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Using the Personality Assessment Inventory to Diagnose and Discriminate between Major Depressive Disorder and Generalized Anxiety Disorder in a University Counseling Center

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To the Graduate Council:

I am submitting herewith a dissertation written by William Edward Nichelson III entitled "Using the Personality Assessment Inventory to Diagnose and Discriminate between Major Depressive Disorder and Generalized Anxiety Disorder in a University Counseling Center." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

Jacob J. Levy, Major Professor

We have read this dissertation and recommend its acceptance:

John Lounsbury, Victor Barr, Joel Diambra

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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A Dissertation
Presented for the
Doctor of Philosophy Degree
The University of Tennessee, Knoxville

William Edward Nichelson
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Dedication

This dissertation is dedicated to my parents and sisters. Although you are many miles away, your love, support, and encouragement have always been with me and carried me through the most difficult times when nothing else could. Thank you for everything you have done for me; without which I would not be where I am or who I am today.

I also dedicate this dissertation to all of my former, current, and future clients, whose strength and courage never cease to amaze me. I cannot thank you enough for granting me the incredible privilege of being allowed into the deepest, most intimate and painful areas of your lives. I consider it an honor to join you in your journey of growth and healing.

Specifically, I would like to dedicate this dissertation to a former client who is no longer with us on this earth. My sincerest hope is that you have found the peace that you were never able to obtain during your living years. You will always be remembered and symbolized in a tangible way in every office I occupy throughout my career.

Finally, I dedicate this dissertation to my precious retired racing Greyhounds, Bella and Batman, whose Greyhound hugs helped me through numerous difficult days and nights on my journey to completing the Ph.D.

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of you into every session I provide; therefore, your influence does not end with me, but is a benefit to many others as well. I continue the development of Beginner's Mind. Thank you for everything!

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Abstract

This study investigated the utility of the Personality Assessment Inventory (PAI) for diagnosing and discriminating between Major Depressive Disorder (MDD) and Generalized Anxiety Disorder (GAD) with university counseling center clients. Participants were 1541 male and female students who received services at a student counseling center at a large university. Participants were classified as MDD, GAD, or Other Diagnosis (OD) based on the diagnosis determined by the treating clinician, and PAI profiles were compared between the three groups.

The PAI Structural Summary-Revised contains Diagnostic Consider Clusters (DCC) that were designed to identify PAI scales/subscales that are typically elevated or suppressed when a particular disorder is present. The DCC's for MDD and GAD were examined and the results demonstrated that the criteria for the DCC for MDD were met by 2.2% of the MDD group, and the criteria for the DCC for GAD were met by 3.8% of the GAD group. A discussion of these findings is offered, and the appropriateness of using the DCC's for the purpose of diagnosis with any population is questioned. Additionally, DCC's for MDD and GAD for use with university counseling center clients are proposed.

Finally, discriminant analysis (DA) was employed to develop various discriminant functions that can be used to classify individual PAI profile data into specific diagnostic groups. In particular, one discriminant function was created that is capable of examining any PAI profile, and classifying it as either MDD or OD. A second

discriminant function was produced that can analyze any PAI profile and categorize it as either GAD or OD. The final discriminant function was developed to evaluate a PAI profile that represents either MDD or GAD and determine which diagnosis is appropriate. Each discriminant function was shown to accurately predict the associated diagnoses. A discussion of the various predictor variables is offered. Taken together, these results support the use of the PAI for diagnosing and discriminating between MDD and GAD with university counseling center clients.

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CHAPTER I: INTRODUCTION

Statement of the Problem

As defined by the text revision of the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV: Text Revision; American Psychiatric Association, 2000), Major Depressive Disorder (MDD) and Generalized Anxiety Disorder (GAD) represent two of the most commonly occurring psychological disorders (see Appendix A and Appendix B for the respective diagnostic criteria for MDD and GAD). Additionally, data collected during a recent 40-month period at a large university counseling center showed that MDD and GAD were the two most frequently diagnosed disorders. In the 2009 Pilot Study (Locke, 2009) from the Center for the Study of Collegiate Mental Health (CSCMH), data was collected using a standardized data set in the fall semester of 2008 from over 28 thousand students who received mental health services at 66 college and university counseling centers. These data demonstrated that the same types of clients and problems tend to be seen by all counseling centers regardless of their parent institution (Locke, 2009). Together, these findings suggest that MDD and GAD are the two psychological disorders most generally treated at university counseling centers.

In addition to the high prevalence rates, the symptoms of MDD and GAD cause clinically significant distress or impairment in one or more important areas of functioning (DSM-IV: TR; APA, 2000). In fact, the CSCMH study found that level of academic distress was most strongly related to symptoms of depression and generalized anxiety

(Locke, 2009). Due to the frequency of these disorders among university counseling center clients and the significant impact they have on an individual's well-being, it is important that each disorder be accurately identified and treated appropriately.

One aspect of this process requires discriminating between MDD and GAD when developing a diagnosis and this process can be complicated by certain issues. In particular, concerns exist regarding the somatic symptoms of GAD in that they almost entirely overlap with those of major depression (Roemer, Orsillo & Barlow, 2002). In fact, Brown, Marten, and Barlow (1995) found that the associated symptom criterion for GAD in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association, 1994) did not significantly discriminate patients with GAD from those with MDD or Dysthymic Disorder. Therefore, in addition to the aforementioned concerns these disorders represent in university counseling centers, difficulties exist in creating accurate differential diagnosis of the disorders.

Throughout the process of psychodiagnostic assessment, psychologists frequently form and test clinical hypotheses based upon data collected from psychological assessment instruments (Spengler, Strohmer, Dixon, & Shivy, 1995). The Personality Assessment Inventory (PAI; Morey, 1991) has become one of the more commonly used tests for measuring psychopathology and psychological functioning (Belter & Piotrowski, 2001; Boccaccini & Brodsky, 1999; Piotrowski & Belter, 1999). The PAI contains 344 items that comprise 22 non-overlapping scales including 4 validity scales, 11 clinical scales, 5 treatment scales, and 2 interpersonal scales (Morey, 1991). Appendix C contains

a description of the PAI clinical, treatment, and interpersonal scales. Kurtz and Blais (2007) note that additional research should be conducted to determine the validity and utility of using personality measures like the PAI to aid in psychodiagnosis.

In his development of the PAI Structural Summary-Revised, Morey (2007a) created diagnostic consideration clusters (DCC) that are based on both the content of the PAI scales (Morey, 1991) and on the results of studies that have examined specific diagnostic groups for typical scale elevations and suppressions (Morey & Hopwood, 2007). The DCC's were designed to identify PAI scales/subscales that are typically elevated or suppressed when a particular disorder is present. See Appendix D for a description of the DCC's for MDD and GAD. In addition to using the respective DCC to aid in the diagnosis of MDD and GAD, Morey and Hopwood (2007) suggest that the DCC's can be useful for differential diagnosis.

The DCC's for GAD and MDD were determined based on trends in the standardization samples used in development of the PAI (Morey, 1996). Three different samples were used when standardizing the PAI and included a community sample, patients from various clinical settings, and college students from several universities (Morey, 1991). Green, Lowry, and Kopta (2003) demonstrated significant differences in college students and college counseling center clients including level of well-being, life functioning, and global mental health. They found that adults not in treatment were the healthiest, followed in decreasing order by college students, college counseling center clients, and adult outpatients. These findings suggest that the DCC's recommended by

Morey (2007a) are not necessarily generalizable to university counseling center clients. Furthermore, Morey (1996) suggested that cross-validational research be conducted on the DCC's since they are based on the standardization samples of the PAI.

To date, no studies have examined the validity of the PAI's DCC's for MDD and GAD. Furthermore, the extant literature does not provide information regarding PAI scales/subscales that discriminate between a diagnosis of MDD and GAD. This study aims to address these gaps in the literature. The purpose of this study is four-fold: (1) To investigate the validity of the PAI's DCC's for MDD and GAD with university counseling center clients, (2) To determine which, if any, scales or subscales of the PAI discriminate between a diagnosis of MDD and GAD in university counseling center clients, (3) To contribute to the growing literature on the use of the PAI as a diagnostic tool, and (4) to provide information to university counseling center professionals that facilitates the diagnosis and treatment of clients who present with MDD or GAD.

CHAPTER II: LITERATURE REVIEW

Major Depressive Disorder

Major Depressive Disorder (MDD) (APA, 2000) is a frequently occurring psychological disorder that causes varying levels of clinically significant distress (see Appendix A for the diagnostic criteria for MDD). Estimates of community samples have reported lifetime risk for MDD of 10% to 25% for women and 5% to 12% for men. The prevalence rates for MDD do not appear to be related to ethnicity, education, income, or marital status (APA, 2000). MDD has been shown to have significant biological/genetic components, and studies have demonstrated that it is 1.5 to 3.0 times as common among first-degree relatives of individuals with the disorder compared to the general population (APA, 2000). The most negative outcome of MDD is suicide, which is estimated to occur in as many as 15% of individuals who have the severe form of the disorder (APA, 2000).

The course of MDD is characterized by one or more Major Depressive Episodes. The rate of recurrence is widely variable, and some individuals will have isolated episodes that are several years apart, while others experience progressively more frequent episodes as they age (APA, 2000). Studies have shown that with each additional episode that occurs, the risk for future episodes is increased to the degree that having three episodes leads to a 90% chance of having a fourth (APA, 2000). Episodes are often preceded by a major psychosocial stressor, and studies have suggested that these stressors may have a more significant impact on the first or second episodes, and less of an influence on subsequent episodes (APA, 2000).

Generalized Anxiety Disorder

Generalized Anxiety Disorder (GAD) (APA, 2000) is a commonly occurring psychological disorder that is characterized by excessive anxiety and worry that cause clinically significant distress (see Appendix B for the diagnostic criteria for GAD). Estimates of community samples have reported the lifetime prevalence rate to be 5% (APA, 2000). GAD has been shown to have significant biological/genetic components. In particular, the genetic factors that appear to play a role in the risk for GAD may be intimately connected to those for MDD (APA, 2000).

The course of GAD is chronic and variable with stressful times often worsening the disorder (APA, 2000). Several individuals diagnosed with GAD report that they have experienced nervousness and anxiety their entire life (APA, 2000). More than half of those who seek treatment for GAD report onset in childhood or adolescence, although it is not uncommon for onset to occur after age twenty (APA, 2000).

Differential Diagnosis of MDD and GAD

Both MDD and GAD frequently co-occur with several other psychiatric disorders, and in particular, the two often co-exist (APA, 2000). Additionally, the associated symptom criteria for MDD and GAD have significant overlap, which complicates differential diagnosis of the two disorders. In particular, four of the six physical symptom criteria of GAD – restlessness, fatigue, difficulty concentrating, and sleep disturbance – are also part of the diagnostic criteria for MDD (APA, 2000). Indeed, Brown et al. (1995) found that the physical symptom criteria for GAD in the DSM-IV (APA, 1994) did not

significantly discriminate patients with GAD from those with MDD or Dysthymic Disorder. Despite the diagnostic symptom overlap, studies have found differences in the physical presentation of MDD and GAD. For instance, Joorman and Stoeber (1999) found that difficulty concentrating was more powerfully linked to depressive symptoms than to worry. Additionally, Aldao, Mennin, Linardtos, and Fresco (2010) demonstrated that muscle tension was experienced to a greater degree in GAD than MDD.

MDD and GAD also have cognitive symptom criteria that overlap; however, recent studies have revealed that there are certain aspects of cognition that appear to manifest differently in MDD and GAD. In particular, intolerance of uncertainty, a measure of the degree to which an individual believes that uncertainty is not acceptable, has been shown to have greater elevations in GAD compared to MDD (Dugas, Buhr, & Ladouceur, 2004; Dugas, Schwartz, & Francis, 2004).

Affective experience is another realm that has been studied in MDD and GAD. Again, although there are emotional symptoms that overlap in the two disorders, studies have uncovered differences in particular aspects of emotional expression between MDD and GAD. Specifically, the construct of emotion intensity, which is defined to be the subjective strength of an emotional response, has demonstrated elevated levels in GAD (Mennin, Heimberg, Turk, & Fresco, 2005). Furthermore, more recent research has found emotion intensity to be greater in GAD than Depressive disorders (Kerns, Aldao, & Mennin, 2008; Mennin, Holoway, Fresco, Moore, & Heimberg, 2007).

Another characteristic of emotional expression that has shown differences of expression in MDD and GAD is the construct of positive affect, which is conceptualized as a measure of the extent to which a person feels enthusiastic, active, and alert. Consequently, low positive affect is manifested as decreased arousal, activity, and energy (Beck et al., 2001). Aldao et al. (2010) found that reduced positive affect was associated with MDD, while individuals with a diagnosis of GAD demonstrated normal levels of positive affect.

Diagnostic Consideration Clusters

The PAI Structural Summary-Revised (Morey, 2007a) was created to provide clinicians with a means of integrating information from a PAI protocol that could be used to facilitate the process of interpretation and case formulation (Morey & Hopwood, 2007). The Structural Summary-Revised is comprised of four sections including: (1) Profile Distortion Analysis, (2) Diagnostic Consideration Clusters, (3) Self/Other Issue Clusters, and (4) Differential Treatment Indicators (Morey, 2007a). Of particular interest to the present study is the second section, Diagnostic Consideration Clusters (DCC).

The DCC's are intended to serve the clinician by guiding them in the formation and testing of diagnostic hypotheses (Morey & Hopwood, 2007). The Structural Summary-Revised contains DCC's for 33 specific disorders that correspond with DSM-IV-TR diagnoses (APA, 2000). The DCC's are separated into the following seven categories: (1) Affective Disorders, (2) Anxiety Disorders, (3) Psychotic Disorders, (4) Somatoform Disorders, (5) Personality Disorders, (6) Substance Abuse Disorders, and (7)

Other Diagnoses (Morey, 2007a). The range of disorders covered by the DCC's includes "No Diagnosis" and Dissociative Identity Disorder (Morey, 2007a). In addition to using the DCC's to determine the presence of specific disorders, Morey and Hopwood (2007) suggest that the DCC's can be useful for differential diagnosis.

Each DCC contains a cluster of scales/subscales that are typically elevated or suppressed in the presence of a particular diagnosis (Morey & Hopwood, 2007). Importantly, the determination of elevation and suppression is made within the context of the profile rather than simply being based on a particular cutoff score. Morey and Hopwood (2007) suggest using the Mean Clinical Elevation (MCE) as a reference point for making this determination. The MCE is the average *T* score from all 11 clinical scales; therefore, if a profile has a MCE of 70*T*, then a scale/subscale score of 60*T* would be considered a relative suppression despite the fact that it is elevated relative to the community norms of the PAI scales/subscales, which are represented by 50*T* (Morey, 1991). The selection of scales/subscales for the DCC's was based on the constructs that individual scales/subscales were designed to measure (Morey, 1991), and on the results of studies that have examined specific diagnostic groups for typical scale/subscale elevations (Morey & Hopwood, 2007). Of particular interest in the present study are the DCC's for MDD and GAD.

The DCC's for GAD and MDD were determined based on trends in the standardization samples used in the development of the PAI (Morey, 1996). Three different samples were used when standardizing the PAI and included a community

sample, patients from various clinical settings, and college students from several universities (Morey, 1991). Appendix D contains a description of the DCC's for MDD and GAD, including which scales/subscales are expected to be elevated or suppressed.

Morey and Hopwood (2007) propose that individuals with a diagnosis of MDD will typically demonstrate elevations of all three DEP subscales and the SUI scale. Additionally, the authors note that the presence of low self-esteem (MAN-G), social withdrawal (SCZ-S) and cognitive inefficiency (SCZ-T), which are often seen in MDD, will significantly impact these subscales. Consequently, the DCC for MDD contains DEP-A, DEP-P, DEP-C, SUI, SCZ-T, and SCZ-S as relative elevations, and MAN-G as a relative suppression.

Morey (2003) suggests that an elevation on the ANX-A subscale, without corresponding elevations on the other two ANX subscales, is suggestive of generalized anxiety as opposed to more specific worries such as obsessive thoughts, phobias, or preoccupation with somatic concerns. Accordingly, the DCC for GAD includes the ANX-A subscale as a relative elevation, but does not contain the other two ANX subscales. Furthermore, Morey and Hopwood (2007) suggest that an elevation on ANX in the absence of elevations on ARD and DEP is indicative of a diagnosis of GAD. Again, this is consistent with the DCC for GAD which contains ANX as a relative elevation and ARD as a relative suppression.

CHAPTER III: MATERIALS AND METHODS

Overview

An archival data set from a counseling center at a large southeastern university was used to obtain the data for this study. Specifically, these data were collected during the period of October 2005 to June 2009 from university students who were receiving psychological services at the counseling center. Prior to inclusion in the research archive, each client consented to have their non-identifying data archived for future research. As an archival study, this study was approved by the university's Institutional Review Board (IRB).

Counseling Center Description

The counseling center provides undergraduate and graduate students of the university with free individual, couples, and group therapy. Students initially come to the center during walk-in hours and complete a packet of information that includes demographic information, current symptoms and concerns, available times for therapy, and information regarding confidentiality and the therapy process. The paperwork contains an informed consent form regarding the archival of their de-identified data for research purposes. Clients who consent to the inclusion of their records in the archival data set are assigned a research identification number that helps to ensure their anonymity and confidentiality, while still allowing for future matching of various forms of client data. Students complete the PAI between intake and their first session of therapy. PAI's

that were either incomplete or completed incorrectly were excluded from use in this study.

The therapists at the counseling center include 10 licensed psychologists, 4 pre-doctoral psychology interns, and 3 graduate assistants and 5 to 16 practicum students who are doctoral students in counseling or clinical Psychology. Each of the therapists has been trained in generating accurate differential diagnoses. Additionally, for those therapists who are still in training, a licensed psychologist supervises their work and reviews the diagnoses they generate to ensure their accuracy and thoroughness. Following the first and fifth sessions of therapy, and again when therapy is terminated, therapists make a full, five-axis DSM-IV-TR (APA, 2000) diagnosis.

Participants

Participants were 1541 students who received services at the student counseling center at a large southeastern university during the period of October 2005 to June 2009. The mean age of the sample was 22.42 (*SD* = 5.15; range 18 - 59), and included 1052 females (68.5%) and 483 males (31.5%). Six participants did not report their gender. There were 683 participants (44.3%) who either did not report their race/ethnicity, or the information had not been recorded. Self-identified racial/ethnic data were available for 858 participants (55.7%) and included 722 (84.1%) White/Caucasian/European American, 71 (8.3%) African American/Black, 25 (2.9%) Asian/Asian American, 13 (1.5%) Other, 11 (1.3%) Hispanic/Latino/a, 8 (0.9%) Multiracial, 5 (0.6%) Arab American, 2 (0.2%) American Indian/Alaskan Native, and 1 (0.1%) East Indian.

The sample used in this study is very similar with respect to age and gender, but somewhat dissimilar in racial/ethnic configuration, to the population in the 2009 CSCMH pilot study (Locke, 2009) which had a mean age of 22.7 (*SD* = 5.38; range 18 – 80), a composition of 64.3% females and 35.4% males, and racial/ethnic configuration of 70.4% White/Caucasian/European American, 7.7% African American/Black, 6.2% Asian/Asian American, 2.5% Other, 5.8% Hispanic/Latino/a, 3.2% Multiracial, 0.5% Arab American, 0.4% American Indian/Alaskan Native, 0.6% East Indian, 0.3% Native Hawaiian or Pacific Islander, and 2.4% who preferred not to answer.

Participants were separated into three categories: (1) those who had received a diagnosis of MDD with no co-morbid Axis I disorder (*n* = 135), (2) those who had received a diagnosis of GAD with no co-morbid Axis I disorder (*n* = 79), and (3) those who had received any diagnosis other than the two just described, which could include a diagnosis of MDD and/or GAD with one or more co-morbid Axis I disorder(s) (*n* = 1327). The three categories described above will be referred to hereafter as MDD, GAD, and OD (Other Diagnosis) respectively.

The choice to restrict participants diagnosed with co-morbid Axis I disorders from the MDD and GAD categories was based upon the belief that the presence of additional Axis I disorders would significantly impact the profile configuration on the PAI. This assumption was based on both the conceptual design of the PAI clinical scales (Morey, 1991) and the findings from previous studies. In particular, Drury et al. (2009) found significant differences in PAI clinical profile elevation when they compared women with

a single Axis I diagnosis of posttraumatic stress disorder (PTSD) to women diagnosed with PTSD and one or more additional Axis I disorders. The authors concluded that the clinical profile elevation of the PAI is clearly impacted by the co-morbidity of psychiatric illnesses. Therefore, in an attempt to create the most representative PAI profiles for MDD and GAD, this study placed participants with co-morbid Axis I disorders in the OD category.

Instrument

The PAI is a self-administered, objective inventory of adult personality that provides information on important clinical variables (Morey, 1991). It contains 344 items that consist of 22 non-overlapping full scales. Additionally, 10 of the full scales contain 3 or 4 subscales that are conceptually derived to cover the full breadth of their corresponding complex clinical constructs. The full scales are grouped into the following four categories: validity, clinical, treatment, and interpersonal. The four validity scales include Inconsistency (ICN), Infrequency (INF), Negative Impression (NIM), and Positive Impression (PIM). See Appendix C for a description of the clinical, treatment, and interpersonal scales/subscales. The scale/subscale raw scores are transformed into *T* scores to allow for interpretation relative to the standardization sample of 1000 community-dwelling adults. Each scale/subscale has a mean of 50*T* and a standard deviation of 10*T*. A scale/subscale score of 70T, two standard deviations above the mean, represents a significant deviation from the typical adult living in the community given that approximately 98% of nonclinical subjects will have scores below this value. As

such, Morey (1991) suggests that scale/subscale scores of 70*T* or higher represent clinically significant problem areas. To view examples of PAI profiles, go to Appendix E which contains separate graphs for the full scales and subscales, including horizontal lines at 50*T* and 70*T* to represent the mean and clinically significant levels respectively.

The PAI was developed based upon a construct validation framework that utilized both rational and empirical approaches to scale development. This method strongly emphasizes scale stability and correlates, and places importance on the use of both theoretical and quantitative items. Morey (1991) found the internal consistency reliability of the PAI full scales to have median coefficient alphas of .81, .86, and .82 for the normative, clinical, and college samples respectively. Additionally, the mean interitem correlations for the full scales were .22, .29, and .21 for the three respective samples. The mean test-retest reliability for the full scales of the various PAI samples ranged from .75 to .79. The PAI has been well validated for several treatment populations (Morey, 2007b), and various PAI scales have correlated well with scales of several other frequently used personality and diagnostic instruments that measure similar constructs (Morey, 1991).

Procedure

For the purposes of this study, the fifth session diagnosis was determined to be the most appropriate based on a number of considerations. First, given that the PAI is administered prior to the first session of therapy, it is important to use a diagnosis that is temporally close to that date due to the possibility of symptom change over time. Second,

under the supposition that additional client contact yields increased diagnostic accuracy, the diagnosis following the fifth session should be more precise than one following the first session. For those clients who attended less than five sessions, their diagnosis following termination was used based upon the same reasoning noted above. Diagnostic qualifiers were taken into consideration and only diagnoses without a qualifier or with a "principle" qualifier were selected for the MDD and GAD groups. Diagnoses with qualifiers of "provisional", "traits", or "rule out" were not placed in the MDD or GAD groups given the uncertainty of the diagnosis. Additionally, diagnoses of MDD with no co-morbid Axis I disorder that had a specifier of either partial or full remission were not included in the MDD group. It is possible that the therapist's diagnostic decisions were influenced by reviewing the results of the PAI prior to making their diagnosis. Although the PAI results do provide interpretive hypotheses regarding diagnosis, they are merely suggestions, and the clinician is still expected to consider all possible diagnoses that are applicable to a given client.

Titanium Schedule was used to generate a report that contained diagnostic and demographic information for clients who had consented to the inclusion of their records in the archival data set. The report also provided the research identification numbers that were then used to match diagnostic and demographic information with PAI data that were only identifiable by the associated research identification numbers. These data were entered into an SPSS file and analyzed as described below.

Analyses

Data analysis began by assessing the validity of each participant's PAI profile, which was determined using the following cutoff scores suggested by Morey (1991) for the four validity scales: ICN >= 73*T*, INF >= 75*T*, NIM >= 92*T*, and PIM >= 68*T*. Every PAI profile that exceeded one or more of these scale scores was considered invalid. This process led to the removal of 79 participants from the study including eight from the MDD group, four from the GAD group, and 67 from the OD group.

The remaining data were then used to calculate mean PAI profiles for the entire sample, the MDD group, the GAD group, and the OD group. Next, the mean clinical elevation (MCE) was computed for each participant using the method described by Morey and Hopwood (2007), which entails summing the *T* scores of the 11 clinical scales and then dividing the sum by 11. The MCE for each participant was used to calculate a mean MCE for the entire sample, the MDD group, and the GAD group. Each participant's MCE was then used to evaluate their scores on the scales/subscales of the DCC's for MDD and GAD (Morey, 2007a). As suggested by Morey (2007b), a scale/subscale was determined to be relatively elevated or suppressed if it had a *T* score that was more than 5 above or below the MCE, respectively. These results were then used to compute the percentage of participants in each of the three diagnostic groups (MDD, GAD, and OD) that exhibited the relative elevations and suppressions of the DCC's for MDD and GAD.

Data analysis concluded by performing three discriminant analyses (DA) to determine the linear combination of scales/subscales of the PAI which most accurately discriminated between each pair of the three diagnostic groups: (1) MDD from OD, (2) GAD from OD, and (3) MDD from GAD. DA is useful for several purposes including, examining differences between groups, determining the most parsimonious way to distinguish between groups by discarding variables that are not very useful for the task, and classifying individual cases into groups using a discriminant prediction equation. The current study used DA to create discriminant functions capable of predicting between two diagnostic groups with the aim of incorporating as few scales/subscales as possible.

To achieve the above mentioned goal, the decision was made to use the stepwise method of DA given the nature of the data. Specifically, 9 of the 11 clinical scales and 1 of the 5 treatment scales of the PAI are comprised of 3 subscales (with the exception of the BOR scale which contains 4 subscales). Each of these 10 full scales is calculated by summing the raw scores of the respective subscales, and then converting the result into an appropriate *T* score (Morey, 1991). As such, there are high levels of correlation between these full scales and each of their subscales. Additionally, many (although not all) subscales are highly correlated with the other subscales associated with the same full scale (e.g., DEP-C and DEP-A). This is due to the fact that they measure specific constructs within the same general construct domain (Morey, 1991). Given the multicollinearity of the data, it was determined that it would be most appropriate to use

the stepwise method of DA to achieve the goal of fewest scales/subscales being used in the discriminant functions.

The stepwise procedure works by first selecting the most highly correlated independent variable (in the case of this study, a PAI scale/subscale), removing the variance in the dependent variable (in the case of this study, diagnosis), then selecting the independent variable (another PAI scale/subscale) that is most highly correlated with the remaining variance in the dependent variable. This process continues until the addition of another independent variable does not increase the canonical R-squared value by a significant amount (.05 was established as the significance level in this study). Thus, an independent variable that is highly correlated with one that has already been selected is unlikely to be added due to the lack of additional discriminatory power. This impacts the current study in that the resultant discriminant function is unlikely to contain multiple scales/subscales from the same domain (e.g., DEP and DEP-P). Although a particular domain may, and often does, contain two or more scales/subscales with significantly different mean *T* scores between the two diagnostic groups being considered, only the scale/subscale that provides the greatest differentiation between groups is likely to be selected. Therefore, the stepwise procedure facilitates the creation of the most parsimonious discriminant function, which was the goal in the present study.

Hypotheses

It was hypothesized that the results of this study would confirm the validity of the DCC's for MDD and GAD with university counseling center clients. Furthermore, based

on the DCC for MDD (Morey, 2007a) and the mean PAI profile for MDD (Morey, 1991), it was hypothesized that the following scales and subscale would be found to discriminate between the MDD and OD diagnostic groups: (1) DEP, (2) SUI, and (3) MAN-G. Morey (1991) does not provide a mean PAI profile for GAD; however, he suggests that an elevation on the ANX-A subscale, without corresponding elevations on the other two ANX subscales, is suggestive of generalized anxiety as opposed to more specific worries such as obsessive thoughts, phobias, or preoccupation with somatic concerns (Morey, 2003). Thus, based on the DCC for GAD (Morey, 2007a) and the recommended use of the ANX subscales to identify general forms of anxiety (Morey, 2003), it was hypothesized that (1) the ANX-A subscale and (2) the SCZ full scale would be found to discriminate between the GAD and OD diagnostic groups. Finally, based on the DCC's for MDD and GAD (Morey, 2007a), the mean PAI profile for MDD (Morey, 1991), and the aforementioned use of the ANX subscales (Morey, 2003), it was hypothesized that the following scale/subscales would be capable of discriminating between the MDD and GAD diagnostic groups: (1) DEP-A, (2) ANX-A, (3) SUI, (4) MAN-G, (5) SCZ-S, and (6) SCZ-T.

CHAPTER IV: RESULTS

PAI Profiles

Various graphs of the mean PAI full scale and subscale elevations for MDD, GAD, OD, and the entire sample can be found in Appendix E. The available graphs include: (1) separate graphs (full scale and subscale) for the entire sample, (2) separate graphs for MDD, including representations of the mean MCE and its elevation and suppression boundaries, (3) separate graphs for GAD, including representations of the mean MCE and its elevation and suppression boundaries, (4) graphs comparing MDD, GAD, and the entire sample, (5) graphs comparing MDD and OD, (6) graphs comparing GAD and OD, and (7) graphs comparing MDD and GAD. Appendix F contains numerical values for the means and standard deviations of the PAI full scale and subscale *T* scores for MDD, GAD, OD, and the entire sample.

Mean Clinical Elevations

The mean MCE for the entire sample was 56.36*T* (*SD* = 7.67; range 32.91 – 84.82; *N* = 1541). The mean MCE for the MDD group was 57.60*T* (*SD* = 6.12; range 46.45 – 74.82; *n* = 135). Finally, the mean MCE for the GAD group was 55.54*T* (*SD* = 6.06; range 42.25 – 78.91; *n* = 79).

Diagnostic Consideration Clusters

Calculations were performed to determine the percentage of participants in each of the three diagnostic groups (MDD, GAD, and OD) that matched every scale/subscale elevation and suppression for the MDD and GAD DCC's. Post-hoc analyses were

conducted to find the percentage of participants in each of the three diagnostic groups that matched each individual scale/subscale elevation and suppression for the MDD and GAD DCC's. The results of these calculations can be found in Appendix G.

Discriminant Analyses

DA's were performed on all pairs of the three diagnostic groups: (1) MDD and OD, (2) GAD and OD, and (3) MDD and GAD. For reasons previously explained, the stepwise method of DA was used. When the stepwise procedure is employed, it is recommended that cross-validation be utilized to confirm the results of the DA. Each of the three DA's were cross-validated using the jack-knife procedure. In each case, the results of the cross-validation procedure confirmed the appropriateness and accuracy of the stepwise procedure.

The first DA was conducted to determine which PAI scales/subscales discriminated between a diagnosis of MDD and OD. The overall Wilks' Lambda was significant, $\Lambda = .907$, $\chi 2$ (4, $n = 1462$) = 141.76, $p < .001$, indicating that the discriminant function differentiated between the two diagnostic groups. The canonical correlation was .304, which reveals that 9.2% of the variation between the two diagnostic groups was discriminated by the selected scales/subscales. Diagnostic category was predicted using four PAI scales/subscales, listed in decreasing order of significance: (1) DEP, (2) ANX, (3) SUI, and (4) ANT-E. Pooled within-groups correlations between the predictors and the discriminant function, and the standardized discriminant function coefficient for each predictor are presented together in Appendix H. When attempting to predict group

membership, classification was successful in 68.1% of the MDD group, and 74.0% of the OD group. Of the original grouped cases, 73.5% were correctly classified.

Next, a DA was run to determine which PAI scales/subscales discriminated between a diagnosis of GAD and OD. The overall Wilks' Lambda was significant, Λ = .899, $\chi 2$ (3, n = 1406) = 149.41, p < .001, indicating that the discriminant function differentiated between the two diagnostic groups. The canonical correlation was .318, which reveals that 10.1% of the variation between the two diagnostic groups was discriminated by the selected scales/subscales. Diagnostic category was predicted using three PAI subscales, listed in decreasing order of significance: (1) ANX-C, (2) BOR-I, and (3) DEP-A. Pooled within-groups correlations between the predictors and the discriminant function, and the standardized discriminant function coefficient for each predictor are presented together in Appendix I. When attempting to predict group membership, classification was successful in 82.3% of the GAD group, and 77.2% of the OD group. Of the original grouped cases, 77.5% were correctly classified.

Finally, a DA was performed to determine which PAI scales/subscales discriminated between a diagnosis of MDD and GAD. The overall Wilks' Lambda was significant, Λ = .412, $\chi 2$ (6, n = 214) = 185.55, p < .001, indicating that the discriminant function differentiated between the two diagnostic groups. The canonical correlation was .767, which reveals that 58.8% of the variation between the two diagnostic groups was discriminated by the selected scales/subscales. Diagnostic category was predicted using six PAI scales/subscales, listed in decreasing order of significance: (1) ANX, (2) DEP-A,

(3) BOR-S, (4) SCZ-P, (5) SOM-S, and (6) MAN-G. Pooled within-groups correlations between the predictors and the discriminant function, and the standardized discriminant function coefficient for each predictor are presented together in Appendix J. When attempting to predict group membership, classification was successful in 93.3% of the MDD group, and 89.9% of the GAD group. Of the original grouped cases, 92.1% were correctly classified.

CHAPTER V: DISCUSSION

Diagnostic Consideration Cluster for MDD

It was hypothesized that the DCC for MDD would be shown to be valid when used with university counseling center clients. In stark contrast to this expectation, the results indicated that only 2.2% of the participants in the MDD group demonstrated all of the scale/subscale elevations and suppressions (see Appendix G for complete results of the DCC analyses); therefore, I decided to examine each of the seven scales/subscales individually. One possible reason for the extremely low hit rate was that one or more of the scales/subscales were not valid. In such a scenario, it was possible for all of the other scales/subscales to be valid, but since the initial computation required all seven to be valid, having even one invalid scale/subscale would likely cause a "miss" for a large majority of the group members, and thus account for the final result being lower than anticipated.

Based upon the aforementioned possibility, I evaluated each scale/subscale individually. The results showed that three subscales – DEP-A, DEP-C, MAN-G – had hit rates greater than 70%, which suggests that they are reasonably valid for the purpose of detecting the presence of MDD in university counseling center clients. The remaining four scales/subscales – SCZ-S, SUI, DEP-P, SCZ-T – had hit rates between 37% and 57%. It could reasonably be argued that these four scales/subscales are not valid for use in detecting the presence of MDD. Although the lowest individual scale/subscale hit rate was still greater than one-third, the fact that more than half of the scales/subscales had hit

rates near or below 50% likely accounts for the extremely low hit rate of 2.2% when every scale/subscale in aggregate was required to meet criteria. Taken together, these results indicate the DCC for MDD is not recommended for detecting the presence of MDD with the population sampled in this study.

When the graphs containing the mean PAI full scale and subscale elevations for the MDD group are examined in Appendix E, it is possible to visualize why the preceding results were obtained. The graphs contain a solid yellow line that represents the mean MCE for the MDD group, and two dashed yellow lines above and below the mean MCE line that represent the boundaries for relative elevation and suppression. As shown in the MDD subscale graph, the mean elevations for DEP-A and DEP-C are a considerable distance above the cutoff for relative elevation. Accordingly, each subscale demonstrated a hit rate in the 80% range. Similarly, the mean elevation for the MAN-G subscale is a moderate distance below the relative suppression, and had a hit rate close to 70%. Three of the four remaining scales/subscales – SUI, DEP-P, SCZ-T – have mean elevations that are only slightly above the cutoff for relative elevation and exhibit hit rates near 50%. Finally, SCZ-S is actually below the cutoff for relative elevation and showed a hit rate near 37%.

It is reasonable that a scale/subscale that is at or very near the relevant cutoff for relative elevation or suppression would have a hit rate near 50%. Based on the assumption that the *T* scores for each scale/subscale are normally distributed within a specified group, it follows that a group with a mean scale/subscale elevation that is near

the cutoff for its corresponding relative elevation or suppression would have half of the group members above and half of them below the cutoff, and thus a near 50% hit rate. Using the same reasoning, it is realistic to expect that a group with a mean scale/subscale elevation that is less than the cutoff for its corresponding relative elevation or more than the cutoff for its corresponding relative suppression would have a hit rate below 50%.

The hit rate of 48.1% for DEP-P was unexpected. It is important to keep in mind that the hit rate is based on the MCE, and thus an extremely large MCE could account for such a low hit rate; however, in the case of the MDD group, the mean MCE was 57.60*T*, which is less than one standard deviation above the community norm of 50*T*. In fact, as seen in Appendix F, the mean elevation on the DEP-P subscale for the MDD group was 63.60*T*, which is less than the level of clinical significance. The other two DEP subscales, DEP-C and DEP-A, each had mean elevations that were clinically significant.

The DEP-P subscale measures constructs such as physical functioning, energy, and activity, as well as level of sleep pattern disturbance (Morey, 1991). One possible explanation for the current findings is that university counseling center clients experience fewer physiological symptoms of MDD than cognitive and affective symptoms. However, the results obtained here are consistent with those found by Morey (1991) in his sample of MDD patients which also demonstrated clinically significant elevations for DEP-C and DEP-A, but not for DEP-P (Regarding the comparisons to the MDD sample used by Morey, it is interesting to note that the present study had a greater number of participants with a diagnosis of MDD, although only slightly so (n = 135 versus n =

126)). This suggests that university counseling center clients are similar to Morey's clinical populations in their presentation of MDD. More likely, the consistent results regarding the DEP-P subscale indicate that either it does not accurately measure the construct it is designed to assess, or patients diagnosed with MDD indicate more cognitive and affective symptoms than physiological symptoms. Future research could examine the DEP subscales with patients who exhibit more prominent physiological symptoms of depression as a means of assessing the accuracy of the DEP-P scale.

The SCZ-T subscale had a hit rate of 56.3% and mean elevation of 66.12*T* for the MDD group. SCZ-T is designed to measure thought processes that are marked by confusion and difficulty concentrating (Morey, 1991). Interestingly, these are similar to one of the cognitive symptoms of MDD (APA, 2000). As such, it is somewhat surprising that the DEP-C subscale, which measures the cognitive aspects of depression, was clinically significant and yet the SCZ-T scale was not. Perhaps one explanation for this finding is that the given the intent of the SCZ-T subscale to measure particular aspects of Schizophrenia, the degree to which MDD patients experience the symptoms measured by SCZ-T is not as high as patients with Schizophrenia, and thus did not reach the level of clinical significance. Similar to DEP-C, DEP-A, and DEP-P, the results obtained here for SCZ-T are consistent with those found by Morey (1991) in his sample of MDD. This provides additional evidence to suggest that university counseling center clients are similar to Morey's clinical populations in their presentation of MDD.

Another surprising result was that SCZ-S had a hit rate of only 37.8% and a mean elevation of 59.08*T*, which was less than 2*T* above the mean MCE for the MDD group. SCZ-S is designed to measure social isolation and amount of interpersonal relationships that could be described as close and warm (Morey, 1991). One possible explanation for the current findings is that at the point university students with MDD typically present for treatment they may not have begun to isolate themselves from their friends as a result of being depressed. Anecdotal evidence has shown that often university counseling center clients are experiencing their first episode of major depression, and are thus confused and startled by what is occurring, which leads them to seek treatment earlier in the process. Another potential reason for these findings is that the environment of a university is such that students will typically be around several others throughout their day as they attend classes, live in a dorm, eat meals, etc. From a clinical standpoint, students with MDD may be deemed to be isolating themselves and feeling they do not have close relationships, but the content of the items for SCZ-S may be such that university students with MDD do not endorse these items as a result of their environment.

The fourth and final scale of the DCC for MDD that was determined to be invalid for detecting MDD in university counseling center clients was the SUI scale which had a hit rate of 45.2% and mean elevation of 64.20*T*. The results obtained here are in stark contrast to those obtained by Morey (1991) in his sample of patients with MDD which showed a mean elevation that was well above the cutoff for clinical significance. One explanation for this difference is that 54.8% of the MDD sample Morey (1991) used was

receiving inpatient treatment. As such, it is reasonable to expect that the mean elevation on the SUI scale would be higher in that sample than the one used for the current study. In fact, Morey (1991) states that the significant proportion of inpatients in the MDD sample likely increased the elevation on the SUI scale.

Another possible explanation for the current finding is that university counseling center clients with MDD either do not express a clinically significant level of suicidal ideation, or they experience suicidal ideation to a lesser degree than the general population with MDD. This is unlikely given that the latest data from the American Association of Suicidology shows suicide to be the third highest cause of death among 15-24 year-olds (McIntosh, 2010). Although the rate of suicide is slightly less for this age group than all ages combined, 9.7 versus 11.5 per 100,000 in the population (McIntosh, 2010), this slight difference is unlikely to account for the results obtained in the present study. Additionally, suicide is the second leading cause of death among 20-24 year-olds, and the lifetime suicide rate peaks for this age group (Locke, 2009). Furthermore, the 2009 CSCMH pilot study (Locke, 2009) found that 25% of university counseling center clients reported they had seriously considered suicide at some point in their life. One implication of the current finding is that when examining the SUI scale for university counseling center clients, clinicians should consider the possibility that the level of suicidality is clinically significant even if it is below 70*T*.

As previously mentioned, Morey and Hopwood (2007) suggest that in addition to using the DCC's to detect the presence of certain psychological disorders, they can be

useful for differential diagnosis. Based on this assumption, it was decided *a priori* to examine the DCC for MDD using the GAD and OD groups, and compare these results with those for the MDD group as a means of inspecting the validity of the authors' claim. Given the results of the analyses on the MDD group, these additional computations were unnecessary in that it was not possible for the DCC for MDD to be valid for differential diagnosis. Nevertheless, the results of the analyses with the GAD and OD groups revealed some rather startling results.

Perhaps the most surprising result was that the GAD group exhibited a slightly higher hit rate than the MDD group on DEP-P. As noted previously, the DEP-P subscale measures constructs such as physical functioning, energy, and activity, as well as level of sleep pattern disturbance (Morey, 1991). These concepts have considerable overlap with the associated symptom criterion for GAD (APA, 2000). The results obtained here are consistent with those of Brown, Marten, and Barlow (1995) who found that the associated symptom criterion for GAD in the DSM-IV (APA, 1994) did not significantly discriminate patients with GAD from those with MDD or Dysthymic Disorder. One implication for the current findings is that the DEP-P subscale does not adequately differentiate between the somatic symptoms of MDD and GAD. In contrast, the other two DEP subscales, DEP-C and DEP-A, both had much higher hit rates for the MDD group than the GAD group, which suggests that they are useful in differentiating between the two disorders.

Also unexpected were the results of the hit rates by each of the three diagnostic groups on the SCZ-T subscale. Specifically, all of the groups had hit rates between 53.1% and 56.3%, and mean elevations between 62.32*T* and 66.12*T*. As discussed previously, SCZ-T is designed to measure thought processes that are marked by confusion and difficulty concentrating (Morey, 1991). As with the aforementioned similarity of these constructs to a cognitive symptom of MDD, they are also related to one of the six criterion symptoms of GAD (APA, 2000). Given this, it is not surprising that the hit rates and mean elevations for the MDD and GAD groups were virtually identical. In contrast, the nearly matching hit rates and mean elevations for the MDD and OD groups seem improbable given the vast heterogeneity of diagnoses in the OD group. One implication of this finding is that regardless of diagnosis, university students who seek services at the counseling center are experiencing similar and somewhat elevated levels of thought disruption in the form of confusion and/or difficulty concentrating.

Although the MAN-G subscale was shown to be fairly capable of detecting the presence of MDD, it does not appear useful for discriminating between MDD and GAD. The hit rates and mean elevations for the MDD and GAD groups on the MAN-G subscale were 70.4% and 64.6%, and 46.36*T* and 47.63*T*, respectively. The MAN-G subscale is designed to measure self-esteem and grandiose thoughts such as possessing special and unique talents that will lead to fortune and fame (Morey, 1991). Considering one of the nine criterion symptoms of MDD is feelings of worthlessness (APA, 2000), and anecdotal evidence that many university counseling center clients suffering from MDD

express a sense of hopelessness, it is expected that the MAN-G subscale would be suppressed for the MDD group. One explanation for the similar suppression seen in the GAD group is that the tendency to worry about the future may impact the responses to the items in the MAN-G subscale that allude to a successful future. Finally, as with several of the other subscales already discussed, the mean elevation for MAN-G in the MDD group is consistent with the findings Morey (1991) obtained from his MDD sample. This lends further credence to the notion that university counseling center clients are similar to Morey's clinical population in their presentation of MDD.

Curiously, when the mean scale/subscale elevations are examined for the MDD sample used by Morey (1991), the choice regarding scales/subscales to include in the DCC for MDD is confusing. In particular, DEP-P and SCZ-T have mean elevations that place them very near the boundary for relative elevation, which as previously noted would likely yield a hit rate in the 50% range. This presumed result is consistent with those obtained in the present study for DEP-P and SCZ-T. Furthermore, the mean elevation for SCZ-S in the MDD sample used by Morey (1991) is below the boundary for relative elevation and would probably result in a hit rate well below 50% for reasons previously explained. Again, this assumed hit rate is consistent with the results obtained in the present study for SCZ-S.

Beyond the three scales/subscales of the DCC for MDD that the present study found to be valid for the purpose of detecting the presence of MDD (DEP-C, DEP-A, and MAN-G), the SUI scale would be the only additional scale/subscale to be valid for this

purpose in the MDD sample used by Morey (1991). As such, the DCC for MDD would have only four of seven scales/subscales that were valid, which leads to the conclusion that overall the DCC for MDD is not valid for use with the MDD sample used by Morey (1991). One implication of this presumed conclusion is that the previously discussed overall lack of validity demonstrated by the DCC for MDD with university counseling center clients is unlikely a result of significant differences in presentation of MDD with university counseling center clients. More importantly, the suggested conclusion calls into question the validity of all the DCC's. Future research should focus on examining each of the DCC's to make this determination.

Diagnostic Consideration Cluster for GAD

Similar to the DCC for MDD, it was hypothesized that the DCC for GAD would be shown to be valid when used with university counseling center clients. Consistent with the findings for the DCC for MDD, the results indicated that only 3.8% of the GAD group demonstrated all of the scale/subscale elevations and suppressions (see Appendix G for complete results of the DCC analyses). As this outcome was so deviant from my expectations, I decided to examine each of the four scales/subscales individually. The rationale for these additional analyses was the same as that described for the MDD DCC.

The results of the individual scales/subscales showed that ANX and ANX-A had hit rates greater than 80%, and ARD and SCZ had hit rates below 27%. These findings suggest that ANX and ANX-A are valid for the purpose of detecting the presence of GAD in university counseling center clients, and ARD and SCZ are not valid for this

purpose. Although the hit rates for two of the individual scales were lower than any of the hit rates for the individual scales/subscales of the MDD DCC, the slightly higher hit rate for the overall GAD DCC (3.8% versus 2.2%) is most likely explained by the lower number of scales/subscales required to meet criteria (four versus seven). Taken together, these results indicate the DCC for GAD is not valid for detecting the presence of GAD with the population sampled in this study.

When the graphs containing the mean PAI full scale and subscale elevations for the GAD group are examined in Appendix E, it is possible to visualize why the preceding results were obtained. The graphs contain a solid yellow line that represents the mean MCE for the GAD group, and two dashed yellow lines above and below the mean MCE line that represent the boundaries for relative elevation and suppression. As shown in the GAD scale and subscale graphs, the mean elevations for ANX and ANX-A are a considerable distance above the cutoff for relative elevation. Accordingly, each scale/subscale demonstrated a hit rate greater than 80%. SCZ and ARD are both above the cutoff for relative suppression and show low hit rates as a result. In fact, SCZ is nearly equal to the mean MCE for the GAD group, and ARD is actually above the mean MCE. The respective hit rates of 26.6% and 15.2% are consistent with this observation.

The hit rate of 15.2% for ARD was in stark contrast to the hypothesized result. It is important to keep in mind that the hit rate is based on the MCE, and thus an extremely small MCE could account for such a low hit rate when determining relative suppression; however, in the case of the GAD group, the mean MCE was 55.54*T*, which is above the

community norm of 50*T*. In fact, as can be seen in Appendix F, the mean elevation on the ARD scale for the GAD group was 59.20*T*, which is above the mean MCE. This result is surprising because it shows that not only is the ARD scale not relatively suppressed as suggested by the DCC for GAD, but also it is actually elevated relative to the mean MCE. Furthermore, the ARD scale showed the third highest mean elevation of all the full scales for the GAD group, lower only than the ANX and DEP scales.

The ARD scale measures constructs related to three different areas of anxiety disorders: (1) fears associated with specific phobias, (2) thoughts and behaviors of an obsessive-compulsive nature, and (3) troublesome occurrences related to a traumatic event (Morey, 1991). Although the mean elevation for ARD was not clinically significant, it was raised compared to the community norm of 50*T*. Morey (1991) suggests that an ARD score in the range seen here is indicative of an individual who has little self-confidence and may have some specific fears or worries. The lack of self-confidence is consistent with the finding previously noted for the MAN-G subscale which was relatively suppressed for the GAD group. Another possible explanation for the results obtained in the present study is that the specific item content of the ARD scale may contain fears or worries that are part of an individual's pattern of generalized worry associated with GAD, thus they endorse those particular items, which leads to an elevated score on the ARD scale. Unfortunately, Morey (1991) does not provide mean scale/subscale elevations for a sample of patients diagnosed with GAD as he did for a sample that had received a diagnosis of MDD. As a result, the previously discussed

comparisons between the MDD group in the present study and the MDD sample used by Morey (1991) cannot be made with the GAD group.

The SCZ scale had a hit rate of 26.6% and mean elevation of 55.33*T* for the GAD group. This result was surprising because not only is the ARD scale not relatively suppressed as suggested by the DCC for GAD, but also it is actually nearly equal to the mean MCE of 55.54*T*. Although the mean elevation for SCZ was not clinically significant, it was raised compared to the community norm of 50*T*.

SCZ is designed to measure several aspects of Schizophrenia including unusual beliefs and perceptions, social anhedonia and lack of social competence, and difficulties related to concentration, attention, and associational processes (Morey, 1991). The difficulty with concentration and attention is consistent with the finding previously noted for the SCZ-T subscale which was elevated relative to the mean MCE for the GAD group. Also, as explained earlier, these symptoms are related to the criterion symptoms of GAD (APA, 2000), and thus an elevation on SCZ-T is not surprising. When the other SCZ subscales are examined for the GAD group, we find that SCZ-P and SCZ-S have mean elevations of 45.76*T* and 53.09*T*, respectively. Again, these results are consistent with expectations for an individual diagnosed with GAD, who would be presumed to have no psychotic symptoms and exhibit fairly normal social functioning. Given the elevation on SCZ-T, nearly normal elevation on SCZ-S, and the suppression on SCZ-P, it is understandable that the full scale score for SCZ, which is calculated from these three subscales, would be in the normal range, showing little elevation or suppression.

As previously mentioned, Morey and Hopwood (2007) suggest that in addition to using the DCC's to detect the presence of certain psychological disorders, they can be useful for differential diagnosis. Based on this assumption, it was decided *a priori* to examine the DCC for GAD using the MDD and OD groups, and compare these results with those for the GAD group as a means of inspecting the validity of the authors' claim. Given the results of the analyses on the GAD group, these additional computations were unnecessary because it was not possible for the DCC for GAD to be valid for differential diagnosis. Nevertheless, the results of the analyses with the MDD and OD groups revealed some interesting results.

Perhaps most surprising, the GAD group exhibited a much lower hit rate (15.2%) than the MDD and OD groups (34.1% and 26.8%) on ARD. The mean scale elevations for GAD, MDD, and OD were 59.20*T*, 56.87*T*, and 57.27*T*. Given that the DCC for GAD expects ARD to be relatively suppressed, it is unexpected that not only is this not the case, but also it has the highest mean elevation of all three diagnostic groups.

As noted above, the ARD scale is designed to measure constructs related to three different areas of anxiety disorders: (1) fears associated with specific phobias, (2) thoughts and behaviors of an obsessive-compulsive nature, and (3) troublesome occurrences related to a traumatic event (Morey, 1991). Potential explanations for the elevation seen with the GAD group were described above. One possible reason for the lower mean elevations of the MDD and OD groups can be drawn from an examination of the ARD subscale elevations. In particular, the GAD group exhibited a higher elevation

than the MDD and OD groups on the ARD-P subscale (59.92*T*, 53.99*T*, and 54.14*T*). ARD-P is designed to measure phobic behaviors that may be interfering with an individual's functioning (Morey, 1991). These results are unexpected, particularly for the comparison between the GAD and OD groups. There were an undetermined number of individuals in the OD group with a diagnosis of specific phobia. The amount of impact these diagnoses would have had on the mean elevation of ARD-P for the OD group is uncertain, however. One implication of the results found here is that the ARD-P subscale may not be adequately differentiating between specific phobias and generalized worry as related to their impact on individual functioning. Future research could address this concern by examining the results of the ARD-P subscale for individuals diagnosed with specific phobias and GAD.

The ANX scale and ANX-A subscale were determined to be valid for the purpose of detecting the presence of GAD in university counseling center clients. Furthermore, it appears that they are useful for differentiating between GAD, MDD, and OD. The hit rates for the GAD, MDD, and OD groups on the ANX scale and ANX-A subscale were: (1) GAD, 93.7% and 83.5%, (2) MDD, 52.6% and 44.4%, and (3) OD, 58.6% and 49.0%. The mean elevations for the GAD, MDD, and OD groups on the ANX scale and ANX-A subscale were: (1) GAD, 75.80*T* and 71.22*T*, (2) MDD, 63.47*T* and 60.72*T*, and (3) OD, 64.41*T* and 61.71*T*.

Overall, the DCC for GAD was determined to be invalid for detecting the presence of GAD in university counseling center clients, as only two of the four

scales/subscales demonstrated acceptable hit rates. The findings for the DCC for GAD are consistent with the results obtained for the DCC for MDD. Based upon a comparison between the mean elevations in the MDD sample used by Morey (1991) and the DCC for MDD, it was hypothesized that the overall lack of validity demonstrated by the DCC for MDD with university counseling center clients was unlikely a result of significant differences in presentation of MDD with this population. Although a similar comparison could not be made for the DCC for GAD due to the lack of reported mean elevations for a GAD sample (Morey, 1991), it is not entirely unreasonable to assume that the overall lack of validity demonstrated by the DCC for GAD with university counseling center clients was also unlikely a result of significant differences in presentation of GAD with this population.

Taken together, all of these results and hypotheses provide further support for the aforementioned concern regarding the validity of all the DCC's. As such, it appears there is substantial need for future research to examine the validity of each of the DCC's. Meanwhile, I suggest that considerable caution be exercised when attempting to use the DCC's for the purpose of diagnosis.

Proposed Diagnostic Consideration Clusters for MDD and GAD

Due to the surprising results of the analyses on the DCC's for MDD and GAD, I decided to perform post-hoc analyses using the data from the present study to develop DCC's for MDD and GAD that would be more appropriate to use with university counseling center clients. The DCC's were designed to identify PAI scales/subscales that

are typically elevated or suppressed when a particular disorder is present (Morey & Hopwood, 2007). As such, it could be stated that the goal of the DCC's is to detect the presence of specific disorders. Based on this goal, the most precise DCC for a given disorder would be composed of the scales/subscales that most frequently meet criteria for elevation or suppression when the PAI is administered to individuals from that diagnostic group. Determining which scales/subscales would be most appropriate is not a simple task as several factors influence the likelihood that each individual in a diagnostic group would demonstrate similar scale/subscale elevations and suppressions relative to their MCE.

The design of a valid DCC is facilitated by prior knowledge of scale/subscale elevations for a given diagnosis. One process that can be used to select scales/subscales involves examining the mean scale/subscale elevations for a given diagnosis; however, it is important to be aware of certain issues associated with this approach. First, when looking at an individual PAI profile, it is clear that the scales/subscales that are above or below the cutoffs for relative elevation and suppression meet criteria, but this is not necessarily true when mean PAI profile data is being examined. For example, if the full scale and subscale graphs for MDD and GAD in Appendix E are inspected, it is easy to visualize the scales/subscales that are above or below the cutoffs for relative elevation and suppression. However, these graphs use scale/subscale values that represent the average scale/subscale scores of all the participants from each diagnosis. As such, it is not appropriate to assume that a mean scale/subscale score that meets criteria for elevation or

suppression would also meet criteria for the majority of individuals with that diagnosis. The reason for this is that the amount of variability within a diagnostic group for that particular scale/subscale would greatly impact the percentage of individuals who meet criteria.

One way to account for within-group variability on a given scale/subscale is to take the standard deviation into consideration. Based on the assumption that the data for each scale/subscale will be normally distributed for a given diagnostic group, it is possible to make use of the available knowledge related to this type of data. In particular, we can calculate the percentage of participants that will exist above and below a particular scale/subscale score based on the standard deviation. The selection of scales/subscales for the proposed DCC's for MDD and GAD with university counseling center clients was made using the preceding information.

The process for scale/subscale selection described below was used for the MDD and GAD diagnostic groups separately. The first step involved computing the absolute value of the difference between each individual mean scale/subscale *T* score and the mean MCE (e.g., for MDD group, mean DEP-C = 73.43*T*; mean MCE = 57.60*T*; so DEP-C minus mean MCE = 15.83*T*). In essence, the result of this calculation for each scale/subscale provided information regarding its distance from the mean MCE. These computed values were referred to as elevation/suppression.

The second step involved multiplying the standard deviation of each scale/subscale by the amount of standard deviation required to meet the desired hit rate.

For instance, using a normal distribution, we know that from 0.5244 standard deviations below the mean, 70% of the area under the normal curve exists above that point. Therefore, to help determine the various mean *T* scores needed by each individual scale/subscale to achieve a 70% hit rate, the standard deviation of each scale/subscale was multiplied by 0.5244 (e.g., for MDD group, DEP-C *SD* = 14.17*T*; so DEP-C *SD* times 0.5244 = 7.43*T*). Basically, the result of this calculation for each scale/subscale provided information regarding how far past the boundary for elevation or suppression its mean *T* score needed to be in order to achieve the desired hit rate. These results were referred to as *SD*-scaled (e.g., for MDD group, DEP-C *SD*-scaled = 7.43*T*; mean MCE = 57.60*T*; boundary for elevation = mean MCE + 5.0 = 62.60*T*; thus the mean DEP-C *T* score must be 7.43*T* above 62.60*T* to achieve a minimum hit rate of 70%).

The final step involved subtracting the value of *SD*-scaled for each scale/subscale from the value of elevation/suppression for each scale/subscale (e.g., for MDD group, DEP-C elevation/suppression = 15.83*T*; DEP-C *SD*-scaled = 7.43*T*; so 15.83*T* minus 7.43*T* = 8.40*T*). Essentially, the result of this calculation for each scale/subscale provided the location of the point above which 70% of the participants *T* scores resided. This point was in relation to the mean MCE so that a negative value indicated a point below the mean MCE, and a positive value indicated a point above the mean MCE. Given that the boundaries for elevation and suppression are defined to be 5.0*T* above and below the MCE, any scale/subscale that had a final result of positive 5.0*T* or greater could be included in the DCC with the expectation that it would achieve at least a 70% hit rate (the

reason why a positive 5.0 value is used for both elevation and suppression is because the choice was made early in the process to create the elevation/suppression values as absolute values so they would all be positive).

The preceding calculations had been designed, organized, and conducted in such a manner that it would be easy to change the value for the amount of standard deviation required to meet a desired hit rate. This allowed multiple analyses to be performed using various hit rates. It was decided to execute analyses with hit rates ranging from 60% to 95%, at intervals of 5%. Appendix K contains the proposed DCC's for MDD and GAD with university counseling center clients, including how they vary based on the hit rate selected.

Examination of the results for the proposed DCC's for MDD and GAD provide some interesting insights. First, doing a comparison between the theoretical hit rates and observed hit rates using the scales/subscales of the original DCC's for MDD and GAD, suggests that the method chosen to develop the proposed DCC's is valid. In particular, for the MDD group, DEP-A showed an observed hit rate of 83.7% and a calculated theoretical hit rate greater than 80% and less than 85%. DEP-C had an observed hit rate of 80.7% and a calculated theoretical hit rate greater than 75% and less than 80%. MAN-G demonstrated an observed hit rate of 70.4% and a calculated theoretical hit rate greater than 70% and less than 75%. The four remaining scales/subscales of the DCC for MDD – SCZ-T, DEP-P, SUI, and SCZ-S – had observed hit rates less than 60%, and none of them were included in the analysis for the 60% or greater theoretical hit rate.

The scales/subscales of the original DCC for GAD showed similar results. In particular, ANX showed an observed hit rate of 93.7% and a calculated theoretical hit rate greater than 90% and less than 95%. ANX-A had an observed hit rate of 83.5% and a calculated theoretical hit rate greater than 80% and less than 85%. The two remaining scales/subscales of the DCC for GAD, ARD and SCZ, had observed hit rates less than 60% and neither of them were included in the analysis for the 60% or greater theoretical hit rate. Taken together, the above results provide evidence in support of the validity of the proposed DCC's for MDD and GAD with university counseling center clients.

The choice to use multiple hit rates in the development of the proposed DCC's for MDD and GAD was based on a few considerations. First, it is conceivable that depending on the particular situation the DCC's are being used for, the clinician may want to include any scale/subscale with a 60% or greater hit rate, or he/she may choose to use only the scales/subscales with much higher hit rates. Secondly, by including additional scales/subscales in the DCC's that meet criteria at a lower frequency, it provides the clinician with the opportunity to make decisions based on the relative importance of a given scale/subscale. For instance, for a particular patient, if the scales/subscales with the highest probability of meeting the associated criteria fail, and yet most of the scales/subscales with the lowest probability of meeting criteria succeed, it is plausible that the patient is not presenting with the disorder related to the DCC under consideration. Conversely, if a given patient meets criteria for the scales/subscales with the highest probabilities and not for those with the lowest probabilities, it may be

reasonable to conclude that the patient does have the disorder associated with the DCC being used. However, if the relative probabilities of the various scales/subscales were not known, it is likely that the choice would be based on number of hits versus misses. In this case, the opposite diagnostic decisions would be made for the scenarios described above.

Perhaps the most surprising aspect of the results for the proposed DCC's for MDD and GAD is the number of scales/subscales that meet criteria with considerable frequency. In particular, selecting 75% as the minimum required hit rate, the DCC for MDD would contain only three scales/subscales: (1) DEP-A, (2) DEP, and (3) DEP-C. Using the same hit rate, the DCC for GAD would contain only four scales: (1) ANX-C, (2) ANX, (3) ANX-A, and (4) ANX-P.

Several concerns arise from the above findings. First, each DCC contains only the scale/subscales related to its associated diagnosis. Given this, it could be argued that the DCC's are not useful for assisting in diagnosis because a clinician could simply examine the elevation for each of the related scale/subscales without needing to make the additional calculations required for the DCC's. Secondly, a hit rate of 75% means that only three out of four patients being administered the PAI would show a particular DCC scale/subscale elevation. Although this may be acceptable to some clinicians, it is presumable that many practitioners would choose not to rely on something that may not detect 25% of the relevant scale/subscale elevations. Furthermore, as a result of the hit rate being for each individual scale/subscale rather than the DCC as a whole, when only three or four scales/subscales exist for a particular DCC, it is entirely possible none of the

scales/subscales would meet criteria for a given PAI profile. This provides additional support to the notion that DCC's may not be a useful tool for diagnostic assessment.

Discriminant Analysis on MDD and OD

The hypothesis for the DA on MDD and OD was that the following scales and subscale would be found to discriminate between the two diagnostic groups: (1) DEP, (2) SUI, and (3) MAN-G. The results of the DA revealed that together, (1) DEP, (2) ANX, (3) SUI, and (4) ANT-E were capable of accurately classifying a given PAI profile into the appropriate diagnostic group. Two of the three hypothesized scales/subscales were selected for inclusion in the discriminant function, and one additional scale, ANX, was also chosen. At first glance these findings may appear to only partially support the hypothesis, but further examination can provide understanding into how the selection of ANT-E is consistent with the reasoning that was used in predicting the inclusion of MAN-G. Furthermore, beyond the scales/subscales that were hypothesized, the addition of the ANX scale can be elucidated when certain aspects of the data are taken into consideration; first, however, clarification will be provided regarding the meaning and appropriate interpretation of the DA results.

It is important to have a clear understanding of two aspects regarding this and the other two DA's: (1) what the results do and do not tell us about the data in general and the PAI scales/subscales in particular, and (2) how the results can be utilized. As already described (see Chapter 3, section on Analyses), DA can be used for multiple purposes including the creation of discriminant functions that are capable of classifying individual

cases into the appropriate group with a reasonably high level of accuracy. Additionally, when the choice is made to use the stepwise method of DA, as was the case for the present study, these discriminant functions will contain the fewest independent variables (PAI scales/subscales) necessary for the task. Furthermore, the variables that are selected for inclusion will be those that provide the greatest discriminatory power. From this, it would be easy to assume that the scales/subscales that possess the largest differences in elevation between groups would be the ones included in the discriminant function. Were this the case, one could simply look at the graphs showing the mean scale/subscale elevations of the two diagnoses under consideration (see Appendix E for the full scale and subscale graphs that contain only MDD and OD together) and find the scales/subscales that visibly showed the maximum discrepancies between the diagnoses; however, it turns out this is not the case. The reason the process is not that simple is due to both the nature of the data in this study as well as the characteristics of the stepwise procedure (again, see Chapter 3, section on Analyses, for more details).

An examination of the results of the DA on MDD and OD that utilizes the aforementioned graphs can help elucidate the process leading to the eventual discriminant function. When the stepwise method selects the first scale/subscale, it looks for the one exhibiting the greatest difference between the two diagnoses; however, for reasons described in the previous section for the proposed DCC's for MDD and GAD, this will not necessarily be the scale/subscale with the greatest between groups mean elevation difference due to the amount of within groups variability for a given scale/subscale.

Looking at the full scale and subscale graphs in Appendix E as well as the numerical values for the mean scale/subscale elevations (Appendix F) for MDD and OD, it is clear that the three scales/subscales with the largest between groups differences are DEP, DEP-C, and DEP-A. As it turns out, the first scale/subscale selected by the DA is the DEP full scale.

Based on the prior description regarding the attributes of the stepwise procedure, the next scale/subscale selected is unlikely to be either DEP-C or DEP-A because they are highly correlated with the DEP scale. Returning to the graphs, the SUI scale appears to have the next largest between groups disparity. Interestingly, it is not the next scale/subscale selected by the DA; the ANX scale is. A look at the graph shows that MDD and OD have nearly identical mean elevations on the ANX scale, which begs the question why it was chosen, particularly over the SUI scale. Again, the correlation issue is likely the reason for this. In particular, SUI is conceptually expected to be highly correlated with MDD, and with that in mind, it seems plausible that it is not the next most discriminatory scale/subscale given that the DEP scale has already been included. Once the ANX scale is added second, the SUI scale is determined to contain the next greatest discriminatory power on the variance that remains between the diagnoses once the variance accounted for by the first two scales, DEP and ANX, has been removed.

The fourth and final scale/subscale chosen for the discriminant function was the ANT-E subscale. A quick look at the graphs would suggest that there are at least a few remaining scales/subscales that appear to have larger between groups differences,

especially MAN-G and BOR-I; however, they are passed over in favor of ANT-E. The explanation for this is likely due to correlation issues again. Although it is not possible to state with certainty what actually led to this result, what is certain is that ANT-E provided the greatest reduction in the remaining variance between the two diagnoses. Following the inclusion of ANT-E, the DA determined there were no additional scales/subscales that could significantly improve the discriminatory power of the function.

Working through the stepwise selection process for the DA on MDD and OD helps clarify what the scales/subscales chosen for inclusion in the discriminant function do and do not explain about the data under consideration. First, the scales/subscales that are selected by the DA do not provide insight into which scales/subscales have the greatest *T* score differences between the two diagnostic groups. Second, the inclusion of a scale/subscale in a discriminant function does not indicate anything with regards to the degree of elevation exhibited by that scale/subscale in either diagnostic group. Specifically, inclusion does not signify that the scale/subscale elevation will typically be very low, very high, or moderate. As such, when examining an individual PAI profile for the purpose of interpretation, using only the knowledge that these four scales/subscales comprise the discriminant function does not indicate the characteristics of the profile in general or each individual scale/subscale in particular. In fact, about the only statement that can be made with significant confidence is that when these specific scales/subscales are assigned the appropriate coefficients, collectively they can be used to classify an

individual PAI profile into the appropriate diagnostic category with a level of accuracy that is significant.

As already noted, the DCC's were designed in such a way that the PAI scales/subscales they contain signify those which are most important and potentially helpful to evaluate when interpreting an individual profile for specific diagnostic possibilities. Specifically, the scales/subscales of a particular DCC should be those that exhibit the highest and lowest elevations in the PAI profile for the corresponding diagnosis. Based on the discussion above, it becomes clear that the scales/subscales selected by DA are not able to provide the same type of information. Furthermore, the scales/subscales chosen for the DCC's are based solely on profile data that represents one specific diagnosis, while those selected by DA are based on a comparison of the profile data for two separate diagnostic categories. Taken together, all of the aforementioned differences between the construction of a DCC and a discriminant function create a situation where it is not valid to make direct, one-to-one comparisons between the scales/subscales of the DCC's and those selected by DA. Although there is modest overlap of the scales/subscales obtained in the computations for the DCC's and the DA's in this study, the basis on which a given scale/subscale is selected by each analysis is generally quite different, even though it may appear on the surface to be for the same or similar reasons.

As noted above, two of the scales/subscales selected by the DA were contrary to the hypothesis for the DA on MDD and OD. First, the ANT-E subscale was included in

the discriminant function while the MAN-G subscale was not. The MAN-G was predicted for inclusion because the mean profile for the MDD sample Morey (1991) used reveals that the typical elevation for MAN-G is well below 50*T*. For several reasons described in the section regarding the DCC for MDD, MAN-G is expected to be suppressed for an individual suffering from MDD. It turns out that ANT-E, which is intended to be a measure of egocentricity (Morey, 1991), measures very similar constructs. In fact, Morey (1991) suggests that high scores on ANT-E are indicative of a person who experiences little guilt or remorse; therefore, low scores on ANT-E may indicate excessive guilt, which is one of the nine criterion symptoms for MDD (APA, 2000). Therefore, for reasons very similar to those of MAN-G, it is expected that ANT-E would be suppressed in individuals presenting with MDD.

The ANX scale was included in the discriminant function although it was not hypothesized to be one of the selected scales/subscales. An examination of the characteristics of the OD group can provide a possible explanation for the selection of ANX by the DA. As previously defined, the OD group is composed of every client who was not diagnosed with: (1) MDD with no co-morbid Axis I disorder, or (2) GAD with no co-morbid Axis I disorder. Notably, due to the selected criteria for the MDD and GAD groups, it is possible for the OD group to include, among others, a diagnosis that consists of: (1) MDD and GAD, (2) MDD and one or more (non-GAD) co-morbid Axis I disorder(s), and (3) GAD and one or more (non-MDD) co-morbid Axis I disorder(s). In fact, the OD group does contain several of the three described diagnoses; however, the

exact number is not known at the time of this writing because that data was not recorded during the process of categorizing the PAI profiles into the diagnostic groups chosen for this study.

Although exact figures are not available at the time of this writing, it is possible to generate an estimate of the number of participants in the OD group with an MDD or GAD diagnosis. As mentioned earlier, a report that contained diagnostic information was produced using Titanium software. The report provides information for each of the diagnoses described in the DSM-IV-TR (APA, 2000), including the percentage of clients who received that diagnosis. Unfortunately, given the significant number of possible variations for the MDD diagnosis (single episode, recurrent, mild, moderate, full remission, etc.), it is not a simple matter to estimate how many participants in the OD group had a diagnosis of MDD. After removing the MDD diagnoses that were given a specifier of either partial or full remission (the MDD group was created using the same guideline), the remaining MDD diagnoses were received by 29.8% of clients. This figure is likely misleading (to an unknown degree) due to the possibility that at one point a given client could have received a diagnosis of MDD, single episode, mild, and then later received a diagnosis of MDD, recurrent, mild. The potential also exists that a particular client could have received two separate diagnoses of MDD that varied only in level of severity (mild, moderate, or severe with/without psychotic features). Each of these occurrences would inflate the total percentage of clients who had a diagnosis of MDD,

but it is not possible from the data available at the time of this writing to determine the extent this value might be exaggerated.

Given the unknown error in the approximation of clients diagnosed with MDD, it was decided to proceed with the current value while bearing in mind that it is likely somewhat inflated. Based on the value of 29.8%, approximately 459 clients in the sample used for this study received a diagnosis of MDD. We know that 135 clients received a diagnosis of MDD with no co-morbid Axis I disorder, which leaves around 324 clients in the OD group with a diagnosis of MDD and one or more additional Axis I disorder(s). The percentage of clients who received a diagnosis of GAD was 18.0% (GAD does not have multiple diagnoses as does MDD), which extrapolates out to an estimate of 277 clients. The GAD group consisted of 79 participants, which leaves approximately 198 participants in the OD group with a diagnosis of GAD and one or more additional Axis I disorder(s).

Returning to the unpredicted inclusion of the ANX scale in the discriminant function for MDD and OD, the preceding discussion regarding the composition of the OD group provides one possible explanation for this finding. Specifically, the OD group contained roughly 198 participants who had GAD as a part of their diagnostic profile. This may account for the ability of ANX to discriminate between the MDD and OD groups. This hypothesis becomes even more plausible when the mean scale elevations for ANX are examined. In particular, the MDD (M = 63.47T; SD = 11.68) and OD (M = 64.41T; SD = 13.91) groups demonstrated mean ANX scale elevations that were within

1*T* of each other. Based on the idea that significant differences in scale elevations between two diagnostic groups should best provide discriminant power, it seems unimaginable that the ANX scale could discriminate between the MDD and OD group when the corresponding mean elevations are so similar. However, an examination of the standard deviations reveals a proportionally larger variability in the OD group. It is conceivable that this variation occurred due to the 198 or so GAD diagnoses in the OD group having elevated scores on the ANX scale. If this is indeed the case, then it is very believable that ANX could discriminate between MDD and OD despite the similar mean scale elevations.

Although the above suppositions regarding the individual scales/subscales that comprise the discriminant function for MDD and OD cannot be verified, there are some aspects of the DA results that are definitive. In particular, the standardized canonical coefficients assigned to each scale/subscale of the discriminant function (see Appendix H) provide useful information in that they can be used to assess the importance of the unique contribution to the discriminant function of each scale/subscale. Put another way, they indicate the relative importance of the scales/subscales in predicting diagnostic group. The standardized canonical coefficient with the maximum absolute value for the discriminant function for MDD and OD belongs to the DEP scale (0.992); the ANX scale is the second highest (-0.810). The interpretation of these findings is that the DEP scale has the most predictive power of the four scales/subscales selected for the discriminant function, and the ANX scale has about 81.7% (0.810/0.992) as much predictive power as

the DEP scale. The ANT-E subscale, which has the lowest standardized canonical coefficient (-0.330), is roughly only one-third as powerful as the DEP scale for predicting diagnostic category. Importantly, these coefficients change whenever a scale/subscale is added or removed from the discriminant function; therefore, what cannot be inferred from these results is how much predictive power the DEP, ANX, SUI, or ANT-E scales/subscales have compared to each of the remaining PAI scales/subscales.

Once a discriminant function has been created, it can be used to classify individual PAI profiles into one of two groups. This step involves multiplying the *T* score of each scale/subscale in the discriminant function by its corresponding unstandardized canonical discriminant coefficient, and summing those values to provide a single numerical result. When the computed result is above a certain cutoff point, that participant is classified into one diagnostic group, and when below the cutoff, it places the participant into the other diagnostic group. To aid in this process, it is recommended that prior probabilities (priors) be set proportional to group size when the two groups do not have equal sample sizes, which is the case in the present instance (MDD: $n = 135$; OD: $n = 1327$). Priors essentially act as weights in such a way as to direct more participants towards the group with the larger prior value, and fewer participants towards the group with the smaller prior value. For example, if the classification of MDD and OD participants used proportionate priors (group size), they would be roughly .092 and .908, respectively.

Initially, when the classification was calculated for each of the MDD and OD participants, the above proportional priors were used; however, this led to a significant problem. With priors set to group size, 90.7% of the original grouped cases were correctly classified, and classification was successful in 99.0% of the OD group, but only 8.9% of the MDD group. In terms of number of participants, this meant that only 12 of the 135 participants in the MDD group were classified in the MDD category.

When priors were set equal (.5 and .5), classification was successful in 68.1% of the MDD group, and 74.0% of the OD group. Of the original grouped cases, 73.5% were correctly classified. Although the total hit rate is significantly lower in this second classification (73.5% versus 90.7%), and the OD group's classification rate decreased from 99.0% to 74.0%, the MDD group increased from being correctly classified 8.9% of the time to 68.1%. Given that the goal of this DA was to create a discriminant function that was capable of taking the PAI profile of any client seeking treatment and detect, identify and diagnose the presence of MDD. To this end, it was decided that the loss in accuracy of correctly classifying the OD group was much less important than the gains for the MDD group with priors set equal.

Furthermore, the composition of the OD group raises some interesting questions regarding the second and final classification using the MDD and OD derived discriminant function. In particular, the 26.0% of OD participants who were "incorrectly" classified into the MDD group represent 345 participants. Earlier, a rough estimate for the number of participants in the OD group with a diagnosis of MDD and one or more additional

Axis I disorder(s) was calculated and determined to be around 324. Perhaps the similarity between this estimated value and the actual number of participants from the OD group who were classified as being in the MDD group is purely coincidence, but it is very intriguing to consider the possibility that the majority of the 345 are comprised of the rough estimate of 324 participants with an MDD diagnosis as part of the clinical picture. Unfortunately, given the available data at the time of this writing there is no way to determine if this is in fact the case, or even what percentage of the 345 has an MDD diagnosis. If this proposed theory is even partially correct, it could be argued that the "lower" hit rate for the OD group when using equal priors is actually a more accurate representation of the PAI profiles being investigated than the 99.0% hit rate when priors were set to group size.

The previous discussion highlights one of the limitations of the present DA. At a basic level, one interpretation of the results from running a DA on MDD and OD is that you can use the resultant discriminant function to examine an individual PAI profile and predict if the client has MDD with no co-morbid Axis I disorder(s) or some other some other diagnosis. If, however, the goal were to create a discriminant function that could detect the existence of MDD regardless of the presence of another Axis I disorder, the discriminant function developed here cannot be assumed to perform such an action. It is suggested that a follow-up study be conducted that places any PAI profile with an associated MDD diagnosis into the MDD group to determine how, if at all, the resulting discriminant function would differ from that created here.

Discriminant Analysis on GAD and OD

It was hypothesized that (1) the ANX-A subscale and (2) the SCZ full scale would be found to discriminate between the GAD and OD diagnostic groups. The results of the DA revealed that together, (1) ANX-C, (2) BOR-I, and (3) DEP-A were capable of accurately categorizing a given PAI profile into the appropriate diagnostic group. Neither of the two hypothesized scales/subscales was selected for inclusion in the discriminant function, and one additional scale, DEP-A, was included. On the surface, these results do not support the predicted outcome; however, for several reasons described in the previous section, it is not a trivial matter to theorize what scales/subscales would be selected by DA. Furthermore, in the case of the GAD group, a mean profile was not available for use in assisting with scale/subscale predictions as was the case for the MDD group. If the process described in the previous section for the selection of scales by the DA for the MDD and OD groups is followed here, insight into the 3 subscales that were selected in this DA can be gained. It is left as an exercise for the reader to step through the procedure. As a reminder, Appendix E contains the full scale and subscale graphs that display the GAD and OD groups together.

The inclusion of ANX-C as opposed to the predicted ANX-A is consistent with the result obtained from the computations used to create the proposed DCC for GAD, which showed the ANX-C subscale to possess the highest hit rate of any scale/subscale for the ANX diagnostic group (see Appendix K). In fact, the mean scale elevation for ANX-C in the GAD group is the highest score of any scale/subscale of the three

diagnostic groups created for this study (see Appendix F). As such, it is clear why it was selected as the first scale/subscale by this DA.

As with the DA for MDD and OD, there was an unexpected scale chosen by the DA for GAD and OD: in this instance, the DEP-A subscale. For the DA on MDD and OD, the ANX scale was selected, and due to the OD group containing large numbers of GAD diagnoses, it is intuitive that the ANX scale would help discriminate between the two diagnostic groups. Following the same reasoning, it is understandable that the OD group's large number of MDD diagnoses, which was estimated to be around 324, would account for the ability of DEP-A to discriminate between the GAD and OD diagnostic groups in the present DA.

Reviewing the standardized canonical coefficients for the DA on GAD and OD (see Appendix I) reveals that, as would be expected, the ANX-C subscale (1.197) has the most predictive power of the three subscales used in the discriminant function. The BOR-I (-0.596) and DEP-A (-0.466) subscales are each a little less than half as powerful for the purpose of predicting.

Similar to the classification for the MDD and OD groups, the selection of priors that were proportional to group size was problematic for GAD and OD. In fact, the ratio for the classification is even worse than it was for MDD and OD (GAD: $n = 79$; OD: $n = 1327$). For the same reasons explained in the classification of MDD and OD, it was decided to set the priors equal (.5 and .5) for classifying GAD and OD. Using these

values, classification was successful in 82.3% of the GAD group, and 77.2% of the OD group. Of the original grouped cases, 77.5% were correctly classified.

A dynamic consistent with the one observed in the MDD and OD classification presented itself here as well. Specifically, the 22.8% of OD participants who were "incorrectly" classified into the GAD group represent 303 participants. As estimated before, roughly 198 participants in the OD group have a diagnosis of GAD and one or more additional Axis I disorder(s). As such, the OD group had about 50% more participants placed in the GAD group than the approximate number who had a diagnosis of GAD as part of the clinical picture (303 versus 198), which is not as accurate as the results obtained from the MDD and OD classification (345 versus 324). However, the result discovered here still generates the intriguing possibility that a significant number of the 303 who were "incorrectly" classified are comprised of the estimated 198 participants with a GAD diagnosis as part of the clinical picture. As with the previous classification, it is not possible to determine the degree to which this relationship may exist due to the lack of necessary data at the time of this writing.

Once again, consistent with the DA on MDD and OD, the above discussion highlights one of the limitations of the present DA. At a basic level, one interpretation of the results from running a DA on GAD and OD is that you can use the resultant discriminant function to examine an individual PAI profile and predict if the client has GAD with no co-morbid Axis I disorder(s) or some other some other diagnosis. If, however, the goal were to create a discriminant function that could detect the existence of

GAD regardless of the presence of another Axis I disorder, the discriminant function developed here cannot be assumed to perform such an action. It is suggested that a follow-up study be conducted that places any PAI profile with an associated GAD diagnosis into the GAD group to determine how, if at all, the resulting discriminant function would differ from the one just created.

Discriminant Analysis on MDD and GAD

The hypothesis for the DA on MDD and GAD was that the following scale and subscales would be found to discriminate between the two diagnostic groups: (1) DEP-A, (2) ANX-A, (3) SUI, (4) MAN-G, (5) SCZ-S, and (6) SCZ-T. The results of the DA revealed that together, (1) ANX, (2) DEP-A, (3) BOR-S, (4) SCZ-P, (5) SOM-S, and (6) MAN-G could accurately classify a given PAI profile into the appropriate diagnostic group. Thus, only two of the six hypothesized scales/subscales were selected for inclusion in the discriminant function, but one, ANX, was very similar to the suspected ANX-A except that rather than the anxiety subscale being selected, the full scale was chosen. As with the DA on GAD and OD, these results do not support the predicted outcome; however, for several reasons already discussed, accurately predicting scale/subscale selection for DA is often not possible. Additionally, the hypothesized scales/subscales for this DA suffered from the same issue as the DA for GAD and OD; namely that there was no mean GAD profile to utilize in developing the predicted scales/subscales. Once again, following the aforementioned process in the DA on MDD and OD, potential explanations for the selection of these six scales/subscales can be

elucidated. It is left as an exercise for the reader to step through the procedure. As a reminder, Appendix E contains the full scale and subscale graphs that display the MDD and GAD groups together.

Some differences between this DA and the first two that were performed are important to mention. First, the relationship between the two groups under consideration for this DA is significantly different than the others. In particular, each of these groups was composed of participants who met very narrowly defined criteria related to diagnosis. In the first two DA's, one of the two groups was extremely heterogeneous and also included participants who had portions of their clinical presentation that overlapped with the comparison group. In the present DA, this was not the case as each group contained only the designated diagnosis, which theoretically should have led to much more consistent PAI profiles with the additional benefit of minimal overlap with the comparison group. Additionally, an enormous improvement in the ratio of group size exists between these two groups.

An examination of the standardized canonical coefficients for the DA on MDD and GAD (see Appendix J) reveals that the ANX (-1.139) and DEP-A (0.707) scale/subscale have significantly more predictive power than the other four subscales in the DA. This finding provides incremental validity for the depression and anxiety scales/subscales of the PAI, particularly with a university counseling center population. Given the unambiguous nature of each group, it is to be expected that the corresponding

scales/subscales of the PAI, depression and anxiety, would provide a significant proportion of the discriminatory power.

Classification for the DA on MDD and GAD was executed differently due to the improvement in ratio of group size (GAD: n = 79; MDD: n = 135). As such, it was determined that this classification could be performed as is typically recommended, which entails using group sizes for the choice of priors. Using these values, classification was successful in 93.3% of the MDD group, and 89.9% of the GAD group. Of the original grouped cases, 92.1% were correctly classified. In terms of the number of PAI profiles misclassified, 9 of the 135 profiles from the MDD group were misclassified as GAD, and 8 of the 79 profiles from the GAD group were misclassified as MDD. The exceptionally high hit rates obtained in this DA are likely influenced by a few factors. First, the ability to select group sizes for the priors boosts accuracy above that seen for the first two DA's. Also, the well-defined nature of each group presumably facilitated the ability to discriminate between them.

The applicability of the discriminant function computed for MDD and GAD is significantly different from the previous two discriminant functions, and this distinctiveness sheds light on an important limitation. Essentially, the discriminant functions computed for MDD and OD, and GAD and OD, are capable of the following: given a PAI profile of any university counseling center client, the diagnosis will be determined to be either MDD (or GAD) with no co-morbid Axis I disorder, or something else. To this end, it could be said that these two discriminant functions are useful for

detecting the presence of the associated disorder (MDD or GAD), or to help rule-out the disorder. In stark contrast, the discriminant function for MDD and GAD provides the ability to do the following. Given a PAI profile of a university counseling center client who has either MDD with no co-morbid Axis I disorder, or GAD with no co-morbid Axis I disorder, the diagnosis will be determined, and thus differentiated, with a high degree of confidence. To this end, it could be said that this function is useful for the task of differentiating between MDD and GAD when the diagnosis has been narrowed to be one of the two. As such, this discriminant function has a very specific application, while the other two could presumably be used with every client. The benefit of such a precise purpose is the extremely high level of accuracy achieved. Alternatively, the broader application provided by the first two discriminant functions comes at the cost of a significant decrease in accuracy.

Similar to the limitations noted for the first two discriminant functions, this one was developed using data from participants who did not have a co-morbid Axis I disorder. If the goal was to have a discriminant function that could be used for the task of differentiating between MDD and GAD regardless of the presence of other Axis I disorders, the discriminant function developed here cannot be assumed to perform such an action. It is suggested that a follow-up study be conducted that places any PAI profile with an associated MDD or GAD diagnosis into the corresponding diagnostic group to determine how, if at all, the resulting discriminant function would differ from the one just created.

Limitations

There are a number of limitations in the present study, and those applicable to only one or a few of the parts have been discussed in the corresponding sections above. One limitation that applies to the study as a whole is the use of clinician's diagnoses as a criterion measure. It is widely accepted that considerable variability exists between individual clinician's diagnostic impressions. Given that the accuracy of the diagnoses used in this study were not verified by a second clinician (except in those cases where the treating clinician was a graduate student being supervised by a licensed psychologist), it is conceivable that variation among clinicians adversely affected the diagnoses used for classification in this study. To the extent that this occurred, the myriad analyses conducted would have been based on PAI data that were erroneously believed to be associated with correct diagnoses. Although the consistent results achieved in many aspects of this study would suggest otherwise, it is still possible that variation in clinician diagnoses adversely affected the results obtained.

Furthermore, it is possible that the clinician's diagnostic decisions were influenced by reviewing the results of the PAI prior to making a diagnosis. Although the PAI results do provide interpretive hypotheses regarding diagnosis, they are merely suggestions, and the clinician is still expected to consider all possible diagnoses that are applicable to a client. Given the nature of this study and the data utilized, this was not a

variable that could be controlled, nor is it possible to estimate the impact it may have had on diagnostic decisions. Again, as mentioned above, the consistency of the results obtained across various analyses and diagnostic groups in the present study suggests that the diagnoses used were accurate and reliable.

The choice to use DA for the purpose of developing discriminant functions that could be utilized for diagnostic classification of individual PAI profiles may have led to problematic results. Other statistical methods exist that can be used for classification purposes, and perhaps different results would have been obtained had another method of analysis been chosen, such as logistic regression. One weakness of multivariate approaches such as DA is that weights (canonical discriminant function coefficients in the present study) may not generalize well across various samples. The reasons for this are that the weights can be affected by sample size, as well as the number and weighting of predictors (Bernstein, 1988). Two directions for future research include: (1) using a different statistical method on the data in this study to create the corresponding discriminant functions, and then comparing those results to the ones obtained here, and (2) conducting DA on data from new samples to determine how well the weights obtained in this study generalize to another sample.

The data used for this study came from a single counseling center at a large southeastern university; as such, the generalizability of this study is limited. It is possible that the student population sampled here differs from other universities of varying size and location. Furthermore, the potential exists that the students who seek services at the

counseling center of this university present with significantly different concerns than those at other universities. Although the CSCMH study (Locke, 2009) demonstrated that the same types of clients and problems tend to be seen by all counseling centers regardless of their parent institution, it is still possible that there are important variations in the students seeking services at this counseling center. Replication of this study at multiple university counseling centers across the U.S. may bolster the generalizability of the results obtained here.

Future Directions

A number of future directions for research have been proposed throughout this study. Combining several of the results and nuances that were revealed in this study, the question arises as to how else the PAI might be utilized for the purpose of diagnosis. In particular, are there methods that could provide more accurate diagnoses than those developed to date? Similarly, could methods be discovered that provide equivalent diagnostic accuracy of existing methods, yet with less analysis, effort, or time involved to achieve the results?

One such possibility comes to mind based on some of the patterns observed in the present study, as well as research conducted by Marlowe and Wetzler (1994). The authors used DA to develop a number of discriminant functions using other popular personality assessment instruments. They found that most of the functions created were able to significantly discriminate patients who were depressed, manic, or psychotic from controls. Despite the significance the authors observed for most of the functions, they

found little improvement in diagnostic efficiency when compared to the use of single-scale elevations at specified cut scores. The findings obtained by Marlowe and Wetzler (1994), and several patterns observed during the analyses of the present study, suggest the need to conduct research on the PAI that compares the use of complicated equations like those developed with DA, and simpler methods of analysis such as individual scale elevations that make use of cut scores to determine inclusion in a diagnostic category.

Conclusions

Overall, the results of this study indicated that the Personality Assessment Inventory can be used to diagnose and discriminate between Major Depressive Disorder and Generalized Anxiety Disorder in a University Counseling Center. However, the ability of the PAI to be utilized for this purpose varied as a function of the application of the PAI results. In particular, it was found that the Diagnostic Consideration Clusters for MDD and GAD were not capable of diagnosing the intended disorders, and were thus incapable of discriminating between MDD and GAD. Furthermore, based on additional analyses and the development of DCC's for MDD and GAD using the data from the present study, I questioned the viability of using DCC's for the purpose of diagnosis and suggested future research examine the validity of DCC's for other psychiatric disorders to aid in addressing the question of viability.

In contrast to the DCC's, discriminant functions were created that were found to accurately diagnose and discriminate between, (1) MDD and all other disorders, (2) GAD and all other disorders, and (3) MDD and GAD. Although these discriminant functions

were effective for the task of diagnosis and discrimination, they require significant effort to develop initially and then additional effort and time to apply to PAI data. Given this drawback to using discriminant functions, I questioned if it would be possible to obtain similar results with less time and effort. Research conducted by Marlowe and Wetzler (1994) suggests that it may be possible to achieve similar levels of diagnostic efficiency by examining single-scale elevations at specified cut scores; therefore, future research could expand upon the work done by these authors to include additional psychiatric diagnoses and assessment instruments, particularly the PAI.

Given the prevalence of MDD and GAD as the two psychological disorders most generally treated at university counseling centers, the clinically significant distress or impairment they cause in important areas of functioning, and the difficulties clinicians face in accurately diagnosing and discriminating between MDD and GAD, the results of this study demonstrate a need to increase the use of the PAI as a part of the treatment process, especially for the population sampled in this study.

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APPENDICES

Appendix A

Major Depressive Disorder (MDD)

A. Presence of one or more Major Depressive Episodes, defined as:

   A. Five (or more) of the following symptoms have been present during the same two-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure. Note: Do not include symptoms that are clearly due to a general medical condition, or mood-incongruent delusions or hallucinations.
      (1) depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful). Note: In children and adolescents, can be irritable mood.
      (2) markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation made by others).
      (3) significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. Note: In children, consider failure to make expected weight gains.
      (4) insomnia or hypersomnia nearly every day
      (5) psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down)
      (6) fatigue or loss of energy nearly every day
      (7) feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick)
      (8) diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others)
      (9) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide
   B. The symptoms do not meet criteria for a Mixed Episode.
   C. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
   D. The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., hyperthyroidism)
   E. The symptoms are not better accounted for by Bereavement, i.e., after the loss of a loved one, the symptoms persist for longer than 2 months or are characterized by marked functional impairment, morbid preoccupation with worthlessness, suicidal ideation, psychotic symptoms, or psychomotor retardation.

Major Depressive Disorder (MDD) (continued)

B. The Major Depressive Episode is not better accounted for by Schizoaffective Disorder and is not superimposed on Schizophrenia, Schizophreniform Disorder, Delusional Disorder, or Psychotic Disorder Not Otherwise Specified.
C. There has never been a Manic Episode, a Mixed Episode, or a Hypomanic Episode. Note: This exclusion does not apply if all of the manic-like, mixed-like, or hypomanic-like episodes are substance or treatment induced or are due to the direct physiological effects of a general medical condition.

Source: Adapted from "*Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision, pp. 356, 369-371)," by American Psychiatric Association, 2000, Washington, DC: Author.

Appendix B

Generalized Anxiety Disorder (GAD)

A. Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least six months, about a number of events or activities (such as work or school performance).
B. The person finds it difficult to control the worry.
C. The anxiety and worry are associated with three (or more) of the following six symptoms (with at least some symptoms present for more days than not for the past six months). Note: Only one item is required in children.
   (1) restlessness or feeling keyed up or on edge
   (2) being easily fatigued
   (3) difficulty concentrating or mind going blank
   (4) irritability
   (5) muscle tension
   (6) sleep disturbance (difficulty falling or staying asleep, or restless unsatisfying sleep)
D. The focus of the anxiety and worry is not confined to features of an Axis I disorder, e.g., the anxiety or worry is not about having a Panic Attack (as in Panic Disorder), being embarrassed in public (as in Social Phobia), being contaminated (as in Obsessive-Compulsive Disorder), being away from home or close relatives (as in Separation Anxiety Disorder), gaining weight (as in Anorexia Nervosa), having multiple physical complaints (as in Somatization Disorder), or having a serious illness (as in Hypochondriasis), and the anxiety and worry do not occur exclusively during Posttraumatic Stress Disorder.
E. The anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
F. The disturbance is not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a general medical condition (e.g., hyperthyroidism) and does not occur exclusively during a Mood Disorder, a Psychotic Disorder, or a Pervasive Developmental Disorder.

Source: Adapted from "*Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text revision, p. 476)," by American Psychiatric Association, 2000, Washington, DC: Author.

Appendix C

PAI Clinical, Treatment, and Interpersonal Scales

Scale	Description
Clinical Scales	
Somatic Complaints (SOM)	Focuses on preoccupation with health matters and somatic complaints related to somatization or conversion disorders. Subscales include Conversion (SOM-C), Somatization (SOM-S), and Health Concerns (SOM- H).
Anxiety (ANX)	Focuses on phenomenology and observable signs of anxiety with an emphasis on assessment across different response modalities. Subscales include Cognitive (ANX-C), Affective (ANX-A), and Physiological (ANX-P).
Anxiety-Related Disorders (ARD)	Focuses on symptoms and behaviors related to specific anxiety disorders. Subscales include Obsessive-Compulsive (ARD-O), Phobias (ARD-P), and Traumatic Stress (ARD-T).
Depression (DEP)	Focuses on symptoms and phenomenology of depressive disorders. Subscales include Cognitive (DEP-C), Affective (DEP-A), and Physiological (DEP-P).
Mania (MAN)	Focuses on affective, cognitive, and behavioral symptoms of mania and hypomania. Subscales include Activity Level (MAN-A), Grandiosity (MAN-G), and Irritability (MAN-I).
Paranoia (PAR)	Focuses on symptoms of paranoid disorders and on more enduring characteristics of paranoid personality. Subscales include Resentment (PAR-R), Hypervigilance (PAR-H), and Persecution (PAR-P).
Schizophrenia (SCZ)	Focuses on symptoms relevant to the broad spectrum of schizophrenic disorders. Subscales include Psychotic Experiences (SCZ-P), Social Detachment (SCZ-S), and Thought Disorder (SCZ-T).
Borderline Features (BOR)	Focuses on attributes indicative of a borderline level of personality functioning, including unstable and fluctuating interpersonal relations, impulsivity, affective lability and instability, and uncontrolled anger. Subscales include Affective Instability (BOR-A), Identity Problems (BOR-I), Negative Relationships (BOR-N), and Self-Harm (BOR-S).
Antisocial Features (ANT)	Focuses on history of illegal acts and authority problems, egocentrism, lack of empathy and loyalty, instability, and excitement-seeking. Subscales include Antisocial Behaviors (ANT-A), Egocentricity (ANT-E), and Stimulus-Seeking (ANT-S).
Alcohol Problems (ALC)	Focuses on problematic consequences of alcohol use and features of alcohol dependence.
Drug Problems (DRG)	Focuses on problematic consequences of drug use (both prescription and illicit) and features of drug dependence.

PAI Clinical, Treatment, and Interpersonal Scales (continued)

Scale	Description
Treatment Scales	
Aggression (AGG)	Focuses on characteristics and attitudes related to anger, hostility, and aggression, including a history of aggression (physical and verbal) and attitudes conducive to aggressive behavior. Subscales include Aggressive Attitude (AGG-A), Verbal Aggression (AGG-V), and Physical Aggression (AGG-P).
Suicidal Ideation (SUI)	Focuses on suicidal ideation, ranging from hopelessness through general and vague thoughts of suicide to thoughts representing specific plans for the suicidal act.
Stress (STR)	Focuses on the impact of current or recent stressors in areas of family, health, employment, finances, and other major life areas.
Nonsupport (NON)	Focuses on a lack of perceived social support, considering both the level and quality of available support.
Treatment Rejection (RXR)	Focuses on attributes and attitudes theoretically predictive of interest and motivation to make personal changes of a psychological or emotional nature: a feeling of distress and dissatisfaction, willingness to participate, recognition of need to change, openness to new ideas, and a willingness to accept responsibility for actions.
Interpersonal Scales	
Dominance (DOM)	Focuses on the extent to which a person is controlling and independent in interpersonal relationships. Conceptualized as a bipolar dimension, with a dominant style at the high end and a submissive interpersonal style at the low end.
Warmth (WRM)	Focuses on the extent to which a person is supportive and empathic in personal relationships. Conceptualized as a bipolar dimension, with a warm, outgoing interpersonal style at the high end and a cold, rejecting interpersonal style at the low end.

Note: Adapted from "*Personality Assessment Inventory: Professional manual,"* by L.C. Morey, 1991, pp. 2-3, Odessa, FL: Psychological Assessment Resources.

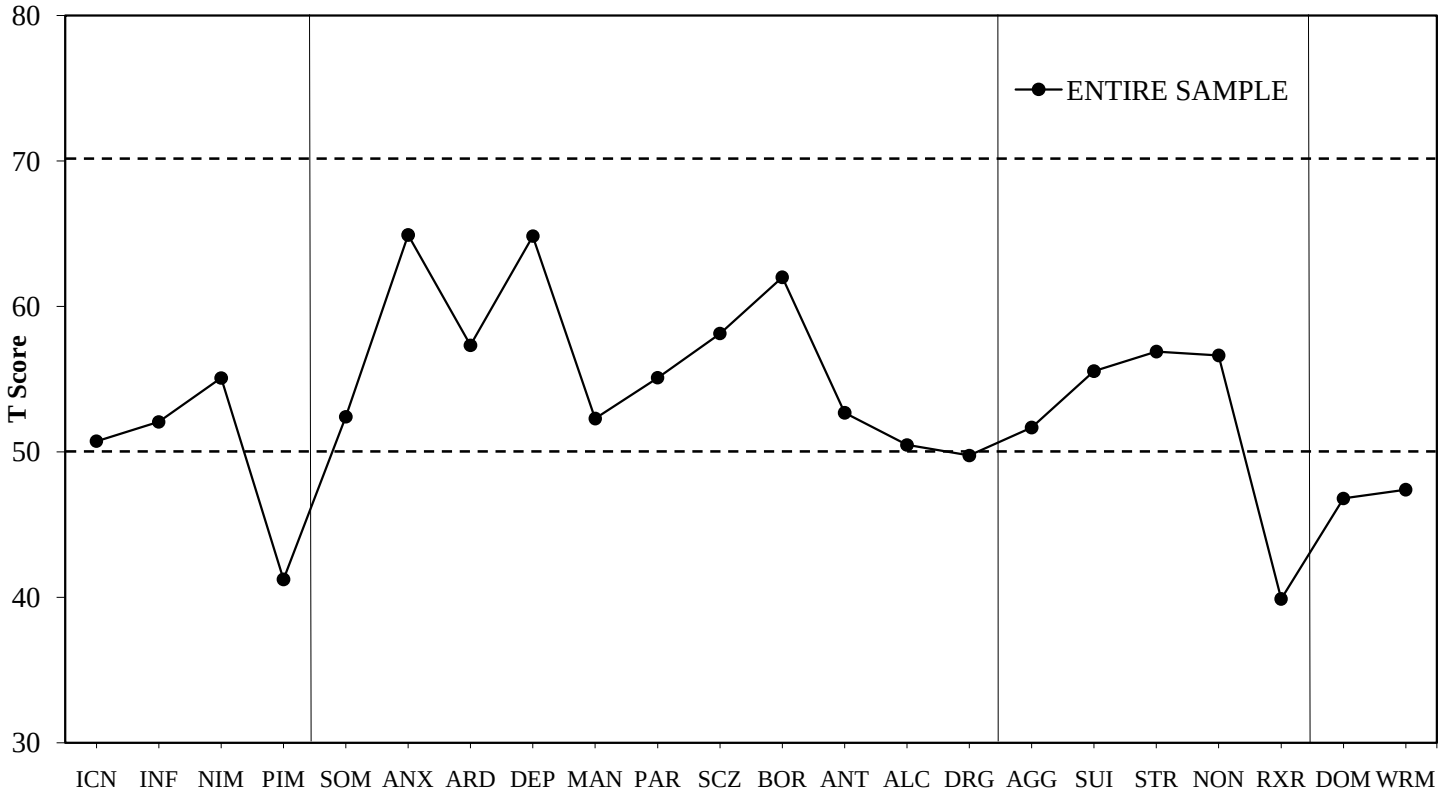
Appendix D

Diagnostic Consideration Clusters for MDD and GAD

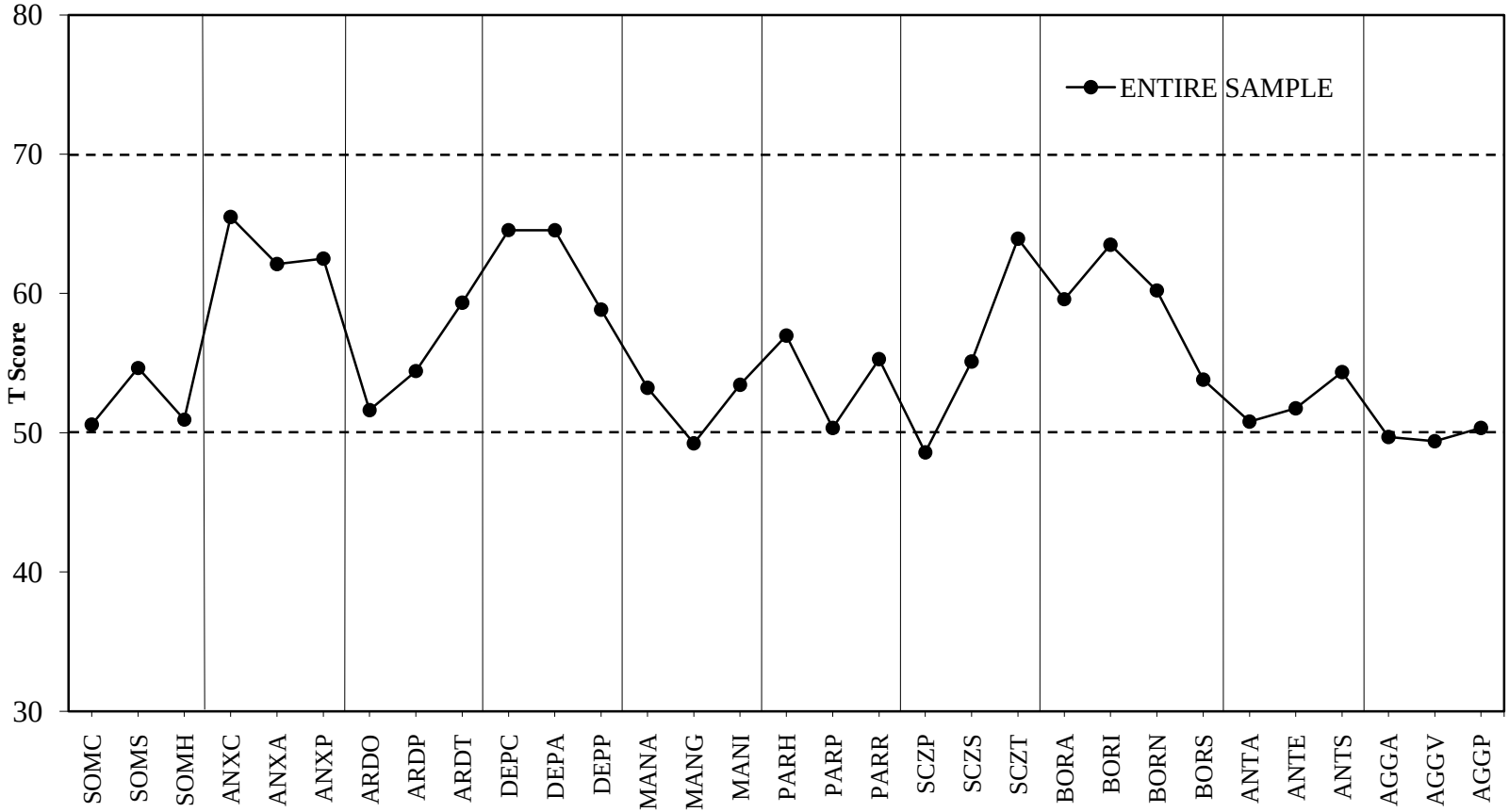
Disorder	Relative Elevation	Relative Suppression
MDD	DEP-A	MAN-G
	DEP-P	
	DEP-C	
	SUI	
	SCZ-T	
	SCZ-S	
GAD	ANX	ARD
	ANX-A	SCZ

Note: Adapted from "*PAI: Structural Summary-Revised,"* by L.C. Morey, 2007, Lutz, FL: Psychological Assessment Resources.

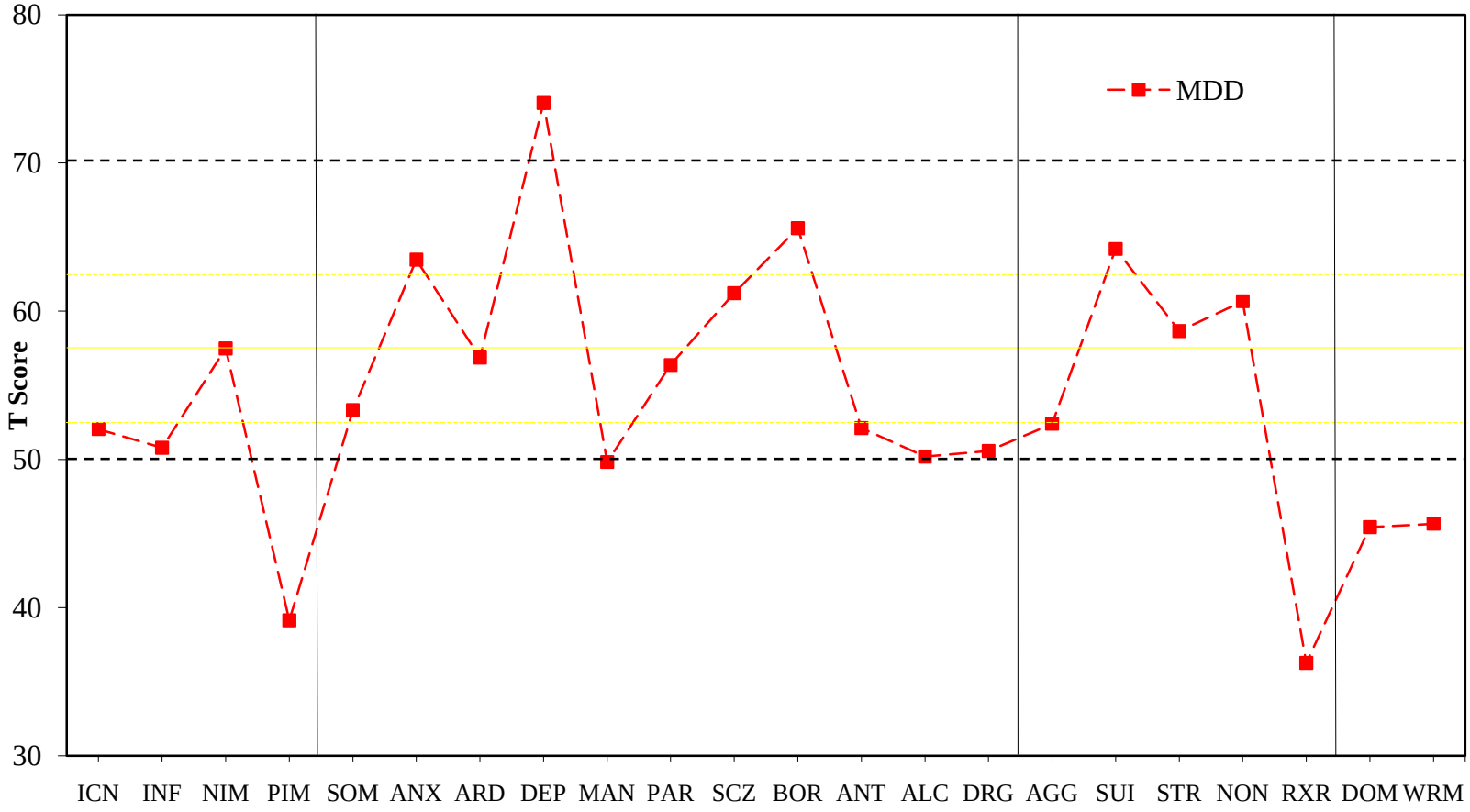
Appendix E



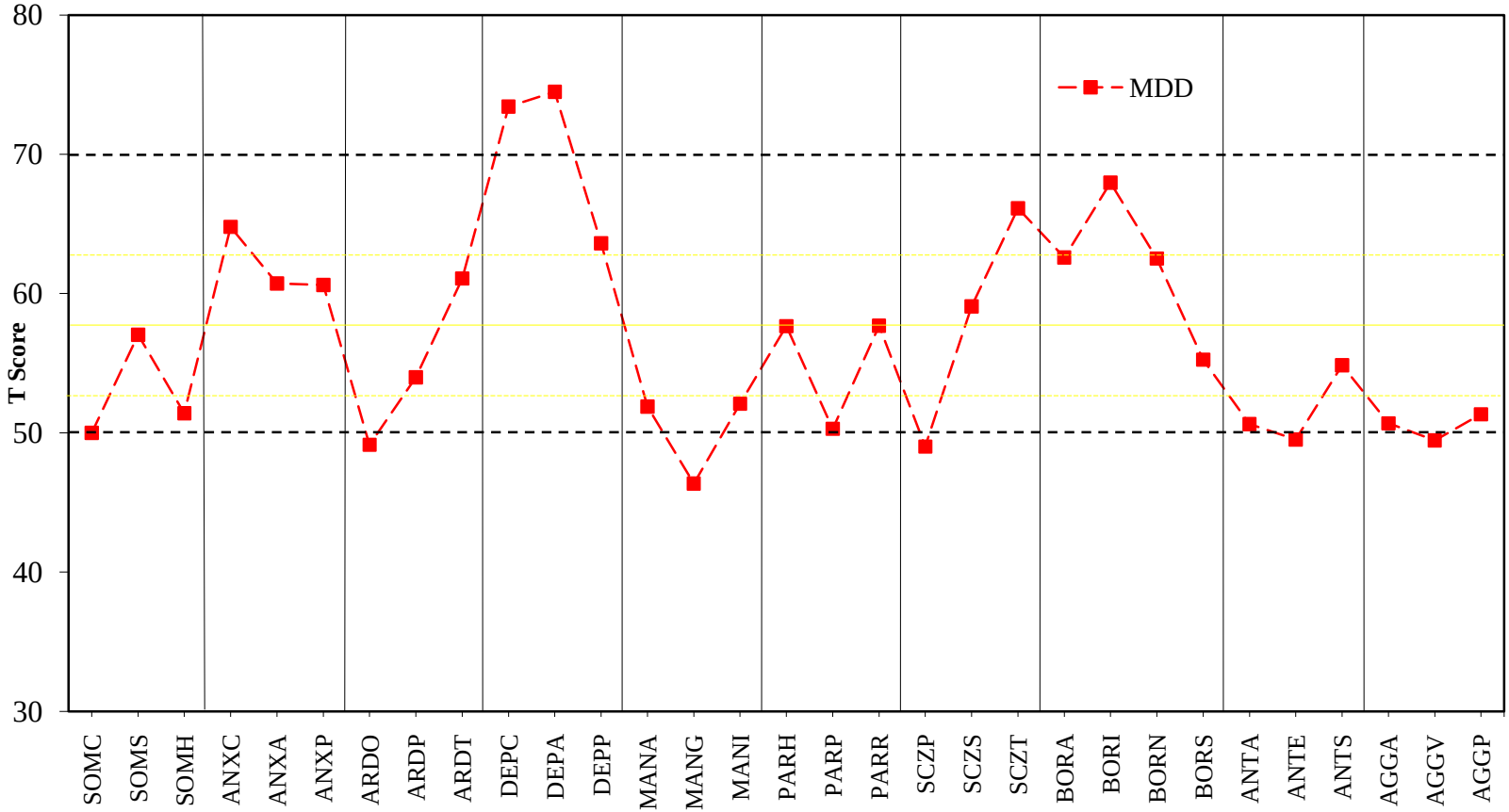
Mean PAI full scale elevations for the entire sample (*N* = 1541).



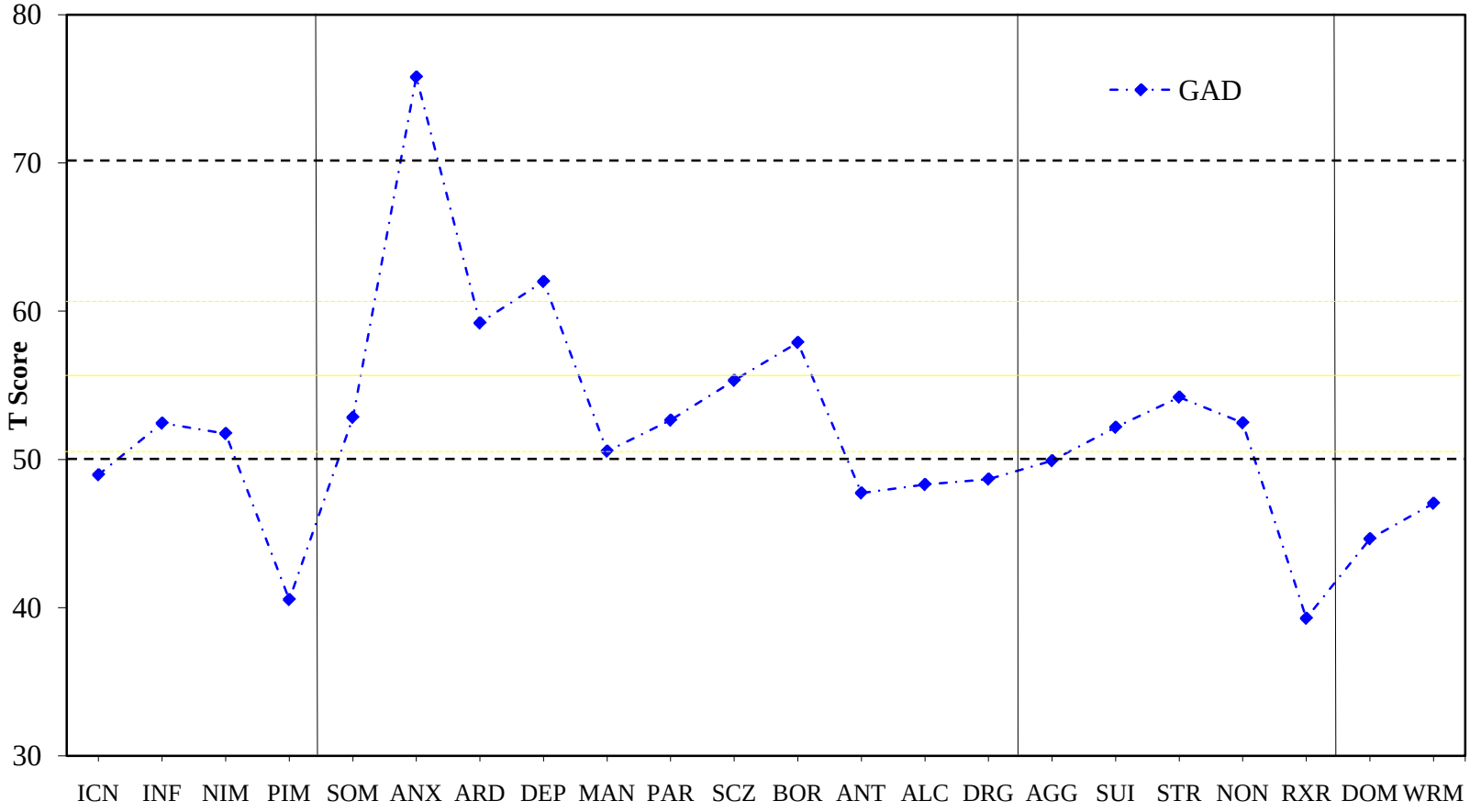
Mean PAI subscale elevations for the entire sample (N = 1541).



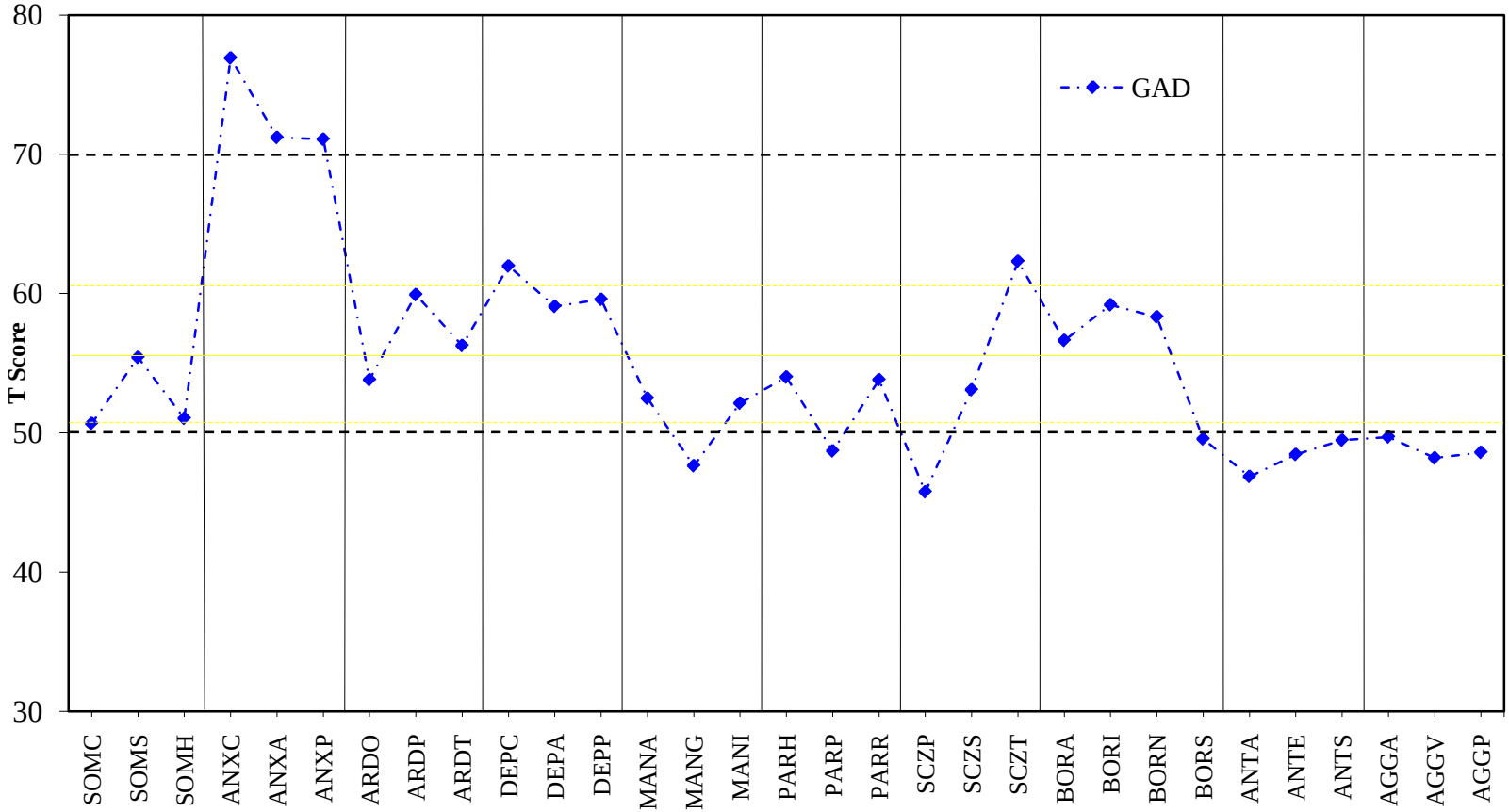
Mean PAI full scale elevations for MDD (*n* = 135). Solid yellow line = MCE = 57.60*T*; dashed yellow lines = relative elevation and suppression boundaries = MCE +/- 5.0*T*



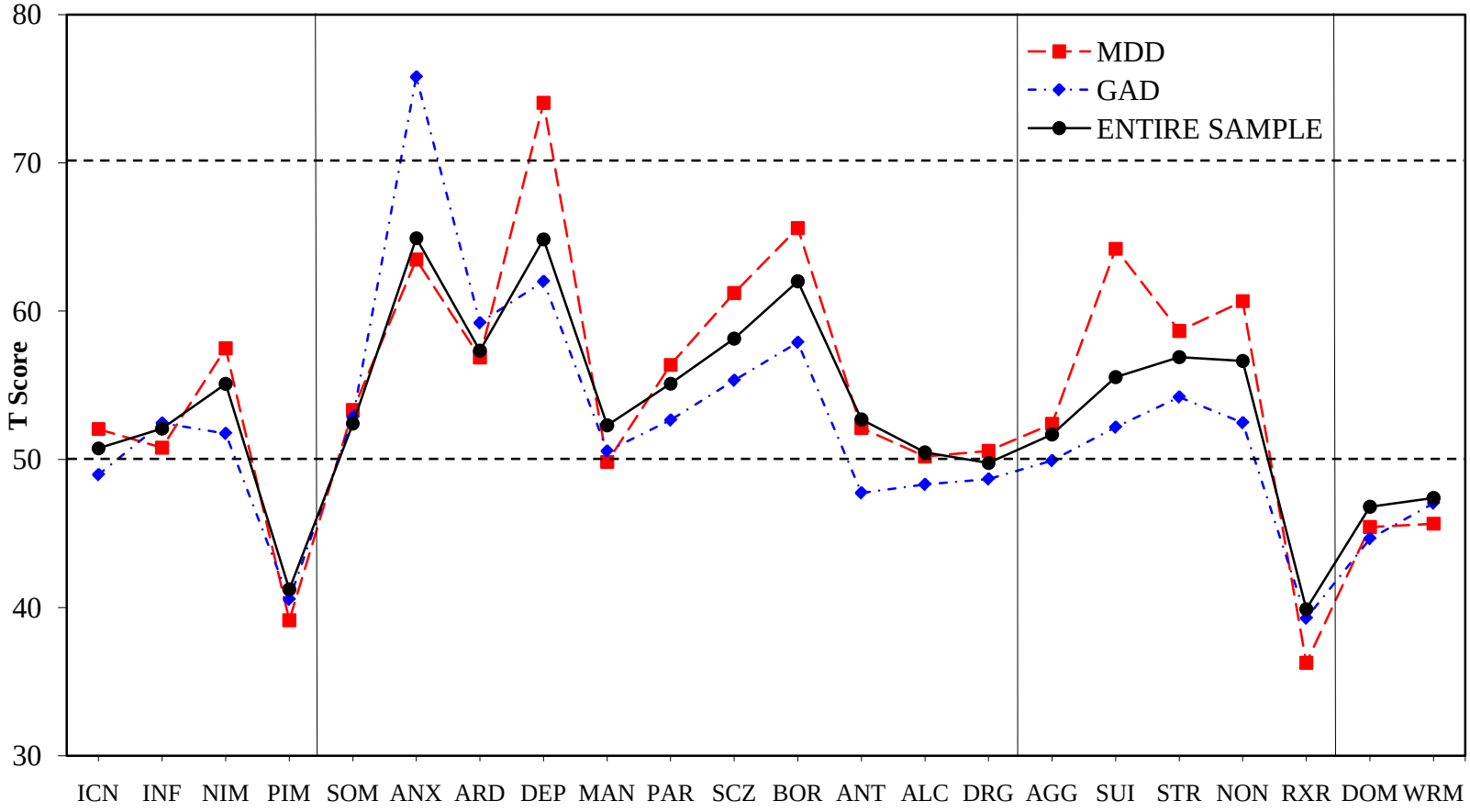
Mean PAI subscale elevations for MDD (*n* = 135). Solid yellow line = MCE = 57.60*T*; dashed yellow lines = relative elevation and suppression boundaries = MCE +/- 5.0*T*



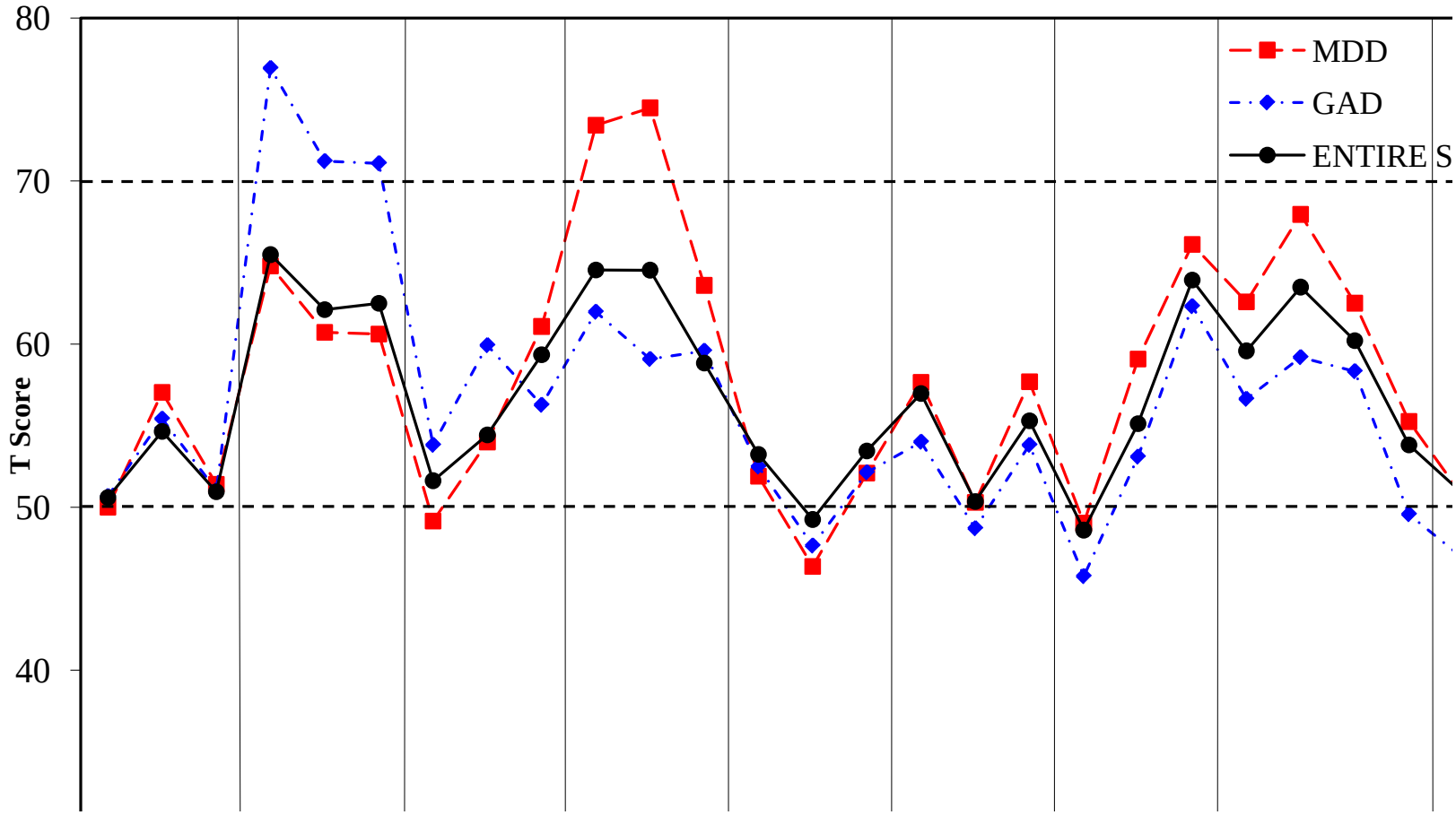
Mean PAI full scale elevations for GAD (*n* = 79). Solid yellow line = MCE = 55.54*T*; dashed yellow lines = relative elevation and suppression boundaries = MCE +/- 5.0*T*



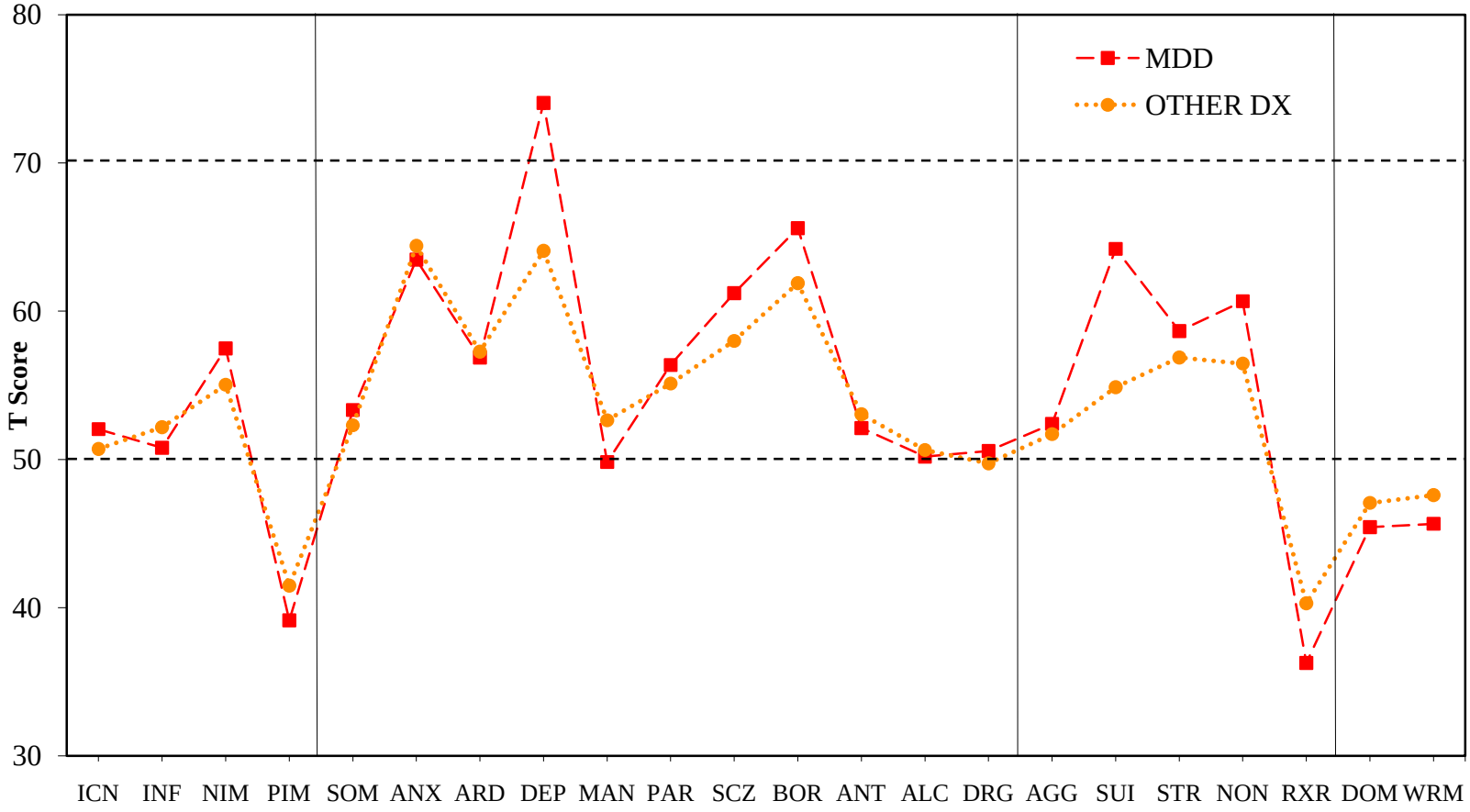
Mean PAI subscale elevations for GAD (*n* = 79). Solid yellow line = MCE = 55.54*T*; dashed yellow lines = relative elevation and suppression boundaries = MCE +/- 5.0*T*



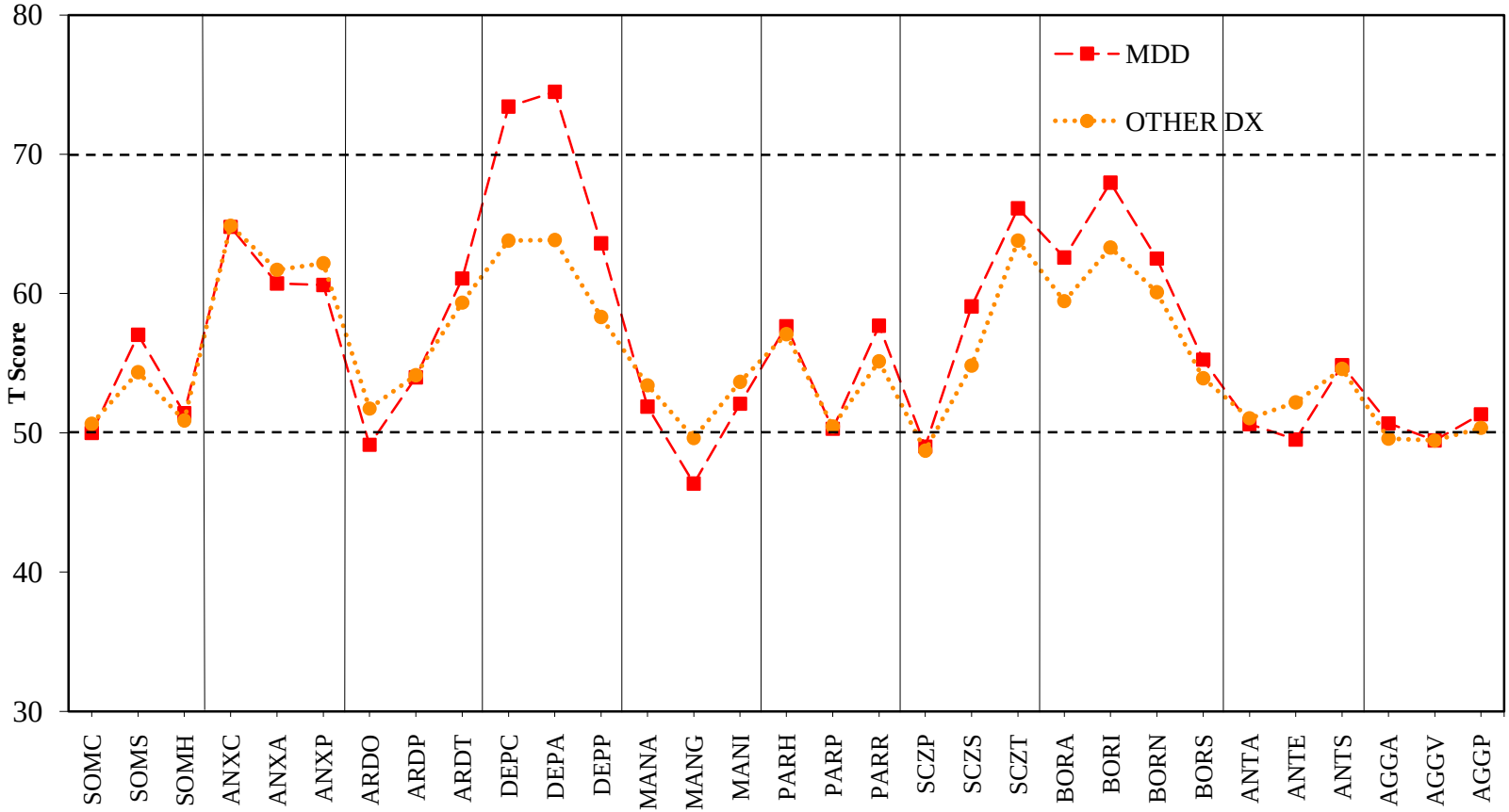
Mean PAI full scale elevations for MDD (*n* = 135), GAD (*n* = 79), and the entire sample (*N* = 1541).



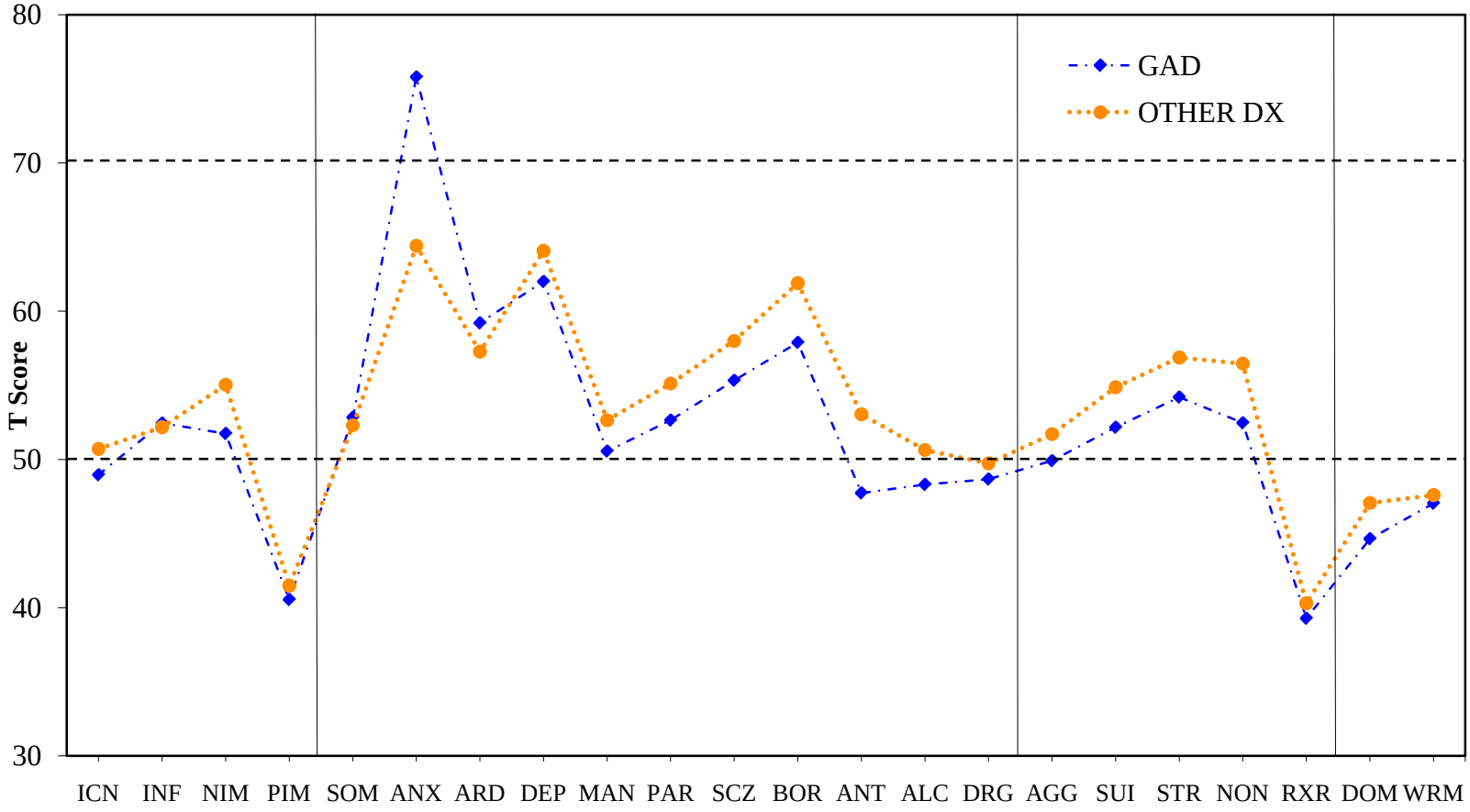
Mean PAI subscale elevations for MDD (*n* = 135), GAD (*n* = 79), and the entire sample (*N* = 1541).



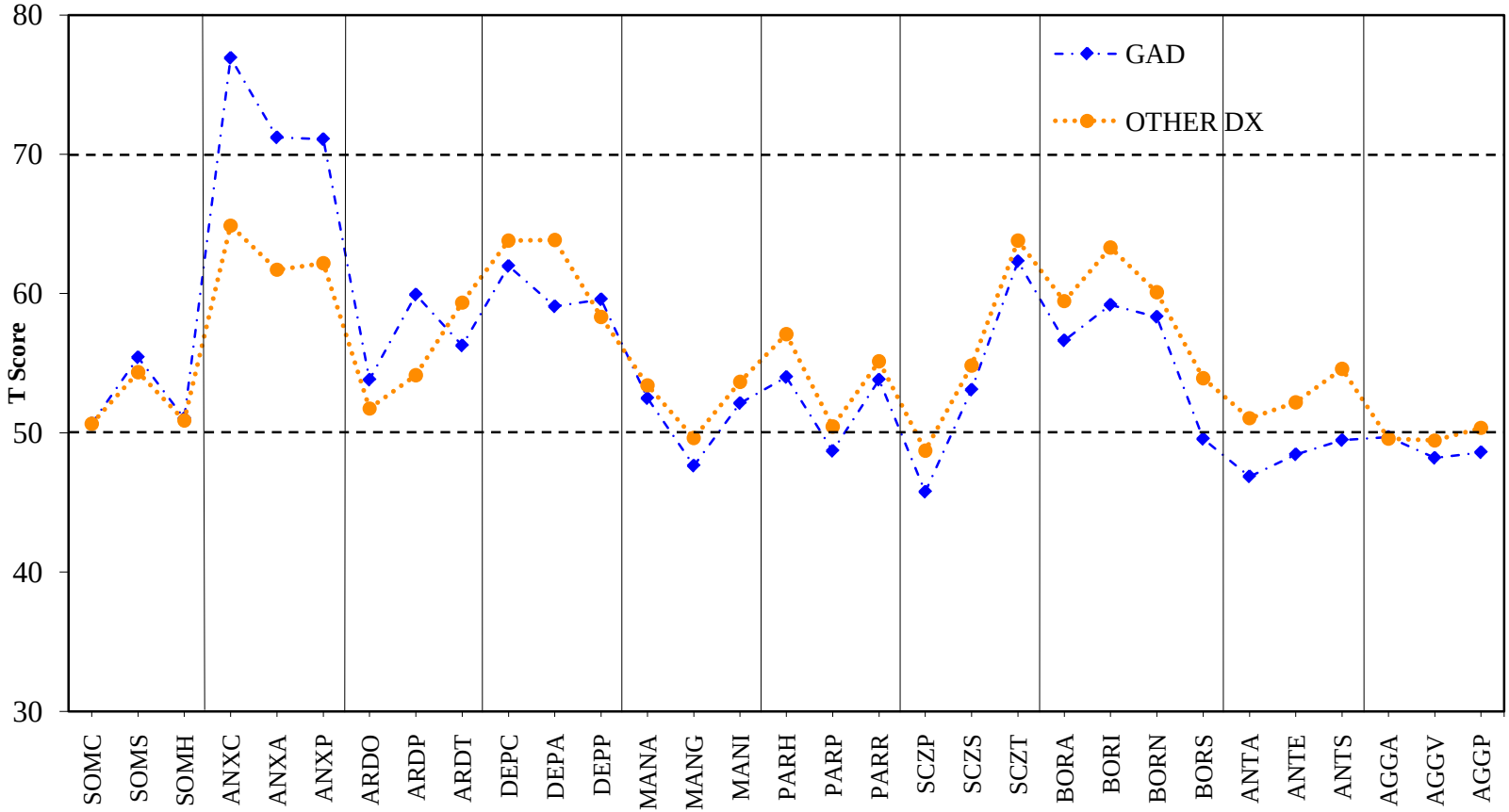
Mean PAI full scale elevations for MDD (*n* = 135) and OD (*n* = 1327).



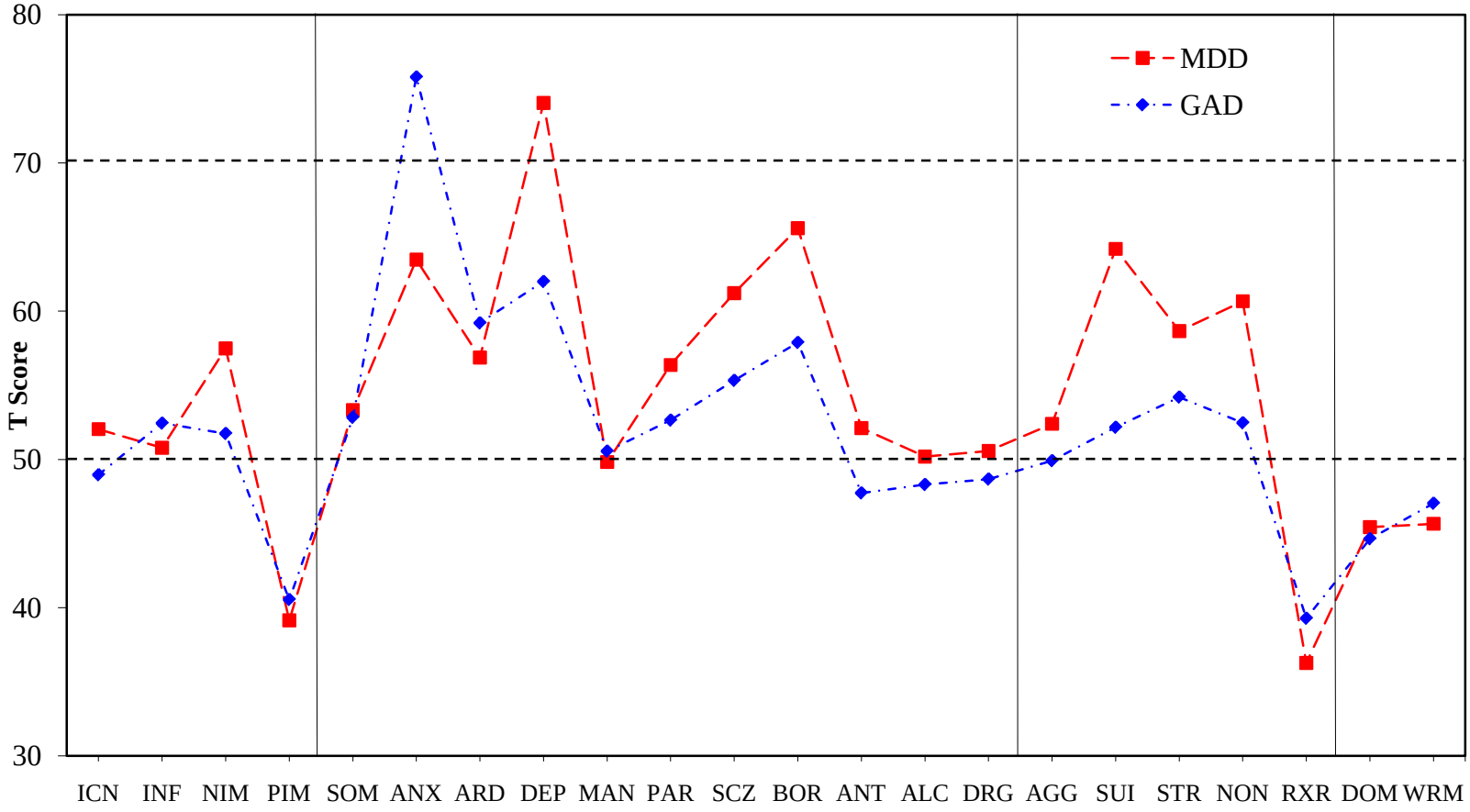
Mean PAI subscale elevations for MDD (*n* = 135) and OD (*n* = 1327).



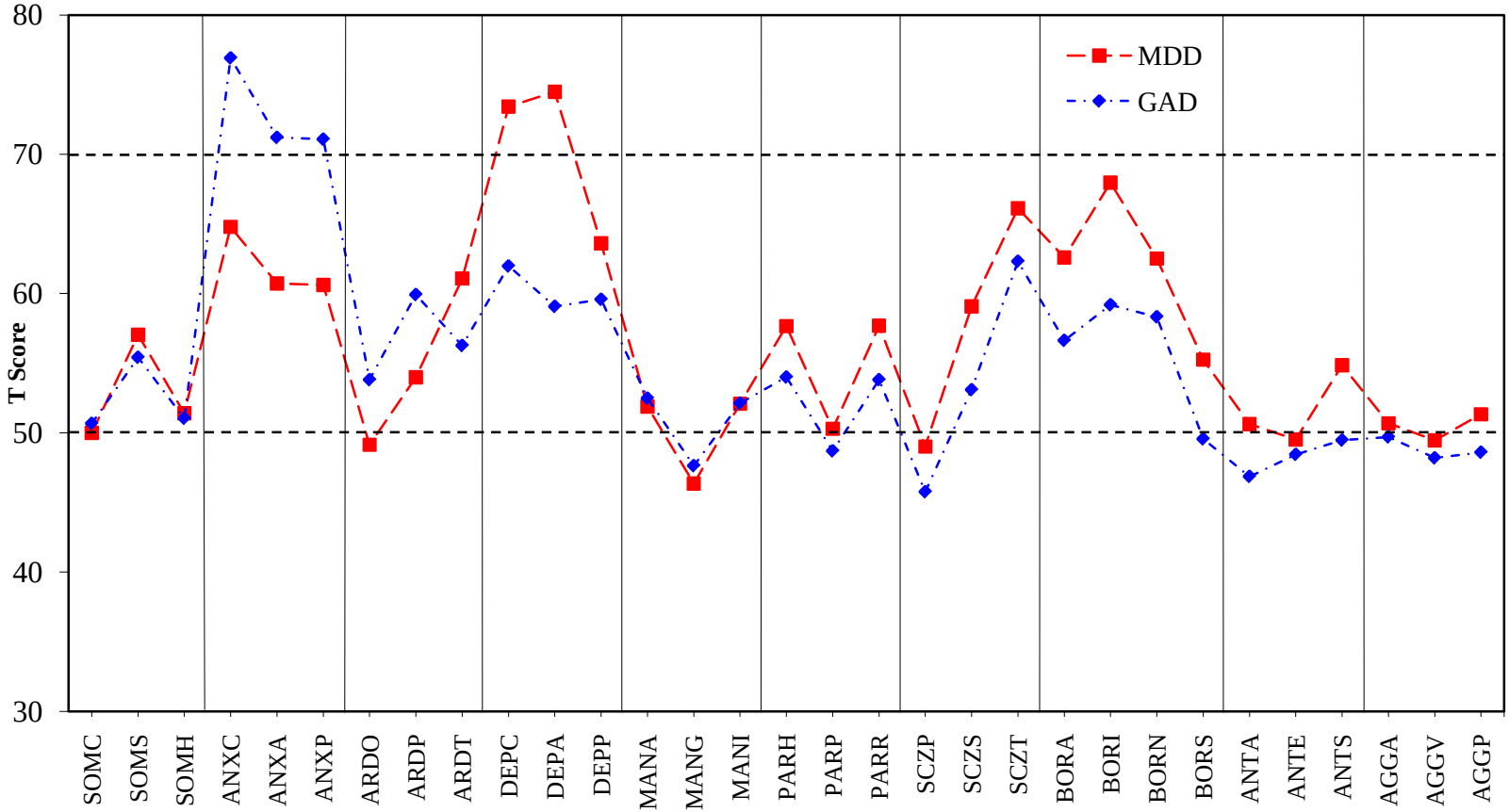
Mean PAI full scale elevations for GAD (*n* = 79) and OD (*n* = 1327).



Mean PAI subscale elevations for GAD (*n* = 79) and OD (*n* = 1327).



Mean PAI full scale elevations for MDD (*n* = 135) and GAD (*n* = 79).



Mean PAI subscale elevations for MDD (*n* = 135) and GAD (*n* = 79).

Appendix F

Mean PAI Scale/Subscale Scores by Diagnostic Group and Entire Sample

PAI Scale/Subscale	MDD[a]		GAD[b]		OD[c]		Total[d]	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Inconsistency (ICN)	52.04	7.13	48.96	6.44	50.71	7.57	50.74	7.49
Infrequency (INF)	50.79	7.91	52.44	8.30	52.17	7.97	52.07	7.99
Negative Impression (NIM)	57.49	10.31	51.75	8.66	55.04	10.31	55.08	10.28
Positive Impression (PIM)	39.15	9.55	40.54	9.81	41.49	10.57	41.23	10.46
Somatic Complaints (SOM)	53.33	8.21	52.84	8.26	52.30	9.85	52.42	9.64
Anxiety (ANX)	63.47	11.68	75.80	10.78	64.41	13.91	64.91	13.82
Anxiety-Related Disorders (ARD)	56.87	12.29	59.20	10.14	57.27	13.16	57.33	12.95
Depression (DEP)	74.04	13.16	62.00	10.96	64.07	14.01	64.83	14.09
Mania (MAN)	49.82	9.45	50.56	9.04	52.64	11.21	52.29	11.00
Paranoia (PAR)	56.37	11.22	52.65	10.85	55.12	11.69	55.10	11.62
Schizophrenia (SCZ)	61.21	12.20	55.33	10.31	57.99	12.50	58.14	12.41
Borderline Features (BOR)	65.59	10.21	57.89	10.24	61.89	11.96	62.01	11.82
Antisocial Features (ANT)	52.12	9.12	47.73	7.73	53.04	11.04	52.69	10.79
Alcohol Problems (ALC)	50.19	9.87	48.30	8.35	50.63	11.05	50.48	10.84
Drug Problems (DRG)	50.56	11.54	48.67	11.71	49.73	12.47	49.75	12.35
Aggression (AGG)	52.40	10.53	49.91	10.11	51.71	11.71	51.68	11.54
Suicidal Ideation (SUI)	64.20	18.28	52.16	14.47	54.87	14.08	55.55	14.76
Stress (STR)	58.66	10.62	54.20	9.01	56.87	11.21	56.89	11.08
Nonsupport (NON)	60.67	12.49	52.47	11.23	56.47	12.79	56.63	12.77
Treatment Rejection (RXR)	36.27	8.81	39.28	9.10	40.30	10.46	39.89	10.32
Dominance (DOM)	45.43	10.65	44.65	11.46	47.07	11.65	46.80	11.57
Warmth (WRM)	45.66	11.89	47.04	9.43	47.60	11.57	47.40	11.50

Mean PAI Scale/Subscale Scores by Diagnostic Group and Entire Sample (continued)

PAI Scale/Subscale	MDD[a]		GAD[b]		OD[c]		Total[d]	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Somatic Complaints								
Conversion (SOM-C)	50.00	7.34	50.67	8.66	50.64	10.15	50.59	9.86
Somatization (SOM-S)	57.04	11.18	55.42	10.31	54.36	10.98	54.65	10.99
Health Concerns (SOM-H)	51.41	8.85	51.04	7.99	50.89	10.02	50.94	9.82
Anxiety								
Cognitive (ANX-C)	64.79	12.05	76.92	8.95	64.88	13.34	65.49	13.31
Affective (ANX-A)	60.72	12.27	71.22	10.51	61.71	13.60	62.11	13.51
Physiological (ANX-P)	60.62	12.26	71.09	14.95	62.17	14.34	62.49	14.34
Anxiety-Related Disorders								
Obsessive-Compulsive (ARD-O)	49.14	11.63	53.81	10.56	51.74	12.43	51.62	12.30
Phobias (ARD-P)	53.99	10.62	59.92	10.60	54.14	11.62	54.43	11.55
Traumatic Stress (ARD-T)	61.08	15.42	56.27	13.30	59.35	14.70	59.34	14.71
Depression								
Cognitive (DEP-C)	73.43	14.17	61.97	13.44	63.80	15.01	64.55	15.11
Affective (DEP-A)	74.49	13.14	59.08	11.48	63.85	14.91	64.53	14.95
Physiological (DEP-P)	63.60	12.31	59.58	10.65	58.31	11.83	58.84	11.90
Mania								
Activity Level (MAN-A)	51.89	10.57	52.48	10.72	53.41	11.83	53.23	11.67
Grandiosity (MAN-G)	46.36	10.78	47.63	9.40	49.63	10.87	49.25	10.83
Irritability (MAN-I)	52.09	10.84	52.13	10.55	53.66	11.87	53.44	11.72
Paranoia								
Hypervigilance (PAR-H)	57.66	13.66	54.00	11.91	57.08	13.30	56.98	13.28
Persecution (PAR-P)	50.29	9.60	48.70	9.57	50.45	9.89	50.34	9.85
Resentment (PAR-R)	57.69	11.06	53.81	10.54	55.14	11.33	55.29	11.29

Mean PAI Scale/Subscale Scores by Diagnostic Group and Entire Sample (continued)

PAI Scale/Subscale	MDD[a]		GAD[b]		OD[c]		Total[d]	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Schizophrenia								
Psychotic Experiences (SCZ-P)	49.01	10.25	45.76	7.15	48.72	10.39	48.59	10.25
Social Detachment (SCZ-S)	59.08	13.34	53.09	11.28	54.83	12.93	55.12	12.94
Thought Disorder (SCZ-T)	66.12	15.18	62.32	12.81	63.80	15.12	63.92	15.03
Borderline Features								
Affective Instability (BOR-A)	62.59	11.05	56.63	12.18	59.46	12.89	59.58	12.75
Identity Problems (BOR-I)	67.96	10.97	59.19	9.78	63.30	11.96	63.50	11.88
Negative Relationships (BOR-N)	62.51	11.39	58.33	11.49	60.09	12.20	60.21	12.12
Self-Harm (BOR-S)	55.25	12.06	49.56	8.62	53.93	12.41	53.82	12.25
Antisocial Features								
Antisocial Behaviors (ANT-A)	50.62	9.91	46.86	7.71	51.05	10.42	50.80	10.29
Egocentricity (ANT-E)	49.52	8.96	48.44	7.52	52.18	10.39	51.76	10.20
Stimulus-Seeking (ANT-S)	54.85	10.87	49.47	9.38	54.59	12.33	54.35	12.12
Aggression								
Aggressive Attitude (AGG-A)	50.68	12.81	49.70	12.18	49.59	12.64	49.69	12.63
Verbal Aggression (AGG-V)	49.45	10.51	48.19	12.44	49.45	12.08	49.38	11.96
Physical Aggression (AGG-P)	51.33	11.42	48.59	8.32	50.36	11.14	50.35	11.04

Note: MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; OD = Other Diagnosis; Total = entire sample.
[a]n = 135. [b]n = 79. [c]n = 1327. [d]N = 1541.

Appendix G

Percentage of Participants who matched Criteria for the Diagnostic Consideration Clusters for MDD and GAD by Diagnostic Group

PAI Scale/ Subscale	Group MDD[a]	GAD[b]	OD[c]
MDD DCC[d]	2.2%	0%	0.8%
DEP-A[e]	83.7%	43.0%	54.0%
DEP-P[e]	48.1%	50.6%	37.8%
DEP-C[e]	80.7%	45.6%	54.6%
SUI[e]	45.2%	16.5%	21.6%
SCZ-T[e]	56.3%	54.4%	53.1%
SCZ-S[e]	37.8%	22.8%	27.1%
MAN-G[f]	70.4%	64.6%	55.1%
GAD DCC[d]	3.7%	3.8%	1.2%
ANX[e]	52.6%	93.7%	58.6%
ANX-A[e]	44.4%	83.5%	49.0%
ARD[f]	34.1%	15.2%	26.8%
SCZ[f]	18.5%	26.6%	21.9%

Note: DCC = Diagnostic Consideration Cluster; MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; OD = Other Diagnosis.
[a]*n* = 135. [b]*n* = 79. [c]*n* = 1327. [d]All Scales/Subscales of the DCC.
[e]Relative Elevation. [f]Relative Suppression.

Appendix H

Standardized Coefficients and Correlations of the Significant PAI Scales/Subscales with the Discriminant Function for MDD and OD

Predictor	Correlation coefficients with discriminant function	Standardized coefficients for discriminant function
DEP	.649	0.992
SUI	.583	0.391
ANT-E	-.235	-0.330
ANX	-.062	-0.810

Note: Pooled within-groups correlations between discriminating variables and standardized canonical discriminant function. Variables ordered by absolute size of correlation within function.

Appendix I

Standardized Coefficients and Correlations of the Significant PAI Scales/Subscales with the Discriminant Function for GAD and OD

Predictor	Correlation coefficients with discriminant function	Standardized coefficients for discriminant function
ANX-C	.630	1.197
BOR-I	-.238	-0.596
DEP-A	-.222	-0.466

Note: Pooled within-groups correlations between discriminating variables and standardized canonical discriminant function. Variables ordered by absolute size of correlation within function.

Appendix J

Standardized Coefficients and Correlations of the Significant PAI Scales/Subscales with the Discriminant Function for MDD and GAD

Predictor	Correlation coefficients with discriminant function	Standardized coefficients for discriminant function
DEP-A	.498	0.707
ANX	-.440	-1.139
BOR-S	.211	0.391
SCZ-P	.143	0.267
SOM-S	.061	0.252
MAN-G	-.050	-0.217

Note: Pooled within-groups correlations between discriminating variables and standardized canonical discriminant function. Variables ordered by absolute size of correlation within function.

Appendix K

Proposed Diagnostic Consideration Clusters for MDD and GAD with University Counseling Center Clients

Disorder	Relative Elevation	Relative Suppression
MDD	DEP-A[c]	
	DEP[c]	
	DEP-C[d]	
		MAN-G[e]
	BOR-I[f]	
	BOR[g]	SCZ-P[g]
		ANT-E[g]
		SOM-C[g]
		ARD-O[g]
		MAN[g]
GAD	ANX-C[a]	
	ANX[b]	
	ANX-A[c]	
	ANX-P[d]	
		SCZ-P[e]
		ANT-A[f]
		ANT[g]
		MAN-G[g]
		ANT-E[g]
		ALC[g]

Note: MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder.
[a] hit rate >= 95%. [b] 90% <= hit rate < 95%.
[c] 80% <= hit rate < 85%. [d] 75% <= hit rate < 80%.
[e] 70% <= hit rate < 75%. [f] 65% <= hit rate < 70%.
[g] 60% <= hit rate < 65%.

VITA

William Edward Nichelson III was born in Lansing, MI in 1972. He was raised in rural Ohio and graduated from Ridgemont High School in 1990. In 1999, his Bachelor of Science degree in Mathematics and Computer Science was completed at the University of Oregon. He worked for several years as a software engineer before moving to Knoxville, TN to attend graduate school. In August, 2010, he completed his doctorate in Counseling Psychology at the University of Tennessee, Knoxville. He completed his pre-doctoral internship at the University of Tennessee Counseling Center, and then accepted a position as Psychologist with the Valdosta State University Counseling Center.