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Personality Correlates of Low Scores on the MMPI-2

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PERSONALITY CORREALATES OF LOW SCORES ON THE MMPI-2

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This quasi experimental design study compares scores of 742 male police academy applicants on the MMIP-2 and the NEO-PI-R, in effort to examine current interpretations for low scores on the MMPI-2 and suggest new interpretations.

The results from the multivariate analyses of variance showed that results differed based on MMPI-2 clinical scales. Except for scale 5 (Masculinity/Femininity) and scale 0 (Social Introversion), low MMPI-2 scores were associated with higher Neuroticism score and Lower scores on Extraversion, Openness, Agreeableness, and Conscientiousness. This generally suggests that low scores are not indicative of greater adjustment as has been suggested by other authors. Additional analysis focused on planned comparisons of MMPI-2 clinical scales and predicted direction of scores on the NEO-PI-R. Of 61 predictions made based on the literature and interpretive manuals, 27 (44%) predictions were confirmed.

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INTRODUCTION

Butcher and Rouse (1996) identified over 4,300 published research articles on the MMPI in the twenty years between 1974 and 1994, as well as an additional 203 articles on the MMPI-2 between 1989 and 1994. Despite this body of literature, which is far greater than that for any other instrument, only a handful of studies have explored the meaning of low and average scores on the MMPI. Poland pointed out, "much less is known about the meaning of scores lower than average on the MMPI-2 despite the fact that low scores, like high scores, represent a set of responses that deviate significantly from the norm." (2005, p.7). Graham, Ben-Porath, and McNulty (1997) indicated that it is often simply assumed that low scores can be characterized as opposite from high scores, but empirical examination of this assumption is required. Others have acknowledged that recommendations for interpretation of low and average scores exist in various interpretive manuals but empirical support for these meanings is limited (Keiller & Graham, 1993). To increase the complexity of the situation, the research that does exist is inconsistent and occasionally contradictory.

The use of the MMPI has evolved over time as a result of its widespread use and volumes of research. However, despite its popularity, little information exists regarding the interpretation of low scores and if these are in any way different from the meaning of normal scores on the MMPI. This paper will explore this issue by examining the history and development of the MMPI and MMPI-2, and the evolution of its meaning and interpretations over time. This paper will also examine the different ways that high, average, and low scores have been defined in research and in interpretive manuals and will also describe the interpretations of scores offered by these manuals.

The limited empirical research that has been conducted will be reviewed and research conducted comparing the MMPI-2 and NEO Personality Inventory Revised Edition (NEO-PI-R).

The Minnesota Multiphasic Personality Inventory (MMPI) is the most widely used and researched psychological instrument in use today (Butcher & Rouse, 1996). Butcher and Williams (2000) outline several reasons for the popularity of the MMPI for use in practice and in research. First, the MMPI provides reliable evaluations, consistent across administrations. Second, the use of validity scales also allows clinicians to make judgments about the credibility of a person's self-report. Finally, they report the use of a normative framework, which allows individuals to be compared with others, as one of the most important factors contributing to the popularity of the MMPI. They further explained the large number of research studies on the MMPI's reliability and validity, stating "it provides information useful in predicting individual clients' problems and behaviors cost-effectively so clinicians are willing to operate in research projects using the MMPI." (Butcher and Williams, 2000, p.2). Cox, Weed, and Butcher help explain the lasting popularity of the MMPI comparing it to "an open source computer program that can be adapted and enhanced depending on the needs of its users, the improvements shared with any who desire them" (2009, p. 273). They go on to explain that though it was originally developed by two visionaries, the MMPI is now the product of many individuals seeking to improve the quality of psychological assessment (Cox, Weed, & Butcher, 2009).

Development of the MMPI and MMPI-2

Development of the original MMPI began in 1939 at the University of Minnesota Hospitals (Bucher and Williams, 2000). Hathaway and McKinley sought to develop a personality inventory that was multifaceted, or as they referred to it, multiphasic. Instead of using individual tests each with a specific purpose, which was typical for the time, they hoped to provide one

instrument that would provide a wide sampling of behavior that was of significance to psychologists (Greene, 2000). They expected this to be useful for routine diagnostic assessments and to improve on efficiency, as it was designed to be a paper and pencil test that could be administered to groups, as opposed to one individual at a time (Graham, 2000).

Hathaway and McKinley began development with nearly 1,000 items pulled from books, other inventories and clinical experience. After deleting nearly half the items, which were deemed to be insignificant or duplicate items, work began on the remaining 504 items (Greene, 2000). Hathaway and McKinley employed an empirical keying approach to construct the various MMPI scales. Instead of developing items subjectively based on their face validity, this approach requires empirical item analysis used to identify test items that differentiated between criterion groups. In the case of the MMPI the criterion groups involved a normal group and a clinical group. The "Minnesota normals" included visitors of patients at the University of Minnesota Hospitals, medical patients, and high school graduates attending conferences at the University of Minnesota. The clinical group consisted of patients at the University of Minnesota Hospitals, representing all of the major categories of psychiatric diagnosis recognized at that time (Graham, 2000). Additional items were added to cover defensive style, distorted self-presentation, and gender role characteristics, bringing the total items to 550 (Hathaway & McKinley, 1989).

After nearly fifty years of use, it became apparent that a restandardization of the MMPI was necessary. Critics raised concerns regarding the original standardization sample which had been a generally homogenous group selected largely based on convenience. Questions were also raised about some of the items, which had become archaic or obsolete in the approximately forty-five years since the items were written. Contemporary test takers also found some items regarding

religious beliefs, sexual behavior, and bowel or bladder functions objectionable and unrelated to personality (Graham, 2000).

One hundred fifty-four provisional items were added to the 550 original items, and 82 original items were rewritten in hopes of providing better wording and more complete coverage of the of the areas of concern (Hathaway & McKinley, 1989). A major goal of the restandardization project was to collect a modern normative sample that was a better representation of the general population. The 1980 census data was utilized to guide participant selection and data was collected from sites in seven different states. Research was used to identify items considered objectionable due to content related to religious attitudes, sexual preferences, or bowel and bladder functioning. The objectionable items were eliminated, leaving the final count of items at the current 567 (Graham, 2000).

Hathaway and McKinley recognized that test takers could distort and falsify their responses given the self-report format of the MMPI. The Cannot Say (?) score simply refers to the number of items omitted, which can lower the scores on clinical scales and affect validity. The Lie (L) scale was developed rationally to detect unsophisticated and naive attempts of test takers to present themselves in a favorable light. The Infrequency (F) scale was designed to detect individuals who approached the test-taking task differently from what was intended by the authors. This was developed by identifying items endorsed in a certain direction by less than 10% of the normal group. The Correction (K) scale was developed to detect defensiveness. This scale was developed empirically by comparing the profiles of individuals who produced normal profiles, despite known psychopathology, with those who produced normal profiles with no known psychopathology (Graham, 2000).

The current MMPI-2 is made up of ten clinical scales that assess a wide variety of personality traits and psychopathology. Scale 1, Hypochondriasis, consists of 32 items that tap a wide variety of vague and nonspecific concerns about bodily functioning. Scale 2, Depression, consists of 57 items aimed at measuring symptomatic depression which is an attitude of low morale, lack of hope, and general dissatisfaction with one's own status. Scale 3, Hysteria, has 60 items in two categories including somatic symptoms and how well socialized and well-adjusted the client considers himself/herself to be (though seemingly unrelated, these categories are closely associated for persons with histrionic personality dynamics). Scale 4, Psychopathic Deviate, is made up of 50 items related to social maladjustment and the absence of strongly pleasant experiences. Scale 5, Masculinity/Femininity, consists of 56 items related to interests in vocations and hobbies, activity-passivity, sensitivity, and aesthetic preferences. This scale was originally characterized as a bipolar dimension with masculinity at one end and feminity at the other, though some view scale 5 as more multidimensional. Scale 6, Paranoia, is made up of 40 items related to interpersonal sensitivity, moral self-righteousness and suspiciousness. Scale 7, Psychasthenia, consists of 48 items that are designed to assess the syndrome characterized by the person's inability to resist thoughts or actions regardless of how maladaptive. It taps obsessive compulsive features, abnormal fears, self-criticism, concentration problems, and feelings of guilt. Scale 8, Schizophrenia, consists of 78 items that assess a variety of content areas including bizarre thought processes, peculiar perceptions, social alienation, poor family relationships, difficulties in concentration, sexual difficulties, and self-identity. Scale 9, Hypomania, is made up of 46 items that address the milder degrees of manic excitement including behavioral and cognitive over activity, grandiosity, egocentricity and irritability. Scale 0, Social Introversion, is made up of 69 items selected to assess the dimension of introversion-extroversion, with high scores reflecting

social introversion (Greene, 2000). Scores on the clinical scales are usually presented as T scores, which have a mean of 50 and a standard deviation of 10.

Shifting Focus of the MMPI

When the original MMPI was published in 1943, Hathaway and McKinley intended it to be used as a reliable way to make accurate assignments of psychodiagnostic labels (Graham, 2000). Higher scores were assumed to indicate psychopathology that was similar to the groups used to develop the scales (Graham, Ben-Porath, & McNulty, 1997). After clinical use and decades of study, it became obvious that clinical scales were not pure measures of the syndromes suggested by their names. Though this may have originally been perceived as a limitation, it has not affected the popularity of the MMPI today. Clinicians now focus on behaviors and characteristics associated with a score on a particular scale that have been identified through research and experience with other individuals with similar scores (Graham, 2000).

In his 1981 article, Messick calls this phenomena "model slippage" and refers specifically to the MMPI as an example. He explains that the original scales on the MMPI were developed for diagnostic placement and, generally speaking, the higher the score, the higher the probability the individual belonged in that particular diagnostic group. However, the MMPI is now generally used to make inferences about personality, and is now interpreted with higher scores indicating the more of an underlying characteristic or trait is present. Messick explains that "classification studies of the accuracy of patient assignment to diagnostic categories would bear directly on the validity of the scales as originally derived but only indirectly, at best, on the validity of the personality interpretations." (Messick, 1981, p. 584)

Generally speaking, the majority of the research on the MMPI has indicated that higher scores on clinical scales are associated with more negative traits and psychological symptoms than are associated with average scores. The focus of the MMPI has been on assessing maladjustment as opposed to the potential to assess positive aspects of personality or overall adjustment. If the original MMPI was designed in such a way that high scores indicated a diagnosis, and low or average scores indicated the absence of a diagnosis, then there would be no need to interpret low scores. However, if what Messick proposes is true and the model has indeed changed, now suggesting that scales reflect traits instead of diagnoses, then it becomes necessary to appropriately understand the meaning of these low scores, and empirically establish whether they differ from average scores.

Various Definitions of High, Average, and Low Scores

There is not complete agreement on what constitutes a low or average score on the MMPI-2. However, most sources agree that, generally speaking, T scores above 65 constitute a high score and are, therefore, clinically significant. In the interpretive manual that accompanies the MMPI-2, scores are divided into five groups: Very High, which is defined as T scores of 76 and above; High, which is considered T scores between 66 and 75; Moderate, which is defined as T scores from 65 to 56; Modal, which includes T score between 55 and 41; and finally a Low score is any T-score below 40. This is true for all of the scales except scale 5 (Masculinity/Femininity), where high, moderate, and modal scores are approximately five points lower for females (Hathaway & McKinley, 1989).

Interpretive manuals for the MMPI-2 differ somewhat in their definitions of low, average, and high scores. Graham (2000) described much of the literature included in this review.

Ultimately, for the purposes of his manual, he defines high scores as T scores higher than 65. He does not offer definitions for low or average scores because he feels that there is not sufficient research to make these inferences. Furthermore, Graham acknowledges that these distinctions are somewhat arbitrary and recommends the use of clinical judgment (2000). In agreement with Graham, Butcher and Williams (2000) indicate that a T score of 65 is where scores become clinically meaningful. Also, like Graham, they do not provide definitions for low or average scores (Butcher & Williams, 2000). Greene offers far more specific definitions for the classification of scores. These classifications include Low, which is considered T scores of 44 and below; Normal, defined as T scores of 45-57; Moderate, which is classified as T scores of 58 to 64; and finally Marked, which is considered T scores of 65 and above. In addition, on scales 7 and 8, he also provides a fifth classification of Extreme, which refers to T scores of 90 and above (Greene, 2000).

Several published articles and empirical studies have also offered classifications of scores. In their study of the meaning of low scores for normal individuals, Keiller and Graham defined low scores as T scores below 40, average scores are T scores between 41 and 64, with high scores being T scores 65 and above (1993). Two additional studies focusing on meaning of low scores in an outpatient mental health setting, used the same definitions for high, medium and low scores (Graham, Ben-Porath, and McNulty, 1997; Poland, 2005).

Meanings of Low Scores Found in Interpretive Manuals

In the administration and scoring manual for the MMPI-2, Hathaway and McKinley offer a brief overview of interpretations for average, modal and low scores for the clinical scales of the MMPI-2. However, they also recommend that users familiarize themselves with more detailed

interpretations offered in manuals by Graham, Greene, and several others (Hathaway & McKinley, 1989). A wide variety of opinions exist in interpretive manuals about the interpretation of low scores. At one extreme, Graham (2005) argues for extreme caution when interpreting low scores, while Greene (2000) argues that low scores provide valuable information that cannot be ignored, with many opinions in between.

In general, Graham recommends a conservative approach to the interpretation of low scores. More specifically, he suggested that in non-clinical settings, low scores should be interpreted as indicating more positive adjustment than high or average scores. He proposed an exception to this general rule if the validity scales suggest defensiveness. In the case of defensiveness, no interpretation of low scores should be made. In clinical populations, it is recommended that low scores not be interpreted, until more research is done. The one exception is for limited inferences on two clinical scales 5 (Masculinity/ Femininity) and 0 (Social Introversion) (Graham, 2000).

According to Butcher and Williams, "low scores on most standard scales are not interpreted as possessing particular meaning" (2000, p.60). However, they suggested several exceptions to this general rule, similar to those outlined by Graham. For example, the Masculinity/Femininity (Scale 5) and Social Introversion (Scale 0) scales are believed to be bipolar, meaning that low scores on these two scales have the opposite meaning of high scores and can be interpreted as such. They further argue that this bipolar interpretation is supported by the use of linear T scores to interpret these scales, as opposed to the uniform T scores used for other scales. In addition to offering interpretations for scale 5 and 0 they also indicate that low scores on the Mania scale may be an expression of a wide variety of problems (Butcher & Williams, 2000).

In contrast to Graham, Butcher, and Williams, Greene advocated for the interpretation of low scores. In his interpretive manual for the MMPI-2, Greene explained, "While interpretation of high-point pairs or code types is the primary focus on the MMPI-2, low points on the clinical scales also deserve careful attention, even though there has been little systematic research on them" (Greene, 2000, p. 130). Greene also pointed out that low scores, which he defined as a T score of 44 or less, could represent good overall adjustment, lesser amounts of the qualities represented by high scores, or may be conceptually different from high scores on the same scale (Greene, 2000).

In another work, Greene emphasizes the importance of interpreting low scores. He states that "frequently the most valuable information in an MMPI-2 profile is the scales that are not elevated. The conventional emphasis on the specific clinical, content, and supplementary scales that are elevated can lead clinicians to ignore low-point scales or scales within the normal range."(Greene, 2006, p. 260). He explains that these low scores have important implications for treatment planning. He gives specific examples, such as an individual with T scores below 50 on scale 2 (Depression) and scale 7 (Psychasthenia) is likely to not be experiencing distress over the problem that brought them in. Another example is of someone with low scores on scales 1 (Hypochondriasis), 2 (Depression), and 3 (Hysteria) likely has few psychological defenses to prevent the overt expression of their symptoms or problem behaviors. A final example he provided is related to low scores on scale 9 (Hypomania), which may suggest the client lacks sufficient energy to adequately engage in treatment (Greene, 2006). It is worth noting that Green is advocating for the configural interpretation of these scores, finding meaning in the combination of low scores on multiple clinical scales. The focus of this research will remain on interpretation of low scores on individual clinical scales.

Empirical Studies Associated with the Meaning of Low Scores

The majority of the articles and book chapters that have been written regarding the meaning of low MMPI scores have been based largely on subjective opinion or logically derived conclusions, with little empirical support. This has led to conflict, as authors stating opinions rarely agree. In response, several studies have sought to take a more objective and empirical approach to understanding the meaning of low scores on the MMPI-2 and determine whether these scores are indeed meaningful.

In 1993, Keiller and Graham explored the meaning of low scores on the MMPI-2 for normal subjects. These subjects were 822 male-female dyads, who were part of the MMPI restandarization project. Ninety-two percent of the sample were married couples, while the rest described themselves as dating, best friends, or co-workers. Each participant completed the experimental 704 item MMPI-AX, from which the MMPI-2 clinical and validity scales could be scored. They also completed a rating form, adapted from the Katz Adjustment Scale, that assessed their perception of their partners. This form consisted of 110 traits, symptoms, attributes, and behaviors that were rated using a four-point Likert scale, based on how often their partners exhibited these traits.

To analyze this data, Keiller and Graham categorized each subject into three categories: high (T>64), Medium (T=41-64), and low (T<41) for each clinical scale on the MMPI-2, except scale 5 and 0. A one-way analysis of variance (ANOVA) was performed for each of the eight clinical scales and for each descriptor from the partner-rating form that was significantly correlated with that scale. Significant correlations were defined as those greater than or equal to .12. For each ANOVA, the independent variable was the T-score categorization (high, medium, low) and the dependent variable was the rating on an item on the partner rating form. The average

number of ANOVAs performed for each scale was 22, with the actual numbers ranging from 4 to 65 ANOVAs per scale.

Keiller and Graham reported that significant differences were found between low and medium scorers for most of the clinical scales. They also note that differences were found between medium and high scorers on all clinical scales. Generally speaking they note that more differences were found between high and medium scorers than were found between low and medium scorers. Significant differences between medium and low scorers were not found on scale 3 for women, scales 1 and 6 for men, or on scale 8 for either gender.

In another study, Graham, Ben-Porath, and McNulty (1997) examined empirical correlates of low scores on MMPI-2 scales in an outpatient mental health setting. Subjects were 274 male and 425 female clients of an outpatient mental health center. Clients completed the MMPI-2, and their therapists completed the Patient Description Form (PDF). The PDF is a 188 item questionnaire, developed by Graham et al. for a larger study. It is used by therapists to describe personality and symptomatic characteristics using a 5 point Likert scale. Twenty-five scales were developed for the PDF using a combination rational-statistical approach. These scales include: Angry Resentment, Critical/Argumentative, Narcissistic, Defensive, Histrionic, Aggressive, Insecure, Anxious, Pessimistic, Depressed, Achievement Oriented, Passive-Submissive, Introverted, Emotionally Controlled, Antisocial, Negative Treatment Attitudes, Somatic Symptoms, Psychotic Symptoms, Family Problems, Obsessive-Compulsive, Stereotypic Masculine Interests, Procrastinates, Suspicious, Agitated, and Work Problems. Clients completed the MMPI-2 following intake interviews. Therapist completed the PDF following the third therapy appointment, and in most cases prior to seeing MMPI-2 data for the client they were rating.

For analysis, clients were categorized into high (T>64), normal (T=64-41), or low (T<41) for each clinical, content, and supplementary scale. Based on power analysis, it was determined that at least 35 individuals were needed in each of the three groups to determine medium or large effect sizes. Only two clinical scales met this criteria, scale 9 and scale 0. For these scales, each group of clients (high, normal, low) were compared to the 25 PDF scales using ANOVAs. Probability values were adjusted using a modified Bonferroni procedure and when significant effects were identified, Tukey post-hoc test were conducted.

Graham, Ben-Porath, and McNulty (1997) reported that differences between low and normal groups and between high and normal groups produced mostly medium effect sizes, suggesting that for the scales that could be examined, both high and low scores provided potentially important information about clients. Despite the fact that low scorers differed significantly from normal scorers on most scales examined, the results did not support a single explanation of the meaning of low scores on the scales. Instead, they indicate that the meaning of low scores seemed to differ from one scale to another. The exception was scale 9, in which low scorers did not differ significantly from normal scorers, suggesting that low scores on this scale do not provide any additional information about clients.

In a dissertation completed in 2005, Danielle Poland expanded on the work of Graham, Ben-Porath, and McNulty (1997) exploring the meaning of low scores on the MMPI in an outpatient setting. Poland employed archival data for 131 male and 316 female clients from a University-based mental health clinic. Similarly to the Graham, Ben-Porath, and McNulty study, clients completed the MMPI-2 and their therapists completed the Client Description Form (CDF). This form was nearly identical to the Patient Description Form used in the original study, except for the addition of four items and the change of name for the instrument in order to reflect the

change in population being studied. As was explained previously, the CDF provides the user with scores on 25 scales used to assess the major content dimensions covered by the CDF. Also, just as in the previous study, the MMPI-2 was administered during the client's second session. The therapist completed the CDF following the third therapy appointment, but before they had the opportunity to view the client's MMPI-2 scores. Analysis of data also followed the methods used by Graham, Ben-Porath, and McNulty.

Poland reported a variety of results associated with four separate research questions, most focused on a calculation of overall adjustment, which is beyond the scope of this research focused on the MMPI-2 clinical scales. However, findings suggested that of all the clinical scales, scale 2 was the only scale in which below average scorers were rated as having fewer and less severe symptoms than average scorers (Poland, 2005).

Proposed Meanings of Low Scores Arranged by Scale

A review of articles, empirical studies, and various interpretive manuals has revealed a wide range of recommended interpretations for low scores (generally a T score of 40 or less). The following is a summary of all reviewed interpretations for low scores for each clinical scale on the MMPI-2 arranged by scale. This review serves as a foundation for the hypothesis of this study. The hypothesis is presented in graphic form in Appendix A.

Several interpretations have been offered for low scores on scale 1, Hypochondriasis. Greene offers specific interpretations for low score on all of the clinical scales. For scale 1, he indicates that low scorers are likely to exhibit no vague physical complaints (Greene, 2000). Keiller and Graham suggest that for women, low scorers are less likely to worry about health a great deal, have more energy, are less likely to be worn out, and are less likely to complain of ailments. They do not offer an interpretation for low scoring males on scale 1 (Keiller & Graham,

1993). Hathaway and McKinley suggest that low scores on scale 1 indicate individuals who may disregard signs or symptoms of illness, and who are also optimistic, energetic, capable, and effective (1989).

Interpretations have also been suggested for low scores on Scale 2, Depression. Green suggests that low scores on this scale may indicate an individual who is alert, gregarious, and active. He goes on to say that the clinician may need to question appropriateness of this behavior (Greene, 2000). Keiller and Graham offer interpretations for low score on scale 2 for both males and females. Low scoring men tend to have less trouble sleeping, worry less about health, are more likely to laugh and joke, more self-confident, less likely to lack interest, less likely to have feelings hurt, less likely to worry or have trouble making decisions, are not overly sensitive, and don't give up easily. Low scoring women also have less trouble sleeping, less health worry, are less likely to blame self, are more cheerful, experience less worry over small things, have less complaints over ailments, and are less nervous or jittery (Keiller & Graham, 1993). Hathaway and McKinley suggest that low scores on scale 2 indicate individuals who are active, enthusiastic, cheerful, optimistic, lacking inhibition, under-controlled, socially outgoing, free of emotional turmoil, and self-confident (1989).

The interpretations for scale 3, Hysteria are relatively brief. Greene suggests that for scale 3, low scorers may be caustic, sarcastic, and socially isolated. They may also have few defenses, narrow interests, and may be socially conforming (Greene, 2000). Keiller and Graham do not offer an interpretation for low scoring women, but suggest that low scoring men are more likely to act shy and are less likely to appear worn out (1993). Hathaway and McKinley indicate that low scores on scale 3 should be associated with having few interests and being cynical, tough minded, socially isolated and aloof (1989).

For scale 4, Psychopathic Deviate, Green indicates that low scores may point to an individual who is rigid and conventional but able to tolerate mediocrity and boredom. He also notes that men with low scores on scale 4 may lack interest in heterosexual activity (Greene, 2000). Keiller and Graham suggest that low scoring men are less likely to be sad, not easily annoyed, don't resent what they are told to do, are less moody, engage in less swearing, experience less resentment, and are less likely to have been in trouble with the law. Low scoring women are likely to be cooperative, pleasant, and relaxed. They have fewer problems with temper, are not stubborn, are more likely to feel cared for, less likely to engage in arguing, less likely to yell or get angry, are less envious or jealous, are not overly sensitive, engage in less nagging are less hostile or unfriendly, experience less irritability, don't give advice too freely, and are less likely to correct others faults/mistakes (Keiller & Graham, 1993). On scale 4, Hathaway and McKinley indicate that low scores indicate a tendency to be conventional and rigid, unassertive, passive, moralistic, self-critical, and over-controlled (1989).

Scale 5, the Masculinity/Femininity Scale, has more suggested interpretations for low score than other scales and these interpretations vary based on sex. Greene suggests that Low scoring men are likely to identify very strongly with the traditional male gender role and may be compulsive and inflexible about their masculinity. Women with low scores on scale 5 may be coy, seductive, and appear helpless. They may over identify with the feminine role to the point of being caricature and may be manipulative or perceive themselves as helpless (Greene, 2000). Scale 5 is one of the few scales for which Graham offers an interpretation of low scores. He suggests that males with low scores on scale five are often traditionally masculine, while females with low score on the same scale may be hyper-feminine or androgynous (Graham, 2000). Hathaway and McKinley indicate that low scoring males are likely macho, crude, aggressive,

reckless, action oriented and self-confident with few interests. They suggest that low scoring women possess a traditional female interest pattern, may be insecure and self-depreciative, passive and submissive, constricted, helpless, dependent, self-pitying and complaining (1989).

Several interpretations have been offered for low scores on Scale 6, Paranoia. Greene suggests that low scores are indicative of narrow interests, as well as a tendency to be insensitive to and unaware of motives of other people. Students with low score on scale 6 are often underachievers (Greene, 2000). Keiller and Graham do not offer an interpretation for low scoring men on this scale. However, they suggest that low scoring women are less likely to be sad, have fewer fears and bad dreams, have more control over emotions, are less moody, worry less about the future, are less likely to be bored or restless, and are less likely to cry or breakdown (Keiller & Graham, 1993). Hathaway and McKinley indicate that low scores on scale 6 should be interpreted as balanced and cheerful, wary and evasive, stubborn, and could be suggestive of paranoid disorder (1989).

Various interpretations have also been given for low scores on Scale 7, Psychasthenia. Greene explains that low scorers on scale 7 are likely secure, comfortable with themselves, emotionally stable, success oriented, persistent, and capable. They may also demonstrate an absence of worries and relaxed attitude toward responsibilities. Again, Greene recommends checking the appropriateness of these behaviors (2000). Keiller and Graham suggest that low scoring men are less likely to put themselves down, have fewer fears, and fewer health worries, while low scoring women are also less likely to put themselves down, have fewer fears, are less likely to blame themselves, are more self-confident, and are more cheerful (1993). For scale 7, Hathaway and McKinley interpret low scorers as self-confident, free of insecurities, relaxed, comfortable, persistent, and efficient (1989).

Scale 8, Schizophrenia, has fewer interpretations for low scores than many other scales. Greene reports that low scores on this scale indicate individuals who are conventional, realistic, and uninterested in theoretical or philosophical issues. They are also unimaginative, concrete, and may have difficulty with persons who perceive the world differently than they do (Greene, 2000). Hathaway and McKinley indicate that low scores on scale 8 should be interpreted as conventional, conservative, self-controlled, and submissive (1989).

Multiple interpretations have also been suggested for low scores on Scale 9, Hypomania. Greene suggests that low scores on scale 9 indicate low energy and activity levels that may reflect various situations such as fatigue or actual depression. He also indicates that T score below 35 are likely indicative of actual depression, and notes that low scores on this scale are more common for individuals over age 40 (Greene, 2000). Keiller and Graham suggest that low scoring men are less likely to stir up excitement, less likely to swear, less likely to talk back, and are less likely to take nonprescription drugs. Women with low scores on scale 9 are less likely to wear strange or unusual clothes, less likely to talk too much, and less likely to stir up excitement (Keiller & Graham, 1993). For scale 9, Hathaway and McKinley suggest that low scores should be associated with poor self-confidence, being apathetic and pessimistic, easily fatigued, depressed, shy and dependent, and lacking in energy (1989).

The final scale, scale 0, Social Introversion, also has several interpretations. According to Greene, low scores indicate individuals who are socially extroverted, gregarious, and socially poised. He further states that T scores below 35 may indicate superficial relationships (Greene, 2000). Scale 0 is the second scale for which Graham offers an interpretation of low scores. He suggests that individuals with low scores on scale 0 are outgoing, talkative, competitive, friendly, expressive, and enjoy being around others (Graham, 2000). Hathaway and McKinley suggest that

low scorers are likely to be warm, sociable and gregarious, self-confident and assertive, self-indulgent, exhibitionistic, and manipulative (1989).

Though opinions abound regarding the interpretation of low scores on the MMPI, the literature on the subject is by no means exhaustive. Given that a summary of only three empirical studies represents a comprehensive overview of the literature, and several of these could only examine a limited number of scales, much work remains to be done. This study seeks to revalidate the MMPI-2, focusing on low scores to determine what, if any, meaning they possess and whether they differ significantly from average scores. For the purpose of this research, scores on the MMPI-2 will be compared to scores from another empirically-supported personality measure, in this case, the NEO Personality Inventory Revised Edition (NEO-PI-R).

The NEO-PI-R

According to Costa and McCrae, the NEO-Personality Inventory-Revised Edition (NEO-PI-R) "is intended to provide a comprehensive description of personality traits: the individual's characteristic and enduring emotional, interpersonal, experimental, attitudinal, and motivational styles. As such, it is useful whenever individual differences in personality are relevant" (2008, p. 189). The NEO-PI-R is a 240-item instrument, most often administered as a self-report measure. Scores are reported on five Domains: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. For each domain there are six subscales, called facet scales. Scales were developed using a combination of rational, theoretical, and factor analytic approaches (Costa & McCrae, 2008). Coefficients for test retest reliability for the NEO-PI-R domains are .79 (Neuroticism), .79 (Extraversion), .80 (Openness), .75 (Agreeableness), .83 (Conscientiousness). Reliabilities for the facet scales ranged from .66 to .92 (Costa & McCrae, 2008).

The NEO-PI-R is based on the five factor model of personality, which started with the work of Norman (1963). Costa and McCrae (2008) reported identifying that three of Norman's five domains could be easily associated with the Neuroticism, Extraversion, and Openness Scales that had been previously utilized in the development of their initial NEO Inventory. However, two of Norman's domains remained unrepresented, and as a result, Costa and McCrae added the Agreeableness and Conscientiousness domains in their new NEO Personality Inventory (NEO-PI). The revised edition of the NEO-PI, called the NEO-PI-R, was published in 1992, adding facet scales for the newest domains, Agreeableness and Conscientiousness, improving norms, and according to Costa and McCrae, enhancing computer scoring and interpretation (2008).

Many articles have compared the MMPI-2 and NEO-PI-R, though much has been focused on issues unrelated to this research. Much work has been done comparing the validity scales on the MMPI-2 to experimental validity scales created for the NEO-PI-R, while others have compared the NEO-PI-R scales with the Personality Psychopathology Five (Psy5) scales, which are supplemental MMPI scales designed to measure abnormal personality symptomatoloy (Trull, Useda, Costa, & McCrae, 1995). More pertinent to this research are several articles looking at the utility of adding a measure of normal personality, such as the NEO-PI-R, to an assessment battery already including the MMPI-2. Ben-Porath and Waller (1992) argued that the MMPI-2 is able to provide information about the client's current psychological state, as well as identify long-standing personality traits, indicating there is some overlap between the MMPI-2 and the NEO-PI-R.

Quirk, Christiansen, Wagner & McNulty (2003) similarly asserted that the MMPI-2 measures both personality pathology and psychiatric diagnoses, and go on to argue for a link between psychiatric diagnosis and personality traits. In order to support their assertions, they

directly examined correlations between the MMPI-2 clinical scales and the five domains of the NEO-PI-R, using scores obtained from 1,342 veteran inpatients at a comprehensive substance abuse treatment center at the Cleveland Veterans Affairs Medical Center. The sample was 95% male, averaged forty-four years of age, came from various ethnic backgrounds and most had a high school education. The MMPI-2 and NEO-PI-R were administered as part of the initial intake, along with structured clinical interviews such as the Substance Use Disorder Diagnostic Schedule and the Structured Clinical Interview for DSM-III-R.

Domain scales from the NEO-PI-R were intercorrelated with twenty-eight scales from the MMPI-2, including all ten clinical scales. For the domain of Neuroticism, the following zero order correlations were identified; .53 (Hs), .64 (D), .38 (Hy), .65 (PD), .31 (MF), .58 (Pa), .77 (Pt), .70 (Sc), .31 (Ma), .66 (SI). Correlations between the domain of Extraversion and the MMPI-2 clinical scales are as follows; -.40 (Hs), -.57 (D), -.30 (Hy), -.31 (PD), -.10 (MF), -.32 (Pa), -.46 (Pt), -.44 (Sc), .12 (Ma), -.71 (SI). Correlations for the clinical scales and the domain of Openness were -.15 (Hs), -.23 (D), -.10 (Hy), -.05 (PD), .21 (MF), -.02 (Pa), -.15 (Pt), -.11 (Sc), .15 (Ma), -.33 (SI). For Agreeableness correlations for the MMPI-2 clinical scales were -.23 (Hs), -.18 (D), -.07 (Hy), -.39 (PD), -.03 (MF), -.29 (Pa), -.34 (Pt), -.39 (Sc), -.38 (Ma), -.27 (SI). For the domain of Conscientiousness, the following zero order correlations were identified; -.37 (Hs), -.51 (D), -.31 (Hy), -.49 (PD), -.14 (MF), -.39 (Pa), .55 (Pt), -.51 (Sc), -.15 (Ma), --.50 (SI). (Quirk, Christiansen, Wagner, & McNulty, 2003).

Quirk, Christiansen, Wagner, and McNulty reported that “Higher levels of Neuroticism and lower levels of extraversion, agreeableness, and conscientiousness were generally associated with higher scores on MMPI-2 psychopathology scales.” (2003, p. 314). They also found that of the five domains of the NEO-PI-R, Openness to Experience showed the least shared variance with

the MMPI-2 scales and Neuroticism consistently correlated with scores designed to measure psychopathology such as scale 2 and scale 7 (Quirk, Christiansen, Wagner, & McNulty, 2003).

The vast majority of research related to the MMPI-2 has focused on the meaning of clinical elevations with a T score above 65, with little emphasis on interpretation of normal scores below 64. Despite the fact that low scores differ significantly from the norm, there is no consensus regarding whether these scores should be interpreted differently from average scores and if so what meaning they possess. Though many authors have documented the shift in the MMPI-2 from a psychodiagnostic tool to a measure of personality, there is very little empirical research on how this model shift may have impacted the meaning of low scores. Furthermore, none of this existing research employed a second measure of personality, such as the NEO-PI-R, to explore potential meanings. Though Quirk, Christiansen, Wager, & McNulty (2003) have empirically examined the correlation between the NEO-PI-R domain scales and the MMPI-2 clinical scales, this differs from this research in several fundamentally important ways. Not only did they utilize a clinical sample as opposed to a "normal" sample which was used for this research, they also examined the entire range of the scores on the MMPI-2, not focusing on any particular classification of scores. This research is intended to focus chiefly on low scores on MMPI-2 clinical scales for a "normal" population, examining if these scores differ from average scores and how they might be interpreted, while also examining proposed interpretations presented in the literature.

II

METHODS

Design

The research utilized a quasi-experimental design using archival records taken from psychological evaluations for police academy candidates in rural Western Pennsylvania. Files were obtained through the Center for Applied Psychology at Indiana University of Pennsylvania, which routinely completes these psychological evaluations. Data was explored from seven hundred forty-two male police academy candidates. Though approximately five percent of the police academy candidates are female, there was not adequate sample size to run separate analysis for females; therefore, data for female applicants was disregarded.

Participants

All participants had a high school diploma or GED and had at least a ninth grade reading level. Ages ranged from 18 to 55 with a mean age of 25.6 years and a modal age of 22. During the process of informed consent, candidates were given the opportunity to voluntarily give permission allowing for their evaluations to be used in the context of future research and these were the files utilized for this research.

The psychological evaluations included a personal interview, individual administration of the reading portion of the Wide Range Achievement Test (WRAT), and group administration of the MMPI-2, NEO-PI-R, Nelson-Denny Reading Test, and Balanced Inventory of Desirable Responding (BIDR). Prior to attending the psychological evaluation, candidates had paid an application fee, been previously screened by the police academy, and most had successfully completed a test of physical conditioning and a cardiac stress test.

Materials

Both the NEO-PI-R and the MMPI-2 were routinely administered during the course of the psychological evaluations for the police academy candidates. The NEO-PI-R is a personality measure that consists of 240 likert scale items, which provides scores for five scales or domains and these five scales are divided into six subscales for each domain called facets. All 240 items of the NEO-PI-R were administered in the context of the psychological evaluations, providing scores on all domain and facet scales. The MMPI-2 is a 567 item instrument consisting of three validity scales, ten clinical scales, and numerous other content and supplementary scales. For the purpose of the psychological evaluations, only the first 370 items were administered. Scoring of this shortened version provided scores for the validity scales and clinical scales for each police academy applicant. The raw data for both the MMPI-2 and the NEO-PI-R had been scored by trained personnel, using computerized scoring programs and the printouts for these score reports were included in the archival files.

The MMPI-2 provides three validity scales to identify deviant test taking attitudes, such as faking-good and faking-bad. In order to eliminate those participants who did not respond in an open and honest fashion, if a candidate's MMPI profile was judged to be invalid, they were rejected from the academy and their data was not included in this sample.

III

ANALYSIS

Several different types of analysis were conducted for the purposes of this research. The first analysis is more descriptive in nature, utilizing a multivariate analysis of variance (MANOVA) to compare scores between low and average scores on the MMPI-2 and the five domain scales of the NEO-PI-R. Scores on the MMPI-2 were defined as average with T scores between 64-41, and low with a T score below 40. For each domain found to be significant, a univariate analysis of variance (t-test) was conducted, and each of the specific facet scales for that domain was analyzed in another MANOVA.

Hypochondriasis

Of the 742 male participants, 729 scored in the low or average range with 107 classified as low scorers (T scores 40 or less) and 622 classified as average scorers (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,723) = 7.65$, $p < .001$, $\eta^2 = .050$). Table 1 gives the means and univariate results for each domain. The Bonferroni adjusted *p*-value of .01 was used to evaluate univariate significance for the domain scores, for this scale and all other similar analyses. The Hypochondriasis low scoring group (Hs-low) scored higher on Neuroticism and Agreeableness than the Hypochondriasis average scoring group (Hs-med).

The group differences on these two domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 1). The Bonferroni adjusted *p*-value of .008 was used to evaluate univariate significance for the facet scores and all other similar analyses. For the Neuroticism domain, the Hs-low group scored significantly higher than Hs-med on all six

facets. The Hs-low group scored lower on all the Agreeableness facets except for the Altruism facet.

Based on the literature and interpretive manuals, specific predictions were made for two facets: Extraversion-Activity and Conscientiousness-Competence. Planned *t*-tests were conducted but no statistically significant differences were found.

Table 1

Hypochondriasis Low and Average Groups: Means, Standard Deviations, and Univariate Results

	MMPI-2 Group		Univariate	
NEO PI-R Subscale	Low	Medium	F	*p*
Neuroticism	50.64 (8.29)	45.34 (9.85)	27.52	<.001
Anxiety	51.54 (8.15)	48.53 (8.37)	11.90	.001
Hostility	51.71 (8.37)	46.87 (9.60)	24.08	<.001
Depression	50.29 (8.46)	46.86 (8.90)	13.74	<.001
Self-conscious	50.43 (9.02)	45.92 (9.35)	21.45	<.001
Impulsive	49.87 (8.58)	46.16 (10.72)	11.54	.001
Vulnerability	48.96 (8.28)	44.20 (9.10)	25.66	<.001
Extraversion	56.11 (8.52)	57.85 (7.92)	4.30	.038
Openness	44.84 (7.83)	45.10 (8.76)	0.09	.771
Agreeableness	46.97 (8.97)	51.07 (10.03)	15.66	<.001
Trust	42.77 (8.04)	47.05 (10.66)	15.76	<.001
Straightforward	48.52 (9.03)	51.46 (9.61)	8.65	.003
Altruism	52.57 (10.26)	55.43 (9.63)	8.56	.011
Compliance	47.05 (9.85)	50.63 (10.36)	11.09	.001
Modesty	48.54 (9.88)	50.37 (9.26)	3.48	.005
Tender-minded	48.22 (8.03)	49.98 (8.21)	4.18	.006
Conscientious	51.70 (9.65)	53.57 (10.41)	2.98	.085

Note. Degrees of freedom for all F-ratios are (1, 727). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Depression

Of the 742 male participants, 729 subjects produced an MMPI-2 Depression scale score in the low or average range with 155 subjects with low scores (T scores 40 or less), and 574 subjects with average scores (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,723)=6.298$, $p < .001$, $\eta^2 = .042$). Table 2 gives the means and univariate results for each domain. The Depression low scoring group (D-low) scored lower on Agreeableness and higher on Extraversion than the Depression average scoring group (D-med).

The group differences on these two domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 2). For the Extraversion domain, the D-low group scored significantly higher than D-med on the Activity, Excitement-seeking, and Positive emotions facets. The D-low group scored lower than D-med on the Compliance and Modesty facets of the Agreeableness domain.

Specific predictions were made for seven facets: Neuroticism-Anxiety and Self - consciousness, Extraversion-Warmth, Gregariousness, Activity, Positive emotions, Contentiousness-Self-discipline. Planned *t*-tests were conducted and three significant differences were found. The first was Neuroticism-Anxiety ($t(727)=-1.98$, $p=.048$). The prediction was that D-low would score lower than D-med, and that prediction was confirmed (D-low M=47.72 and D-med M=49.22). The second significant difference was for Extraversion-Activity ($t(727) = 3.13$, $p = .002$). The prediction was that the D-low group would score higher and that prediction was confirmed (D-low M = 56.19 and D-med M = 54.09). The third facet with a significant difference was Extraversion-Positive emotions ($t(727)=3.31$, p=.001). The prediction that D-low would score higher and this was also confirmed (D-low M=53.76 and D-med M=51.03).

Table 2

Depression Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	46.12 (8.94)	46.07 (10.02)	.004	.950
Extraversion	59.81 (7.15)	57.10 (8.05)	14.47	<.001
Warmth	53.57 (8.18)	52.21 (8.41)	3.21	.074
Gregariousness	58.55 (7.77)	57.15 (8.71)	3.33	.068
Assertiveness	57.21 (7.93)	56.14 (8.65)	1.93	.166
Activity	56.19 (7.13)	54.09 (7.48)	9.80	.002
Excite Seeking	60.28 (6.54)	57.15 (8.26)	19.09	<.001
Positive Emotions	53.77 (8.51)	51.03 (9.26)	11.01	<.001
Openness	45.72 (8.86)	44.96 (8.55)	0.95	.330
Agreeableness	48.63 (9.41)	50.98 (10.09)	6.83	.009
Trust	46.35 (9.67)	46.56 (10.58)	.048	.827
Straight-forward	49.37 (9.38)	51.40 (9.59)	5.49	.019
Altruism	54.51 (9.34)	55.26 (9.64)	.752	.386
Compliance	47.50 (9.75)	50.78 (10.37)	12.50	<.001
Modesty	47.49 (9.78)	50.79 (9.06)	15.68	<.001
Tender-mind	49.25 (7.20)	49.97 (8.39)	.945	.331
Conscientious	53.32 (9.57)	53.28 (10.49)	0.003	.960

Note. Degrees of freedom for all F-ratios are (1, 727). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Hysteria

Of the 742 male participants, 735 subjects produced an MMPI-2 Hysteria scale score in the low or average range with 159 subjects with low scores (T scores 40 or less), and 576 subjects with average scores (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant (F (5,729)=14.415, p<.001, η^2 =.090). Table 3 gives the means and univariate results for each domain. The Hysteria low scoring group (Hy-low) scored higher on Neuroticism than the Hysteria average scoring group (Hy-med), but Hy-low was lower than Hy-med on Extraversion, Openness, and Agreeableness.

The group differences on these four domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 1). For the Neuroticism domain, the Hy-low group scored significantly higher than Hy-med on all facets except Vulnerability. The Hy-low group scored lower on all the Extraversion facets except for the Activity and Excitement Seeking facets. For the Openness domain, Hy-low was significantly lower on the Actions and Ideas facets. Finally, for the Agreeableness domain, Hy-low was significantly lower than Hy-med on all facets except Altruism and Modesty.

Specific predictions were made for eight facets: four on the domain of Extraversion-Warmth, Gregariousness, Assertiveness, and Activity, two on the domain of Openness- Actions and Ideas, and two on the domain of Agreeableness-Trust and Tender-mindedness. Planned t-tests were conducted and seven significant differences were found. Three extraversion facets were found to have significant differences including Warmth (t(733)=-6.49, p=<.001), Gregariousness (t(733)=-5.07, p=<.001), and Assertiveness (t(733)=-2.68, p=.008). For all three facets, the low scoring group (Hy-low) was expected to be lower than the average scoring group (Hy-med) and

this was confirmed (Warmth: Hy-low M=48.55 and Hy-med=53.37) (Gregariousness: Hy-low M=54.32 Hy-med M=58.18) (Assertiveness: Hy-low M=54.65 and Hy-med M=56.69). There were two Openness facets with significant differences, including Actions (t(732)=-3.84, p=<.001) and Ideas (t(732)=-2.69, p=.007). The prediction for these facets was that Hy-low would be lower and this was confirmed for both Actions (Hy-low M=46.03 and Hy-med M=49.11) and Ideas (Hy-low M=44.59 and Hy-med M=47.05). Finally, there were two significant facets on the domain of Agreeableness, including Trust (t(733)=-7.76, p=<.001) and Tender-mindedness (t(733)=-3.69, p=<.001). In both cases, the prediction that the Hy-low group would have lower scores was supported (Trust: Hy-low M=40.92 and Hy-med M=47.87) (Tender-mindedness: Hy-low M=47.59 and Hy-med M=50.27).

Table 3

Hysteria Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	50.18 (8.62)	45.11 (9.84)	34.73	<.001
Anxiety	51.40 (8.37)	48.33 (8.33)	16.86	<.001
Hostility	51.66 (9.20)	46.54 (9.40)	37.36	<.001
Depression	49.70 (8.29)	46.84 (9.03)	12.94	<.001
Self-conscious	49.96 (8.89)	45.72 (9.33)	26.28	<.001
Impulsive	50.70 (8.96)	45.70 (10.60)	29.62	<.001
Vulnerable	46.92 (9.28)	44.48 (9.05)	9.00	.003
Extraversion	55.45 (8.32)	58.13 (7.85)	14.12	< .001
Warmth	48.55 (9.26)	53.37 (8.00)	42.23	<.001
Gregarious	54.32 (9.07)	58.18 (8.34)	25.69	<.001
Assertiveness	54.65 (8.03)	56.69 (8.63)	7.17	.008
Activity	55.20 (8.04)	54.28 (7.28)	1.88	.171
Excite-seeking	58.54 (7.65)	57.53 (8.20)	1.95	.164
Positive Emotions	49.35 (9.72)	52.28 (9.00)	12.79	<.001
Openness	43.45 (8.33)	45.49 (8.62)	7.065	.008
Fantasy	46.42 (9.11)	45.50 (8.91)	1.31	.253
Aesthetics	43.32 (8.72)	45.11 (8.93)	5.05	.025
Feelings	48.30 (9.17)	48.23 (9.43)	.007	.934
Actions	46.03 (8.55)	49.11 (9.08)	14.71	<.001
Ideas	44.59 (9.93)	47.05 (10.28)	7.22	.007
Values	46.33 (7.22)	47.98 (7.25)	6.52	.011
Agreeableness	45.94 (8.95)	51.62 (9.87)	42.85	<.001
Trust	40.92 (9.03)	47.87 (10.24)	60.26	<.001
Straightforward	48.87 (9.48)	51.56 (9.47)	9.98	.002
Altruism	52.15 (9.16)	55.87 (9.50)	19.41	<.001
Compliance	46.58 (11.03)	50.98 (9.93)	23.32	<.001

Modesty	48.82 (10.08)	50.44 (9.14)	3.73	.054
Tender-minded	47.59 (8.40)	50.27 (8.04)	13.61	<.001
Conscientious	51.73 (9.90)	53.60 (10.38)	4.11	.043

Note. Degrees of freedom for all F-ratios are (1, 733). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Psychopathic Deviate

Of the 742 male participants, 690 subjects produced MMPI-2 Psychopathic Deviate scale scores in the low or average range with 64 subjects with low scores (T scores 40 or less), and 626 subjects with average scores (T scores 41 or higher but less than or equal to 65).

There was not a significant effect of the level of MMPI-2 Psychopathic Deviate score (low, average) on the combined dependent variable of NEO-PI-R Scale scores, $F(5,684)=2.144$, $p=.059$; Hotelling's Trace =.016; partial η^2 =.015.

Based on the literature, specific predictions were made for eight individual facets including: Neuroticism-Angry Hostility, three on the domain of Extraversion-Assertiveness, Excitement Seeking, Positive Emotions, one for the domain of Openness-Values, and three facets of Conscientiousness-Dutifulness, Self-discipline, and Deliberation. Only one of the eight predictions were found to have significant differences between the Psychopathic Deviate low scoring group (PD-low) and the Psychopathic Deviate average scoring group (PD-med). A significant result was found for Extraversion-Assertiveness ($t(688)=-2.63$, $p=.009$). The prediction was that scores for PD-low would be lower than PD-med and this prediction was confirmed (PD-low M=53.64 and PD-med M=56.58).

Masculinity/Femininity

Of the 742 male participants, 739 subjects produced MMPI-2 Masculinity/Femininity scale scores in the low or average range with 519 subjects with low scores (T scores 40 or less), and 220 subjects with average scores (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant (F (5,733)=17.080, $p<.001$, $\eta^2 = .104$). Table 4 gives the means and univariate results for each domain. The Masculinity/Femininity low scoring group (MF-low) scored significantly lower on the domains of Neuroticism and Openness than the Masculinity/Femininity average scoring group (MF-med), but MF-low was significantly higher than MF-med on the domain of Conscientiousness.

The group differences on these three domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 4). For the Neuroticism domain, the MF-low group scored significantly higher than MF-med on all facets except Vulnerability. The MF-low group scored lower on all six Neuroticism facets. For the Openness domain, MF-low was significantly lower on the Fantasy, Aesthetics and Feelings facets. Finally, for the Conscientiousness domain, MF-low was significantly higher than MF-med on all facets except Order.

Specific predictions were made for males on seven facets: three on the domain of Extraversion- Assertiveness, Activity, Excitement-Seeking, three on the domain of Openness- Feelings, Ideas, Values and one on the domain of Agreeableness- Modesty. Planned *t*-tests were conducted and significant differences were found on four of the seven predicted facets. Two of the predicted facets on the domain of Extraversion, including Assertiveness ($t(737)=5.73$, $p=<.001$) and Activity ($t(737)=2.96$, $p=.003$) were found to have significant differences. The

prediction that MF-low would score higher was confirmed (Assertiveness: MF-low M=57.39 and MF-med M=53.55) (Activity: MF-low M=55.00 and MF-med M=53.23). Two of the predicted facets on the domain of Openness, including Feelings ($t(737)=-6.16$, $p=<.001$) and Values ($t(737)=-2.42$, $p=.016$) were also found to have significant differences. The prediction that MF-low would score lower was confirmed (Feelings: MF-low M=46.88 and MF-med M=51.42) (Values: MF-low M=47.23 and MF-med M=48.63).

Table 4

Masculinity/Femininity Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	44.70 (8.97)	49.81 (10.93)	43.84	<.001
Anxiety	48.02 (7.79)	51.36 (9.50)	24.75	<.001
Hostility	46.79 (9.13)	49.77 (10.36)	14.79	<.001
Depression	46.23 (8.14)	50.41 (10.14)	35.15	<.001
Self-conscious	45.12 (8.86)	50.07 (9.74)	45.50	<.001
Impulsive	45.83 (10.18)	49.14 (10.96)	15.58	<.001
Vulnerability	43.71 (8.49)	48.10 (9.97)	37.08	<.001
Extraversion	58.01 (7.74)	58.38 (8.61)	6.40	.012
Openness	44.05 (8.01)	47.40 (9.44)	24.20	<.001
Fantasy	44.68 (8.60)	48.12 (9.17)	23.76	<.001
Aesthetics	43.94 (8.37)	46.50 (9.81)	12.98	<.001
Feelings	46.88 (8.93)	51.42 (9.59)	37.93	<.001
Actions	48.41 (8.95)	48.49 (9.28)	.012	.914
Ideas	46.22 (9.69)	47.18 (11.68)	1.34	.247
Values	47.23 (7.14)	48.63 (7.49)	5.83	.016
Agreeableness	50.80 (9.91)	49.42 (10.10)	2.98	.085
Conscientious ness	54.24 (9.88)	50.63 (10.96)	19.30	<.001
Competence	52.45 (9.73)	50.29 (10.84)	7.06	.008
Order	50.36 (8.69)	49.31 (10.10)	2.06	.152
Dutifulness	50.05 (9.88)	47.04 (11.26)	13.21	<.001
Achieve Striving	57.06 (8.25)	54.13 (9.79)	17.51	<.001
Self-discipline	55.21 (8.75)	51.48 (10.03)	25.69	<.001
Deliberation	53.44 (10.08)	50.15 (10.98)	15.63	<.001

Note. Degrees of freedom for all F-ratios are (1, 737). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Paranoia

Of the 742 male participants, 721 subjects produced MMPI-2 Paranoia scale scores in the low or average range with 232 subjects with low scores (T scores 40 or less), and 489 subjects with average scores (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,715)=6.836$, $p<.001$, $\eta^2 =.046$). Table 5 gives the means and univariate results for each domain. The Paranoia low scoring group (Pa-low) scored significantly lower on the domains of Extraversion, Openness, and Agreeableness than the Paranoia average scoring group (Pa-med).

The group differences on these three domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 5). For the Extraversion domain, the Pa-low group scored significantly lower than Pa-med on the Warmth and Positive emotions facets. For the Openness domain, Pa-low was significantly lower on the Aesthetics and Values facets. Finally, for the Agreeableness domain, Pa-low was significantly lower than Pa-med on the Trust, Altruism, and Tender-mindedness facets.

Specific predictions were made for five facets: two on the domain of Extraversion- Warmth and Gregariousness, two on the domain of Openness-Actions and Ideas and one on the domain of Conscientiousness- Achievement Striving. Planned *t*-tests were conducted and three facets were found with a significant difference. The first was Extraversion-Warmth ($t(719)=-3.63$, $p=<.001$). The prediction that Pa-low would score lower on the warmth facet was supported (Pa- low M=50.69 and Pa-med M=53.16). A significant difference was found for the facet of Extraversion-Gregariousness ($t(719)=-2.31$, $p=.021$), and confirmed the hypothesis that Pa-low would score lower (Pa-low M=56.32 and Pa-med M=57.89). There was also a significant

difference for the facet of Openness-Ideas ($t(718)=-2.36$, $p=.018$), that confirmed the prediction of lower Ideas scores for Pa-low (Pa-low M=45.22 and Pa-med M=47.16).

Table 5

Paranoia Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	46.17 (8.51)	45.83 (10.24)	.190	.663
Extraversion	56.31 (7.69)	58.09 (8.08)	7.85	.005
Warmth	50.70 (8.15)	53.16 (8.63)	13.21	<.001
Gregariousness	56.32 (8.56)	57.90 (8.56)	5.34	.021
Assertiveness	56.15 (8.49)	56.31 (8.58)	.057	.812
Activity	54.56 (7.13)	54.37 (7.62)	.100	.752
Excite-seeking	57.49 (8.02)	57.74 (8.13)	.154	.695
Positive-emotions	49.12 (9.03)	52.68 (9.17)	23.99	<.001
Openness	43.33 (7.74)	45.81 (8.90)	13.21	<.001
Fantasy	45.29 (8.84)	45.76 (8.86)	.442	.506
Aesthetics	42.99 (8.22)	45.42 (9.14)	11.89	.001
Feelings	47.07 (8.61)	48.71 (9.65)	4.86	.028
Actions	47.57 (8.54)	48.83 (9.31)	3.05	.081
Ideas	45.22 (9.23)	47.16 (10.74)	5.60	.018
Values	46.50 (6.64)	48.27 (7.50)	9.40	.002
Agreeableness	48.33 (9.27)	51.69 (10.10)	18.30	<.001
Trust	43.16 (8.97)	47.96 (10.68)	35.09	<.001
Straightforward	50.69 (9.54)	51.42 (9.48)	.934	.334
Altruism	53.16 (9.37)	56.11 (9.53)	15.26	<.001
Compliance	49.00 (10.43)	50.77 (10.26)	4.64	.032
Modesty	49.41 (9.20)	50.74 (9.28)	3.25	.072
Tender-minded	48.31 (7.66)	50.46 (8.36)	10.97	.001
Conscientious	52.31 (10.43)	53.84 (10.23)	3.50	.062

Note. Degrees of freedom for all F-ratios are (1, 719). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Psychasthenia

Of the 742 male participants, 720 subjects produced MMPI-2 Psychasthenia scale scores in the low or average range with 108 subjects with low scores (T scores 40 or less), and 612 subjects with average scores (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,714)=4.262$, $p=.001$; $\eta^2 =.029$). Table 6 gives the means and univariate results for each domain. The Psychasthenia low scoring group (Pt-low) scored significantly lower on the domains of Openness and Agreeableness than the Psychasthenia average scoring group (Pt-med).

The group differences on these three domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 6). For the Openness domain, Pt-low scores were significantly lower Pt-med for only the Aesthetics facet. On the Agreeableness domain, Pt-low was significantly lower than Pt-med on the Trust, Altruism, and Compliance facets.

Table 6

Psychasthenia Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	47.01 (8.04)	45.59 (9.76)	2.03	.154
Extraversion	56.49 (8.27)	57.87 (7.94)	2.74	.098
Openness	42.96 (7.99)	45.39 (8.62)	7.35	.007
Fantasy	44.86 (8.63)	45.72 (8.95)	.845	.358
Aesthetics	42.52 (8.15)	45.03 (8.89)	7.48	.006
Feelings	46.68 (8.54)	48.41 (9.46)	3.17	.076
Actions	47.64 (8.45)	48.63 (9.19)	1.08	.299
Ideas	45.13 (9.76)	46.88 (10.36)	2.67	.103
Values	46.27 (6.86)	47.95 (7.32)	4.94	.027
Agreeableness	47.12 (9.55)	51.22 (9.91)	15.78	<.001
Trust	41.95 (9.41)	47.37 (10.31)	26.02	<.001
Straightforward	50.06 (9.25)	51.35 (9.55)	1.71	.192
Altruism	52.78 (9.83)	55.68 (9.43)	8.61	.003
Compliance	47.58 (10.09)	50.62 (10.28)	8.07	.005
Modesty	48.63 (9.45)	50.39 (9.35)	3.26	.072
Tender-minded	48.03 (8.09)	50.04 (8.20)	5.57	.019
Conscientious	52.59 (9.24)	53.67 (10.34)	1.03	.309

Note. Degrees of freedom for all F-ratios are (1, 718). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Schizophrenia

Of the 742 male participants, 714 subjects produced MMPI-2 Schizophrenia scale scores in the low or average range with 125 subjects with low scores (T scores 40 or less), and 589 subjects with average scores (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,708)=2.405$, p=.036; $\eta^2 = .017$). Table 7 gives the means and univariate results for each domain. The Schizophrenia low scoring group (Sc-low) scored significantly higher on the domain of Neuroticism than the Schizophrenia average scoring group (Sc-med).

The group differences on these three domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 7). On the Neuroticism domain, Sc-low was significantly higher than Sc-med on only the Angry Hostility facet.

Specific predictions were made for eight facets: one for the domain of Neuroticism-Impulsiveness, four on the domain of Openness-Fantasy, Actions, Ideas, Values, two on the domain of Agreeableness-Compliance and Tender-mindedness, and one on the domain of Conscientiousness- Self-discipline. Planned *t*-tests were conducted and significant differences were identified for two facets. First, on the domain of Neuroticism, the facet of Impulsiveness ($t(712)=2.52$, $p=.012$) was found to be significant. It was predicted that Sc-low would produce facet scores lower than that of Sc-med, however the Sc-low scores were instead higher than Sc-med (Sc-low M=48.57 and Sc-med M=45.99) . A significant difference was also found for Openness-Actions ($t(711) =-1.98$, $p = .048$). The prediction that the Sc-low group would score lower than Sc-med was confirmed (Sc-low M = 47.36 and Sc-med M = 48.54).

Table 7

Schizophrenia Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	48.04 (8.08)	45.28 (9.81)	8.60	.003
Anxiety	50.34 (7.88)	48.32 (8.37)	6.13	.014
Hostility	49.76 (9.00)	46.78 (9.45)	10.41	.001
Depression	48.15 (7.51)	46.87 (8.93)	2.22	.136
Self-conscious	47.84 (8.37)	45.95 (9.38)	4.32	.038
Impulsive	48.57 (8.57)	46.00 (10.69)	6.36	.012
Vulnerability	46.36 (7.79)	44.37 (9.21)	5.06	.025
Extraversion	56.62 (7.57)	57.74 (8.10)	2.00	.157
Openness	43.58 (7.80)	45.14 (8.59)	3.49	.062
Agreeableness	49.32 (9.60)	51.05 (9.94)	3.15	.076
Conscientious	52.31 (8.77)	53.81 (10.49)	2.23	.135

Note. Degrees of freedom for all F-ratios are (1, 712). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Hypomania

Of the 742 male participants, 646 subjects produced MMPI-2 Hypomania scale scores in the low or average range with 32 subjects with low scores (T scores 40 or less), and 614 subjects with average scores (T scores 41 or higher but less than or equal to 65).

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,640)=8.308$, $p<.001$, $\eta^2 =.061$). Table 8 gives the means and univariate results for

each domain. The Hypomania low scoring group (Ma-low) scored significantly lower on the domain of Extraversion than the Hypomania average scoring group (Ma-med).

The group differences on this domain were further explored with univariate tests for the facet scores (also shown in Table 8). For the Extraversion domain, the Ma-low group scored significantly lower than Ma-med on the Warmth, Gregariousness, Assertiveness, Excitement-seeking and Positive emotions facets.

Specific predictions were made for five facets: two on the domain of Neuroticism-Depression and Self-consciousness, two on the domain of Extraversion- Activity and Excitement-Seeking, one on the domain of Agreeableness-Compliance. Planned *t*-tests were conducted and significant differences were found for three facet scales. First, Neuroticism-Self-consciousness ($t(644)=3.40$, $p=.001$) was found to be significant and confirmed the prediction that Ma-low would produce higher scores than Ma-med (Ma-low M=51.38 and Ma-med M=45.79). Both of the predicted facets on the domain of Extraversion were found to be significant, including Activity ($t(644)=-2.28$, $p=.023$) and Excitement-seeking ($t(644)=-4.29$, $p=<.001$). Ma-low was expected to produce lower scores on both Activity and Excitement-seeking and this was confirmed (Activity: Ma-low M=51.44 and Ma-med M=54.45) (Excitement-seeking: Ma-low M=51.41 and Ma-med M=57.52).

Table 8

Hypomania Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	48.84 (10.26)	45.12 (9.32)	4.79	.029
Extraversion	49.28 (9.03)	57.59 (7.64)	35.30	<.001
Warmth	45.59 (10.81)	52.67 (8.12)	22.29	<.001
Gregariousness	51.28 (10.81)	57.41 (8.41)	15.66	<.001
Assertiveness	52.16 (11.41)	56.45 (8.39)	7.64	.006
Activity	51.44 (8.82)	54.45 (7.22)	5.18	.023
Excite-seeking	51.41 (8.16)	57.52 (7.85)	18.41	<.001
Positive-emotions	44.00 (10.02)	51.56 (9.06)	20.93	<.001
Openness	40.93 (8.21)	44.82 (8.49)	6.40	.012
Agreeableness	50.90 (11.03)	51.27 (9.78)	.043	.836
Conscientious	51.46 (10.89)	53.94 (10.08)	1.82	.178

Note. Degrees of freedom for all F-ratios are (1, 644). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Social Introversion

Of the 742 male participants, 726 subjects produced MMPI-2 Social Introversion scale scores in the low or average range with 270 subjects with low scores (T scores 40 or less), and 456 subjects with average scores between (41-65).

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,720)=39.258$, $p<.001$, $\eta^2 =.214$). Table 9 gives the means and univariate results for each domain. The Social Introversion low scoring group (SI-low) scored significantly lower

on the domain of Neuroticism than the Social Introversion average scoring group (SI-med) and SI-low was significantly higher than SI-med on the domains of Extraversion, Openness, Agreeableness and Conscientiousness.

The group differences on these five domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 9). For the Neuroticism domain, the SI-low group scored significantly lower than SI-med on all facets except Impulsiveness. On the domain of Extraversion, SI-low scored significantly higher than SI-med on all six facets. For the Openness domain SI-low scored significantly higher than SI-med on all facets except Fantasy. On the domain of Agreeableness, SI-low scored significantly higher than SI-med on theAltruism and Trust facets. Finally, on the Conscientiousness domain, SI-low scored significantly higher on the Competence, Achievement Striving and Self-discipline facets.

On the Social Introversion Scale, specific predictions were made for six facets: Neuroticism-Anxiety and Impulsiveness, three on the domain of Extraversion- Warmth, Gregariousness, Assertiveness and on the domain of Agreeableness-Straightforwardness. Planned *t*-tests were conducted for each prediction and significant differences were found for four of five predicted facets. The first Neuroticism-Anxiety $t(724)=-5.87$, $p=<.001$) was significant and confirmed the prediction that SI-low would produce scores lower than that of SI-med (SI-low M=46.55 and SI-med M=50.23). All three predicted facets on the domain of Extraversion were found to be significant, this includes Warmth ($t(724)=8.72$, $p=<.001$) , Gregariousness ($t(724)=9.87$, $p=<.001$) and Assertiveness ($t(724)=8.54$, $p=<.001$). SI-low was expected to produce higher scores on all three and this was confirmed for each facet (Warmth: SI-low M=55.94 and SI-low M=50.75) (Gregariousness: SI-low M=61.38 and SI-med M=55.34) (Assertiveness: SI-low M=59.76 and SI-low M=54.52).

Table 9

Social Introversion Low and Average Groups: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low	Medium	Univariate F	*p*
Neuroticism	43.43 (8.47)	47.45 (10.05)	30.35	<.001
Anxiety	46.55 (7.34)	50.23 (8.62)	34.40	<.001
Hostility	45.87 (8.91)	48.38 (9.72)	12.05	.001
Depression	45.23 (7.86)	48.48 (9.10)	23.92	<.001
Self-conscious	43.56 (8.35)	48.01 (9.33)	41.67	<.001
Impulsive	45.76 (10.04)	47.05 (10.66)	2.62	.106
Vulnerability	42.89 (7.99)	46.00 (9.41)	20.69	<.001
Extraversion	62.07 (6.58)	55.28 (7.34)	156.31	<.001
Warmth	55.94 (7.27)	50.75 (8.04)	75.95	<.001
Gregariousness	61.38 (7.04)	55.34 (8.47)	97.41	<.001
Assertiveness	59.76 (7.06)	54.52 (8.50)	72.89	<.001
Activity	56.27 (6.84)	53.66 (7.48)	22.04	<.001
Excite-seeking	60.29 (7.30)	56.18 (8.22)	46.00	<.001
Positive-emotions	54.97 (8.47)	49.86 (8.97)	57.55	<.001
Openness	47.68 (8.45)	43.72 (8.32)	37.90	<.001
Fantasy	46.73 (8.68)	45.03 (9.03)	6.21	.013
Aesthetics	46.31 (9.19)	43.90 (8.63)	12.53	<.001
Feelings	49.97 (9.47)	47.42 (9.18)	12.83	<.001
Actions	50.83 (9.61)	47.37 (8.27)	26.31	<.001
Ideas	48.75 (9.90)	45.34 (10.23)	19.32	<.001
Values	48.69 (7.32)	47.17 (7.14)	7.54	.006
Agreeableness	51.89 (9.65)	49.85 (9.93)	7.29	.007
Trust	49.75 (9.95)	44.73 (10.13)	42.14	<.001
Straightforward	50.75 (9.04)	51.31 (9.79)	.585	.445
Altruism	56.79 (9.37)	54.36 (9.37)	11.47	.001
Compliance	50.01 (9.78)	50.30 (10.61)	.128	.720

Modesty	49.80 (9.09)	50.36 (9.41)	.602	.438
Tender-minded	50.24 (8.29)	49.55 (8.13)	1.19	.274
Conscientious	54.80 (9.28)	52.50 (10.61)	8.69	.003
Competence	54.19 (9.69)	50.78 (9.84)	20.56	<.001
Order	51.17 (8.91)	49.40 (9.11)	6.52	.011
Dutifulness	49.97 (9.85)	48.94 (10.61)	1.68	.196
Achieve Striving	57.65 (8.43)	55.60 (8.76)	9.54	.002
Self-discipline	55.85 (7.82)	53.40 (9.71)	12.37	<.001
Deliberation	52.34 (9.72)	52.73 (10.86)	.245	.621

Note. Degrees of freedom for all F-ratios are (1, 724). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

Low and Average Profiles

An additional MANOVA sought to examine differences in NEO-PI-R scores between low profiles (defined as 3 or more MMPI-2 clinical scales at a T score of 40 or less) and average profiles (defined as 2 or fewer MMPI-2 clinical scales at a T score of 40 or less). Of the 742 male participants 453 individuals produced medium profiles and 289 produced low profiles.

The multivariate test for differences in the five domain scores between the two groups was significant ($F(5,735) = 7.36$, $p < .001$, $\eta^2 = .048$). Table 10 gives the means and univariate results for each domain. The Bonferroni adjusted *p*-value of .01 was used to evaluate univariate significant for the domain scores. The low profile group scored significantly lower on Agreeableness than the average profile group.

The group differences on these five domains were further explored with univariate tests for the facet scores for each domain (also shown in Table 10). For the Agreeableness domain, the low profile group scored significantly lower than medium profile group on the Trust, Compliance and Modesty facets.

Table 10

Low and Average Profiles: Means, Standard Deviations, and Univariate Results

NEO PI-R Subscale	MMPI-2 Group Low Profile	Average Profile	Univariate F	*p*
Neuroticism	46.91 (8.37)	45.84 (10.71)	2.06	.152
Extraversion	58.21 (8.08)	57.08 (7.99)	3.49	.062
Openness	44.30 (8.07)	45.56 (8.89)	3.76	.053
Agreeableness	48.47 (9.25)	51.65 (10.25)	18.29	<.001
Trust	44.05 (9.30)	47.86 (10.80)	24.38	<.001
Straightforward	49.99 (9.28)	51.59 (9.69)	4.95	.026
Altruism	55.68 (9.43)	52.78 (9.83)	2.24	.135
Compliance	48.42 (10.37)	51.10 (10.19)	11.94	.001
Modesty	48.83 (9.52)	50.95 (9.15)	9.13	.003
Tender-minded	48.88 (7.74)	50.19 (8.49)	4.50	.034
Conscientious	52.61 (9.17)	53.50 (11.02)	1.33	.249

Note. Degrees of freedom for all F-ratios are (1, 739). Results for facet scores are shown only when the univariate domain score was significant using the Bonferroni adjusted *p*-value of .01.

IV

DISCUSSION

Results indicate that the meaning of low scores on the MMPI-2 clinical scales varies from one scale to another. Low scores on the MMPI-2 clinical scales were at times associated with characteristics that may be considered more positive but more often with traits that may be more negatively associated. NEO-PI-R domains and facets were designed as continuums of normal personality traits and not necessarily classified as positive or negative (Costa & McCrae, 1992), however, most would agree that a higher score on Neuroticism, for example, is not indicative of greater overall adjustment. This is in some contrast to reported findings by Graham, Ben-Porath, and McNulty (1997) who indicated that low scores on the MMPI-2 were not associated with more negative functioning or poor adjustment and well-being and Keiller and Graham (1993) who reported that low scorers were rated more favorably than average scorers on nearly every descriptor. In general, Scale 0, Social Introversion was the only scale in which low scores were consistently associated with more positive traits.

In contrast to the general finding that lower MMPI-2 scores are generally associated with more negative traits, this does not appear to be true for Scales 5 (Masculinity/Femininity) and 0 (Social Introversion). These two scales have been identified as bipolar, meaning authors suggest that low scores on these particular scales should be interpreted as meaning the opposite of high scores on these scales (Butcher & Williams, 2000, Graham, 2000). General findings for this research support this assertion and these were the only two scales on which low scorers produced lower Neuroticism domain scores than average scorers. Furthermore, most of the predictions made based on this assumption were confirmed and statistically significant.

In contrast, findings related to the neurotic triad (scales 1, 2, 3) indicate that both high and low scores appear to be associated with negative traits. Particularly on scale 1, Hypochondriasis, and scale 3, Hysteria, the interpretations of low scores indicated by this research are very similar to the interpretations provided by both Graham (2000) and Greene (2000) for high scores on these scales. Interpretations for scale 2, Depression, are less clear. In some regards, low scores should be interpreted similarly to high scores, but in other cases the opposite appears to be true. For example, Graham (2000) suggests high scorers on scale 2 are likely to be selfish, self-centered, and narcissistic, but low scorers are also more likely to be conceited and arrogant, as indicated by their lower scores on the Agreeableness-Modesty facet. However, another example suggests that high scores on the Depression scale have also been associated with lack or loss of energy (Graham, 2000). Low scorers produced higher scores on the facet of Extraversion-Activity indicating they have more energy than average scorers, which is the opposite of high scorers on the same scale. Interpretations for Depression and all other clinical scales will be discussed individually in more detail below.

The psychotic tetrad (scales 6, 7, 8 & 9) appears to be similar to the neurotic triad, suggesting that low scores on these scales may have meanings similar to high scores, perhaps with the exception of scale 9, Hypomania. Within the psychotic tetrad, the strongest case for similar meanings for high and low scores is found on scale 6, Paranoia and scale 8, Schizophrenia. Specifically, high scores on scale 6, Paranoia are associated with negative emotions such as depression, sadness and withdrawal, rigidity in attitudes and opinions, and suspicion (Graham, 2000). Findings indicated that low scores on Paranoia are similarly associated with fewer positive emotions (Extraversion-Positive Emotions facet), rigidity related to values (Openness-Values facet) and less trust of others (Agreeableness-Trust facet). There were few findings for scales 7

(Psychasthenia) and 8 (Schizophrenia), suggesting that there may be few correlates on the NEO-PI-R for the factors measured by these scales. However, the results that were found support similar interpretations for high and low scores on these scales. For example, high scores on Psychasthenia are associated with rigidity and difficulty with social situations, which is related to lower Openness and Agreeableness scores produced by low scorers on Psychasthenia. Similarly high scores on Schizophrenia, scale 8, are interpreted as being associated with anxiety, hostility, depression, feelings of inferiority, self-doubt and impulsivity. Each of these traits corresponds to facets of the Neuroticism scale, which was found to be significantly higher for low scorers on Scale 8.

Interpretations for Scale 9, Hypomania, are less clear. Low scores on scale nine were associated with lower levels of extraversion, indicating they are less active, less excitement-seeking and do not prefer the company of others which is, generally speaking, the opposite of high scores on this scale. However, they also scored higher on the facet of Neuroticism-Impulsiveness which indicates they have difficulty inhibiting cravings and urges, which is similar to interpretations of high scores on this scale.

Findings by Individual MMPI-2 Clinical Scales

In order to provide specific details about the interpretation of low scores for each individual clinical scale, the first set of analyses was exploratory in nature, searching for relationships between low scores on the MMPI-2 clinical scales and scores on the NEO-PI-R. These results are summarized in Table 11. Additional analysis focused on planned comparisons of MMPI-2 clinical scales and predicted direction of scores on the NEO-PI-R. Of 61 predictions made based on the literature and interpretive manuals, 27 (44%) predictions were confirmed and

one additional comparison was statistically significant but in the opposite direction from what was predicted.

Table 11

Results for Lower Scores on each MMPI-2 Scale

MMPI-2 Scale	**Neuroticism**	**Extraversion**	**Openness**	**Agreeableness**	**Conscientious**
1 (Hs)	Higher			Lower	
2 (D)		Higher		Lower	
3 (Hy)	Higher	Lower	Lower	Lower	
4 (PD)					
5 (MF)	Lower		Lower		Higher
6 (Pa)		Lower	Lower	Lower	
7 (Pt)			Lower	Lower	
8 (Sc)	Higher				
9 (Ma)		Lower			
0 (SI)	Lower	Higher	Higher	Higher	Higher

Though differences in scores on the NEO-PI-R for the low and medium scorers on the MMPI-2 are statistically significant, means for the two groups often fall in the same functional classification. For example, there is a statistically significant difference between the mean scores of Hy-low M=51.54 and Hy-med M = 48.61, but both of these scores would be classified in the average range on the NEO-PI-R. However, unlike the MMPI-2, which is interpreted based on classification, the NEO-PI-R was devised as traits on a continuum and is interpreted as such.

Most scores fell within the average classification, which is defined as T scores between 55-45. Some scores also fell in the low range (defined as T scores that are 44 or lower) or high range (T scores of 56 or higher). When scores on any domain or facet scale fell outside of the average classification range, that difference was specifically noted in the discussion of that domain, under the relevant MMPI-2 clinical scale.

Hypochondriasis

In the descriptive analysis, for low scores on MMPI-2 scale 1, Hypochondriasis (Hs), the domains of Neuroticism and Agreeableness were significant with significant differences found for 11of their respective facet scores. For Neuroticism, low scores on Hypochondriasis (Hs-low) were associated with higher neuroticism scores, indicating that low scores on Hs are associated with higher levels of emotional distress and poorer coping than average scorers (Hs-med). On all six facets of Neuroticism, Hs-low produced significantly lower scores than Hs-med. This suggests that these individuals are more likely to be anxious, tense, worried and fearful (Anxiety facet); more likely to be angry, frustrated and bitter (Angry Hostility facet); and more like to experience depressive affect (Depression facet). Low scorers on Hs are also more likely to be ashamed and embarrassed (Self-Consciousness facet), more likely to have difficulty controlling urges and cravings (Impulsiveness facet), and likely to be more vulnerable to stress (Vulnerability facet). For the Vulnerability facet, Hs-low produced scores in the average range, but Hs-med produced scores on the low range for this facet.

Hs-low scored significantly lower than Hs-med on the domain of Agreeableness, indicating that low scores on Hs are associated with more disagreeableness, antagonism and egocentrism than average scorers. Hs-low was significantly lower on five of the six Agreeableness facet scales, indicating that low scores on Hs are associated with more cynicism

and skepticism (Trust facet) and more willingness to be manipulative or stretch the truth (Straightforwardness facet). Low scorers on Hs may also be competitive, aggressive, and willing to express anger (Compliance facet), and may be more likely to be arrogant and believe they are superior (Modesty facet). Finally, they may also be more hardheaded and more likely to make decisions based on cold logic (Tender-mindedness facet) than average scorers.

In the interpretive manual that accompanies the MMPI-2, Hathaway and McKinley (1989) suggest that low scorers on scale 1 are energetic, capable and effective. Based on this interpretation, it was predicted that low scorers would have higher scores on Extraversion-Activity and Conscientiousness-Competence facts. However, differences for these facets were not statistically significant. When considering interpretations of low scores offered by other authors, predictions for the Hs scale of the MMPI-2 were difficult to make, given that the NEO-PI-R does not have domain or facet scales specifically aimed at physical complaints or ailments which were predicted to be less for low scorers by both Greene (2000) and Hathaway and McKinley (1989).

Depression

Descriptive analysis for the MMPI-2 scale 2, Depression (D), revealed a statistically significant difference between low and average scorers for the domains of Extraversion and Agreeableness, and significant differences for five of their facet scores. Low scorers on the Depression scale (D-low) produced higher scores on the domain of Extraversion, which suggests that generally speaking, low scores on D are associated with being more sociable, active, and preferring to be around others. D-low produced significantly higher scores on three facets, suggesting that more specifically, low scores on D are associated with a greater sense of energy and a need to keep busy (Activity facet), more craving for excitement and stimulation (Excitement-seeking facet) and a greater tendency to laugh easily and be cheerful and optimistic

(Positive-emotions facet). Scores for D-low and D-med fell in the high range for the domain of Extraversion and for the Excitement-seeking facet. On the Activity facet, D-low produced scores that would be classified as high but D-med produced scores that would be classified in the average range.

Low scorers on the Depression scale produced lower scores on the domain of Agreeableness, indicating that overall, they are more likely to be disagreeable, antagonistic and egocentric. Analysis of facet scales more specifically suggests that low scores on D may be associated with being more competitive, aggressive, and willing to express anger (Compliance facet), and also associated with arrogance and a belief of superiority (Modesty facet).

Based on interpretive manuals and research, differences were predicted for several facets. Tests revealed several statistically significant differences between low scores and average scores on the MMPI-2 clinical scale, Depression. As a result of these significant differences, the following interpretations are suggested. As predicted, low scorers appear to have less anxiety and may be more relaxed (Neuroticism-Anxiety facet) than average scorers. This is consistent with proposed interpretations by Keiller and Graham (1993), suggesting they are less likely to worry. They may also have more energy, and desire to stay more active (Extraversion-Activity facet). This is consistent with the suggested interpretation that low scorers are more active (Greene, 2000). Low scorers are also more likely to laugh and joke and to be cheerful and optimistic (Extraversion-Positive Emotions facet), which is similar to interpretations suggested by Keiller and Graham (1993) indicating that low scorers are more likely to laugh and joke and Hathaway and McKinley's interpretation that low scorers are more cheerful (1989). Interestingly, though both Keiller and Graham (1993) and Greene (2000) indicated that low scorers on D were more

gregarious, there was not a significant difference between low and average scorers on the Extraversion-Gregariousness facet.

Of all the MMPI-2 clinical scales, the interpretations for scale 2, Depression, appear to be the least clear and most contradictory. As mentioned previously, in some respects, low scores on are interpreted similarly to high scores on scale 2, particularly with regard to the domain of Agreeableness. However, significant differences between scores on the domain of Extraversion indicate interpretations for low scores that are the opposite of high scores on scale 2. Perhaps most confusing is the fact that D-low produced higher scores on the Extraversion-Positive emotions facet, indicating a greater tendency to laugh and joke and to be cheerful and optimistic, while producing lower scores on the domain of Agreeableness and the facet of Compliance indicating they are more likely to be competitive and are more willing to express anger. However, it is important to remember that while Costa and McCrae conceptualize both Extraversion and Agreeableness as "dimensions of interpersonal tendencies" (p.15, 1992), these are still separate domains and scores on one do not necessarily affect scores on the other. For example, one might find joy in competition or prefer the company of others for the sake of competition. Furthermore, just because one is more willing to express anger (as in Agreeableness-Compliance), this does not necessarily indicate that they are angrier than anyone else; they are simply more willing to share this emotion with others.

Hysteria

In the descriptive analysis, for low scores on MMPI-2 scale 3, Hysteria (Hy), four domains including Neuroticism, Extraversion, Openness and Agreeableness were significant with significant differences found for 17 of their respective facet scores. For Neuroticism, low scores

on Hysteria (Hy-low) were associated with higher Neuroticism scores, indicating that low scores on Hy are associated with higher levels of emotional distress and poorer coping than average scorers. On all six facets of Neuroticism, Hy-low produced significantly lower scores than Hy-med. This suggests that these individuals are more likely to be anxious, tense, worried and fearful (Anxiety facet), more likely to be angry, frustrated and bitter (Angry Hostility facet) and more likely to experience depressive affect (Depression facet). Low scorers on Hy are also more likely to be ashamed and embarrassed (Self-Consciousness facet), more likely to have difficulty controlling urges and cravings (Impulsiveness facet), and more vulnerable to stress (Vulnerability facet). Hy-med produced low scores on the Vulnerability facet while Hy-low scores were in the average range.

Low scorers on the Hysteria scale (Hy-low) produced lower scores on the domain of Extraversion, which suggests that generally speaking, low scores on Hy are associated with being more introverted, reserved, and independent. More specifically, Hy-low was associated with lower scores on four facet scales, indicating that low scores on Hy are likely an indication of being more reserved, formal, and distant (Warmth facet); may indicate a greater tendency to avoid the company of others (Gregariousness); are associated with a preference to keep to the background (Assertiveness facet); and though not necessarily unhappy, display a tendency to show less exuberance (Positive-emotions facet). Domain scores for Extraversion fell in the high classification range for both Hy-low and Hy-med.

Low scores on Hy are also associated with lower scores on the domain of Openness, indicating an overall tendency to be more conventional in behavior and conservative in outlook. Specifically, significant differences were found between Hy-low and Hy-med for two facets indicating that low scores may be associated with finding change difficult and a preference for the

"tried and true" (Actions facet). Low scorers may also have a tendency to be more closed and conservative, with greater acceptance of authority and tradition (Ideas facet). Hy-low produced scores that would be classified as low on both the domain of Openness and the facet of Ideas, while Hy-med produced average scores for this domain and facet.

Finally, low scorers on the Hy scale produced lower scores on the domain of Agreeableness, indicating that overall, they are more likely to be disagreeable, antagonistic and egocentric. Analysis of facet scales more specifically suggests that low scores on Hy are associated with more cynicism and skepticism (Trust facet) and more willingness to be manipulative or stretch the truth (Straightforwardness facet). Low scorers on Hy may also be more self-centered and reluctant to become involved in others' problems (Altruism facet); they may be more competitive, aggressive, and willing to express anger (Compliance facet); and may also be more hardheaded and likely to make decisions based on cold logic (Tender-mindedness facet) than average scorers. For the domain of Trust, Hy-low produced scores that would be classified as low, while Hy-med produced average scores for this facet.

Seven of the eight predicted relationships were statistically significant. Low scorers may be more reserved and distant (Extraversion-Warmth facet), less likely to seek out social stimulation (Extraversion-Gregariousness facet), and more likely to keep to the background and let others lead (Extraversion-Assertiveness facet) than average scorers. This is consistent with interpretations indicating that low scorers on Hy are social isolated (Greene, 2000), more likely to act shy (Keiller & Graham, 1993), and are socially isolated and aloof (Hathaway & McKinley, 1989). Also consistent with interpretations by Greene (2000) and Hathaway and McKinley (1989), low scorers may be less likely to try new things (Openness-Actions facet) and have fewer interests (Openness-Ideas facet). They may be more cynical and hard-hearted (Agreeableness-

Trust facet) and more hard-headed and less sympathetic to others (Agreeableness-Tender-mindedness facet). This is in line with interpretations which suggest low scorers are cynical and tough minded (Hathaway & McKinley, 1989).

Psychopathic Deviate

Exploratory analysis did not reveal a statistically significant difference between low and average scoring groups for scale 4, Psychopathic Deviate. However, based on predictions from the literature, specific planned t-tests revealed one significant relationship. Low scorers on scale 4, Psychopathic Deviate produced lower scores on the Extraversion-Assertiveness facet indicating low scorers are more likely to prefer keeping to the background and letting others do the talking and are less likely to be group leaders. This is consistent with Hathaway and McKinley's assertion that low scorers are unassertive and passive (1989). Two authors had indicated that low scorers on scale 4 are likely conventional and rigid; however, there was not a statistically significant difference for the groups in relation to the associated facet of Openness-Values, perhaps indicating that "conventional and rigid" do not necessarily correspond to rigidity related to values specifically.

Masculinity/Femininity

In the descriptive analysis, for low scores on MMPI-2 scale 5, Masculinity/Femininity (MF), three domains, Neuroticism, Openness, and Conscientiousness were significant with significant differences found for 14 of their respective facet scores. For Neuroticism, low scores on MF (MF-low) were associated with lower neuroticism scores, indicating that low scores on MF are associated with lower levels of emotional distress and better coping than average scorers. All six facets of Neuroticism were significantly lower for MF-low suggesting that when compared to

average scorers, low scorers are more calm and relaxed (Anxiety facet), more easygoing and slow to anger (Angry Hostility facet), less likely to experience depressive affect (Depression facet), less awkward in social situations (Self-Consciousness facet), more tolerant of frustration and less likely to give into temptations (Impulsiveness facet), and feel more capable of handling themselves in difficult situations (Vulnerability facet). For the domain of Neuroticism and the facet of Vulnerability, MF-low produced scores that would be classified as low while MF-med produced average scores.

Low scores on MF are also associated with lower scores on the domain of Openness, indicating an overall tendency to be more conventional in behavior and conservative in outlook. Specifically, significant differences were found between MF-low and MF-med for three facets, indicating that low scores may be associated with less imagination and a preference for keeping one's mind on the task at hand (Fantasy facet), more of an insensitivity and disinterest in art and beauty (Aesthetics facet) and a tendency to place less emphasis on feelings and have a more blunted affect (Feelings facet). For the domain of Openness and the facets of Fantasy and Aesthetics, MF-low produced scores that would be classified as low while MF-med produced average scores.

Low MF scores were also associated with statistically significant higher scores on the domain of Conscientiousness, suggesting that overall low scores may be associated with being more purposeful, strong-willed, and determined. MF-low produced significantly higher scores on five of six Conscientiousness facet scales indicating that low scores on MF may be associated with feeling more capable, prudent, sensible and effective (Competence facet) and a greater tendency to adhere strictly to their moral obligations and ethical principles (Dutifulness facet). Low scorers may also be more hard working, diligent, and have high aspirations (Achievement-

Striving facet); may possess a greater ability to motivate themselves to get the job done (Self-Discipline facet) and tend to be more cautious and deliberate (Deliberation facet). On the facet of Achievement-striving, MF-low produced scores that would be classified as high, while MF-med produced scores in the average classification range.

In terms of predicted relationships, both the Extraversion-Assertiveness and Extraversion-Activity facets were significantly higher, suggesting low scores on scale 5 may indicate a tendency to be more dominant, forceful, and a greater tendency to be group leaders (Assertiveness), as well as preference for being active, busy and fast paced (Activity). This is consistent with Graham (2000) and Greene's (2000) interpretation that low scoring males on scale 5 would likely possess personality traits considered traditionally masculine and Hathaway and McKinley's suggestion that low scoring males are likely to be aggressive and action oriented (1989). They also indicate the low scores are associated with a tendency to be "macho" and analysis revealed that low scores also indicate a more blunted affect with less importance placed on feelings (Openness-Feelings facet). Finally, low scoring males may be more likely to honor tradition and be less willing to reexamine values (Openness-Values facet), which is in line with Greene's assertion that low scorers are more traditional and inflexible (2000).

Paranoia

Descriptive analysis for the MMPI-2 scale 6, Paranoia (Pa), revealed a statistically significant difference between low and average scorers for three domains (Extraversion, Openness and Agreeableness) and significant differences for seven of their respective facet scores. The Paranoia low scoring group (Pa-low), produced lower scores on the domain of Extraversion, which suggests that low scores on Pa are associated with being more introverted, reserved, and

independent. More specifically, Pa-low was associated with lower scores on four facet scales indicating that low scores on Pa are likely an indication of being more reserved, formal and distant (Warmth facet) and a greater tendency to show less exuberance (Positive-emotions facet). On the domain of Extraversion, both Pa-low and Pa-med produced scores that would be classified as high.

Low scores on Pa are also associated with lower scores on the domain of Openness, indicating an overall tendency to be more conventional in behavior and conservative in outlook. Specifically, significant differences were found between Pa-low and Pa-med for two facets, indicating that low scores may be associated with more of an insensitivity and disinterest in art and beauty (Aesthetics facet) and a tendency to accept authority and honor tradition (Values facet). For both the domain of Openness and the facet of Aesthetics, Pa-low produced scores that would be classified as low while Pa-med produced scores in the average range.

Pa-low scored significantly lower than average scorers (Pa-med) on the domain of Agreeableness, indicating that low scores on Pa are associated with more disagreeableness, antagonism and egocentrism than average scorers. Pa-low was significantly lower on three of the six Agreeableness facet scales, indicating that low scores on Pa are associated with more cynicism and skepticism (Trust facet) and also being more self-centered and less willing to see to the needs of others (Altruism facet). Low scorers on Pa may also be more hardheaded and more likely to make decisions based on cold logic (Tender-mindedness facet) than average scorers. On the facet scale of Trust, Pa-low produced scores that would be classified as low while Pa-med produced scores in the average range. Also on the facet of Altruism, Pa-med produced scores that would be classified as high, while Pa-low produced average scores.

Of the five predicted relationships, six were statistically significant and suggest the following interpretations may be associated with low scores on Scale 6, Paranoia. These individuals are more distant and formal (Extraversion-Warmth facet), which is generally consistent with Greene's suggestion that low scorers are insensitive and unaware of others motives (2000). Low scorers are also more likely to be loners who do not enjoy or actively avoid the company of others (Extraversion-Gregariousness facet), which is in line with Hathaway and McKinley's (1989) interpretation that low scorers are wary and evasive. Low scorers may have fewer interests (Openness-Ideas), and this is consistent with Greene (2000) suggestion that low scores are indicative of narrow interests.

Psychasthenia

Descriptive analysis for the MMPI-2 scale 7, Psychasthenia (Pt), revealed a statistically significant difference between low and average scorers for two domains (Openness and Agreeableness) and significant differences for four of their respective facet scores. The low scoring group on Pt (Pt-low) produced lower scores on the domain of Openness, indicating an overall tendency to be more conventional in behavior and conservative in outlook. Specifically, significant differences were found between Pt-low and average scorers (Pt-med) for the Aesthetics facet, indicating that low scores may be specifically associated with more of an insensitivity and disinterest in art and beauty. For both the domain of Openness and the facet of Aesthetics, Pt-low produced scores that would be classified as low while Pt-med produced scores in the average range.

Pt-low scored significantly lower than Pt-med on the domain of Agreeableness, indicating that low scores on Pt are associated with more disagreeableness, antagonism and egocentrism than

average scores. Pt-low was significantly lower on three of the six Agreeableness facet scales, indicating that low scores on Pt are associated with more cynicism and skepticism (Trust facet), being more self-centered and less willing to see to the needs of others (Altruism facet) and being more competitive, aggressive, and willing to express anger (Compliance facet) than average scorers. On the facet scale of Trust, Pt-low produced scores that would be classified as low while Pt-med produced scores in the average classification.

Though many interpretations were proposed for low scores on scale 7, Psychasthenia, none of the predicted facet scales were statistically significant. Based on the interpretations by three separate authors, Greene (2000), Hathaway and McKinley (1989), and Keiller and Graham (1993) indicating that these individuals are likely secure, comfortable with themselves, emotionally stable, confident, and capable with an absence of worries and relaxed attitude toward responsibilities, it was predicted that scores on several facets of the Neuroticism domain would be lower for low scorers on scale 7, but differences between low and average scorers were not statistically significant for any of the Neuroticism facets.

Schizophrenia

In the descriptive analysis, for low scores on MMPI-2 scale 8, Schizophrenia (Sc), the domain of Neuroticism was significant with significant differences found for one facet scale. This suggests that generally, low scores on Sc are associated with higher levels of emotional distress and poorer coping than average scorers. For Neuroticism, the only significant facet scale was Angry Hostility, suggesting that these individuals are more likely than average scorers (Sc-med) to be angry, frustrated and bitter.

Of eight predicted relationships for low scores on scale 8, Schizophrenia, two facet scales were found to be significant. Hathaway and McKinley indicated that low scores should be interpreted as self-controlled (1989). As predicted, the corresponding facet of Neuroticism-Impulsiveness was significant; however, low scorers produced higher scores on this facet scale indicating an inability to control urges and temptations in direct opposition to the prediction of self-control. However, this is consistent with Graham's (2000) interpretation of impulsivity in high scorers on Schizophrenia and supports the hypothesis that low scores on this scale may be interpreted more similarly to high scores than average scores. The second statistically significant comparison from this scale was that of Openness-Actions, which suggests that low scorers on scale 8 are more likely to resist change and prefer the familiar. This is generally consistent with Greene's assertion that low scorers are conventional and concrete (2000). Though two authors suggested that low scorers were likely conventional and conservative (Hathaway & McKinley, 1989; Greene, 2000), the corresponding facet of Openness-Values did not show a statistically significant difference between low and average scorers.

Hypomania

In the descriptive analysis, for low scores on MMPI-2 scale 9, Hypomania (Ma), the domain of Extraversion was significant with significant differences found for five of the six facet scores. Low scorers on the Hypomania scale (Ma-low) produced lower scores on the domain of Extraversion, which suggests that generally speaking, low scores on Ma are associated with being more introverted, reserved, and independent. More specifically, Ma-low was associated with lower scores on five facet scales indicating that low scores on Ma are likely an indication of being more reserved, formal and distant (Warmth facet) and may indicate a greater tendency to avoid the company of others (Gregariousness). Ma-low was also associated with a greater preference to

keep to the background (Assertiveness facet), a preference for fewer thrills, that some may describe as boring (Excitement-seeking facet), and though not necessarily unhappy, a tendency to show less exuberance (Positive-emotions facet).

Several statistically significant differences on facet scores between low and average scorers on scale 9, Hypomania, were predicted and confirmed. Interpretations based on this research may suggest that low scorers on scale 9 are more easily embarrassed and more likely to show discomfort around others (Neuroticism-Self-consciousness facet). This is consistent with Hathaway and McKinley's suggestion that low scores on this scale may be indicative of poor self- confidence and shyness (1989). They may also prefer a slower pace that is more leisurely and relaxed (Extraversion-Activity), which is consistent with Greene (2000) and Hathaway and McKinley's (1989) interpretation that low scores on scale 9 may indicate low energy and activity levels (2000). Low scorers may also be less likely to seek excitement and stimulation (Extraversion-Excitement Seeking) which is supportive of Keiller and Graham's interpretation that low scorers are less likely to stir up excitement (1993).

Social Introversion

Low scorers on the MMPI-2 scale of Social Introversion (SI) produced significant scores on all five domains, including Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness with significance found for 21 of their respective facet scales. For Neuroticism, low scores on Social Introversion (SI-low) were associated with lower neuroticism scores, indicating that low scores on SI are associated with lower levels of emotional distress and better coping than average scorers. For five of six facets of Neuroticism, SI-low produced significantly lower scores than SI-med. This suggests that these individuals are more likely to be

calm and relaxed (Anxiety facet), more likely to be easygoing and slow to anger (Angry Hostility facet), and less likely to experience depressive affect (Depression facet). Low scorers on SI are also less likely to be uncomfortable in awkward social situations (Self-Consciousness facet) and feel more capable of handling themselves in stressful situations (Vulnerability facet).

Low scorers on SI also produced higher scores on the domain of Extraversion, which suggests that generally speaking, low scores on SI are associated with being more sociable, active, assertive, energetic and showing a preference for the company of others. More specifically, SI-low was associated with higher scores on all six facet scales indicating that low scores on SI are likely an indication of being more affectionate and friendly (Warmth facet), may indicate a greater preference to be in the company of others (Gregariousness), a greater tendency to be dominant, forceful and socially ascendant (Assertiveness facet), having more energy and a busier lifestyle (Activity facet), being more likely to crave excitement and stimulation (Excitement-Seeking facet) and a tendency to show positive emotions such as joy and happiness (Positive-emotions facet).

Low scores on SI are also associated with higher scores on the domain of Openness, indicating an overall openness to emotions and new experiences and a tendency to be willing to entertain novel ideas and unconventional values. Specifically, significant differences were found between SI-low and SI-med for five facets, indicating that low scores may be associated with a deep appreciation for art and beauty (Aesthetics facet), receptivity to one's own emotions and their importance (Feelings facet), a greater preference for novelty and variety (Actions facet), greater intellectual curiosity (Ideas facet) and a willingness to reexamine social, political and religious values (Values facet).

SI-low scored significantly higher than SI-med on the domain of Agreeableness, indicating that low scores on SI are associated with being more altruistic, sympathetic and trusting than

average scorers. SI-low was significantly higher on two of the six Agreeableness facet scales, indicating that low scores on SI are associated with a tendency to believe that others are honest and well intentioned (Trust facet) and having active concern for the welfare of others (Altruism facet).

Out of six predicted relationships, low scores on scale 0, Social Introversion, are associated with higher scores on three of the extraversion facets and lower scores on one Neuroticism facet. Low scorers are more likely to be warm and friendly (Extraversion-Warmth), more likely to prefer the company of others (Extraversion-Gregariousness) and more likely to be dominant and forceful (Extraversion-Assertiveness). This is consistent with some of the interpretations by Greene (2000), who suggested low scores indicate individuals who are socially extroverted, gregarious, and socially poised; interpretations by Graham (2000), who suggested these individuals are outgoing, talkative, competitive, friendly, expressive, and enjoy being around others; and Hathaway and McKinley (1989), who suggested that low scorers are warm, sociable, gregarious, and assertive. They are also statistically more likely to be confident and optimistic and less nervous than average scorers (Neuroticism-Anxiety) which is consistent with the interpretation that low scorers are self-confident (Hathaway & McKinley, 1989). The findings for Social Introversion appear consistent with research that suggests scale 0 may represent a true continuum, meaning that low scores on Scale 0 are the opposite of high scores (Graham, 2000).

Low and Average Profiles

An additional analysis sought to examine the cumulative effect of low scores across the profile on NEO-PI-R scores. For this analysis, low profiles were defined as 3 or more MMPI-2 clinical scales at a T score of 40 or less and these were compared to average profiles, which were defined as 2 or fewer MMPI-2 clinical scales at a T score of 40 or less. The low profile group

scored significantly lower on Agreeableness than the average profile group, suggesting that individuals with low profiles may be generally more likely to be disagreeable, antagonistic and egocentric than those with average profiles. Individuals with low profiles produced significantly lower scores on three of the six Agreeableness facet scales, indicating that low profiles are associated with more cynicism and skepticism (Trust facet), they may be more competitive, aggressive, and willing to express anger (Compliance facet), and may be more arrogant with a belief of superiority (Modesty facet). On the facet of trust, those with low profiles produced trust scores in the low classification range while those with average profiles produced scores in the average classification range. These findings indicate that overall low scores across the profile may be associated with greater dysfunction, in contradiction to earlier research (Graham, Ben-Porath, and McNulty, 1997 and Keiller and Graham, 1993) that suggested that low scores are not associated with poorer functioning.

Limitations

Several aspects of this study limited the generalizability of results. The relatively small number of females did not allow for separate gender analysis and results of this research can only be applied to males. The sample was also somewhat limited in terms of age of participants, and though ages ranged from 18-55, the average age was relatively young at 25 years. The sample was also limited geographically to Western Pennsylvania.

Another significant limitation is related to the fact that all participants were presenting for testing as part of an application to a police academy. This is a unique sample of individuals which are likely interested in law enforcement, may be more traditional and more action oriented. It was also a concern that they may be higher on certain personality traits, such as Contentiousness, therefore possibly restricting the range on that particular NEO-PI-R scale. However, when

examining the scores for this group on the NEO-PI-R, this group scored very similarly to the general population. Means for the five NEO-PI-R domains were within seven points of the expected mean of 50. The highest being Extraversion (M=57) and the lowest being Openness (M=45). Standard deviations for this population were also similar to the expectation of 10. Both Extraversion and Openness had standard deviations of 8.06 and 8.81 respectively, while Contentiousness had the highest standard deviation at 10.48.

A high number of descriptive or exploratory analyses were run in an effort to identify relationships between low scores on the MMPI-2 and scores on the NEO-PI-R. This was deemed necessary in order to contribute to the rather limited body of literature on interpretations of low MMPI-2 clinical scales. However, it is recognized that in running so many analyses one is likely to find statistical significance based on chance alone. In an effort to control for this, MANOVAs were utilized to analyze factors in groups and Bonferroni corrections were used to correct for potential error.

Though differences in scores on the NEO-PI-R for the low and medium scorers on the MMPI-2 are often statistically significant, means for the two groups often fall in the same functional classification. Regardless of the MMPI-2 clinical scale, low and average scorers produced scores in the average classification range on nearly all domain and facet scales. However, the NEO-PI-R was devised as traits on a continuum and is interpreted as such, suggesting that even a small difference represents more or less of that particular trait. Perhaps findings would have been more meaningful if low and average scores had fallen more frequently in different classification ranges.

Additionally, though results are significant the effect sizes are not large. It is important to remember that these reflect group differences and one must use caution when applying findings

for a group to an individual. For example, if an individual produces a low score on the MMPI-2 scale 1, Hypochondriasis, they may be more likely to produce a higher score on the angry hostility facet of the NEO=PI-R. However, this is not sufficient to indicate that this specific individual is any angrier than anyone else. These findings serve as a hypothesis for further research and not necessarily as implications for direct interpretation of the MMPI-2.

Implications for Clinical Practice and Future Research

Clearly, additional research is needed to both propose and validate interpretations for low scores on the MMPI-2 clinical scales, particularly with a more varied population. Additional research is also needed to further examine the specific hypotheses related to similar meanings for high and low scores on the neurotic triad and psychotic tetrad, particularly to alleviate confusion related to low scores on scale 2, Depression. Also, given that much of the interpretation of the MMPI-2 involves examining more than one scale at a time in the form of code types, future research may wish to consider interpreting combinations of low scores.

In conclusion, the most significant finding of this research is that generally, lower MMPI-2 scores are not suggestive of greater overall adjustment as has been suggested by other authors. Also, though by no means exhaustive, these findings strengthen the case for some of the interpretations that have been recommended for low scores on the MMPI-2 clinical scales. It also calls into question some proposed interpretations with unsupported or occasionally contradictory results. Finally, these findings suggest some possible new interpretations of low scores on the clinical scales of the MMPI-2, which should serve as the basis for future research.

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Appendix A

Hypothesized Relationships between MMPI-2 Clinical Scales and NEO-PI-R Facet Scales

		1	2	3	4	5	6	7	8	9	0
Anxiety	N1		-					- -			-
Angry Hostility	N2				-						
Depression	N3									+ +	
Self-consciousness	N4		-					- -		+	
Impulsiveness	N5								-		+
Vulnerability	N6							- -			
Warmth	E1		+	- -			-				+ +
Gregariousness	E2		+ +	- -			-				+ +
Assertiveness	E3			-	-	+		+			+
Activity	E4	+	+	+		+				- -	
Excitement-seeking	E5				-	+				-	
Positive emotions	E6		+		+						
Fantasy	O1								-		
Aesthetics	O2										
Feelings	O3					-					
Actions	O4			-			-		-		
Ideas	O5			-		-	-		-		
Values	O6				- -	- -			- -		
Trust	A1			-							
Straightforwardness	A2										-
Altruism	A3										
Compliance	A4					+			+	+	
Modesty	A5					-					
Tender-mindedness	A6			- -					-		
Competence	C1	+						+			
Order	C2										
Dutifulness	C3				+						
Achievement Striving	C4						-	+ +			
Self-discipline	C5		+ +		+				+		
Deliberation	C6				+						

\+ Indicates low MMPI-2 scores are associated with high scores on this particular facet scale

\- Indicates low MMPI-2 scores are associated with low scores on this particular facet scale

*****Multiple signs suggest that multiple authors supported this association

*****Predictions are for males only when the author made a distinction

Appendix B

Significant Relationships between MMPI-2 Clinical Scales and NEO-PI-R Facet Scales

		1	2	3	4	5	6	7	8	9	0
Anxiety	N1		-					- -			-
Angry Hostility	N2				-						
Depression	N3									+ +	
Self-consciousness	N4		-					- -		+	
Impulsiveness	N5								-		+
Vulnerability	N6							- -			
Warmth	E1		+	- -			-				+ +
Gregariousness	E2		+ +	- -			-				+ +
Assertiveness	E3			-	-	+					+
Activity	E4	+	+	+		+				- -	
Excitement-seeking	E5				-	+				-	
Positive emotions	E6		+ +		+						
Fantasy	O1								-		
Aesthetics	O2										
Feelings	O3					-					
Actions	O4			-			-		-		
Ideas	O5			-		-	-		-		
Values	O6				- -	-			- -		
Trust	A1			-							
Straightforwardness	A2										-
Altruism	A3										
Compliance	A4								+	+	
Modesty	A5					-					
Tender-mindedness	A6			- -					-		
Competence	C1	+						+			
Order	C2										
Dutifulness	C3				+						
Achievement Striving	C4						-	+ +			
Self-discipline	C5		+		+				+		
Deliberation	C6				+						

\+ Indicates low MMPI-2 scores are associated with high scores on this particular facet scale

\- Indicates low MMPI-2 scores are associated with low scores on this particular facet scale

Indicates a statistically significant relationship

Indicates a significant relationship in the opposite of the predicted direction