), L-Mode (.50), and the mean (.42) supported a dimensional structure. Only the CCFI L-Mode fell in the ambiguous category. (see Figure 9).

Schizoid. After listwise deletion, 992 participants remained (96.31%). Consistent with the hypothesized categorical structure of the Spectra, all comparison CCFI values (MAMBAC = .60, MAXEIG = .67, and L-Mode = .60, and mean CCFI = .62) for the Schizoid scale (8 indicators) fell within the range of a categorical structure. (see Figure 10). To further elucidate

the categorical structure, I examined taxon base rate estimates. The taxon base rate estimates were MAMBAC = .52, MAXEIG = .88, L-Mode .28, and had a mean of .56.

Schizotypal. After listwise deletion, 1013 participants remained (98.35%). The comparison CCFI values for the Schizotypal scale (15 indicators) were MAMBAC = .67, MAXEIG = .75, and L-Mode = .48. Consistent with the hypothesized categorical structure of the Spectra Schizotypal scale, the mean CCFI was .63. The MAXEIG, MAMBAC and mean CCFI values fell above the .55 cut for a categorical structure, though the L-Mode CCFI was in the ambiguous range leaned more toward the direction of a dimensional structure (see Figure 11). To further elucidate the categorical structure, I examined taxon base rate estimates. The taxon base rate estimates were MAMBAC = 1, MAXEIG = .96, L-Mode .29, and had a mean of .75.

Somatizing. After listwise deletion, 1001 participants remained (97.18%). All comparison CCFI values for the Somatizing scale (20 indicators [MAMBAC = .81, MAXEIG = .64, and L-Mode = .56]) supported a categorical structure, supporting the Spectra Somatizing scale as a categorical construct. Indeed, observation of the data curve shows the data more closely follow the categorical than the dimensional parallel analyses (see Figure 12). To further elucidate the categorical structure, I examined taxon base rate estimates. The taxon base rate estimates were MAMBAC = .74, MAXEIG = 0.94, L-Mode 0.37, and had a mean of 0.68.

MMPI-2 PSY-5 Scale Results

Aggression (AGGR). After listwise deletion, 1002 participants remained (97.28%). For the PSY-5 AGGR scale (17 indicators), the comparison CCFI values were MAMBAC = .45, MAXEIG = .44, and L-Mode = .51. The mean CCFI was .47. While the MAMBAC and MAXEIG values are within the range of a dimensional structure, this was not supported by L-

Mode or mean CCFI values. Thus, AGGR falls in the ambiguous range, and does not support the dimensionality of PSY-5 Aggression (see Figure 13).

Disconstraint (DISC). After listwise deletion, 990 participants remained (96.11%). The comparison CCFI values for the PSY-5 DISC scale (25 indicators) were MAMBAC = .54, MAXEIG = .48, and L-Mode = .50. The mean CCFI was .51. All values fell in the ambiguous range, thus the dimensional model for PSY-5 Disconstraint was not supported. Examination of the data curves was also inconclusive regarding a categorical or dimensional structure (see Figure 14).

Introversion. After listwise deletion, 984 participants remained (95.53%). Contrary to the hypothesized dimensionality of the PSY-5, none of the PSY-5 INTR (28 indicators) comparison CCFI values supported a dimensional or categorical, as all values fell in the ambiguous range (MAMBAC = .52, MAXEIG = .53, and L-Mode = .54, and mean CCFI = .53) (see Figure 15).

Negative Emotionality/Neuroticism (NEGE). 27 variables, 999 sample size. After listwise deletion, 999 participants remained (97.00%). Quite contrary to the dimensional PSY-5 model, the PSY-5 NEGE (27 indicators) comparison CCFI values for MAMBAC (.70), MAXEIG (.66), and the mean CCFI (.63) supported a categorical structure. The L-Mode (.54), though, was inconclusive. (see Figure 16). To further elucidate the categorical structure, I examined taxon base rate estimates. Estimates for Negativity were MAMBAC = .60, MAXEIG = .94, L-Mode .48, and had a mean of .67.

Psychoticism (PSYC). For the PSY-5 PSYC scale (24 indicators), listwise deletion retained 997 participants remained (96.80%). Consistent with the dimensional PSY-5 model, the comparison CCFI values for MAMBAC (.38), MAXEIG (.43), and the mean (.42) were all

within the dimensional range for quantitative structure. Only the L-Mode (.46) fell slightly above the upper limit of dimensional structures. (see Figure 17).

CHAPTER V: DISCUSSION

In the present study, I examined the structure of two major sets of MMPI-2 scales relevant to PDs. My aim was to clarify whether personality pathology manifests primarily as a categorical or a dimensional quantitative structure in two sets of MMPI-2 personality pathology scales, the MMPI-2 Spectra scales and the MMPI-2 PSY-5 scales.

General Findings

Hypothesis 1: Spectra vs. PSY-5 Scales

Contrary to my initial predictions, the MMPI-2 Spectra and PSY-5 scales did not differ in their representation of dimensional structures. Findings were ambiguous across both sets of scales, such that most scales were neither strongly categorical nor strongly dimensional. Further, scales that leaned toward categorical or dimensional structures were represented in both the Spectra and PSY-5 scales. There are a few possible reasons for the lack of differentiation. Perhaps the dichotomous format of MMPI-2 responses (either true or false) limited the possibility for detecting dimensionality. A review of taxometric results indicated dichotomous indicators are slightly biased toward taxonic findings (Haslam et al., 2012). However, even with the dichotomous indicators, the dimensionally modeled PSY-5 should have grouped more closely together.

MMPI-2 Spectra Scales Findings

Hypothesis 2b: Spectra Scales. My hypothesis was supported that the Spectra scales, which were designed to reflect the categorical model of the DSM-5 (but which demonstrated overlap and comorbidity with a dimensional model when crosswalked with the AMPD), would reflect both categorical and dimensional elements of pathology. Of the 12 Spectra scales, one fell in the Dimensional range (Paranoid), seven fell in the Ambiguous range (Antisocial, Avoidant,

Borderline, Depressive, Histrionic, Narcissistic, and OCPD), and four fell in the Categorical range (Dependent, Schizoid, Schizotypal, and Somatizing). The taxonic bias of dichotomous indicators is one possible explanation for these results (Haslam et al., 2012). However, the use of mean CCFIs has been shown to have 99% accuracy in elucidating taxonic and dimensional findings (Ruscio et al., 2010). The Monte Carlo simulations of the CCFI index, in particular, yield fewer taxonic results than do taxometric procedures alone (Haslam et al., 2012). Therefore, the current findings provide tentative caution against a full transition to dimensional models of PDs. These ambiguous and taxonic results suggest there are categorical constructs within the scales that need further elaboration and study.

Hypothesis 3: Schizoid. My hypothesis that the Schizoid scale would emerge as a categorical structure was supported. While Schizoid did not have the highest CCFI value of the Spectra scale, it was one of the few scales that revealed a distinctly categorical structure. Previous research into the taxometrics of psychopathology, especially that done by Paul Meehl, has supported the notion of a schizoid taxon (Golden & Meehl, 1979). This is to say that people either are schizoid or they are not; there is no in-between. The finding of the current study provides additional support for this claim. By contrast, taxometric analyses from Ahmed et al. (2011) examining the latent structure of paranoid and schizoid PD did find support for a dimensional model of schizoid PD. Items chosen to tap the schizoid PD differed from items included in the Schizoid Spectra scale in that they included references to emotional detachment, e.g., “find nothing makes you happy or sad” not present in the Spectra scale. Therefore, it is possible that emotional detachment is a dimensional trait of schizoid PD, and social withdrawal, strongly represented in the present scale, is more categorical. Additionally, Ahmed et al. (2011) acknowledged that their use of a clinical interview may result in different results than would self-

report measures due to general discordance between self-report and interview formats. However, a review of taxometric results dispelled hypotheses that sample settings and data types (e.g., self- vs. informant-report) produce pseudo-taxonic findings (Haslam et al., 2012).

Hypothesis 4: Borderline. My fourth hypothesis, that the Borderline scale would manifest a dimensional structure, was not supported. The term Borderline initially referred to the phenomena of pathology that did not meet full criteria for schizophrenia. It was a milder form that *bordered* true psychosis. Subsequent evidence supported the concept of borderline as a distinct level of functioning in its own right, between psychotic functioning and neurotic functioning (Liebowitz, 1979). Modern conceptualizations of Borderline Personality Disorder (BPD) as a distinct diagnosis within the borderline level of functioning emerged with the *DSM-III* (New & Triebwasser, 2018). Today, BPD is one of the most fraught PD diagnoses both because of its high comorbidity and prevalence. Previous exploratory bifactor analyses have demonstrated that BPD loads onto a g-factor of self-interpersonal functioning (think Criterion A of AMPD) or overall severity under which other PDs would be subsumed (Sharp et al., 2015; Whitley, 2019). However, it is important to understand that the ability to fit PDs to factor modeling does not preclude the presence of a taxonic structure (Ahmed, Green, Buckley, & McFarland, 2011). It is possible that while BPD corresponds to severity within PDs, it is not a continuous measure of severity from normal to abnormal personality.

Suicidal ideation (“recent suicidal thoughts”), represented within the Borderline Spectra, could also account for the ambiguous findings. While self-injurious behavior has not been shown to be taxonic (Orlando, Broman-Fulks, Whitlock, Curtin, & Michael, 2015), suicide risk has demonstrated consistent taxonic results (Rufino, Marcus, Ellis, Boccacini, 2018; Witte et al., 2017). Therefore, removing indicators of suicidality may yield more dimensional results.

Additional Notable Findings within the Spectra Scales. Given previous support for a schizoid taxon, it is not surprising that examination of the Schizotypal scale revealed a categorical structure. Quite unexpectedly, however, Dependent and Somatizing scales also manifested categorical structures. Each of these results necessitates careful consideration and are discussed below.

Dependent. It is difficult to imagine dependency as a categorical psychological phenomenon; dependency is a facet of all human relationships. While dependency itself may be a dimensional construct, pathological dependency may be a distinct psychological phenomenon. Previous descriptors of dependent personalities include “infantile,” “immature,” and “inadequate,” highlighting a lack of self-definition that is not an aspect of dynamic, normal dependency (Bornstein, 1997; PDM Task Force, 2006). It is possible that the specific items chosen for the Dependent Spectra scale reflect these idiosyncratic elements of pathological dependency. Infantile aspects of dependency are well represented in the Dependent Spectra scale in the items “wish to be a child” and “helpless making decisions.” Aspects of inadequate self-definition are also particularly well captured in items “changeable opinions” and “model behavior after that of others.” Bifactor analyses of PD constructs have also identified passivity (Whitley, 2019), and the Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017) workgroup identified a trait of detachment that they labeled “interpersonal passivity,” which may be infantile indicators of Dependency Spectra.

Somatizing. Interestingly, the mean CCFI (.68) for the Somatizing scale revealed the most support for a categorical structure of all the scales analyzed. There is some debate about whether somatizing behavior can be so key to a person’s way of being that it meets general criteria for personality pathology. Somatizing PD is not represented in the *DSM-5* (APA, 2013)

or the *ICD-11* (WHO, 2015), but it is defined in the *PDM-2* (PDM, 2017). The authors of the *PDM-2*, Lingardi & McWilliams (2017), acknowledge the paucity of research into a somatizing personality but posit that individuals are too enmeshed within medical models of treatment to present for psychological treatment and are more likely to be diagnosed with chronic pain or autoimmune disorders. As a result, these individuals are likely to exhaust their healthcare resources in search for help that treatment of their physical ailments cannot provide.

More recent research (published after finalization of the *PDM-2*) does support somatizing as a discrete pathological construct. Bifactor models have named somatization as a facet subsumed under a general severity factor. The Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017) workgroup named six spectra incorporated under a superspectra of severity (antagonistic externalizing, detachment, disinhibited externalizing, internalizing, somatoform, and thought disorder). Similarly, bifactor analyses of the PD Spectra arrived at a five-factor model (somatizing, extraversion, depression, passivity, and anger) underlying the general severity dimension (Whitley, 2019). Therefore, cutting edge research not only argues for a somatizing PD but argues that representation of somatization may be more important than representation of more widely accepted PDs.

Conceptualizing somatization as a categorical psychological phenomenon could lead to substantial improvements in healthcare. First, categorical diagnoses are an excellent fit with the medical model. This means that healthcare professionals will be better able to incorporate advances in our understanding of Somatizing PD into their diagnostic framework. Second, categorical diagnoses are easier to make because levels of severity are qualitatively different, not just different by degrees as with a dimensional diagnosis (Streiner et al., 2015).

MMPI-2 PSY-5 Scale Findings

Hypothesis 2a: PSY-5 Scales. I hypothesized that all PSY-5 scales (which are modeled as the pathological version of the FFM personality traits) would manifest a dimensional structure. This hypothesis was not supported. Only the PSYC scale was dimensional. The AGGR, DISC, and INTR scales were ambiguous, and the NEGE scale was categorical. While the PSY-5 are based on the well-established dimensional FFM, the PSY-5 constructs may not be uniformly dimensional. Another possibility is that the items chosen from the MMPI-2 item pool to represent the PSY-5 are less representative of dimensionality than the constructs that they aim to tap.

Additional Notable Findings within the PSY-5 Scales.

PSYC. It is not particularly notable that Psychoticism manifested a dimensional structure, since it was conceptualized within the dimensional framework of the PSY-5. It is notable, however, that of the five scales, it was the most dimensional. Due to the aim of the PSY-5 to represent dimensional constructs, a dimensional result suggests that the items chosen for the scale were better representations of dimensionality than items on other scales. However, the strong dimensionality of PSYC is notable for two reasons. First, it is worth reiterating that the PSY-5 are derived from the FFM, but they are not mirrored models. The PSYC construct is not represented in the FFM and cannot be construed as the pathological counterpoint to any of the FFM constructs.

It is also worth noting the contrast between the dimensionality of PSY-5 Psychoticism and the categorical structures of the Schizoid and Schizotypal Spectra. Typically, we think only of the psychotic disorders when we think of psychosis, e.g., schizotypal PD, schizophrenia, delusional disorder, etc. But McWilliams's (2019) points out that psychotic symptoms may occur

in many Axis I disorders. Psychotic states can occur with severe depression, within OCD, in eating disorders and body dysmorphia, and in dissociative reactions to trauma (McWilliams & Shedler, 2017). Harkness and McNulty (1994) took an even broader view of the PSYC construct that emphasized a cognitive style that is overinclusive and internally preoccupied/externally detached. In point of fact, PSYC was conceptually unrelated to specific disorders (Harkness & McNulty, 1994).

NEGE. On the surface, it is surprising that NEGE emerged as categorical in nature given the dimensional theoretical underpinnings of the PSY-5. Recall that NEGE is labeled as Negative Emotionality/Neuroticism. NEGE appears to be conceptually closer to neuroticism than negative emotionality or pessimism. Harkness et al. (2011) pointed to NEGE as a measure of hypervigilance to danger that is met with fear and anxiety (i.e., a disposition toward flight rather than fight). Relatedly, Arnau, Handel, and Archer (2005) identified a Phobias subscale to NEGE using principal components analysis.

Additionally, NEGE has been correlated with a wide array of pathology including history of suicide attempts, alcohol abuse, and Avoidant, Borderline, Narcissistic, Paranoid, and Schizotypal traits (Harkness et al., 2011; Mulay et al., 2019). Factor analysis of the MMPI-2 Spectra, PSY-5, and the MCMI-III scales elucidated a first factor including Borderline Spectra, MCMI Borderline, and PSY-5 NEGE. Taken together with findings that BPD loaded almost entirely onto a first-order severity factor of PDs (Sharp et al., 2015; Whitley, 2019), NEGE may be a strong component of PD severity also. The taxon base rate for NEGE (.67) in the current dataset indicates a robust representation of neuroticism within a clinical sample. It is possible that NEGE is categorical to the extent that it differentiates healthy from unhealthy personality functioning.

Limitations of the Present Study

The present study is limited to examination of personality pathology as measured by the MMPI-2. While the MMPI-2 has a number of advantages as an assessment tool, it comes with challenges both as a general assessment tool and as a measure of personality pathology. Both the Spectra and PSY-5 scale sets were created post-hoc from preexisting MMPI items. This is quite different than formulating items with the express purpose of measuring personality pathology. MMPI-2 items are also answered in dichotomized responses of “yes” or “no,” which has demonstrated partial bias toward taxonic findings (Haslam et al., 2012). Further, the current study did not match clinic diagnoses to MMPI-2 responses. However, the scales have undergone considerable external validation with existing personality measures including the MCMI-III, PID-5, and PSY-5 (Mulay et al., 2018).

The patient population at the university clinic encompasses a wide range of personality pathology, both in terms of level of severity and specific PDs. A large outpatient population, like that of the current data sample, covers a range of personality disorder diagnoses but is also likely to be limited in the inclusion of persons at the highest and lowest ends of psychological functioning. High functioning individuals will not present to treatment and very low functioning individuals will require more intensive care than an outpatient clinic. While there may be benefits to separate analysis of community and inpatient samples, a mixed sample of community, outpatient, and inpatient populations would be best suited to assessing possible dimensionality of PD constructs. Nonetheless, descriptive statistics for the scales indicate a large range within the present sample (Mulay et al., 2018). Additionally, sample type has not been shown to bias taxonic results (Haslam et al., 2012).

Specific to the current dataset, custody evaluations were a significant referral source for assessments used in this dataset. It is possible that respondents may have wished to downplay undesirable traits, thereby suppressing some of the true dimensionality of specific constructs. While possible, descriptive statistics indicate these results are less likely to be an artifact of the population tested. Further, a review of taxometric results dispelled hypotheses that sample settings and data types (e.g., self- vs. informant-report) produce pseudo-taxonic findings (Haslam et al., 2012).

Directions for Future Research

I recommend a few extensions to the present study. My initial recommendation is to expand the number of cases included in the analysis. Conventional standards for valid MMPI responses suggest cutoffs of $VRIN \leq 80T$, F and $FB \leq 110$, $Fp \leq 100$, $L \leq 80 T$, $K \leq 75T$, and $S \leq 75 T$. It is possible that responses falling above these cutoffs include profiles of severe pathology in addition to spurious profiles. Results for a number of scales were ambiguous. Running analyses on the full data set may yield clearer dimensional or categorical results. *RTaxometrics* handles missing data by deleting responses. Data analytic strategies, such as multiple imputation for missing data, might result in more significant results. Further, our clinic research group should consider external validation of responses by matching each MMPI profile to the chart diagnosis (Witte et al., 2017).

I also recommend that future research analyze the indicators of each of the Spectra and PSY-5 scales to better understand taxometric results. Parsing indicators into facets of the identified constructs may disentangle ambiguous results. It will be beneficial to pair indicators from each scale to indicators from other assessment measures (e.g., MCMI, PID-5) to provide a robust sampling of the identified construct. For example, pulling indicators of suicidality from

the Borderline Spectra (e.g., “Recent suicidal thoughts”) and pairing them with additional indicators of suicidal risk are likely to increase taxometric results (Rufino et al., 2018; Witte et al., 2017). Similarly, there is some support for manipulation as taxonic (Tran, Bertl, Kossmeier, Pietschnig, Stieger, & Voracek, 2018). Removing those indicators from the Antisocial Spectra may increase its dimensionality, and pairing manipulation indicators with Interpersonally Exploitive indicators from the MCMI-III Narcissism scale may increase categorical results.

Conclusions

The current study examined the structure of personality pathology by analyzing MMPI-2 Spectra and PSY-5 scales to determine whether each scale fit a dimensional or categorical structure. The Spectra scales were created as a hybrid model of dimensional and categorical elements of personality pathology. In contrast the PSY-5 are modeled after the FFM personality traits and are conceptualized as dimensional representations of personality pathology. As such, I hypothesized that 1) the Spectra scales would look more categorical than the PSY-5 scales, but that 2) the Spectra would overall represent a mixed or ambiguous structure. Hypothesis 1 was not supported; most scale structures were ambiguous and there were dimensional and categorical scales within each set. Consistent with past taxometric research, I hypothesized that 3) the Schizoid scale would manifest a categorical structure, which was supported. I also hypothesized that 4) the Borderline scale would support a dimensional structure because theory and research has questioned whether BPD is a discrete diagnosis or whether it is more representative of personality functioning broadly. This hypothesis was not supported.

It is possible that dimensionality emerged in fewer scales than hypothesized due to the fact that both the PSY-5 and the Spectra scales were created post-hoc from existing MMPI-2 items. Perhaps PSY-5 scales would manifest greater dimensionality were items composed with

the express intent of capturing dimensional aspects of personality pathology. Moreover, as dichotomous response formats have shown a slight bias toward taxonic findings, it is possible for increased dimensionality to emerge with alternative forms of assessment. Future research can address these questions by analyzing other measures of PDs including self-reports, performance-based measures, and items from structured interviews. It is also important to replicate findings across other samples in addition to across assessment formats.

One argument made against categorical models of PDs contends that because the 10 PDs described in the DSM have not found significant support, there is not support for categorical models. Numerous findings replicating four to five discrete PD phenomena and which mimic the five-factor solution of normal personality functioning (Samuel & Griffen, 2015) have been used to support the dimensionality of PDs. The lack of support for categorical models of PDs is more closely related to the manner in which these disorders have been divided up into categories. It is possible and should be considered that PDs can be reconstituted into five discrete phenomena and that these phenomena are categories, not dimensions. Nevertheless, scales with taxonic results are directly and indirectly supported within the existing literature. Taxometric and bifactor models support schizoid, schizotypal, somatization, negative emotionality/neuroticism, and interpersonal passivity as discrete constructs important to PDs (Kotov et al., 2017; Whitley, 2019). Still, it is unlikely that these phenomena alone explain the full landscape of PD pathology. Therefore, it is important that researchers consider that a one-size-fits-all model of PDs is insufficient. Some phenomena may be better captured categorically while others, dimensionally.

The structural heterogeneity of PDs in the current study has profound implications not only for diagnostic systems but also for assessment and treatment. Within the realm of assessment, dimensional and categorical components of PDs have unique utility. Dimensional

components speak to the variation of personality present across the population. As such, assessing dimension improves our ability to see nuance rather than splitting people into categories of normal and abnormal. Because normal often reads as “good” and abnormal as “bad,” a dimensional focus reduces stigma. This approach is appealing and consequential to clinicians whose aims are toward understanding and building empathy for their patients. Thus, clinicians may prefer dimensions during ongoing treatment. By contrast, assessment of the categorical components of PDs are useful in identifying a person in need of treatment and in evaluating meaningful change from treatment. For example, if a “wish to be a child” is a feature of pathological dependency underlying a person’s inability to pursue work and satisfying romantic relationships, it will be a more useful target for therapy than is a person’s sensitivity to criticism. Whereas dimensions increase empathy, categories point us toward where to help. Each plays an essential role in clinical psychology.

In sum, the primarily ambiguous findings caution researchers, authors of diagnostic manuals, and clinicians against a wholesale shift toward dimensionality. While the mixed model of the Alternative Model of Personality Disorders within the DSM-5 was seen as a *compromise* between the old guard and the new, these findings provide tentative support that neither approach has an authority on the true nature of PDs.

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APPENDICES

Appendix 1: PD Spectra Scales ItemsAntisocial Scale

- 27 Payback when wronged (T)
- 35 History of stealing (T)
- 41 Lying (T)
- 66 Don't like laws (T)
- 81 Most people would lie to do better than others (T)
- 84 History of school suspension (T)
- 100 Don't take risks for fun (F)
- 105 Sometimes sent to principal (T)
- 110 Most people will act unfairly to get ahead (T)
- 123 Would sneak into a movie (T)
- 134 Wants to start physical fights (T)
- 240 Can't resist stealing (T)
- 250 Entertained by others' criminal activities (T)
- 266 No illegal activity (F)
- 269 Best to come up with a story if caught (T)
- 284 People lie to get out of things (T)
- 324 Scares others for fun (T)
- 344 Likes gambling (T)
- 412 History of school truancy (T)
- 418 Bending laws is okay (T)
- 429 No history of illicit drug use (F)
- 431 Bad grades in school (T)
- 432 Selective truth telling to protect self (T)
- 540 Broken things when drunk (T)
- 548 Physically attacked others when drunk (T)

Avoidant Scale

- 46 Avoid talking to old friends (T)
- 79 Teasing doesn't bother me (F)
- 161 Often try to hide embarrassment (T)
- 167 Difficulty talking to new people (T)
- 178 Sweat when embarrassed (T)
- 185 Wish less shy (T)
- 243 Difficulty choosing topic in group of people (T)
- 262 Would not be embarrassed to state opinion in a group (F)
- 265 Others speak to me first (T)
- 275 Difficulty talking in class (T)
- 289 Easily embarrassed (T)
- 310 Cross streets to avoid people (T)
- 321 Comfortable entering a room of people (F)
- 335 Not self-conscious (F)
- 337 More likely to be a wallflower at a party (T)
- 342 Speak with strangers on public transit (F)
- 360 Like meeting new people (F)
- 375 Personal questions are nerve-wracking (T)
- 446 Difficulty standing up for self (T)

Borderline Scale

- 23 Uncontrollable crying and laughing (T)
- 37 Feel like breaking things (T)
- 63 Thick-skinned (F)
- 82 Often regret actions (T)
- 116 Unexplainable irritability (T)

- 146 It is easy to make me cry (T)
- 213 Anger easily but calm down quickly (T)
- 215 Frequent brooding (T)
- 256 Hate family at times (T)
- 271 Intense feelings (T)
- 285 Heightened sensitivity (T)
- 288 Relatives find fault with me (T)
- 302 Lose patience (T)
- 328 Unpleasant thoughts linger (T)
- 372 Difficult to anger (F)
- 382 Frequent serious arguments with close others (T)
- 386 Physically removed self to avoid regret (T)
- 389 Hotheaded (T)
- 405 Generally calm (F)
- 430 Regret being irritated often (T)
- 442 Unreasonable worries (T)
- 444 High-strung (T)
- 502 Harmful habits (T)
- 513 All-encompassing anger (T)
- 520 Recent suicidal thoughts (T)
- 530 Self injury (T)
- 542 Intense anger (T)
- 564 Never lose self-control (F)

Dependent Scale

- 70 Easily defeated in arguments (T)
- 127 Hurt by critique (T)

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

Depressive Scale

- 9 Interesting things in life (F)
- 22 Misunderstood (T)
- 38 Unable to get going on tasks (T)
- 52 Life lived wrongly (T)
- 56 Wish to be happy as others (T)
- 75 Life is usually worthwhile (F)
- 92 Uncaring about what happens to me (T)
- 130 Uselessness (T)
- 148 Never felt better (F)
- 196 Often worries (T)
- 273 Often straining (T)
- 301 Near constant anxiety (T)
- 303 Most of the time I wish I were dead (T)
- 317 Anxious/upset to leave home (T)
- 339 Problems pile up (T)
- 364 Gives up quickly (T)

- 377 Unhappy with self (T)
- 388 Infrequently sad (F)
- 400 Uncaring (T)
- 408 Difficulty letting go of disappointment (T)
- 411 Self is no good (T)
- 415 Worries things will go wrong (T)
- 450 Unable to do things well (T)
- 454 Hopeless future (T)
- 485 Not as good as others (T)
- 516 Empty/meaningless life (T)
- 517 Difficulty keeping jobs (T)
- 539 Loss of desire to make things better (T)
- 546 Thoughts of death and afterlife (T)
- 556 Financial worries (T)

Histrionic Scale

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

- 353 Enjoy just being with other people (T)
- 359 Find crowds exciting (T)
- 363 Worries melt in a lively crowd (T)
- 370 Enjoy parties (T)
- 456 Want pricey clothes (T)
- 552 Trust will always be cared for (T)

Narcissistic Scale

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

Obsessive Compulsive Scale

- 55 Perseverate (T)
- 87 Unable to make up mind - too many options (T)

- 135 Unable to make up mind - lost opportunities (T)
- 136 Impatient when interrupted (T)
- 212 Principled (T)
- 309 Overly thoughtful (T)
- 313 Obsessive counting (T)
- 346 Just as good as experts (T)
- 356 Hard to set aside projects (T)
- 410 Verbally address small social faux pas (T)
- 423 Persistent to win arguments (T)
- 461 Don't like to be rushed (T)
- 535 Angry when others take too long (T)
- 547 Hoarding (T)

Paranoid Scale

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

- 445 My managers have stepped on their subordinates to get ahead (T)
- 484 People are unkind (T)
- 549 Always being tested (T)

Schizoid Scale

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

Schizotypal Scale

- 32 Strange experiences (T)
- 72 Soul leaves body (T)
- 168 Derealization (T)
- 198 Hear voices (T)
- 298 Strange smells (T)
- 307 Hear too well (T)
- 311 Unreality (T)
- 316 Strange thoughts (T)
- 319 Strange sounds (T)
- 361 Mind control (T)
- 427 No visions (F)

- 448 Secret imaginary life (T)
- 466 Telepathy of others (T)
- 508 Telepathy of self (T)
- 551 Hear thoughts out loud (T)

Somatizing Scale

- 3 Wake up rested (F)
- 28 Frequent stomach aches (T)
- 33 Infrequent health worries (F)
- 39 Sleeps poorly (T)
- 45 As healthy as friends (F)
- 53 Burning/tingling sensation all over body (T)
- 57 Never feel pain in back of neck (F)
- 91 No muscle twitching (F)
- 97 Fullness in head/nose most of the time (T)
- 101 Feeling of a tight band around head (T)
- 111 Frequent stomach trouble (T)
- 118 Not worried about germs (F)
- 141 Mostly well for past few years (F)
- 149 Tenderness atop head (T)
- 165 Okay memory (F)
- 177 No clumsiness in hands (F)
- 181 No hay fever/asthma (F)
- 208 Infrequent heart/lung symptoms (F)
- 247 Numbness on skin (T)
- 295 No paralysis/muscle weakness (F)
- 536 Upset leads to headache (T)

Appendix 2: Figures

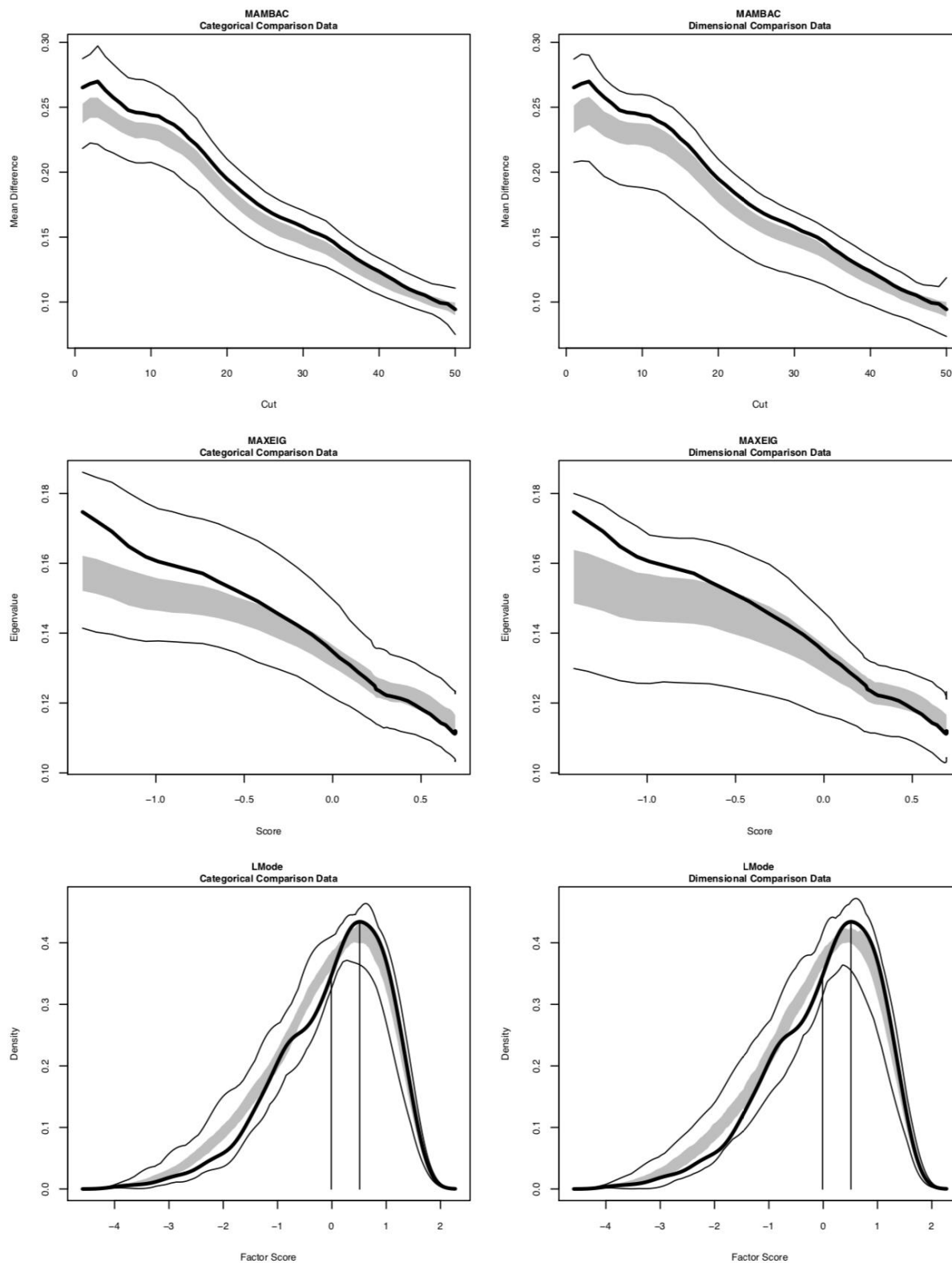


Figure 1. MMPI-2 Antisocial Spectra Taxometric Results

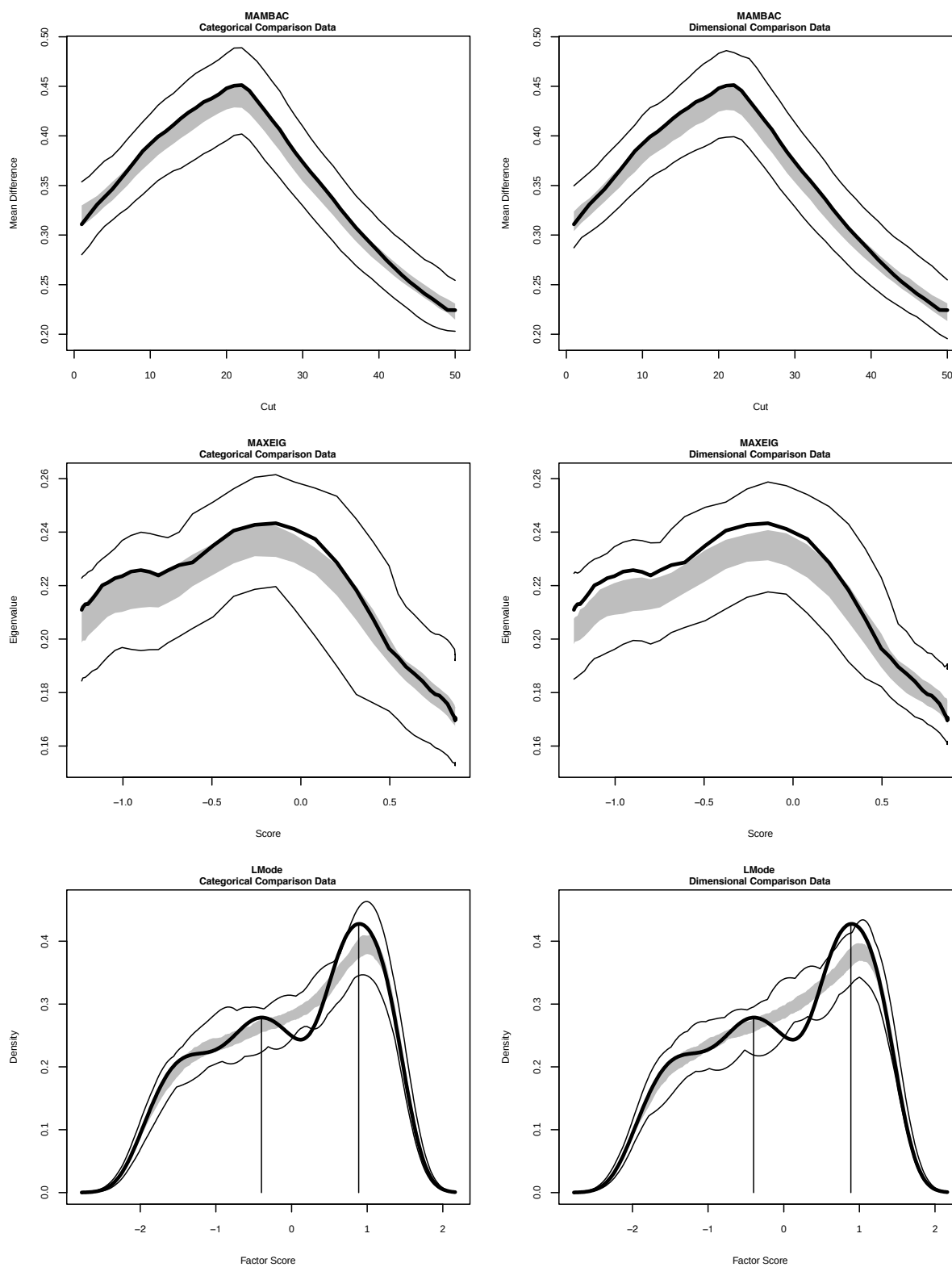


Figure 2. MMPI-2 Avoidant Spectra Taxometric Results

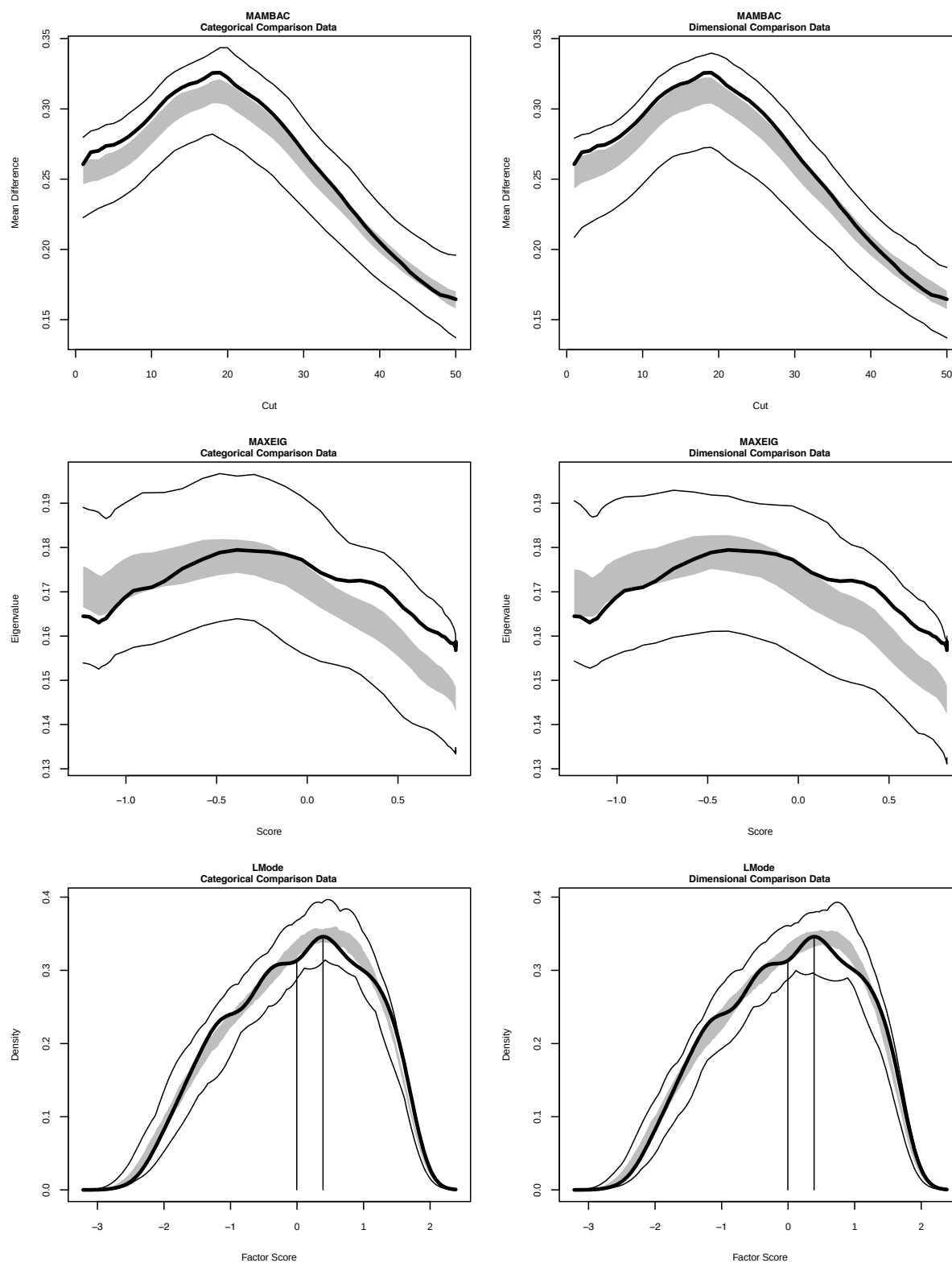


Figure 3. MMPI-2 Borderline Spectra Taxometric Results

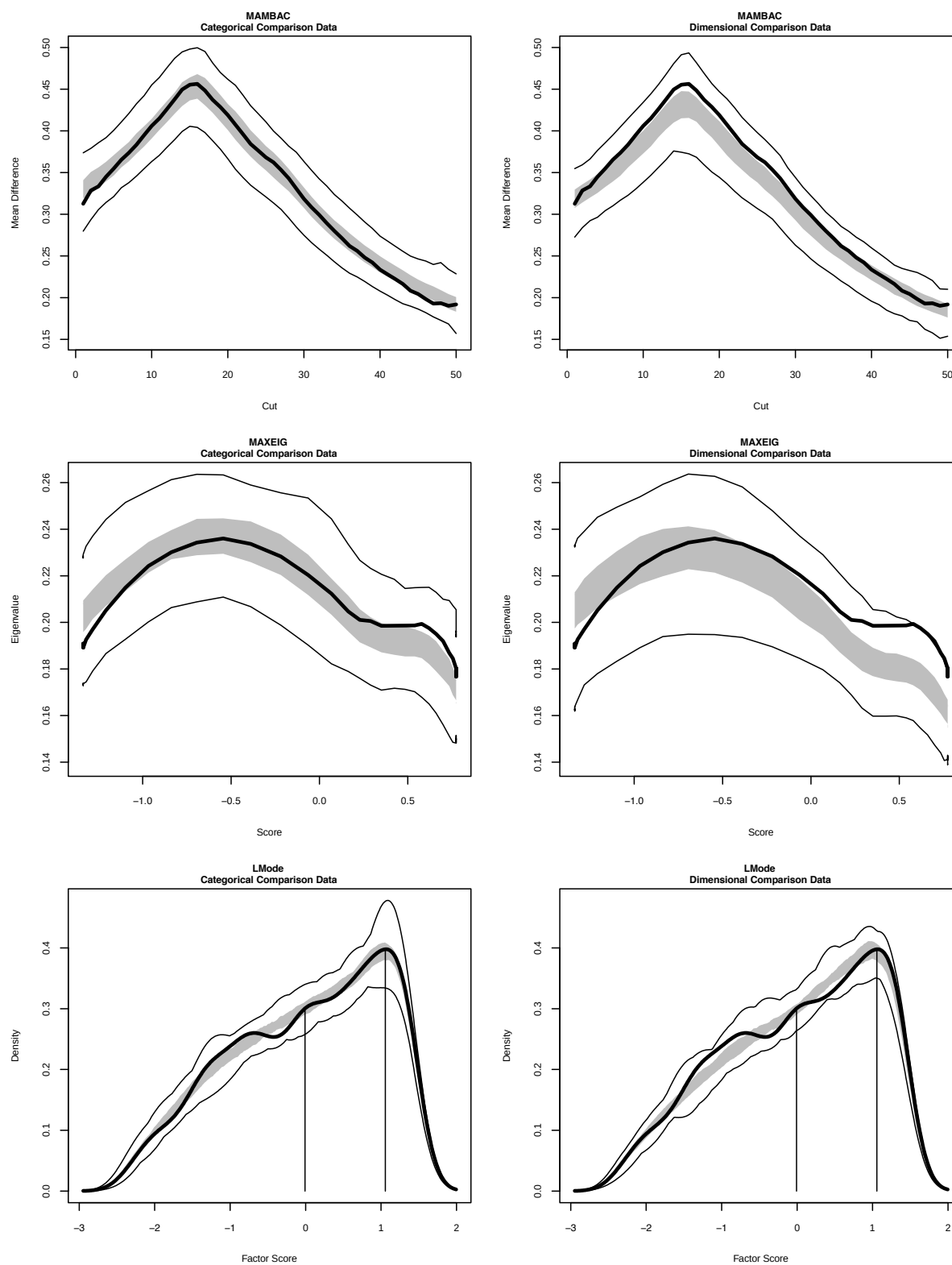


Figure 4. MMPI-2 Dependent Spectra Taxometric Results

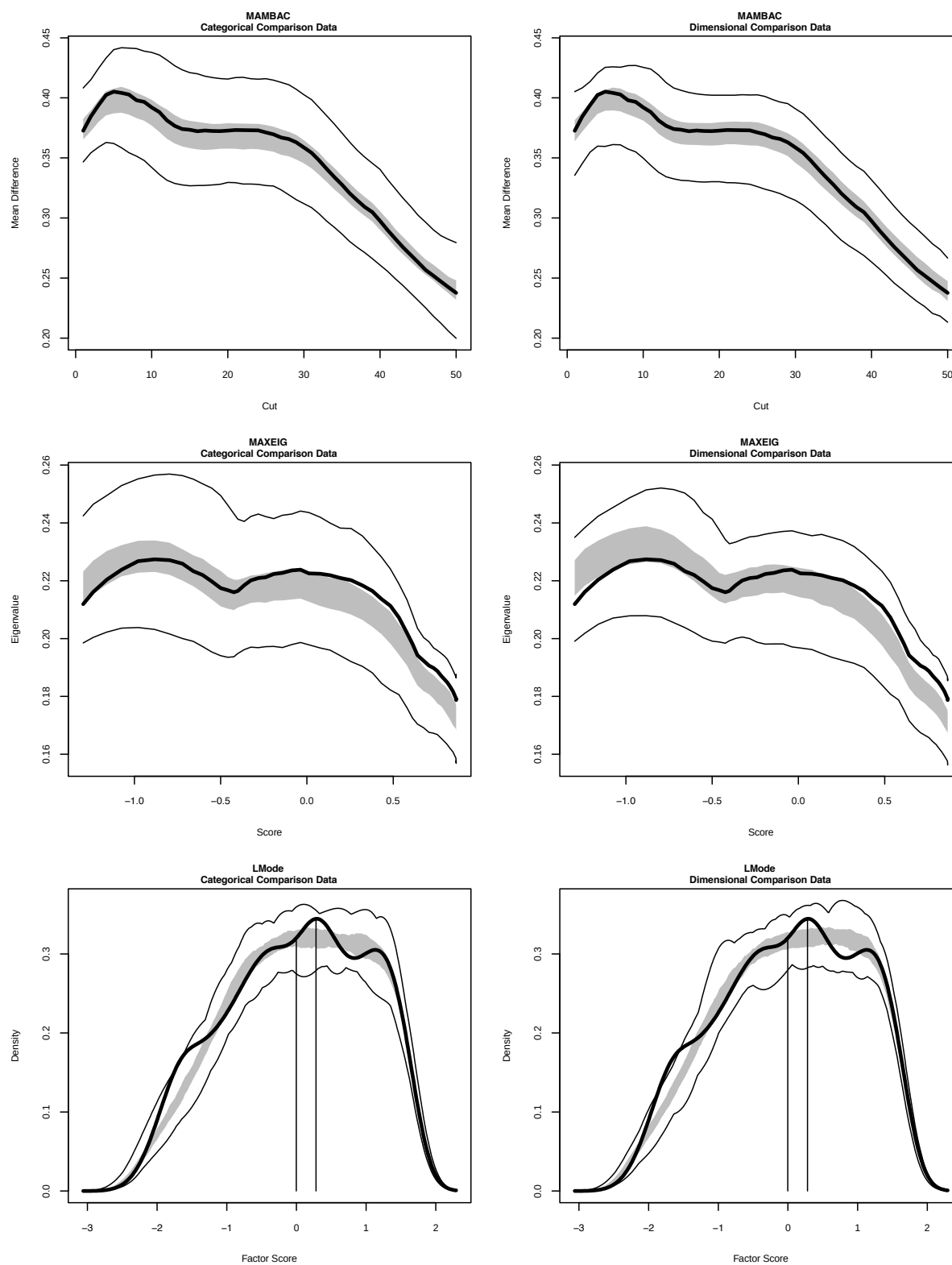


Figure 5. MMPI-2 Depressive Spectra Taxometric Results

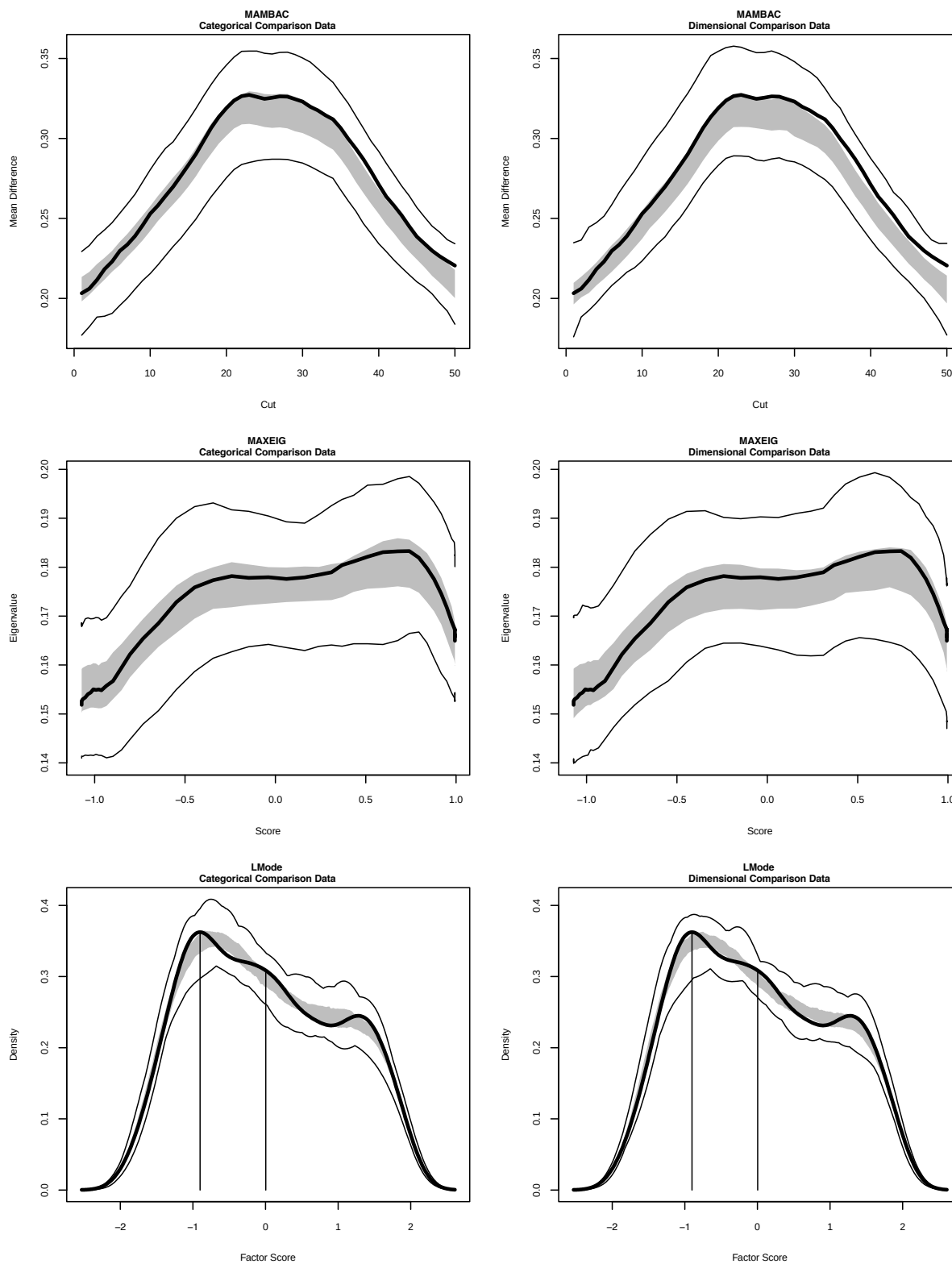


Figure 6. MMPI-2 Histrionic Spectra Taxometric Results

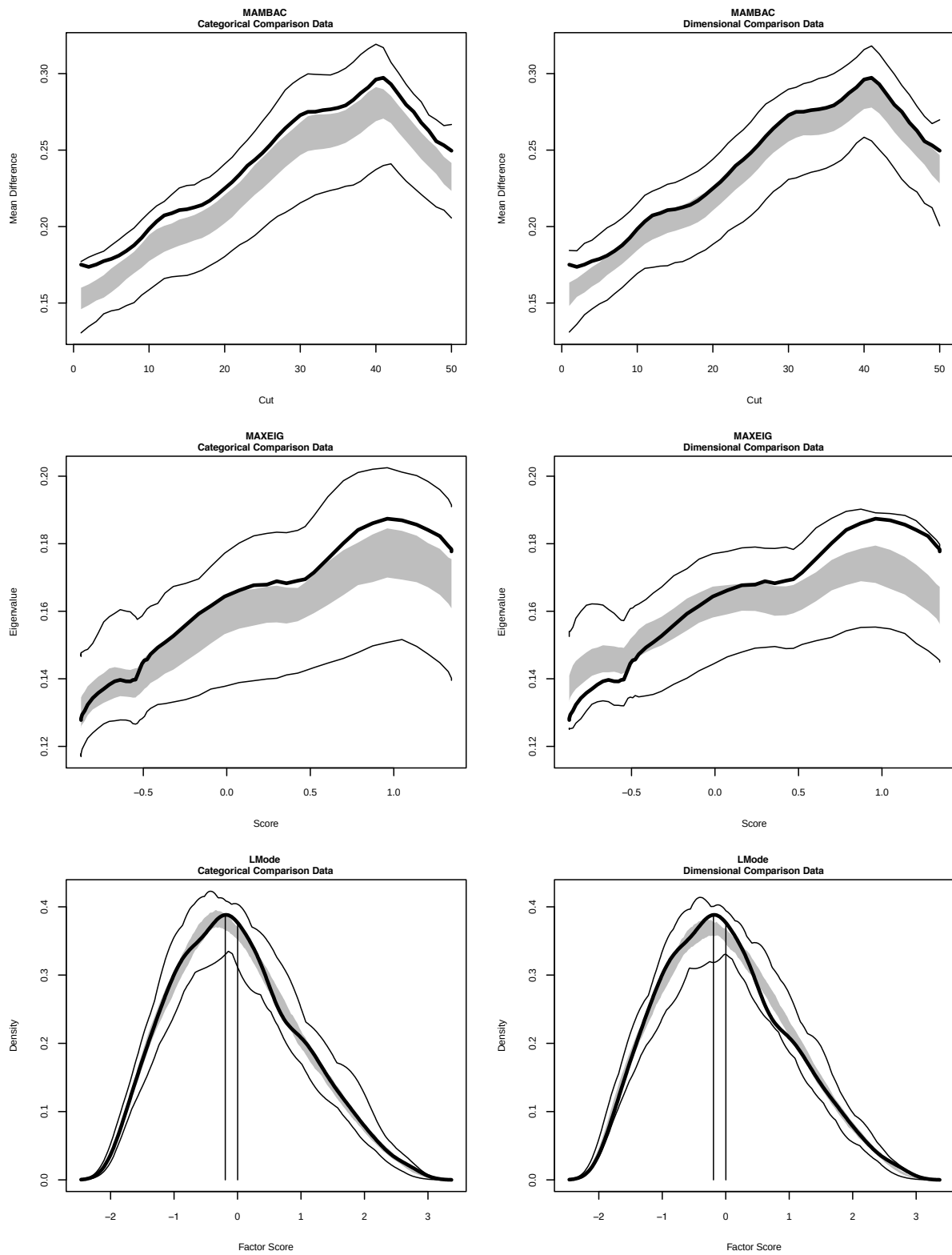


Figure 7. MMPI-2 Narcissistic Spectra Taxometric Results

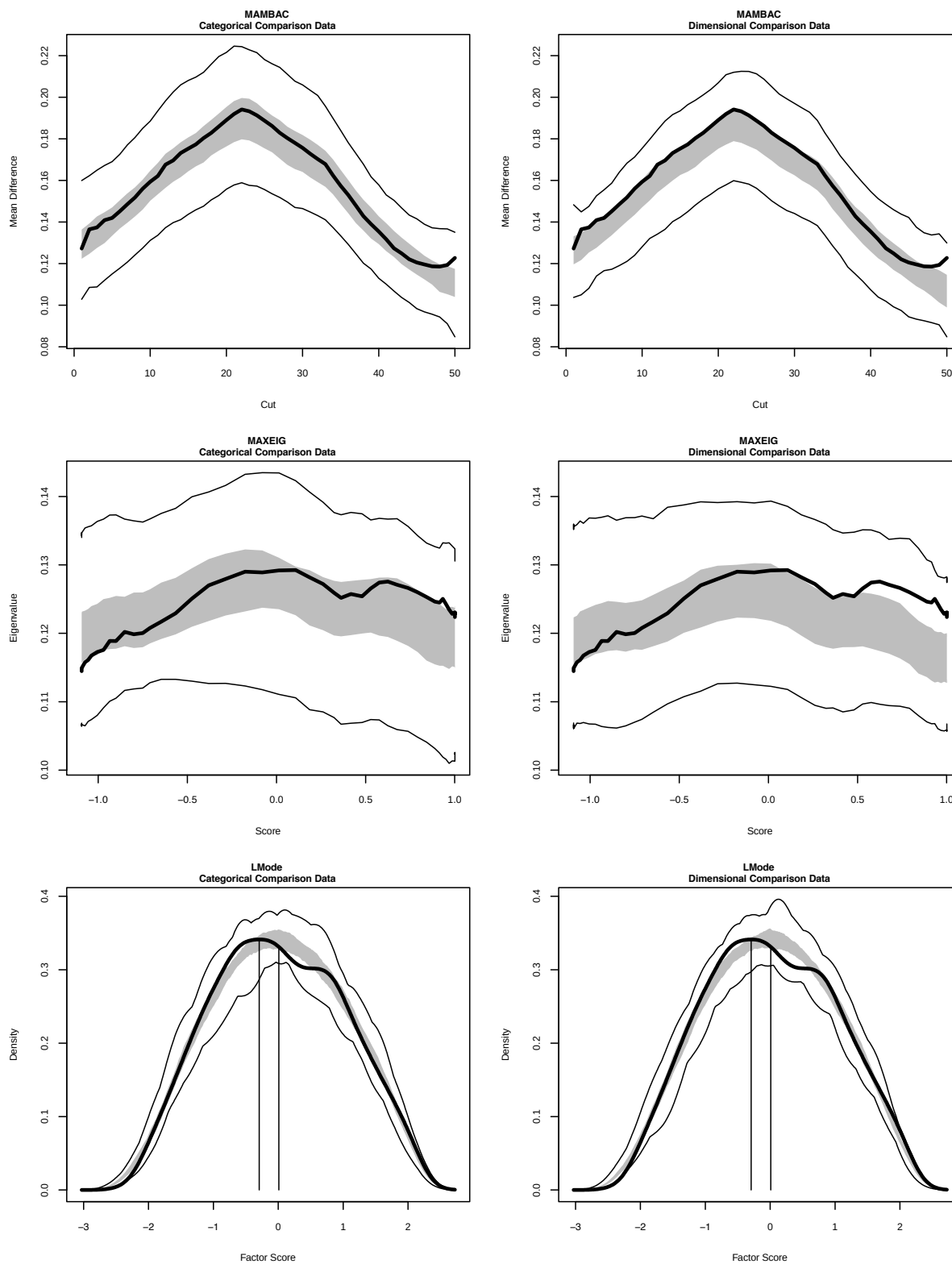


Figure 8. MMPI-2 OCPD Spectra Taxometric Results

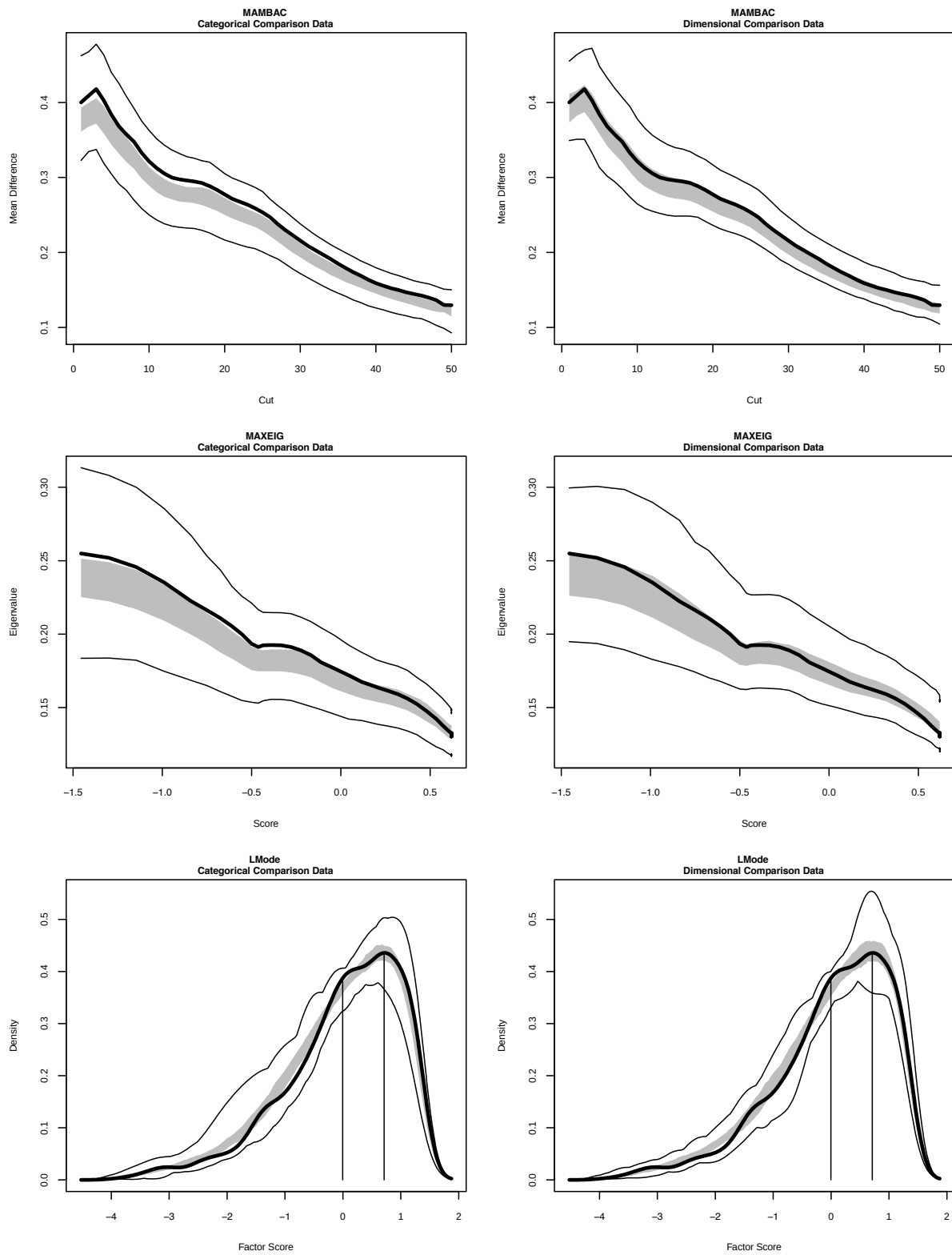


Figure 9. MMPI-2 Paranoid Spectra Taxometric Results

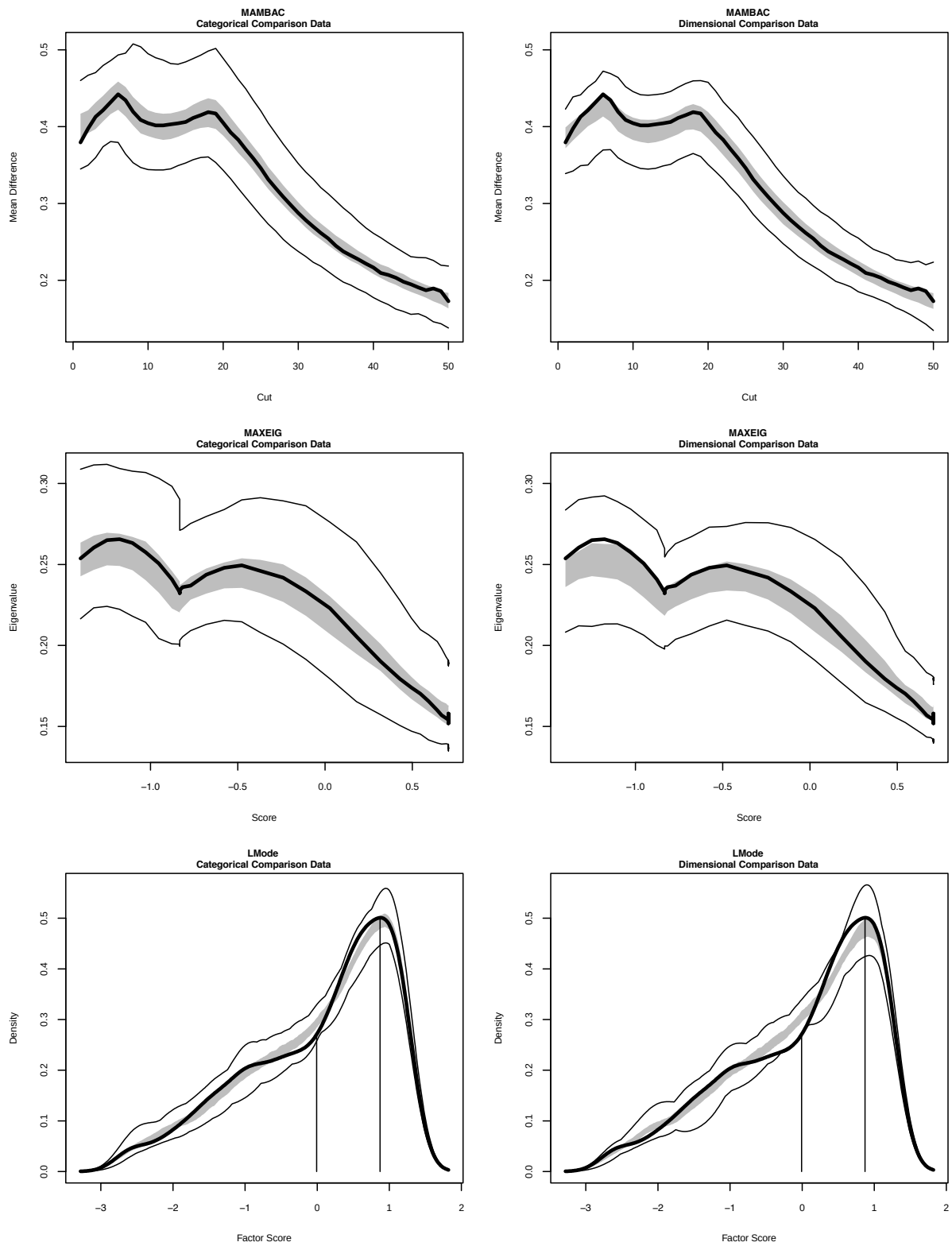


Figure 10. MMPI-2 Schizoid Spectra Taxometric Results

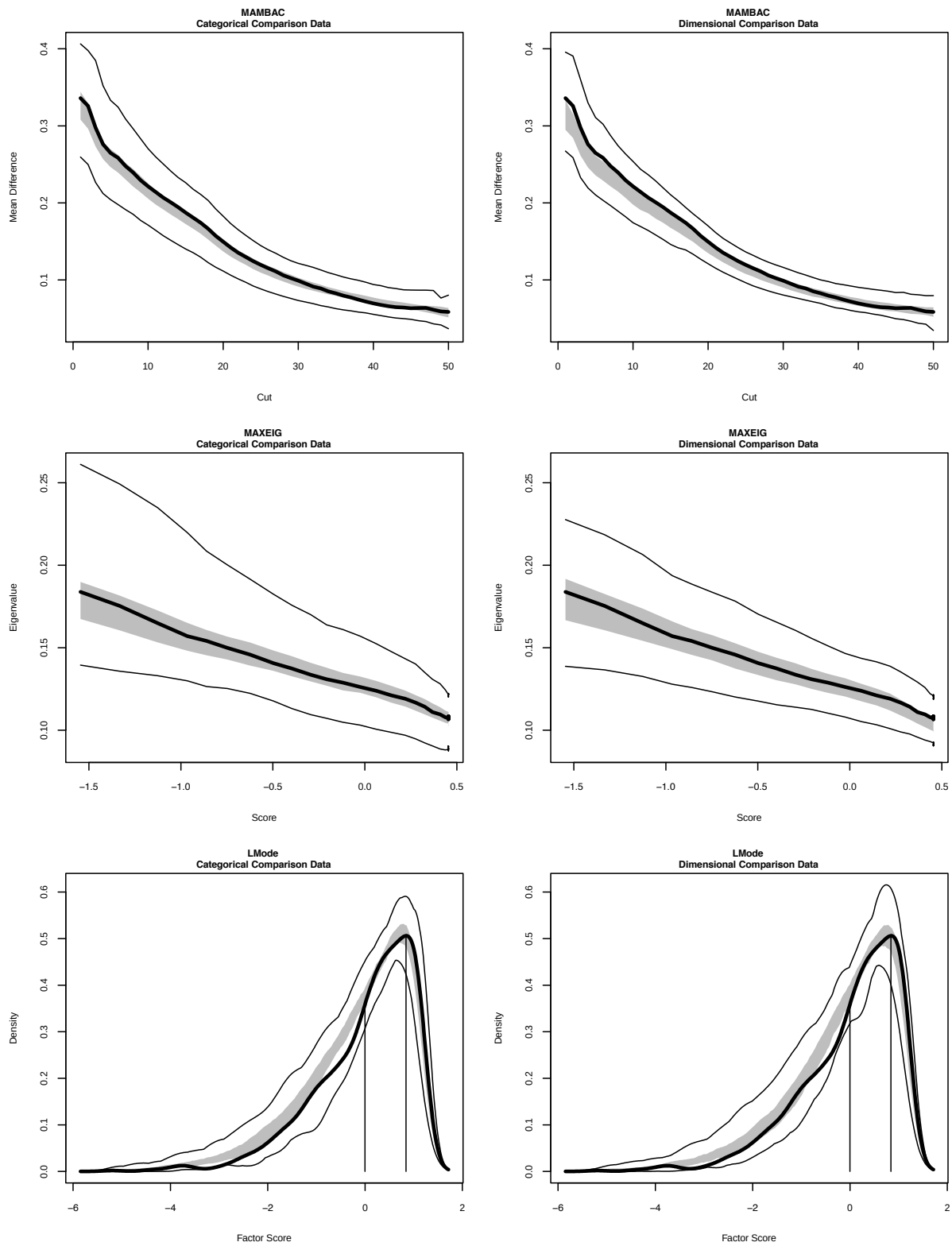


Figure 11. MMPI-2 Schizotypal Spectra Taxometric Results

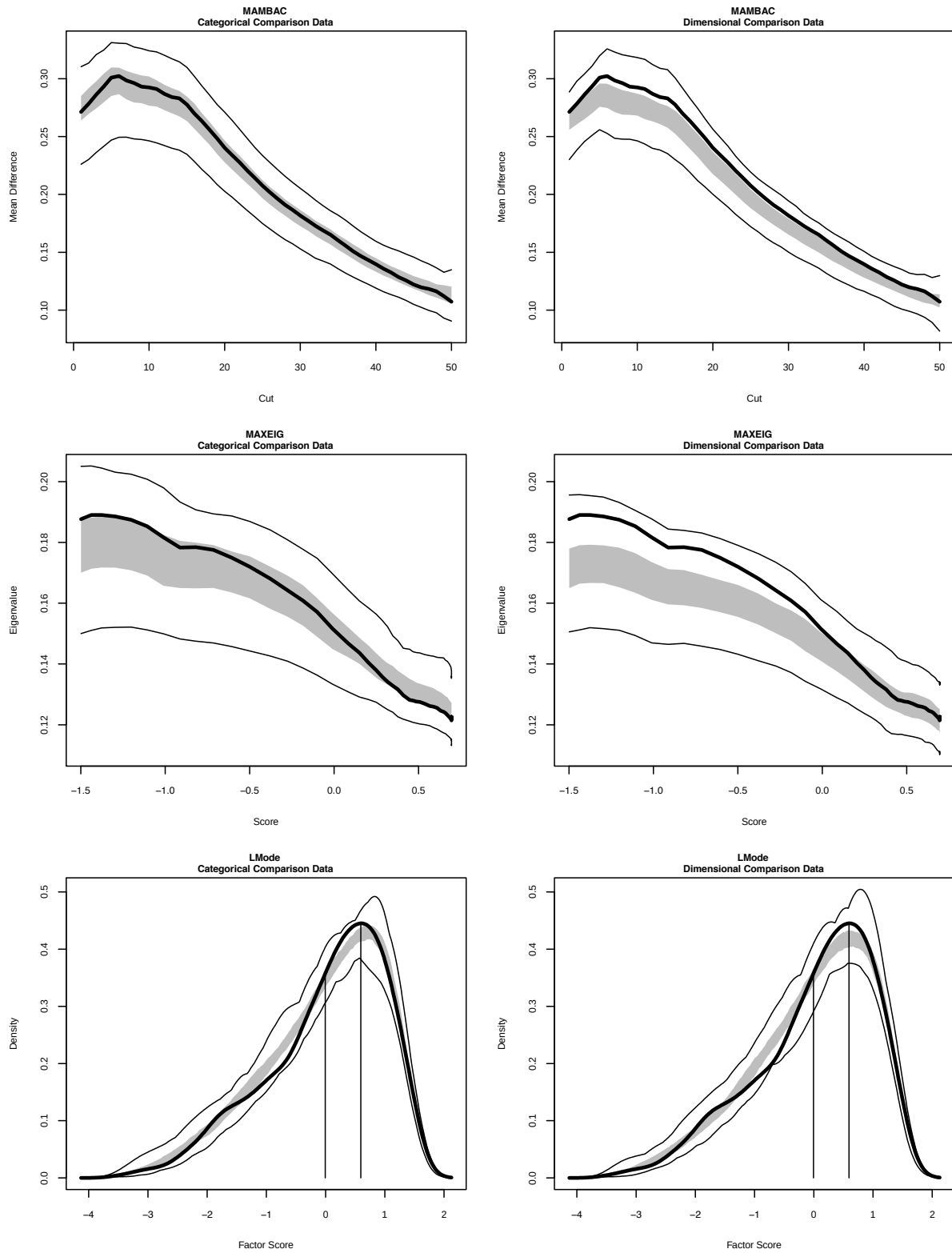


Figure 12. MMPI-2 Somatizing Spectra Taxometric Results

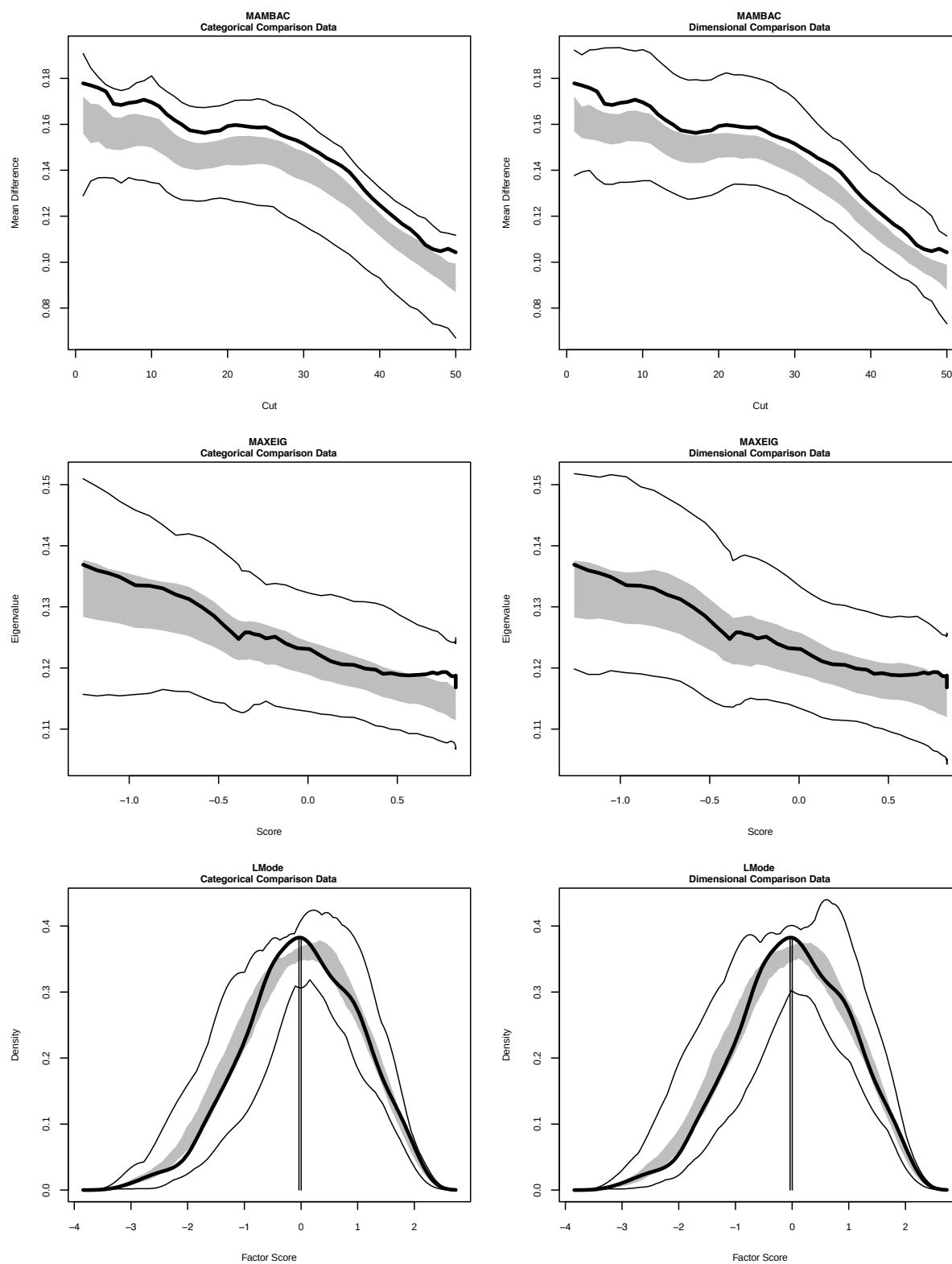


Figure 13. MMPI-2 PSY-5 AGGR Taxometric Results

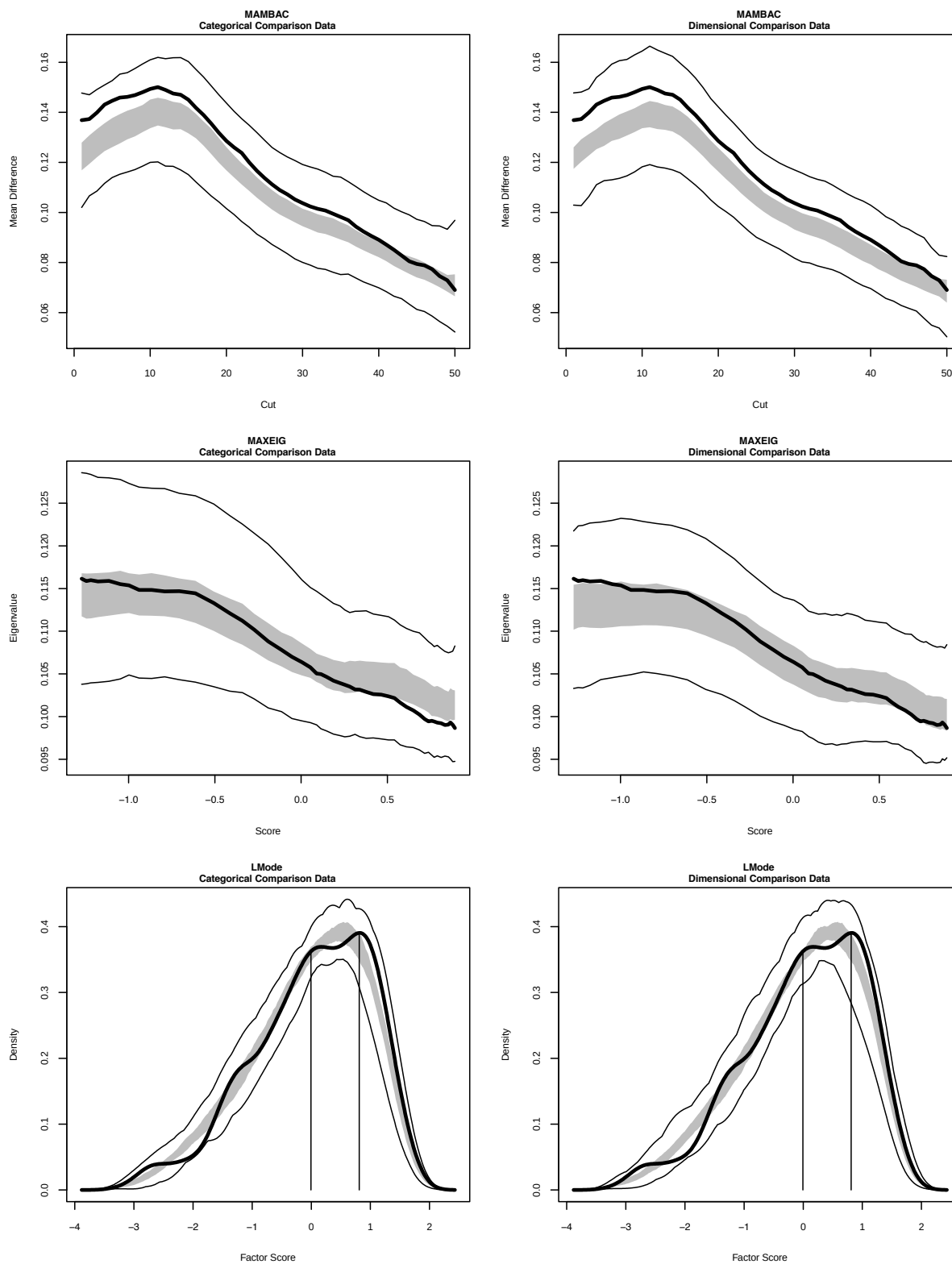


Figure 14. MMPI-2 PSY-5 DISC Taxometric Results

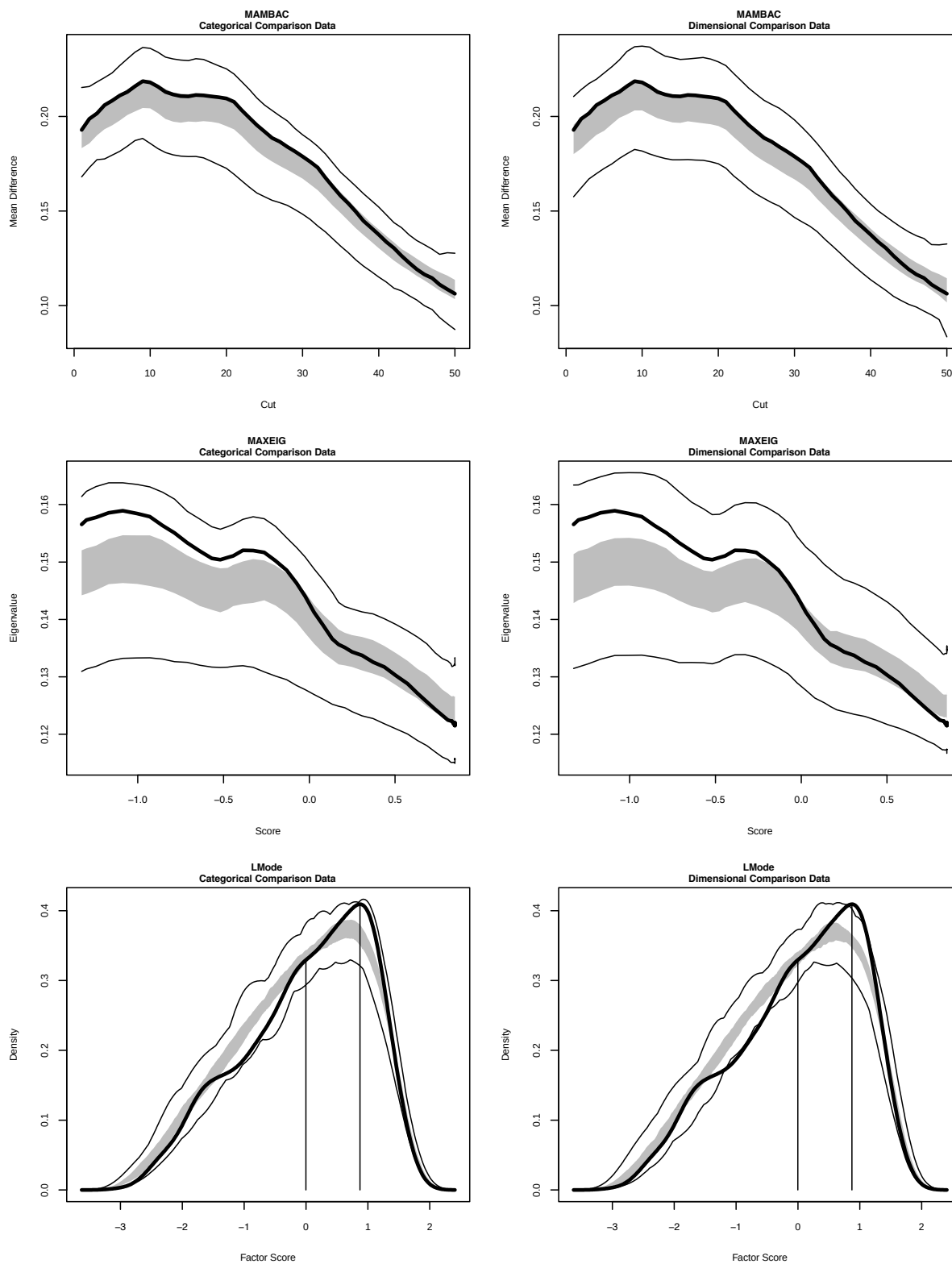


Figure 15. MMPI-2 PSY-5 INTR Taxometric Results

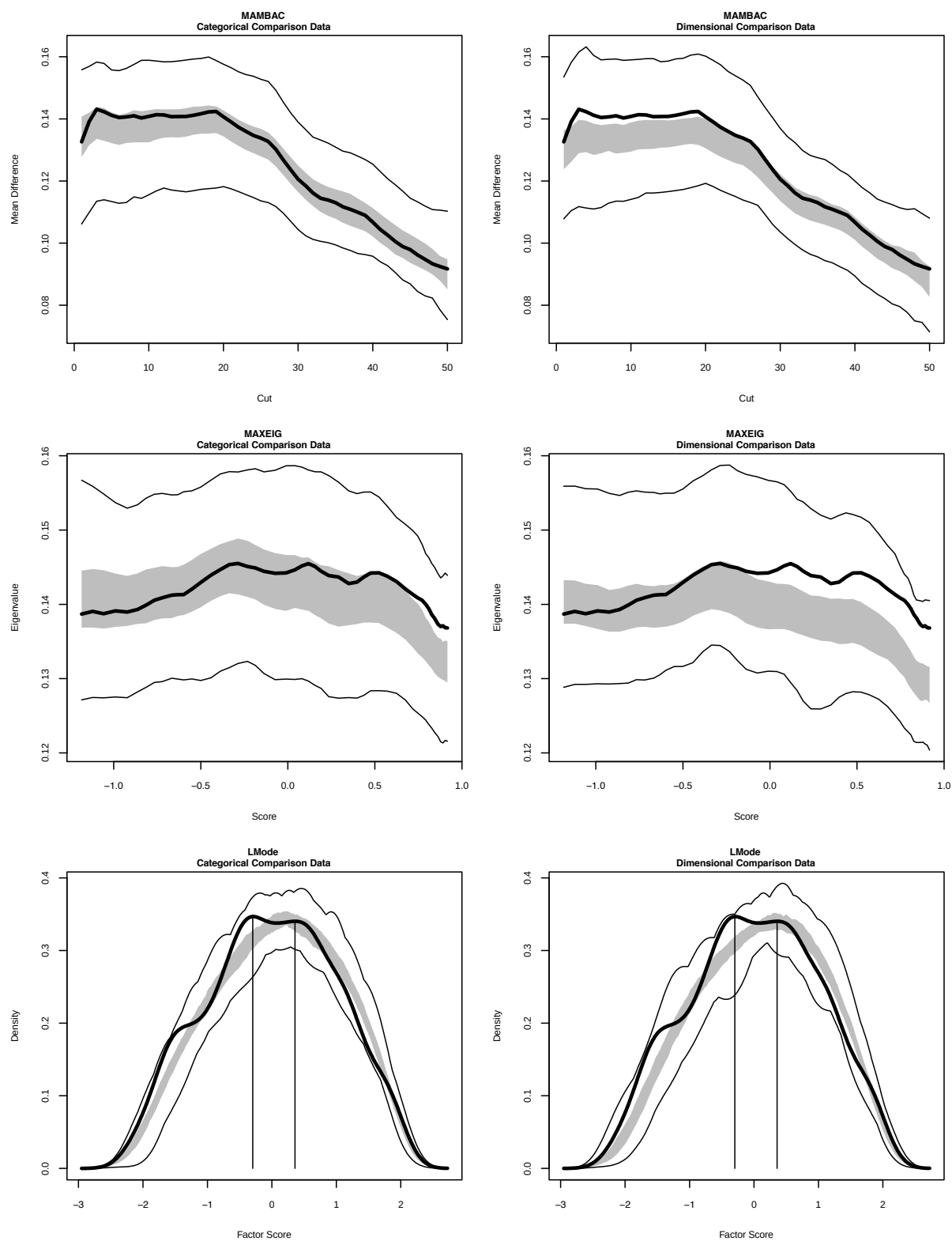


Figure 16. MMPI-2 PSY-5 NEGE Taxometric Results

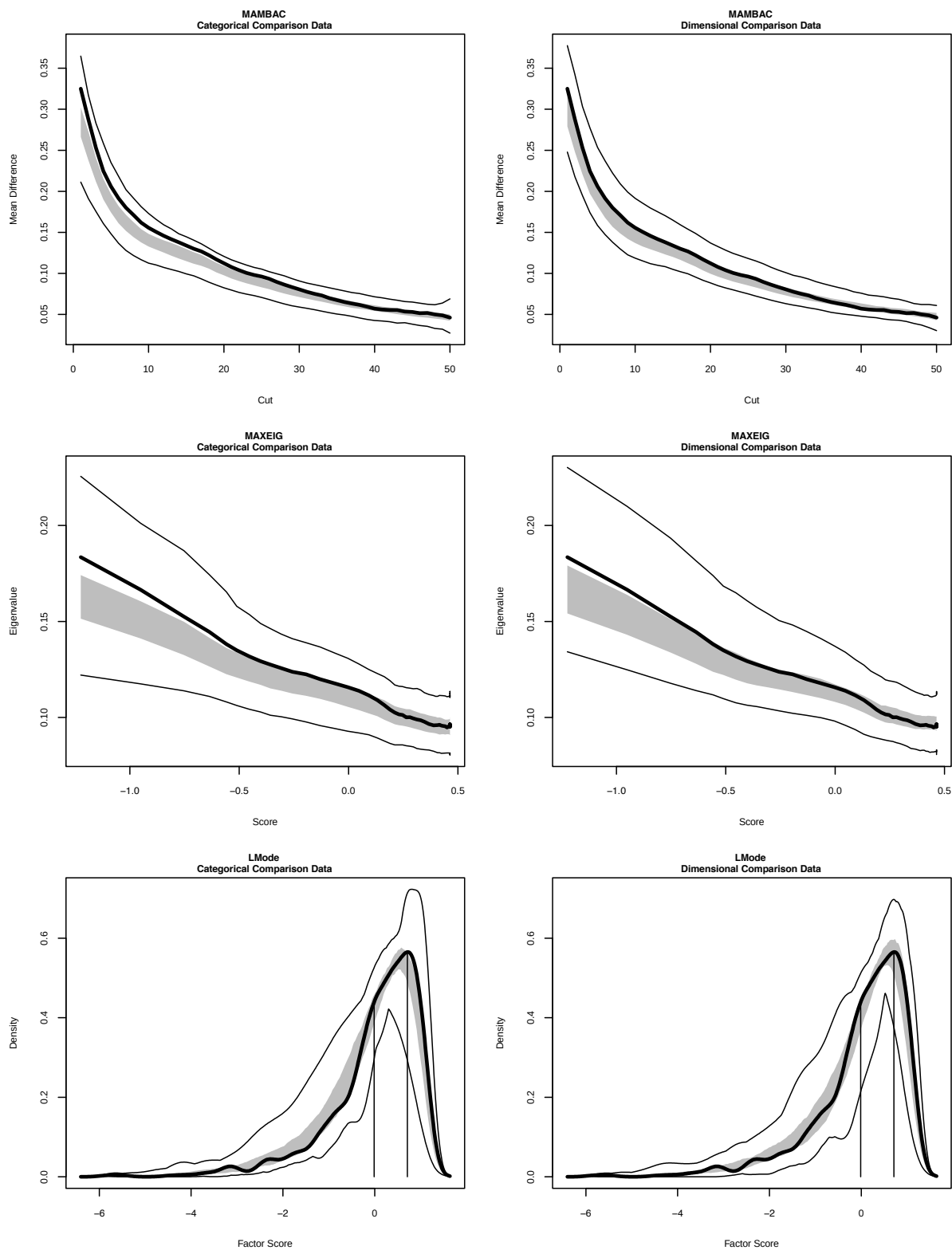


Figure 17. MMPI-2 PSY-5 PSYC Taxometric Results

VITA

Jenna Gilmore was born and raised in Edmond, Oklahoma. She attended Oklahoma State University in Stillwater, OK and graduated with a B.A. in Psychology. She was later admitted to the Clinical Psychology Ph.D. program at the University of Tennessee – Knoxville. In 2018, she obtained her M.A. in Clinical Psychology. She is currently on internship at Pennsylvania Hospital/University of Pennsylvania, where she is enjoying her time working on inpatient psychiatry units and conducting outpatient teletherapy. She looks forward to the end of the COVID-19 pandemic when therapists and patients can not only drop their metaphorical but also their physical masks.