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Determining Cutoff Scores for the MMPI-2 Substance Abuse Scales For an Inmate Population

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DETERMINING CUTOFF SCORES FOR THE MMPI-2 SUBSTANCE ABUSE SCALES FOR AN INMATE POPULATION

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DETERMINING CUTOFF SCORES FOR THE MMPI-2 SUBSTANCE ABUSE SCALES FOR AN INMATE POPULATION

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The current research project examined the psychometric properties of the substance abuse scales of the Minnesota Multiphasic Personality Inventory, Second Edition (MMPI-2) with an inmate population. The scales of interest included the MacAndrews Alcoholism Scale Revised (MAC-R), the Addiction Potential Scale (APS) and the Addiction Acknowledgement Scale (AAS).

A total of 80 subjects were administered the MMPI-2 which resulted in 73 valid profiles. Of the valid profiles, 54 were chemically dependent and 19 were non-chemically dependent inmates. There were no differences between groups in regard to sociodemographic variables.

The data analyses indicated that the AAS and APS are efficient and accurate at discriminating between inmates who do and do not have chemical dependency diagnoses. Furthermore, it was determined that cutoff scores for all three substance abuse scales, AAS, APS and MAC-R, had to be lowered from those of the original standardization sample in order to increase the overall accuracy of the each scale. In addition, it was found that there is no significant difference between ethnic groups.

However, the APS required an analysis of covariance (ANCOVA) to

eliminate variability from age and education. Finally, there was no predictive relationship between the subject's test score and severity of drug use.

In conclusion, the AAS and APS showed more promise for identification of chemically dependent inmates than the MAC-R. However, lowered cutoff scores for each scale are necessary to increase the classification accuracy.

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS ii

LIST OF TABLES vii

CHAPTER

I. INTRODUCTION 1

II. LITERATURE REVIEW 3

Clinical Scales 10

Profile Configurations 11

Substance Abuse Scales 13

III. METHOD 23

Description of Site 23

Subject Recruitment 25

Sample Characteristics 26

Assessment Instruments 26

Procedure 27

Confidentiality of Data 29

Scoring 30

IV. ANALYSIS 32

Demographic Characteristics 32

Discriminative Accuracy 32

Table of Contents—continued

CHAPTER

Analysis of Variance 37

Correlation and Regression Analysis 37

V. RESULTS 39

Demographic Characteristics 39

Discriminative Accuracy 41

Analysis of Variance and Covariance 44

Correlation and Regression Analyses 45

VI. DISCUSSION 47

APPENDICES

A. Letters of Approval From Western Michigan University, Federal Medical Center, and the Central Regional Office 54

B. Recruitment Protocol 58

C. Debriefing Statement 60

D. Sign Up Sheet 62

E. English and Spanish Assent and Consent Forms 64

F. Demographic Questionnaire 71

G. Master List 74

H. MMPI-2 Instructions 76

I. Classification Decision Scheme to Determine the Accuracy of a Test in Discriminating Between Diagnostic Groups 78

Table of Contents—continued

APPENDICES

J. Symbols and Formulas to Be Used in Determining the Efficiency of a Test in Classification Between Diagnostic Categories 80

K. Mean and Statistical Differences for Demographic Variables 82

L. Graphical Representations of Demographic Data 84

M. Stepwise Statistics From the Discriminant Analysis 92

N. Histograms of the Canonical Discriminant Function for Non-Chemically Dependent, Chemically Dependent, and Overall Sample 94

O. Casewise and Cross-Validation Statistics 97

P. Measures of Discriminant Accuracy for AAS 100

Q. Measures of Discriminant Accuracy for APS 102

R. Measures of Discriminant Accuracy for the MAC-R 104

S. Measures of Discriminant Accuracy for the Optimal Cutscore (OCS) for Each MMPI-2 Substance Abuse Scale 106

T. Means and Standard Deviations for Ethnic Groups on the MMPI-2 Substance Abuse Scales 108

REFERENCES 110

LIST OF TABLES

1. Ethnic Description of Subjects 27

2. Test of Equality of Group Covariance Matrices Using Box's M 41

3. Classification Results 43

4. Multivariate Analysis of Variance Results 44

5. Univariate Analysis of Variance Results (DF = 2, 70) 45

6. Analysis of Covariance Results for the APS 45

7. Correlation Matrix for MMPI-2 Substance Abuse Scales and Severity of Drug Use and Diagnosis (N=51) 46

CHAPTER I

INTRODUCTION

Alcohol and drug abuse is a major social problem in today's culture. Aside from the significant impact that substance dependence has on the individual, drug and alcohol use implodes the criminal justice system with difficulties. Between 1973 and 1993, there was a 446 percent increase in prisoners in the state and federal prisons in the United States (Megargee, 1997). Furthermore, the increasing trend of incarcerating substance dependent individuals continues to remain strong with changes in drug laws and sentencing guidelines. Therefore, it is necessary for the criminal justice system to respond to inmates in an effective manner through assessment and treatment of substance use disorders.

The relationship between substance abuse and criminal behavior has been of interest to both addiction treatment specialists and psychologists in correctional settings. Early theories were based on the assumption that individual disorders were independent of each other without overlap in diagnostic consideration (Grande, Wolf, Schubert, Patterson, & Brocco, 1984). As an example, antisocial personality disorder would be considered as separate from alcohol or drug dependence and vice versa. However, in the previous decade a shift occurred in which the interrelationship between disorders became more important. Thus, diagnosis and treatment based on the interaction between substance use disorders and antisocial behavior is aimed at

determining if chemical dependency or antisocial behavior is primary to, or simultaneous with the other (Lewis & Bucholz, 1991; Vaillant, 1983). Furthermore, Grande et al. (1984) encouraged clinicians to begin considering additional mental disorders when diagnosing alcoholism, drug abuse or antisocial personality.

The inmate population provides a challenge to clinicians in assessment and diagnosis of chemical dependence and criminality. The unreliability of self-report regarding substance abuse mandates the use of objective assessment procedures (Grande et al., 1984). The collateral information may include use of laboratory tests and specialized psychological assessment, such as the Minnesota Multiphasic Personality Inventory-2, Second Edition (MMPI-2). The objective measures become critical for correctional management due to the high level of deception used for secondary gain in the inmate population. To exemplify, consider an inmate without a history of chemical dependency who would like to be housed in the drug abuse unit because of other inmates on this unit with whom he has associated in the past. Therefore, he may attempt to present himself as being chemically dependent in order to be transferred to the unit. Limited resources in the correctional system would be inappropriately allocated based on the inmate's self-report without corroborating information to support participation in drug treatment. When objective measures are applied, the probability of inappropriately allocating resources to inmates is reduced. The MMPI-2 is widely used in forensic settings. It is considered very useful in forensic evaluations because of the validity measures, broad research base and wealth of information it can provide about the individual (Roman, Tuley, Villanueva, & Mitchell, 1990).

CHAPTER II

LITERATURE REVIEW

The Minnesota Multiphasic Personality Inventory (MMPI) was originally developed in 1943 with the intent of providing useful diagnostic information to psychologists (Graham, 1990). The underlying rationale for the assessment protocol is an empirical keying of items capable of discriminating between different groups of subjects. The logical keying approach provided the basis for most psychological assessments until empirical strategies were employed in developing the MMPI. Therefore, the MMPI was based on empirical validity as opposed to the earlier reliance on face validity.

In 1989, the MMPI was revised to address concerns about the standardization sample, breadth of assessment, item content and language (Graham, 1990). As a result 567 items were included in the final revised version, the MMPI-2. The normative sample consisted of 1138 men and 1462 women, for a total of 2600 subjects. The geographic representation found in the normative sample was modeled after 1980 United States Census data. The ethnic breakdown of the subjects consisted of the following: white, 81 percent; black, 12 percent; Hispanic, 3 percent; American Indian, 3 percent; and Asian-American, 1% (Graham, 1990).

Butcher, Graham and Ben-Porath (1995) and Graham (1990) stated that the research based on the interpretation of the original MMPI is applicable to the MMPI-

2. Several categories of subjects have been examined for differences between assessment versions, including Vietnam Veterans with post-traumatic stress disorder (Litz et al., 1991), psychiatric inpatients (Blake et al., 1992; Edwards, Morrison & Weissman, 1993) and law enforcement officers (Hargrave, Hiatt, Ogard & Karr, 1994). Overall, the literature indicates a strong relationship between raw scores of the MMPI and MMPI-2. However, the combination of scales to form code-types is less comparable between the two assessment versions.

Research done by Ladd (1996) with chemically dependent inpatients found similarity in the endorsement patterns of the Koss-Butcher and Lachar-Wrobel critical item categories between the MMPI and MMPI-2. Legan and Craig (1996) conducted a similar study also based on chemically dependent inpatient subjects. Their results indicated that the overall profiles generated by the MMPI and MMPI-2 were similar. More complex relationships were observed in the two and three-point codetypes between the original and revised versions. Furthermore, correlation between the raw scores on the MacAndrew's Alcoholism Scale (MAC) and MacAndrew's Alcoholism Scale-Revised (MAC-R) yielded a coefficient of .59 for men, with higher scores on the MAC-R.

Utilization of the MMPI in correctional settings has a primary focus on the classification of prisoners (Graham, 1990). If an inmate is accurately categorized, the prison system will have increased efficiency because limited resources will be appropriately provided (Graham, 1990; Megargee, 1997). For example, increased supervision or security would be applied to inmates who are at high risk for becoming

violent while incarcerated. Less dangerous inmates would not require the additional resources necessary to maintain individual and institutional security. Another example would be the provision of substance abuse treatment only to individuals classified as chemically dependent, rather than providing treatment to individuals who do not have a history of substance abuse treatment.

Of critical importance in the use of the MMPI in correctional settings is the reliability of the instrument with inmates. VonCleve, Jemelka, and Trupin (1991) conducted a study to test the reliability of the MMPI and other psychological measures for felony offenders who were incarcerated in a state prison. They found that the MMPI test scores remained stable during the first month of incarceration. They concluded that the environmental stress associated with being incarcerated had little effect on the psychological assessment results within the first month. Furthermore, the authors stated that there was no difference in the stability of test scores for inmates when compared to other groups of subjects. In a study based on a substance abuse sample, test-retest coefficients for the validity, clinical and supplemental scales ranged between r =.85 to r =.57 with the retest interval at approximately 5.27 months (Ryan, Dunn, & Paolo, 1995). The MAC-R Scale had a test-retest coefficient of .78. The authors concluded that with an extended lapse between test administrations, the reliability coefficients are respectable.

The primary classification system for using the MMPI with inmates has been based on determining propensity for violence and malingering (Chick, Loy, & White, 1984; Hawk & Cornell, 1989; Herkov, Gynther, Thomas, & Myers, 1996; Megargee,

1997; Nichols & Greene, 1997; Roman et al., 1990; Shea & McKee, 1996). Megargee (1997) developed a widely used classification system to assist in management and treatment of inmates and reduction of institutional violence. An initial cluster analysis of MMPI profiles was followed by a classification strategy that considered elevation, slope, scoring patterns and differences between selected scales. The results provided ten groups of offenders and operational definitions of each offender group were created. Megargee (1997) cited Bohn's (1979) findings that the classification system was effective in reducing assaults by 46 percent when used in determining dormitory assignments. Megargee (1997) eventually extrapolated the aforementioned procedures to a female population and a similar classification system for female prisoners resulted.

Herkov et al. (1996) utilized the MMPI-2 to distinguish between types of adolescent sex offenders and psychiatric patients. They found significantly greater psychological disturbance on both single scale and code-types in the sex offenders than the psychiatric patients. Furthermore, the adolescents who had sodomized or forcibly raped their victims demonstrated higher clinical scale elevations than subjects who had engaged in exhibitionism, non-consenual oral sex or fondling the victim.

In a study based on determining violence in opiate-addicted inmates, the MMPI was again found to be effective in classification (Chick et al., 1984). The authors were able to distinguish between inmates who had committed or attempted bodily injury from those who were potentially bodily violent, materially violent, or non-violent. It is important to note that the MMPI results did not distinguish between

forms of violence less than bodily injury.

Decker-Roman and Gerbing (1989) found less compelling results for developing a classification system when the MMPI was used with mentally disordered offenders. The study was conducted on male patients in a forensic state hospital. Demographic, diagnostic and MMPI data were used to develop clusters types. It was found that the MMPI data was insufficient in classification without more direct and specific measures of mental disorders such as sociopathy and substance abuse (Decker-Roman & Gerbing, 1989). They attributed their results to two factors. First, the subject pool may have been homogenous due to all subjects being committed to psychiatric treatment. Second, non-uniform methods of measuring sociopathy may have impacted the results.

Malingering or feigning of psychiatric illness is another condition that the MMPI has been used to categorize (Hawk & Cornell, 1989; Nichols & Greene, 1997; Otto, Lang, Megargee & Rosenblatt, 1988; Roman et al., 1990). Nichols and Greene (1997) contributed a comprehensive discussion regarding the common types of malingering and deception. Furthermore, the authors discussed the differences between intentionally deceptive strategies and non-intentional deception based on the response style of the test-taker. Hawk and Cornell (1989) conducted a study based on forensic pre-trial evaluations using the MMPI. They found that the validity scales were able to distinguish between malingering, psychotic and non-psychotic subjects. Roman et al. (1990) reported less promising results in differentiating between malingering and psychopathology. The study resulted in the authors' suggestion that

cutoff scores for the validity scales may be questionable in this population. Furthermore, they suggested the elevated validity scales may be due to a combination of personality factors, substance abuse, acute psychopathology and malingering.

An important facet of MMPI-2 research in the correctional setting is the incorporation of ethnicity as a variable. Megargee (1997) stated that the number of minorities in correctional settings is much higher than in other settings. He underscored the importance of determining the utility of assessment instruments for ethnic minorities who are incarcerated. Greene, Gwin and Staal (1997) minimized the impact of ethnicity on the MMPI-2; however, this conclusion has not been tested with an inmate population. Due to the high degree of minorities who are incarcerated, differences between ethnic groups on the substance abuse scales are of considerable interest in the current research study.

Greene et al. (1997) stated that ethnic differences on the MMPI-2 are more likely to be related to correlates, such as age or education, than to true ethnic differences. Furthermore, in his review of the literature based on the relationship between ethnicity and MMPI performance, Greene (1987) mounted a strong argument for the inclusion of moderator variables, such as age and education, in comparing scores of different ethnic groups. These two variables become increasingly significant when considering differences between ethnic groups (Butcher et al., 1995; Greene, 1987).

Use of the MMPI-2 with Chicanos, Hispanic and Latino individuals has gained considerable attention due to the differences in culture and language. Velasquez et al. (1997) discussed strategies for a clinician to be culturally competent in assessing

Chicanos. They emphasized the importance of using the MMPI-2 due to the over-pathologization of Chicanos found in the use of the original MMPI. Butcher et al. (1995) examined the use of translated versions of the MMPI-2 with non-english speaking individuals. The concluded that when effective test translation procedures are followed, there is considerable validity in the respondent's scores.

Research based on the original MMPI claimed ethnic differences between groups on the MAC scale. It is clear from Greene's (1987) review of ethnicity and its impact on the MacAndrew Alcoholism Scale (MAC) (MacAndrews, 1965) that more research was necessary to utilize the original MMPI substance abuse scales in the most effective manner. Greene (1987) found considerable variation in the contrast between White subjects and ethnic minorities. More specifically, comparison of scores on the MAC Scale showed minimal difference between White and African-American subjects with positive histories of substance abuse. However, African-American subjects without substance abuse scored higher on the MAC than their White counterparts. Greene (1987) stated that there were no comparisons between Asian American and White subjects on the substance abuse scales. There were no significant differences between Hispanic and White MAC scores for either prisoners (McCreary & Padilla, 1977) or substance abusers (Page & Bozlee, 1982). However, in considering the disparity between African-American and Hispanic prisoners, Hispanic inmates were more likely to have lower scores than African-American prisoners. No differences were reported when comparing MAC Scores of Native Americans to White subjects in a substance abuse sample (Uecker, Boutilier & Richardson, 1980).

Several attempts to identify individuals in the general population who use alcohol and/or drugs excessively have been made using the MMPI and the MMPI-2. Research has been based on one of three experimental methods. First, investigators have used the 13 traditional clinical scales to determine consistent patterns of responses to characterize individuals who misuse substances versus those who do not. Second, studies have relied on cluster analysis to differentiate between types of sub-stance abusers. Finally, subscales have been developed to detect individuals who misuse substances.

Clinical Scales

The clinical scales utilized to detect substance abusers are primarily the Psychopathic Deviate (Pd) and Depression (D) (Clopton, 1978; Graham & Strenger, 1988). In addition to the Pd scale, elevations on the MMPI D and PT (Psychasthenia) scales are also associated with alcohol and drug abuse (Butcher & Pancheri, 1976; Dahlstrom, Welsh & Dahlstrom, 1972). Several authors have indicated that elevations on the MMPI Pd scale (Scale 4) are the most reliably associated with drug and alcohol problems (Button, 1956; Hoyt & Sedlacek, 1958; Loper, Kammeier & Hoffmann, 1973; MacAndrew, 1978; MacAndrew & Geertsma, 1963). The elevations in Scale 4 were consistent across additional moderator variables, including treatment setting, race, gender, and age (Graham & Strenger, 1988). Furthermore, the elevations on Scale 4 remained stable over time with a slight decrease in subjects who were involved in chemical dependency treatment (Graham & Strenger, 1988). Characteristics

associated with elevated scores on Scale 4 include difficulty maintaining social norms or rules, rebelliousness, unstable relationships, impulsivity, poor judgement and risk taking (Graham, 1990). On the other hand, in their review of the literature Graham and Strenger (1988) reported that overall an elevated score on Scale 4 was unable to distinguish alcoholics from non-alcoholics.

Profile Configurations

Authors who have been interested in cluster analysis have provided code types or cluster types that characterize different subgroups of individuals with drug or alcohol problems (Goldstein & Linden, 1969; Nervaino & Gross, 1983; Whitlock, Overall & Patrick, 1971). Code types refer to the combination of two or more clinical scales that are frequently found in certain subgroups. The cluster types utilize the entire MMPI profile rather than just two or more scales. It is important to remember Butcher et al.'s (1995) discussion regarding the relationship between MMPI and MMPI-2 scores when considering code-types. They stated that there is a strong relationship between raw scores; however, the code-types are less comparable between the two assessment versions.

A review of the literature (Graham & Strenger, 1988) determined that an MMPI "42 code type" associated with alcoholism was consistent throughout various studies. The "42 code type" refers to elevations on Psychopathic Deviate and the Depression scales. Graham (1990) described these individuals as being impulsive with little respect for social norms. Furthermore, their reaction to stress may be

characterized by excessive alcohol use and acting out behavior. Another common code type in substance abusers is the 49 two-point code with elevations on the Psychopathic Deviate scale and Hypomania scales. These individuals tend to be anti-social and exhibit alcoholism, excessive fighting and marital discord.

Isenhart and Silversmith (1996) considered the validity scale clustering of the MMPI-2 with a sample of individuals in treatment for alcoholism. The clusters analysis identified three types of response sets, defensive, exaggerated and straightforward. Furthermore, the authors found support for using the MMPI-2 data to generalize the subject's approach to additional substance abuse instruments.

Studies based on identifying cluster types have resulted in approximately six subtypes of alcoholics. Goldstein and Linden (1969) identified four of the cluster types on the MMPI. Type I is characterized by elevation on Scales 4 and 2 and without elevation on the remaining clinical scales. These individuals are described as being characterized by high levels of stress, excitability and impulsivity. Type II consists of elevations on Scales 2, 7, and 8 with Scale 4 having secondary elevation. The personality characteristics of these individuals include significant levels of tension, anxiety, dependency and somatic complaints. Type III includes individuals who have a primary elevation on Scale 4 and secondary high scores on Scales 2 and/or 9. Individuals with the Type III configurations tend to have a primary diagnosis of alcoholism, a secondary diagnosis of anxiety or depression, and their prognosis tends to be poor. Type IV is exemplified by elevations on Scales 4 and 9 without elevations on other clinical scales. The clinical characteristics of this subgroup include antisocial

personality and a binge pattern of chemical use during which periods of abstinence are associated with adequate handling of responsibility. Additional research has provided two additional profile configurations of the MMPI, beyond those of Goldstein and Linden (1969). Eshbaugh, Tosi and Hoyt (1978), Nerviano, McCarty and McCarty (1980), and Pfost, Kunce and Stevens (1984) identified a subgroup of alcoholic individuals who produce primary elevations on MMPI Scales 1 (Hypochondriasis), 2 (Depres-sion), and 3 (Hysteria) and secondary elevation on Scale 4. Individuals associated in this group experience somatic complaints, personality disorders and lack of insight regarding the relationship between emotional functioning and somatic symptoms. The second subgroup described by Graham and Strenger (1988) is based on MMPI pro-files with T scores between 80 and 100 on Scales 8 and F, while other clinical scales have T scores above 70. The profile is associated with very serious psychopathology requiring inpatient treatment to manage psychotic symptoms.

Substance Abuse Scales

The studies based on profile configurations have provided information regarding types of drug or alcohol abusers, but they have not focused on developing specific scales to be utilized in clinical practice. The development of specific scales to identify drug or alcohol abusers has occurred since the inception of the MMPI and has continued with the MMPI-2. Subscales afford a more simple and reliable method of identifying substance misuse than using either clinical scales or profile configurations. The specific substance abuse scales, MacAndrews Alcoholism Scale-Revised (MAC-

R), Addiction Potential Scale (APS) and Addiction Acknowledgement Scale (AAS) is the primary interest in the current study. More specifically, the relationship between these scales, their effectiveness in identifying inmates with substance abuse problems, and the impact of ethnicity on scores will be examined.

The MAC and the MAC-R has been the most widely used substance abuse scale, and it was the earliest substance abuse scale developed from the MMPI. It was constructed with the intent of measuring personality characteristics of alcoholics. More specifically, MacAndrew (1965) attempted to resolve the early debate that alcoholics may be individuals who are "simply neurotics who happen to drink too much" (p. 238), or that there was a distinguishable constellation of personality characteristics exhibited in alcoholics. The MAC consisted of a total of 49 items from the MMPI which were believed to distinguish alcoholic outpatients from psychiatric outpatients.

Research surrounding the MAC Scale has been varied and contradictory. Early research indicated that the MAC was able to accurately identify 81.5 percent of subjects diagnosed with alcoholism (Burke & Marcus, 1977; MacAndrew, 1967). However, subsequent studies were not as convincing and showed that the MAC failed to differentiate alcoholics from non-alcoholics (Apfeldorf & Hunley, 1981; Davis, Colligan, Morse & Offord, 1987; Gripshover & Dacey, 1994; MacAndrew, 1981; Miller & Streiner, 1990; Svanum & Ehrmann, 1993; Svanum & Hoffman, 1982). Apfeldorf and Hunley (1981) provided an alternative explanation of the disparity in research based on the MAC Scale. They postulated that the MAC Scale was not useful in measuring the degree of alcoholism, but that it was effective in measuring

psychological maladjustment. Their theory was based on the observation that high scores were associated with alcoholism and low scores were obtained by individuals with severe psychiatric diagnoses. A group of normal subjects, without alcoholism or psychiatric disorder, obtained scores between the means of alcoholics and those with severe psychiatric diagnoses. Ward and Jackson (1990) supported these findings in a study based on identifying primary and secondary alcoholics using the MAC Scale.

MacAndrew (1981) supported Apfeldorf and Hunley's (1981) idea that the MAC Scale is not a measure of short or long-term consequences of alcohol use. He discussed the hypothesis that the MAC Scale was measuring a polarized dimension of reward and punishment sensitivity. Individuals who scored high were characterized by a reward seeking orientation. Conversely, low scoring subjects were more focused on avoiding punishment. He stated that common traits of individuals who score high on the MAC Scale include pleasure-seeking, aggression, uninhibited impulses, gregariousness, rebelliousness and self-confidence (MacAndrew, 1981).

Another indication that the MAC Scale does not measure alcoholism is the incorporation of personality disorders in the research design. Several studies have been conducted with individuals who meet criteria for personality disorders, primarily antisocial (Preng & Clopton, 1986; Ruff, Ayers & Templer, 1975; Schwartz & Graham, 1979; Zager & Megargee,1981). For example, Preng and Clopton (1986) found that the presence of a personality disorder was associated with the MAC Scale's failure to accurately distinguish between alcoholics and non-alcoholics. Subjects with personality disorders were more likely to obtain high MAC scores independent of

diagnosis of alcoholism. Wolf, Schubert, Patterson, Grande and Pendleton (1990) further researched the relationship between MAC Scores and characterological disorders. They found the highest MAC scores in subjects who were diagnosed with antisocial personality or a combination of antisocial personality, alcoholism and drug dependence. Furthermore, their results showed that alcoholics without antisocial personality disorder or drug dependence and normal subjects scored the lowest on the MAC Scale. The authors concluded that the combination of antisocial personality disorder and substance use disorders has a significant impact on MAC scores. Finally, a study conducted by Svanum and Ehrmann (1992) was able to incorporate the aforementioned theories of characteristics measured by the MAC Scale, including the bipolar personality dimension and antisocial characteristics. They assessed alcohol dependent individuals in treatment and found several important relationships. First, they found support for MacAndrew's (1981) idea that high scorers on the MAC Scale were typically gregarious, aggressive and experienced legal difficulties. Second, low MAC scores were associated with increased social withdrawal, solitary drinking and psychiatric diagnosis. These findings were consistent with Apfeldorf and Huntley's (1981) hypothesis. Finally, since the presence of antisocial characteristics was identified in the high scoring subjects, the authors postulated that the inability of the MAC Scale to distinguish between alcoholics and non-alcoholics in forensic settings may be impacted by the presence of antisocial behavior.

When the MMPI was revised and the MMPI-2 was released, the MAC was revised and two additional scales to measure substance abuse were developed:

MacAndrews-Revised (MAC-R), Addiction Potential Scale (APS), and Addiction Acknowledgement Scale (AAS). According to Weed, Butcher, McKenna & Ben-Porath (1992), the APS is designed to elucidate the personality characteristics and life-style patterns of individuals who use drugs or alcohol excessively. In contrast, the authors describe the AAS as a measure of the denial or disclosure of difficulties commonly associated with alcohol and drug abuse. Therefore, the AAS differs from the MAC-R and APS in its focus on the respondent's willingness to directly report drug or alcohol related problems. The APS and AAS used in combination are believed to be a more accurate measure of a client's addictive pattern and willingness to address these issues (Weed et al., 1992).

Weed et al. (1992) introduced both the APS and AAS following the release of the MMPI-2. The original construction of these scales was based on using the MMPI-2 normative sample along with volunteers from inpatient psychiatric and substance abuse populations. The MMPI-2 normative sample was comprised of 2,600 subjects from seven regions of the United States (Butcher, Dahlstrom, Graham, Tellegen & Kaemmer, 1989). The psychiatric subgroup was based on 423 subjects who were hospitalized in two mental health facilities and one state hospital (Weed et al., 1992). The sample of substance abusers was formed from 1,212 individuals admitted to an inpatient substance abuse treatment unit. Inclusion criteria for all subjects included fewer than 30 items omitted, F Scale raw score of 25 or below, and Back Page Infrequency (Fb) Scale raw score of 25 or below.

The APS Scale includes 39 questions, which were empirically selected based

on differential responses from subjects included in substance abuse, psychiatric and normative groups. The scale was constructed in a similar fashion to the MAC and MAC-R Scale. More specifically, the APS is based on the relationship between drug or alcohol abuse and lifestyle characteristics or personality dimensions (Weed et al., 1992). Therefore, the questions that comprise the APS are much more indirect than other substance abuse measures that directly probe chemical dependency.

The development of the APS took several steps. First, Weed et al. (1992) identified MMPI-2 items that were higher or lower in the substance abuse sample than in the normal and psychiatric subgroups. However, the authors found that the substance abuse subjects tended to score in the midrange with normal and psychiatric subjects scoring at the extremes. There were a total of 180 items that were retained for the next level of analysis. The second phase of development was based on subjecting the 180 test items to four chi-square analyses. The chi-square analyses were based on the comparison of the substance abuse sample with the psychiatric and normal samples for each gender. Finally, 46 items were analyzed for content, internal consistency, and questions with direct references to alcohol abuse were eliminated. Seven items were eliminated and the remaining questions comprise the final pool of 39 items.

The AAS is based on 13 items that are obviously related to substance use. Weed et al. (1992) described how the scale was developed by analysis of the obvious content of the MMPI-2 questions. In order to improve the psychometrics of the AAS scale, the internal consistency was examined. The analysis resulted in two items being discarded. The 11 items remaining were then correlated with the entire pool of the

MMPI-2 items. There were two items in the MMPI-2 pool found to have a high point-biserial correlations with the preliminary 11 items of the AAS and were included in the item pool for the AAS. Lastly, the internal consistency of the resulting 13 items was analyzed and the scale was finalized.

The APS and AAS have proven to be promising instruments thus far. The utility and discriminative ability of the APS and AAS Scales have been found to be greater than the revised version of the MAC scale (MAC-R) in subject populations comprised of normal, psychiatric and substance dependent subjects (Weed et al., 1992). When the APS and AAS scales are used in conjunction, discrimination between normal and substance abuse subgroups is increased. However, the combination of the APS and AAS did not enhance discrimination between substance abuse and psychiatric samples (Weed et al., 1992). The authors stated that using the APS alone was sufficient to discriminate between substance abuse and psychiatric groups. Furthermore, the test-retest correlations for the APS and AAS are high, $r=.77$ and $r=.84$, respectively (Weed et al., 1992).

Four additional studies have been conducted looking at the APS, AAS or a combination of the two scales. First, Greene, Weed, Butcher, Arredondo, and Davis (1992) conducted a study similar to the one done by Weed et al. (1992). The authors (Greene et al., 1992) confirmed the findings that using either the APS or AAS was useful in discriminating between psychiatric and substance abuse subjects. They further stated that the new addiction scales were more effective in identifying substance abuse than previous substance abuse scales derived from the original MMPI.

Furthermore, the APS was the most effective in discriminative validity and more resistant to response distortion. The resistance to dissimulation is important because substance abuse inventories which have questions obviously related to chemical usage have been criticized (Otto et al., 1988). The second study (Aaronson, Dent and Kline, 1996) considered the MAC-R, APS and AAS as predictors of length of stay in a Veteran's Administration domiciliary and type of discharge. They found that all three scales had a negative correlation with length of stay. Furthermore, the AAS was found to correlate with type of discharge. The authors concluded that patients who admit to using drugs and alcohol are more likely to receive irregular discharges. Svanum, McGrew and Ehrmann (1994) considered the MMPI-2 substance abuse scales using college students. Their findings were less compelling, with only the AAS having moderate utility for predicting substance abuse. They concluded that the shift in subject pool from a clinical population to a university sample influenced the results. Lastly, Swarie et al. (1996) conducted an analysis of the internal structure of the APS. In their research, the authors elucidated the personality dimensions associated with the APS. They were able to identify five components hypothetically measured by the scale. These include satisfaction/dissatisfaction with self, powerlessness/lack of self-efficacy, antisocial acting-out, surgency, and risk-taking/recklessness.

Greene et al. (1992) encouraged future research with the new MMPI substance abuse scales to determine the usefulness of the APS and AAS in other populations. Several authors have cautioned that in populations with high base rates of substance abuse, the optimal cutting scores may need to be altered in order to improve

the scale's discriminative ability (Butcher et al., 1995; Greene et al., 1992; Meehl & Rosen, 1955). Therefore, determining optimal cutting scores would be helpful for using the APS and AAS in populations that exhibit high base rates of chemical dependency.

Meehl and Rosen (1955) wrote a classic paper on the importance of antecedent probability and efficiency of assessment devices. The authors stated that in order for a psychometric test to be efficient, the frequency of correct predictions using the assessment must exceed the number of correct decisions made solely on the basis of base rates. Therefore, the assessment device enhances the professional's ability to make correct decisions. Furthermore, the authors examined the relationship between changes in base rates of the characteristic of interest and the resultant changes in cutting scores. When a psychometric test is validated in one population and is then extended to a different population, the psychometric properties may change if the frequency of the behavior in question fluctuates between the groups. For example, the MMPI-2 substance abuse scales were initially established using a normative sample and cutoff scores were developed. If the same cutoff scores are used in a population with high base rates of substance abuse, the efficiency of the test is decreased and the number of false positive or false negative cases increases. Therefore, in order for the assessment device to be efficient in the population with high base rates of substance abuse, the cutting scores must be reestablished.

The current research study considered the psychometric properties of the MAC-R, APS and AAS with an inmate population. The incidence of substance abuse

in a correctional population remains higher than the general population. Therefore, in order for the MMPI-2 substance abuse scales to be efficient and accurate in identifying substance dependent inmates, cutoff scores for this population must be calculated. Furthermore, sensitivity to ethnic differences is crucial due to the high proportion of minorities who are currently incarcerated. The research questions and hypotheses of interest include the following. First, are the substance abuse scales capable of discriminating between chemically dependent and non-chemically dependent inmates? It is hypothesized that all three substance abuse scales will show significant discrimination between groups. Second, what is the optimal combination of subtests to predict group membership (chemically dependent or non-chemically dependent). Based on previous research (Greene et al., 1992), it is hypothesized that, at minimum, the AAS and APS will be effective in distinguishing between groups. Third, if the subtests are able to distinguish between the two groups, what are the cutoff scores for the MAC-R, APS and AAS in the overall sample of inmates? It is theorized that the cutoff scores for each scale may need to be lowered in order to demonstrate classification accuracy. Fourth, are there any ethnic differences in scores? No ethnic differences are expected when covariates, such as age or education, are considered. Lastly, what is the relationship between each subtest and severity of dependence or types of substances used? It is expected that individuals who have a greater severity of drug dependence will have higher scores on the substance abuse scales.

CHAPTER III

METHOD

Description of Site

The current study was conducted at the Federal Medical Center (FMC) in Rochester, Minnesota. Letters of approval from both FMC Rochester and Western Michigan University's Human Subjects Institutional Review Board are attached in Appendix A.

The FMC is a federal prison with a mission of providing medical, psychiatric and chemical dependency treatment to inmates. However, there is also a segment of the population that is referred to as Work Cadre. The Work Cadre inmates are considered General Population inmates and perform work duties that maintain the smooth operation of the facility. Therefore, they are representative of inmates without primary medical and/or psychiatric concerns.

Several modalities of chemical dependency treatment are provided at FMC-Rochester, including a nine-month residential program, non-residential drug treatment, dual diagnosis treatment, and basic chemical dependency education. Inmates who are identified as having a substance abuse problem and are eligible to participate in residential drug treatment are housed in the Residential Drug Abuse Program (RDAP), or DAP Unit. Other inmates who participate in drug treatment, but are not housed in the

DAP unit, participate in the Non-Residential Drug Abuse Program (NRDAP). For the purpose of the current study, only inmates participating in RDAP will be recruited. Because of the medical mission of the FMC, participants in NRDAP are typically housed at the institution due to primary medical or psychiatric concerns. Therefore, NRDAP participants will be eliminated in order to obtain a more homogenous sample of chemically dependent inmates without primary medical or psychiatric concerns.

The inmate's eligibility for RDAP is determined by FMC following a referral or request for participation in RDAP. The DAP Coordinator screens the inmates for substance abuse problems and determines a chemical dependency diagnosis using a standard Bureau of Prisons diagnostic interview. The final step in the referral process is to assign the inmate as "DRG" in SENTRY, which is the Bureau of Prisons' data-base for managing inmate information. After the re-designation of the inmate to DRG, he is placed on a waiting list (DAP WAIT). When an inmate is taken off the waiting list and enters the program, he is assigned to a cohort and Drug Treatment Specialist (DTS). Each cohort is a closed group that begins and ends on a specific date. The cohort remains together as a group throughout the nine-month program. The treatment approach is based on a manual of cognitive behavioral interventions developed by the Bureau of Prisons. The manual is based on orienting the inmate to the program, rational behavior therapy, criminal lifestyles, relapse prevention, wellness/health and transitioning back to the community drug-free. Interventions include psycho-education, group therapy and individual therapy.

Subject Recruitment

Participation in the study was voluntary. Recruitment of RDAP participants began with the student investigator attending each cohort for a few minutes at the beginning of an orientation session. The recruitment took place during the orientation phase of treatment because it comprises the first month of treatment. Therefore, all subjects were tested at a uniform time in the beginning of their participation in the RDAP program. The opportunity for the inmates to participate in the study was introduced by reading the Recruitment Protocol (Appendix B), the Debriefing Statement (Appendix C), and circulating a sign up sheet (Appendix D).

Recruitment of Work Cadre inmates began with identifying inmates who lack a substance abuse history and are not associated with either the RDAP or NRDAP Programs. These inmates were initially identified by the DAP Coordinator using the SENTRY database to verify general population housing and non-participation in drug treatment programs. The Student Investigator and a research assistant reviewed their Pre-Sentence Investigation (PSI) report. The PSI is a comprehensive investigation performed by a United States Parole Officer (USPO) after a person is charged with a federal crime. The USPO investigates the person's background by interviewing the defendant, family members, friends, and reviewing the individual's criminal history. The PSI provides information about the individual's involvement in the current offense, criminal history, family history, mental health treatment, substance abuse history, educational and vocational history. For the purpose of the current study, the

section regarding chemical use in the PSI was reviewed. Those who had a positive history of substance abuse were eliminated from the list of potential subjects. Individuals with no history of substance abuse reported in their PSI were identified as potential subjects.

Sample Characteristics

A total of 80 subjects was assessed, which slightly exceeds the minimal sample size of 20 subjects per variable suggested for a discriminant analysis (SPSS Base 7.5 Applications Guide, 1997). Table 1 represents the ethnic characteristics of the overall sample and the two sub groups of drug dependent and non-drug dependent subjects. It is important to note that data are missing from one subject or 1.4 percent of the total sample. Therefore, Table 1 summarizes 98.6 percent of the population.

Assessment Instruments

Each subject was given the full administration of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2). The MMPI-2 is a 567 item true and false questionnaire which has 3 validity scales, 13 clinical scales and approximately 450 supplementary scales (Graham, 1990). The scales of primary interest in the current study are three validity scales (F, Fb & VRIN), and three substance abuse scales, MacAndrews-Revised (MAC-R), Addiction Potential Scale (APS) and Addiction Acknowledgement Scale(AAS).

Table 1

Ethnic Description of Subjects

	African American	Hispanic	Native American	Multiracial	White	Other
Total Group Percentage (Frequency)	28.8% (21)	12.3% (9)	12.3% (9)	4.1% (3)	39.7% (29)	1.4% (1)
Non-Drug Dependent (Frequency)	21.1% (4)	31.6% (6)	5.3% (1)	0.0% (0)	42.1% (8)	0.0% (0)
Drug Dependent (Frequency)	31.5% (17)	5.6% (3)	14.8% (8)	5.6% (3)	38.9% (21)	1.9% (1)

Procedure

Inmates in the DAP Unit who indicated their desire to participate and the potential subjects identified from the DAP Waiting List and Work Cadre Unit were placed on call out. "Call-out" is the Bureau of Prisons required method of maintaining accountability for inmates at all times. Call-outs are generated via computer system and indicate the location the inmate can be found at a specific time. The location of the call-out indicated the room in which test administration was scheduled. Each different group, DAP Unit, Work Cadre and DAP Waiting List were kept in their respective groups during testing. At this time, inmates in the Work Cadre Unit and those on the DAP Waiting List listened to the Recruitment Protocol (Appendix B) and

Debriefing Statement (Appendix C). Inmates who were interested in participating remained in the group and those who chose not to participate were allowed to leave the testing session.

Each testing session was comprised of the following stages: consent for participation, demographic information, recording of subject numbers, and test administration. Each session took place in a group format beginning with each inmate receiving a testing packet that includes Assent and Consent Forms (Appendix E), Demographic Questionnaire (Appendix F), MMPI-2 Test Booklet, and MMPI-2 answer sheet. All testing materials, except the MMPI-2 Test Booklet, were coded with subject numbers prior to being given to the inmate.

Morning and afternoon phases of testing took place to avoid conflict with the inmate's treatment groups and dining schedule. The morning session was held from 7:30 am to 10:15 am, and the afternoon session was held from 12:30 pm to 3:30 pm. The total length of time each subject was involved with the study ranged from one to three hours, depending upon the length of time necessary to complete the MMPI-2.

The session began with the student investigator reading the assent and informed consent (Appendix E). Each inmate's signed forms were collected independently from the data and were not associated with an individual subject's testing packet. Inmates were advised that they would receive a copy of the informed consent upon completion of testing and submission of testing materials. In the consent form, the voluntary nature of the study was highlighted and the examiner reminded the subjects that there would be no consequences to him if he chose not to participate in the

study. Furthermore, if an inmate requested to terminate participation once the study was underway, there were no consequences.

The Demographic Questionnaire (Appendix F) was completed next. While the subjects from the DAP Program and DAP Waiting List were completing the Demographic Questionnaire, the Student Investigator recorded subject numbers on the Master List (Appendix G). When subjects completed the Demographic Questionnaire, and it was collected by the student investigator, instructions for completing the MMPI-2 were read to the group (Appendix H) and subjects began testing. Upon completion of testing, the subject turned in the MMPI-2 Test Booklet and score sheet. When all testing materials were collected from the subject, the inmate was allowed to leave the testing session.

Confidentiality of Data

The Student Investigator maintained the master list of Work Cadre, DAP and DAP Waiting List subjects (Appendix G) until collection of data was complete. It was locked in a file cabinet located in her office on the Mental Health Unit. The master list was used by the Student Investigator in order to obtain diagnostic codes from the inmate's treatment or central file. When the data were collected, the master list was destroyed. The Demographic Questionnaires and MMPI-2 answer sheets will be maintained for three years after the Student Investigator has completed dissertation defense. The information will remain stored in the WMU's Psychology Department research files under Dr. Lester Wright's name. After this three year period, the data

will be destroyed. Furthermore, the data will not be used in other studies beyond the current dissertation project.

Scoring

The Student Investigator and research assistants scored the response sheets. All research assistants were Master's level professionals who were employed by the Bureau of Prisons; however, scoring took place during non-work hours. The manual scoring templates for three validity scales: (1) Variable Response Inconsistency Scale (VRIN), (2) Infrequency Scale (F), and (3) Backside F (Fb), and three substance abuse scales: (1) MAC-R, (2) APS, and (3) AAS, were utilized in lieu of computer scoring. Thirty percent of subjects were randomly selected following data collection for inter-scorer reliability. Then, the three validity scales and three substance abuse scales were re-scored by a person other than the person who originally scored the data in order to determine consistency between scorers.

Each profile was examined for validity and inclusion in the analysis. The criteria for determining validity of tests were based on the number of omitted questions and accuracy as suggested by Butcher et al. (1995). Profiles with more than 30 items left unanswered or with both true and false responses were considered invalid. To maintain subject response accuracy, the following exclusion criteria were used: (a) raw scores on the F Scale no greater than 25, (b) raw scores on Fb Scale no greater than 25, and (c) VRIN T scores no greater than 80. Profiles considered invalid were

retained to determine if the demographic backgrounds differed between valid and invalid profiles.

CHAPTER IV

ANALYSIS

Demographic Characteristics

The Demographic Questionnaire and diagnostic information were analyzed as follows. Means were calculated for age, education, months incarcerated, length of sentence, previous convictions, and number of previous substance abuse treatment episodes. Percentages were computed for ethnicity and diagnosis. T-tests or chi-squares were computed on the aforementioned demographic and diagnostic variables to determine if there was a significant difference between valid and invalid profiles and between diagnostic groups. Interscorer reliability was determined by dividing the number of matching observations by the total number of observations selected for reliability. The resulting figure represented the percentage of correct observations.

Discriminative Accuracy

In order to determine if the MMPI-2 substance abuse scales accurately predicted group membership, a discriminant function analysis was computed. The aforementioned analysis was based on both multivariate analysis of variance and multiple regression (SPSS Base 7.5 Applications Guide, 1997). The procedure resulted in a linear combination of variables, or discriminant function, which resembles

a regression equation due to the multiplication of variables by coefficients. The coefficients that were estimated result in a function that makes it possible to classify additional cases. As with regression equations, the discriminant function analysis resulted in combined information from two or more variables that maximizes the difference between groups.

There are two main underlying assumptions that must be met in order to rely on the results of the analysis. First, there must be an adequate number of subjects per variable. Second, the group covariances must be approximately equal, which was tested using Box's multivariate *M* statistic (SPSS Base 7.5 Applications Guide, 1997). Any evidence of unequal covariance would require the use of a quadratic discriminant analysis rather than a linear one.

There were several steps to completing a decisive and reliable discriminant function analysis, after meeting the aforementioned assumptions. First, it was necessary to determine the degree of separation between the means of the two groups (SPSS Base 7.5 Applications Guide, 1997). The Wilks' lambda was used for the current analysis and resulted in a multivariate analysis of variance. The resulting statistic indicated the degree of total variance that was not explained by group differences. The null hypothesis stated that the means of all the variables across groups were equal. However, there was no consideration for the correct classification of subjects.

Second, a stepwise discriminant analysis was conducted using the three substance abuse scales. In order to determine the optimal combination of subtests (X_1: AAS; X_2: APS; X_3: MAC-R) in predicting group membership (Y: group) for the

current sample, a stepwise regression analyses was calculated. The statistical procedure elucidated the scales that were most useful in predicting group membership. The actual calculations were computed in the context of the discriminant function analysis with SPSS computer software. However, in order to clearly understand the purpose of the analysis, a brief explanation of the procedure follows. The theory behind stepwise discriminant analysis is based on adding one variable (X_1: AAS; X_2: APS; X_3: MAC-R) to a discriminant equation at a time and eliminating those variables that are no longer useful in the equation. Step one consists of using the subtest with the highest discriminant power, for example X_1(AAS), to determine an equation equation. Successive steps look at remaining variables and which scales best improve the discrimination between groups. Before adding X_2 (APS) to the equation, variables previously added to the equation (X_1: AAS) will be examined to determine if their contribution remains significant. If the X_1 (AAS) is no longer useful, it will be removed before adding X_3 (MAC-R). The process continues using X_3 (MAC-R) as the last predictor. The results provide the equation utilizing variables most efficient in predicting a chemical dependency diagnosis.

The third step in the discriminant function analysis was two-fold. First, the canonical discriminant function coefficients were calculated and entered into the linear equation. The procedure yielded a canonical variable score for each case. Based on the results of each case, casewise statistics were computed predicting the group membership for each score based on the linear equation. The predicted group membership for each subject resulted in overall classification results, which indicated the degree of

success of the classification for the sample.

The final step in the discriminant analysis was cross-validation of the original results. The purpose of cross-validation was to reduce the optimistic bias in the original sample. A cross-validation procedure can be done in two ways. First, data from a new sample of subjects can be collected and the statistical procedure can be repeated. However, repeating the original study may be difficult in some cases. Therefore, the second option is based on using the original sample to cross-validate the classification results. The cross-validation procedure is repeated for each subject by computing classification functions on the entire sample except one case. The last case is then classified using the classification functions derived from the rest of the sample. The resulting statistic is the estimate of misclassification and the correct classification percentage. In classification and cross-validation, the characteristic percentages are 86 and 80 respectively.

Significant results from the discriminant analysis provided the basis for examining the cutoff scores for each of the substance abuse scales included in the regression equation. This final step in discriminative accuracy was needed because the high rate of substance use disorders in the incarcerated population negatively impacts the applicability of previously established cutoff scores. Therefore, it was necessary to determine the discriminative accuracy and establish new cutoff scores for the inmate population for each substance abuse scale used in the linear equation.

The discriminative accuracy was based on determining the following five measures for various scores: overall accuracy (OA), sensitivity (Sen), specificity

(Spe), positive predictive power (PPP) and negative predictive power (NPP) (Grisphover & Dacey, 1994). These measures were computed using the information provided in Appendices I and J for each score.

To increase clarity of the statistical procedures utilized in the current study, it was necessary to define and describe the computations necessary for determining the aforementioned discriminative accuracy measures. Overall accuracy refers to the proportion of correct predictions for both substance dependent and non-substance dependent groups at a given cut-off score. More simply, it is the number of cases correctly identified when a specific cut off score is used. The computation for overall accuracy was based on adding the true positives and true negatives at a given cutting score and dividing by the total number of subjects. Sensitivity refers to the proportion of subjects, at a given cut off score, accurately classified as being chemically dependent. It was determined by dividing the true positives by the summation of true positives and false negatives. Specificity is based on the proportion of those without the substance dependence and accurately classified. It was computed by dividing the number of true negatives by the summation of false positives and true negatives. Positive predictive power is the proportion of those accurately classified as being chemically dependent by the test and who actually have a positive diagnosis. It was determined by dividing the number of true positives by the summation of true positives and false positives. Negative predictive power refers to the proportion of individuals accurately classified as not being substance dependent and who actually do not meet criteria for diagnosis. It was computed by dividing the number of true negatives by the summation of false

negatives and true negatives. Tables that represent these computations are provided in Appendices I and J.

The final step in determining the accuracy of the test in discriminating between diagnostic groups involved completing Appendix I using each score interval. Appendix I was then used for computations in Appendix J. Upon completion of the equations in Appendix J, the five measures of discriminative accuracy, OA, Sen, Spe, PPP and NPP, were summarized for each substance abuse scale at a specific cutoff score.

Analysis of Variance

To examine the differences in means between ethnic groups on test scores, a multiple analysis of variance was computed. The independent variable was the inmate's ethnic group and the dependent variables included each subject's subtest scores. Significant results were further elucidated using the Tukey Highest Significant Difference (HSD). Any significant differences between groups would indicate the need for an analysis of covariance to remove variability from the analysis.

Correlation and Regression Analyses

The relationship between scores on the substance abuse scales and type of drug used was determined using a multiple correlation matrix. The analysis delineated possible relationships between the variables. In order to decrease the probability of Type I error in the family of tests, the Bonferroni procedure was employed. The critical value of r_I was determined by taking the square root of $F_B/N-2+ F_B$. F_B is a

critical value based on an alpha level, number of correlations and number of subjects. A regression equation was also calculated to determine if the substance abuse scales were able to predict the severity of drug problems and diagnosis.

CHAPTER V

RESULTS

A total of 80 subjects were administered the MMPI from which 73 valid protocols were obtained. The seven invalid protocols were comprised of three individuals who began taking the MMPI-2 and refused to finish and four individuals whose validity scales did not meet the inclusion criteria. Chi square analysis between valid and invalid protocols yielded significant results only for marital status ($\chi^2 = 6.175$, df = 2, $p = .05$). The differences between other demographic variables were non-significant. More specifically, t-tests and chi square analyses indicated there were no significant differences between valid and invalid profiles for the following demographic variables: age ($t = 1.01$, $p = .316$); education ($t = -.73$, $p = .470$); months incarcerated ($t = -.22$, $p = .827$); sentence length ($t = -.20$, $p = .844$); previous convictions ($t = -1.65$, $p = .104$); and ethnicity ($\chi^2 = .5385$, df = 2, $p = .7640$). Interscorer reliability was estimated at 96 percent. It should be noted that data are missing from one subject. The inmate completed the MMPI-2; however, he failed to complete the demographic information form.

Demographic Characteristics

The demographic characteristics for the overall group, drug dependent and

non-drug dependent are summarized in Appendix K along with values associated with results of the t-tests. Graphical representations of the data are displayed in Appendix L. T-tests were used to determine if there were any significant differences between the characteristics of the two groups of inmates based on age, education, months incarcerated, sentence length, and previous convictions. No significant differences for age, education, months incarcerated, sentence length, and previous convictions were found. Chi-square analyses were completed to examine differences in ethnicity and marital status. Due to low subject numbers in some cells, data were collapsed into the following groups: African American, Other Minority (including Native American, Hispanic, Multiracial and Other) and White. There were no significant differences found between groups ($\chi^2 = 1.4247$, $df = 2$, $p = .4905$). Data regarding marital status were also collapsed due to low subject numbers in certain cells. The resulting groups were Single, Married, and Other (including divorced, separated and widowed). No significant differences were found between differing marital status groups ($\chi^2 = 4.4658$, $df = 2$, $p = .1072$.

Additional descriptive information regarding the drug dependent group includes previous treatment episodes, severity of drug use and type of drug(s) used. The drug dependent group had a mean of 1.18 previous treatment episodes with a range of zero to seven previous treatments. Data on severity of drug use indicated that the majority of inmates, or 65 percent, had received between 2 and 3 substance dependence diagnoses. Of the remaining inmates, 20 percent received one dependence diagnosis or one dependence diagnosis and one abuse diagnosis. Fifteen

percent had received more than three substance dependence diagnoses, some with additional substance abuse diagnoses.

Discriminative Accuracy

In order to conduct the discriminant function analysis, there were two assumptions that needed to be met. First, a ratio of 20 subjects to each variable needs to be present in order to have sufficient numbers to draw conclusions from the discriminant analysis. In the current study, there was a ratio of 24 to 1, which was above the required ratio. Second, the assumption of equality of group covariance matrices was tested using Box's M statistic. The null hypothesis stated that group covariances are equal, and if the results are not significant, the null hypothesis is not rejected. Furthermore, with a non-rejection of the null hypothesis, the discriminant function analysis can be computed with assurance that the underlying assumptions have not been violated. In the current study, the null hypothesis was not rejected based on the results in Table 2. Therefore, the assumption of approximately equal group covariance matrices was met in the current study and there is no evidence of a need for a more complex procedure.

Table 2

Test of Equality of Group Covariance Matrices Using Box's M

Box's M	Approximate F	Degrees of freedom	Significance
.100	.032	3, 18965.13	.992

In order to determine if the substance abuse scales were able to distinguish between the two groups of inmates, several steps involved in the discriminant function analysis were computed. First, Wilks' Lambda indicated there was a significant difference between the means of the two groups, $\Lambda = 594$, $\chi^2 = 36.417$, $df = 2$, $p = .000$. Second, the stepwise regression analysis indicated that combining information from the AAS and APS was the most efficient approach to predicting group membership. Third, the MAC-R did not provide additional significant information that assisted in discriminating between the drug dependent and non-drug dependent. Appendix M shows the procedure and results of the regression analysis.

The Fisher's linear discriminant function defines the linear function that distinguishes between groups. It can be determined by the following equation: $z = -.742$ (AAS) - 0.231(APS) + 7.269. The estimate of the classification function coeffi-cient for subjects in both groups is as follows: Non-Drug Dependent Discriminant Score = .211(AAS) + 1.255(APS) + 13.706 and Drug-Dependent Discriminant Score = .953(AAS) + 1.486(APS) + 20.975. These discriminant scores for each subject are represented in the graphs in Appendix N. Furthermore, these scores are used to determine casewise and cross-validation statistics that are summarized in Appendix O. Table 3 summarizes the overall classification results based on both casewise and cross-validation statistics.

In the current study, the original grouping of cases resulted in 86.3 percent correct classification and the cross-validation procedure yielded 84.9 percent correct classification. These classification rates are higher than the typical 86 and 80 percent

Table 3

Classification Results

			Predicted Group Membership		
		Group	0	1	Total
Original	Count	0	12	7	19
		1	3	51	54
	Percentage	0	63.2	36.8	100
		1	5.6	94.4	100
Cross-Validated	Count	0	12	7	19
		1	4	50	54
	Percentage	0	63.2	36.8	100
		1	7.4	92.6	100

suggested in the statistical literature (SPSS Base 7.5 Applications Guide, 1997).

Further analyses of the substance abuse scales were completed to determine discriminative accuracy. Each substance abuse scale was examined for overall accuracy (OA), true positive (TP), false positives (FP), true negative (TN), false negatives (FN), sensitivity (Sen), specificity (Spe), positive predictive power (PPP) and negative predictive power (NPP). The summary of calculations can be found in Appendices P and Q for the AAS and APS, respectively. Results of the MAC-R were also summarized in Appendix R, despite their non-inclusion in the analysis. The primary interest in the current study was determining the optimal cutting score (OCS) for each substance abuse scale. The OCS is determined by comparing the OA for each score, which indicates the greatest proportion of the total sample that is accurately classified. In the current sample, the optimal cutoff scores for each substance abuse scale were lower than reported in the standardization sample (Graham, 1990). A

summary of the cutoff scores for each test is presented in Appendix S.

Analysis of Variance and Covariance

The results of the multivariate ANOVA are summarized in Table 4, while univariate ANOVA results are summarized in Table 5. Overall, there is a significant difference for ethnicity on the APS scale ($F = 3.55$, $df = 2, 70$, $p = .034$). Pairwise comparisons using Tukey's HSD indicated a significant mean difference on the APS between white and the collapsed group of Other Minority subjects (Native American, Hispanic, Multiracial, and Other). More specifically, the observed mean difference [$t'(6, 70) = 3.39$] exceeded the critical value of $t'_{.05}(6, 70) = 2.99$. However, by considering age and education as covariates the ethnic differences were eliminated. The results of the ANCOVA on the APS are summarized in Table 6. There was no significant mean differences between African American ($x = 22.90$) and Other Minority ($x = 20.86$). Furthermore, there was no significant differences between African American ($x = 22.90$) and White subjects ($x = 24.00$). Summarization of the means and standard deviations for each substance abuse scale by ethnic groups is presented in Appendix T.

Table 4

Multivariate Analysis of Variance Results

Test Name	Value	Approx. F	DF	Sig of F
Pillais	.18685	2.37027	6, 138	.033
Hotellings	.21024	2.34772	6, 134	.035
Wilks Lambda	.82034	2.35933	6, 136	.034

Table 5

Univariate Analysis of Variance Results (DF= 2, 70)

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. Of F
AAS	21.48	388.08	10.74	5.54	1.94	.152
APS	126.95	1252.42	63.48	17.89	3.55	.034
MAC-R	27.12	1235.51	13.56	17.65	.77	.468

Table 6

Analysis of Covariance Results for the APS

Source	Sum Of Squares	DF	Mean Square	F	Sig. of F
Covariates:	70.035	2	35.017	2.014	.141
Age	29.750	1	29.750	1.711	.195
Education	46.333	1	46.333	2.665	.107
Main Effects:	72.149	2	36.074	2.075	.133
Ethnic	72.149	2	36.074	2.075	.133
Explained	196.986	4	49.247	2.832	.031
Residual	1182.383	68	17.388		
Total	1379.370	72	19.158		

Correlation and Regression Analyses

Spearman correlation and regression analyses yielded no significant results in the current study. When the substance abuse scales were used to predict severity of drug use and diagnosis, no variables were entered into the equation. Furthermore,

correlations between substance abuse scales, severity of drug use and diagnosis were also non-significant. Table 7 displays the correlation coefficients and corresponding p value for each relationship.

Table 7

Correlation Matrix for MMPI-2 Substance Abuse Scales and Severity of Drug Use and Diagnosis (N= 51)

Variable	AAS	APS	MAC-R
Severity of Drug Use	-.2353 p = .096	.1458 p = .307	.1799 p = .206
Abuse Diagnoses	-.1941 p = .172	-.1430 p = .317	-.0088 p = .951
Dependence Diagnoses	-.2212 p = .119	.2451 p = .083	.1838 p = .197

CHAPTER VI

DISCUSSION

The current study examined the discriminative ability of, and ethnic differences on, the MMPI-2 substance abuse scales in an inmate population. The results provided several implications for using these abuse scales with inmates. The implications include using certain substance abuse scales with greater discriminative ability, using new cutoff scores, and considering the impact of ethnic minority status in the assessment process.

In an overall interpretation, it was found that the MMPI-2 substance abuse scales are an effective tool in the identification of substance abuse in a volunteer inmate sample. The discriminant analysis initially provided statistical information that indicated that the AAS and APS were the most efficient and effective scales to distinguish between chemically dependent and non-chemically dependent inmates. The AAS was found to have a somewhat greater discriminative power than the APS. However, using both scales increased the discrimination between substance dependent and non-substance dependent inmates. Incorporating the MAC-R provided no advantage over using the APS and AAS in the current sample. These findings conformed to the majority of observations in previous literature using the AAS, APS and MAC-R to identify substance dependent individuals (Weed et al., 1992; Greene et al., 1992). The

aforementioned studies also found the AAS and APS to be the most effective scales to distinguish between psychiatric patients and drug abusers, with the MAC-R providing no additional discriminative ability. The current findings, based on an inmate population, were more compelling than those found using a college sample (Svanum et al., 1994). In the prison setting, these results have important implications. First, if forensic psychologists continue to rely on the MAC-R to help elucidate the presence of chemical dependency, their findings are less reliable. By shifting focus to the new substance abuse scales, more accurate case formulations will result. Therefore, the forensic psychologist's credibility in the courtroom is enhanced. Furthermore, using the AAS and APS with inmates can also provide additional support for clinical observations or hypotheses regarding the inmate's substance use.

The classification results and cross-validation provide very useful clinical information. More specifically, original classification results indicated that by using the AAS and APS there is an 86.3 percent accuracy rate. Therefore, a clinician using these scales will make accurate decisions regarding chemical dependency in 86.3 percent of cases. Furthermore, the cross-validation results indicated the AAS and APS maintained their effectiveness with identification of substance dependent inmates other than those who formed the criterion group. The classificatory accuracy for the cross-validation procedure was 84.9 percent, which is 4.9 percent higher than the typical cross-validation results (SPSS Base 7.5 Applications Guide, 1997). Therefore, the optimistic bias that can occur without cross-validation was diminished, providing a more accurate estimate of the classificatory accuracy of the AAS and APS at 84.9

percent.

The ability of the MMPI-2 substance abuse scales to discriminate between the chemically dependent and non-chemically dependent indicated the need to examine the cutoff scores for each substance abuse scale. As indicated by several authors (Butcher et al., 1995; Greene et al., 1992; Meehl & Rosen, 1955), in settings that have high base rates of substance abuse, cutoff scores may need to be lowered in order to increase accurate detection. In the current sample, new cutoff scores were established for each substance abuse scale. Furthermore, each scale required lower cutoff scores to reach the optimal level of overall accuracy. First, the AAS has a cutoff score of 6 that indicates a T-score of 65 for the original MMPI-2 norms. However, in the current sample, the overall classification accuracy was determined to be a score of three. When a cutoff score is lowered to three in the current sample, 86.5 percent of cases were accurately classified. If a score of 6 were used in the current sample, only 68.9 percent of subjects would have been accurately identified. Therefore, using the newly established cutoff scores increased the discriminative accuracy by 17.6 percent. Second, the original MMPI-2 norms for the APS indicated a cutoff score of 29 to reach a T-score of 65. In the current study, when the original cutoff score is used, classification accuracy is only 33.8 percent. However, using the cutoff score of 17 derived in the current study increased the classification accuracy by 45.9 percent. When the new cutoff score is used, 79.7 percent of cases are accurately classified. The original research indicated that the MAC-R requires a cutoff score of 28 to reach a T-score of 65. Using this score with the current sample would produce only 51.4

percent overall accuracy. Lowering the cutoff score to 21 resulted in an overall classification accuracy of 77 percent. Therefore, lowering the cutoff scores of each substance abuse scale substantially increased the classification accuracy of each substance abuse scale. However, the impact of using the MAC-R or original cutoff scores can be detrimental in a forensic setting. For example, relying on the MAC-R is inefficient and ineffective, and inmates may be misclassified when using the old cutoff scores. As a result, there may be a significant percentage of cases that were not identified as chemically dependent when, in fact, they were.

The ethnic differences observed for subtest scores provided information that is useful for several reasons. First, previous literature has been concerned primarily with the original version of the MMPI and MAC scale. Second, research on ethnic differences on the MAC-R are limited, and the differences on the AAS and APS have not been explored until the current study. The results indicated there was no significant difference between ethnic groups on the AAS and MAC-R. However, there appeared to be a significant ethnic difference on the APS. The difference was found between white inmates and minorities other than African American. By including covariates of age and education, as suggested by Greene, Gwin and Staal (1997), the significant difference between ethnic groups was eliminated. Therefore, the conclusion can be drawn that the APS may be more sensitive in the inmate population to the influence of sociodemographic influences that are related to ethnicity.

One hypothesis statedthat the severity of drug use would be positively correlated with substance abuse scale scores. More specifically, it was believed that as the

score on the subtest increased, the number of diagnoses would also increase. However, the findings indicated no significant relationship between severity of drug use and subtest scale score. Therefore, the substance abuse scales of the MMPI-2 appeared to be adequate for detecting the general phenomenon of chemical dependency regardless of the severity. A curious observation was the negative correlation between the AAS score and the severity of drug use found in Table 6. Although the correlation was not statistically significant, the statistic indicates that there is a negative relationship between the AAS score and number of diagnoses an individual received. Perhaps this observation can be explained by the fact that some of the questions on the AAS are directly related to one specific drug. For example, there are four questions based solely on alcohol, and one based solely on marijuana. Therefore, the negative correlation between number of diagnoses and AAS score may be spuriously high due to the item content of the AAS scale and the ranking of diagnoses. Further investigation of the relationship between severity of drug dependence and AAS score is necessary to give a definitive answer.

The limitations of the current findings are based on several different aspects of the design or analysis. First, there is a self-selection factor at work due to the voluntary nature of the study. Prospective research with prisoners is done primarily on a voluntary basis in order to preserve the prisoner's rights. Therefore, any additional studies based on an inmate population may also encounter the current difficulty. Second, subjects were selected only from one Bureau of Prison's facility. Cross-validation of the current results with inmates from a variety of facilities may prove

useful for generalizability. Lastly, the method for determining severity of drug use was based on information available to the researcher. Although diagnoses were standardized, they may not be the most effective way to describe the severity of an individuals drug abuse. As a result, the ability of the test scores to predict severity of drug use through regression may have been reduced.

Recommendations for future research would include broadening the sample to include inmates from additional facilities and female inmates. Including additional correctional settings, such as penitentiaries or community correction settings, as well as female inmates, would provide useful information on the generalizability of the findings. Furthermore, inclusion of individuals who suffer from mental illness is important. Psychologists working in a forensic assessment setting could benefit from determining how well the AAS, APS and MAC-R discriminate between chemically dependent and mentally ill inmates. A challenge for future research would be to determine the ability of the MMPI-2 substance abuse scales to discriminate between mild to moderate substance abusing inmates from non-substance abusing inmates. Determining critical items that distinguish chemically dependent and non-chemically dependent inmates could also provide useful information to clinicians in a correctional setting. Finally, further examination of the sociodemographic variables that relate to ethnicity and its influence on subscale scores is crucial for using the substance abuse scales with minority inmates. The possibility may exist that different ethnic groups require different cutoff scores, or perhaps a correction factor based on cultural factors that influence test scores. If ethnic differences are not taken into consideration when making

important clinical decisions, inaccurate conclusions may be drawn. In turn, these conclusions may have a significant and negative impact on the individual assessed.

In conclusion, the current study highlights the utility of the MMPI-2 substance abuse scales with a volunteer inmate sample. The discriminative power of the AAS and APS may assist psychologists in forensic assessment and treatment settings. Furthermore, the current study provides a sound basis for conducting future research based on an inmate population.

Appendix A

Letters of Approval From Western Michigan University, Federal Medical Center, and the Central Regional Office

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899

WESTERN MICHIGAN UNIVERSITY

Date: 4 August 1998

To: Lester Wright, Principal Investigator
Barbara Johnston, Student Investigator

Cc: Malcolm Robertson

From: Richard Wright, Chair (Cecile Peterson for Richard Wright)

Re: HSIRB Project Number 98-05-09

This letter will serve as confirmation that your research project entitled "Determining Cutoff Scores on the Minnesota Multiphasic Personality Inventory (2nd Edition) Substance Abuse Scales for an Inmate Population" has been **approved** under the **full** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: 4 August 1999

U.S. Department of Justice

Federal Bureau of Prisons

FMC Rochester, MN 55903-4600
July 14th, 1998

MEMORANDUM FOR G.L. Hershberger
Regional Director North Central Regional Office

FROM: Phillip S. Wise
Warden

SUBJECT: Research Proposal

The Research Committee of FMC, Rochester, has met and reviewed the research proposal from Barbara Johnston, Psychology Intern. The proposal is titled "Determining cutoff scores for the Minnesota Multiphasic Personality Inventory-2 Substance Abuse Scales for an inmate population." The Research Committee recommends full approval of this project and that it be considered for an expedited review.

U.S. Department of Justice

Federal Bureau of Prisons

Washington, DC 20534
September 4, 1998

MEMORANDUM FOR G.L. HERSHBERGER, REGIONAL DIRECTOR
NORTH CENTRAL REGION

FROM: Thomas R. Kane, Assistant Director
Information, Policy, and Public Affairs Division

SUBJECT: Research Proposal of Barbara Johnston

This is in response to a request by Barbara Johnston, Psychology Intern, FMC Rochester, to conduct a study entitled, "Determining Cutoff Scores on the Minnesota Multiphasic Personality Inventory (2nd Edition) Substance Abuse Scales for an Inmate Population."

We concur with your recommendation for approval, and Ms. Johnston is authorized to proceed with her study, subject to the capability of the institution to accommodate her.

Any questions that arise may be directed to Gerry Gaes, Chief, Office of Research and Evaluation, at (202) 307-3871, ext. 115.

cc: Warden, FMC Rochester
Chair, Local Research Review Board, FMC Rochester
Barbara Johnston, Psychology Intern, FMC Rochester

Appendix B

Recruitment Protocol

Recruitment Protocol

As part of my Doctoral Work, I am conducting a study based on the inmate population. I am here today to request your assistance in this project. This is a project only you can help me with. It is based on determining how inmates respond to a personality questionnaire and how we, as psychologists can improve our services to inmates. The study will consist of each person completing the MMPI-2. It will take between one and three hours to complete. Your participation is voluntary. Furthermore, you will not receive a penalty for not participating and the DAP program will not receive your individual results because the testing will be done anonymously. If you would like to participate, please write your name and inmate number on the sign up sheet in order to be placed on call-out. Furthermore, if you are in need of test materials in Spanish or on audio-tape please put a check mark behind your name

Appendix C

Debriefing Statement

Debriefing Statement

The study you participated in was based on the substance abuse scales from the MMPI-2. I was primarily interested in seeing if the test was doing its job, identifying people who are chemically dependent. Substance abusers who are in treatment centers on the outside are the only individuals that have been used for this type of study. The substance abuse scales haven't been tested using an inmate population. Therefore, it was important to find out if the test is valid or working for inmates.

Appendix D

Sign Up Sheet

Sign Up Sheet

	Name	Number	Translation/ Audio
1.			
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3.			
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Appendix E

English and Spanish Assent and Consent Forms

Assent Form

I, _____ understand the study entitled, Determining cutoff scores on the Minnesota Multiphasic Personality Inventory (2nd Edition) substance abuse scales for an inmate population as explained on page one and I consent to participate in the study. My participation is completely voluntary.

I consent to the following procedures (initial what you agree to – cross out what you do not agree to):

1. I authorize the staff at FMC Rochester to release the information specified below to the researchers only for the purpose of this study and only until the completion of this project. I understand that I may revoke this consent in writing before the information is disclosed.

   _____Central File Initials _____

   _____ Other (Specify) _____

2. I consent to complete written tests/questionnaires/surveys and or to participate in an interview, and/or to

   _____
   _____. Initials _____

I understand that all research information (with the exceptions mentioned above) will be handled in the strictest confidence and that my participation will not be individually identifiable in any reports. I understand that participation or non-participation in this research project will not affect my release date or parole eligibility. I further understand that there is no penalty or prejudice of any kind for withdrawing from or not participating in the study.

_____ _____ _____
(Signature) (Date) (Register No.) (Unit)

Barbara A. Johnston, MA _____ _____
Witness' Typed Name and Signature) (Date)

cc: Research Project File, Privacy File (Only where the researcher is authorized access to the inmate's Central or Medical File), Subject (Upon Subject's request)

Forma de Assento

Yo, _____ entiendo el estudio titulado "Determinando los cortes de la escala del abuso de sustancia segun el Inventario Multifasico de la Personalidad-2-Minnesota sobre la poblacion reclusa" como explicado en la pagina uno y doy consentimiento a participar en este estudio. Mi participation es completamente voluntario.

Yo doy consentimiento a los siguientes prodedimientos (inicial donde estas de acuerdo – y-techase lo que no esta de acuerdo):

1. Yo doy autorizacion al personal de FMC Rochester para divulgar la informacion indicaco abajo a los investigadores simplemente para el motivo de este estudio y solamente hasta la terminacion de este proyecto. Yo entiendo que puedo revocar este formulario de consentimiento por escrito antes de divulgar la informacion.

   _____Fichero Central Iniciales _____
   _____Otros (Especificar) _____

2. Yo doy consentimiento a rellenar los ejercicios escritos/cuestionarios/informes y o participar en una entrevista y o

   _____
   _____Iniciales _____

Yo entiendo que toda la informacion de la investigacion (con los excepciones mencionados arriba) que estaran manejado en la mas absoluta confianza y que la participacion mia no sera identificable en ninguno de los reportes. Yo entiendo que ni participacion o no participacion en este proyecto de investigacion no influye me fecha de ecarcelacion o la elegibilidad de la libertad condicional. Ademas entiendo que no hay ningun penalte o perjucio de caulquier forma por retirarse de o no participar en el estudio.

_____ _____ _____ _____
(Firma) (Fecha) (Numero de Registro) (Unidad)

Barbara A. Johnston, MA_____ _____
(Nombre del testigo escrito a maquina y firma) (Fecha)

cc: Fichero del Proyecto de Investigacion, Fichero de Confianza (Solo cuando la investigadora esta autorizada a tener acceso a los ficheros central o medico de el preso), Participante(Si el participante haga una solicitacion)

WESTERN MICHIGAN UNIVERSITY
H. S. I. R. B.
Approved for use for one year from this date:

AUG 04 1998

HSIRB Chair

Consent Form

Western Michigan University
Department of Psychology

Principle Investigator: Dr. Lester Wright

Student Investigator: Barbara A. Johnston, M.A.

I have been invited to participate in a research project entitled "Determining cutoff scores on the Minnesota Multiphasic Personality Inventory (2nd Edition) substance abuse scales for an inmate population." I understand that this research is intended to determine how inmates respond to a personality questionnaire and how psychologists can improve our services to inmates from a variety of ethnic backgrounds. I further understand that this project is Barbara A. Johnston's dissertation project.

My consent to participate in this project indicates that I will be asked to attend one testing session which will last between one and three hours conducted by Ms. Johnston. I will be asked to meet for these sessions on the DAP unit on one weekend day. The session will consist of completing a demographic questionnaire and the Minnesota Multiphasic Personality Inventory, Second Edition (MMPI-2). The demographic questionnaire will provide information about myself such as my age, marital status, ethnicity, education, number of previous substance abuse treatments, length of incarceration and previous convictions. There will be approximately 110 subjects involved in the study. I understand that Ms. Johnston will provide a more detailed explanation of the study when all the data is collected.

As in all research, there may be unforseen risks to the participant. I understand that one potential risk of my participation in this project is that I may be upset by the content of the personality questionnaire. I understand, however, that Ms. Johnston is prepared to provide crisis counseling should I become significantly upset. I also understand that participating in the study may disrupt my schedule for approximately three hours.

Although there may be minimal direct benefits from this activity, I will be able to assist in establishing appropriate guidelines for psychologists who use the MMPI-2 with other inmates and those individuals who share a similar ethnic background.

I understand that my participation may be terminated by the student investigator or DAP Coordinator if my behavior during the testing session is disruptive to the others or poses a security risk to the institution.

I understand that all the information collected from me is confidential. That means my name will not appear on any papers on which this information is recorded. The forms will all be coded and the Student Investigator will keep a separate master list with the names of participants and corresponding code numbers. Once the data are collected and analyzed, the master list will be destroyed. All other forms will be retained three years in a locked file in the WMU's Psychology Department research files under Dr. Lester Wright's name. All information will be used for research purposes only and handled in the strictest confidence, so that only researchers will have access to information that is traceable to a particular person. The only exception to the guarantee of confidentiality is specific information about intent to commit a future crime or to harm myself or someone else. My participation will not be individually identifiable in any reports.

I understand that I may refuse to participate or quit at any time during the study without prejudice or penalty from the DAP Program. Furthermore, I understand that my participation or non-participation will not affect my release date or parole eligibility. If I have any questions or concerns about this study, I may contact either Dr. Steve Norton at (507) 287-0674, ext. 126 or Ms. Johnston at (507) 287-0674, ext. 513. My signature below indicates that I understand the purpose and requirements of the study and that I agree to participate.

_____ _____

Signature Date

Universidad de Western Michigan
Departamento de Psicologia

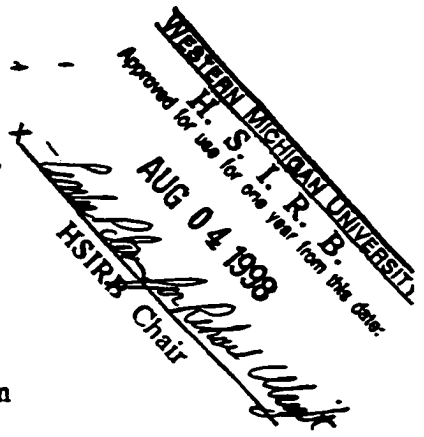
Investigador Principal: Dr. Lester Wright

Investigadora Estudiante: Barbara A. Johnston, M.A.

Yo he sido invitado a participar en un proyecto de investigacion titulado, "Determinando los cortes de las escalas de abuso de sustancia segun en Inventario Multifasico de la Personalidad-2-Minnesota sobre la poplacion reclusa." Yo entiendo que este investigacion desea determinar como los presos atenden a un cuestionario de personalidad y como los piscologos pueden mejorar los servicios a los presos de diversos antecedentes etnicos. Ademas entiendo que este proyecto es un tesis de Barbara A. Johnston.

Mi consentimiento a participar en este proyecto indica que me van a preguntar a asistir a una sesion de ejercicios escritos dirigido por Srta. Johnston y el coordinador del DAP que puede durar entre una hora a tres horas. Me van a preguntar a asistir una de estas sesiones durante un fin de semana en la unidad de DAP. La sesion consiste de rellenar un cuestionario demografico y el Inventario Multifasico de la Personalidad-2-Minnesota (MMPI-2). El cuestionario demografico dara en suministrar informacion sobre me mismo, tal como, me edad, estado civil, etnico, educacion, numero de veces que ha asistido a tratamientos sobre el abuso de sustancias y condenas previas y duracion de encarcelamiento. Habra aprosimadamente 110 sujetos participando en este proyecto de investigacion. Yo entiendo que Srta. Johnston proveera una explicacion mas entallada de este proyecto de investigacion cuando todos los datos esten acumulados.

Como en toda las investigaciones puede ocurrir riesgos imprevistos a lost participantes. Si ocurre un acidente de lesion, se tomaran los apropriado medidas de emergencia, no obstante, ningun compensacion o tratameinto sera asequible a me con excepcion de lo que ests especificado en este formulario de consentimiento. Yo entiendo que un riesgo potencial en participar en este proyecto puede ser que me causa gran pesar el contiendo del cuestionario de personalidad. No obstante, yo intiento que Srta. Johnston esta preparada a suministrar ayuda psicologico se deberia ponerme muy purturbado. Yo tambien entiendo que a participar en este proyecto puede desbaratar me horario por aproximadamente tres horas.



A pesar de que haya minimo beneficios directos de esta actividad, yo podre asistir en establecer las pautas apropriados para los psicologos quienes emplean el MMPI-2 con otros presos y esos individuales quienes comparten un parecido antecedene etnico.

Yo entiendo que me participacion puede ser terminado por la investigadora estudiante o el coordinador de DAP si me comportamiento durante los sesiones de ejercicios escritos es perjudicial a otros o posea un riesgo de securidad al instituto.

Yo entiendo que toda la informacion acumulado de me is en confianza. Eso quiere decir que mi nomber no va aparecerse en ninguno de los papeles en que la informacion este registrado. Los formularios van a estar en clave y la investigadora estudiante va a retener separado un fichero maestro con los nombres de los participantes y los claves correspondientes. Cuando todo los datos esten recogidos y analizados, el fichero maestro ser destruido. Todo los otros formularios estaran mantenidos por tres anos en un fichero con llave en un fichero de investigaciones en el departamento de psicologia hajo el nombre de Dr. Lester Wright a la Universidad Michigan Oeste. Toda la informacion sera solamente usado para el motivo de este investigacion y manejado en la mas absoluta confianza, asi solo los investigadores tendran acceso a la informacion que da referencia a una persona en particular. La unica excepcion a la garantia de confianza es informacion especifica de un intento a cometir un delito en el futoro a hacer dano a me misme o a otra cualquier persona. Mi participacion no sera identificable en ninguno de los reportes.

Yo entiendo que you puedo a calquier momento durante la investigacion negar a participar o abandonar sin perjuicio o penalte de la programa de DAP. Ademas, yo entiendo que mi participacion o no participacion en este proyecto de investigacion no influye mi fecha de encarcelacion a la elegibilidad de la libertad condicional. Si tengo algunas preguntas o preocupaciones sobre este proyecto de investigacion, yo puedo contactar cualquier de los dos investigadores: Dr. Steven Norton al (507) 287-0674, ext. 126) o Srta. Johnston (507) 287-0674, ext. 513). Mi firma abajo da a indicar que you entiendo el motivo y los estipulaciones de este proyecto de invetigacion y que yo consiento a participar.

_____ _____

(Firma) (Fecha)

Appendix F

Demographic Questionnaire

Demographic Questionnaire
Subject Number: _____

1. **Age:** _____

2. **Marital Status: (Circle One)**

   Single Married Divorced Separated Widowed

3. **Ethnicity: (Circle One)**

   African American
   Hispanic
   Asian
   Native American
   Caucasian
   Other: _____

4. **Highest Grade Completed:** _____ (GED=12th Grade)

5. **Number of Previous Substance Abuse Treatments:**
   _____

6. **Number of Months Incarcerated:** _____

7. **Length of Sentence:** _____

8. **Number of Previous Convictions:** _____

Cuestionairo Demografico
Numero de Participante: _____

1. **Edad:** _____

2. **Estado Civil (Marca Uno)**

   Soltero CasadoDivorciado Separado Viudo

3. **Orijen Civil (Marca Uno)**

   Americano Africano
   Hispano
   Asiano Americano
   Indio Americano
   De Las Islas Pacificas
   Nativo de Alaska
   Internacional/no Residente de E.E.U.U.
   Multiracial _____
   Raza Blanca
   Otro _____

4. **Grado Completo Escolar:** _____ **(GED = Grade 12)**

5. **Numero de Tratamientos Para el Abuso de Drogas Anteriores:**
   _____

6. **Numero de Meses Encarcelado:** _____

7. **Cuanto Tiempo de Sentencia:** _____

8. **Numero de Conviciones Anteriores:** _____

Appendix G

Master List

Master List

Inmate	Subject Number	Diagnosis

Appendix H

MMPI-2 Instructions

MMPI-2 Instructions

In your packet of materials, you will find a Test Question Booklet, which looks like this (Student Investigator holds up copy of the MMPI-2 Test Booklet) and an Answer Sheet (Student Investigator holds up copy of the MMPI-2 Answer Sheet). Please do not put your name or inmate number on any of the materials. You are to read each question and record the first answer that comes to mind on your answer sheet. You begin in the first column, when you have completed the first column, return to the top of the next column and continue recording your answers. Be sure the question number you are answering corresponds to the answer number. If you have any questions, please raise your hand.

Appendix I

Classification Decision Scheme to Determine the Accuracy of a Test in Discriminating Between Diagnostic Groups

Classification Decision Scheme to Determine the Accuracy of a Test in Discriminating Between Diagnostic Groups*

		Actual Diagnosis		
	Test Classification	Substance Dependent	Non-Substance Dependent	Total diagnosed from test
Positive	a	b	a + b = +	
Negative	c	d	c + d = -	
Total with actual diagnosis	a + c = E	b + d = F	E + F = N	

*Adapted from Meehl and Rosen (1955) and Gripshover and Dacey (1994).

Appendix J

Symbols and Formulas to Be Used in Determining the Efficiency of a Test in Classification Between Diagnostic Categories

Symbols and Formulas to Be Used in Determining the Efficiency of a Test in Classification Between Diagnostic Categories*

Variable	Symbol	Equation	Description
True positive	a	NA[a]	accurately diagnosed with the disorder
True negative	d	A[a]	accurately diagnosed without the disorder
False Positive	b	NA[a]	Inaccurately diagnosed with the disorder
False Negative	c	NA[a]	Inaccurately diagnosed without the disorder
Subjects	N	a+b+c+d	Total number of subjects
Base Rate	BR	(a+c)/N	Proportion of those with the disorder in the sample
Well Rate	WR	(b+d)/N	Proportion of those without the disorder in the sample
Overall Accuracy	OA	(a+d)/N	Proportion of total sample accurately classified
Misses	NA[a]	(c+b)/N	Proportion of total sample inaccurately classified
Sensitivity	Sen	(a/a+c)	Proportion of those with the disorder and accurately classified by the test
Specificity	Spe	(d/b+d)	Proportion of those without the disorder and accurately classified
Positive Predictive Power[b]	PP	(a/a+b)	Proportion of those accurately classified as having the disorder by the test and who actually have the disorder
Negative Predictive Power[b]	NPP	(d/c+d)	Proportion of those accurately classified as not having the disorder and who actually do not have the disorder

*Adapted from Gripshover and Dacey (1994).
[a]Not applicable
[b]Influenced by base rate fluctuations

Appendix K

Mean and Statistical Differences for Demographic Variables

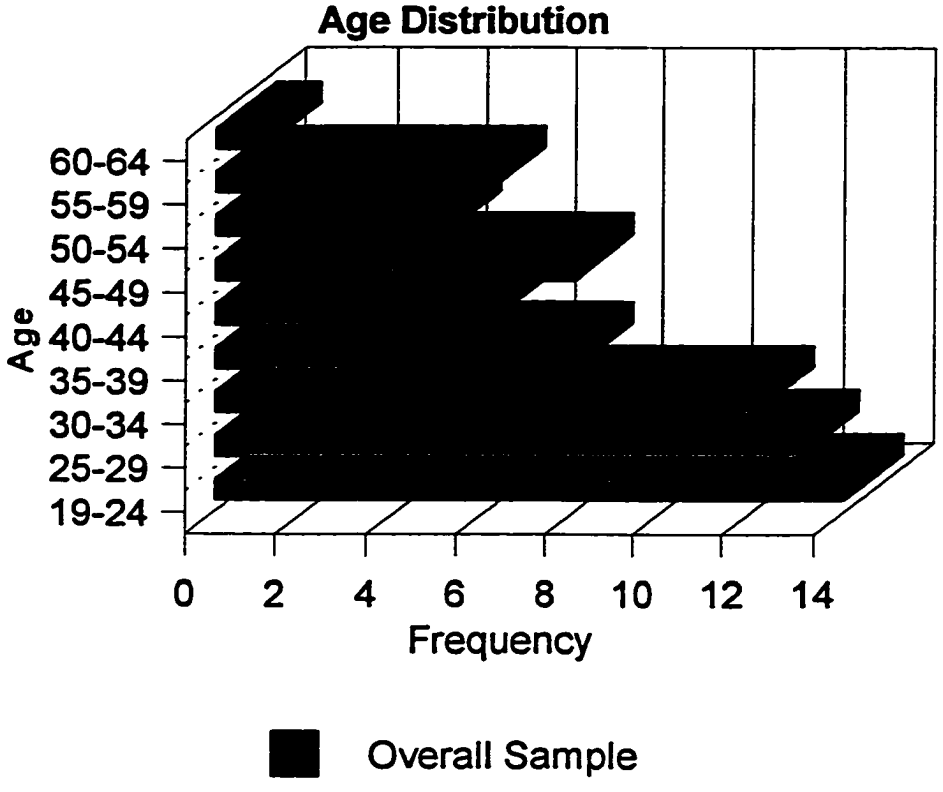
Means and Statistical Differences for Demographic Variables

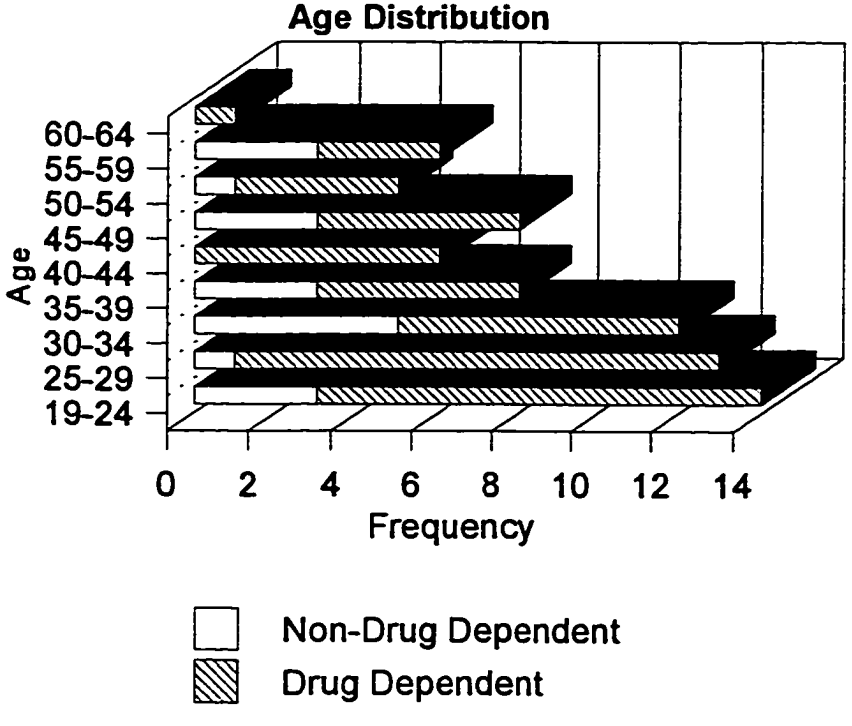
Variable	Range	Overall Mean	Drug Dependent	Non-Drug Dependent	t (71)	p-value
Age	19-63	35.68	34.87	38.00	1.01	.316
Education	6-18	12.53	12.64	12.21	-0.73	.470
Months Incarcerated	0-172[a]	42.93	43.48	41.37	-0.22	.827
Sentence Length	10-235	70.38	70.96	68.73	-0.20	.844
Previous Convictions	0-10	1.24	1.44	0.61	-1.65	.104

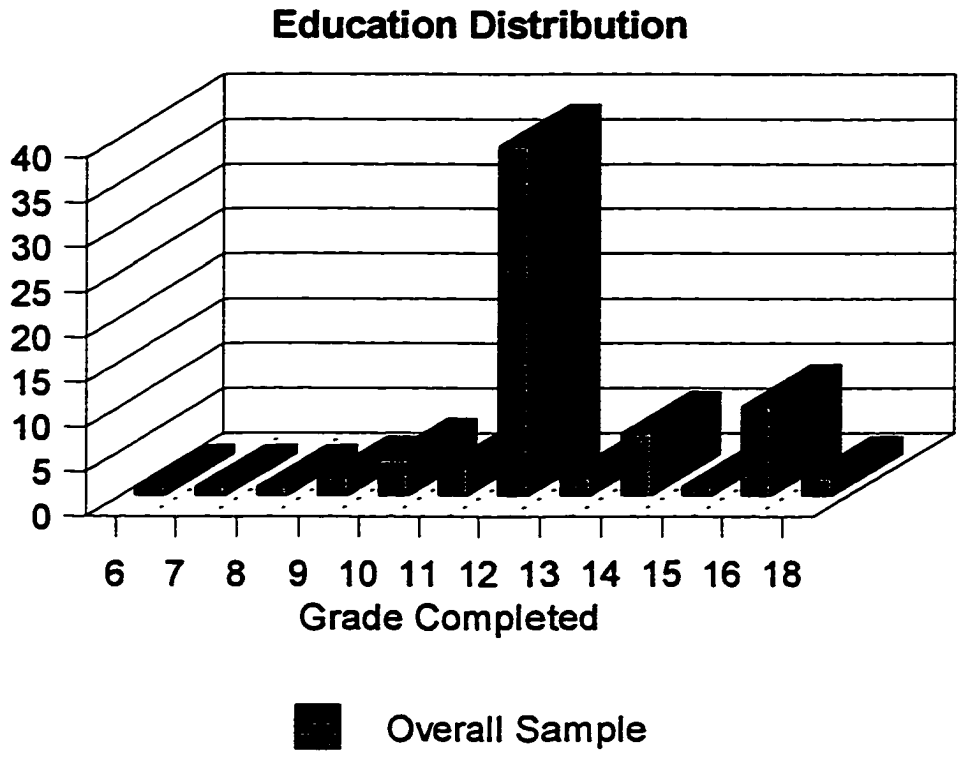
[a] The individual with 0 months incarcerated had been incarcerated less than one month.

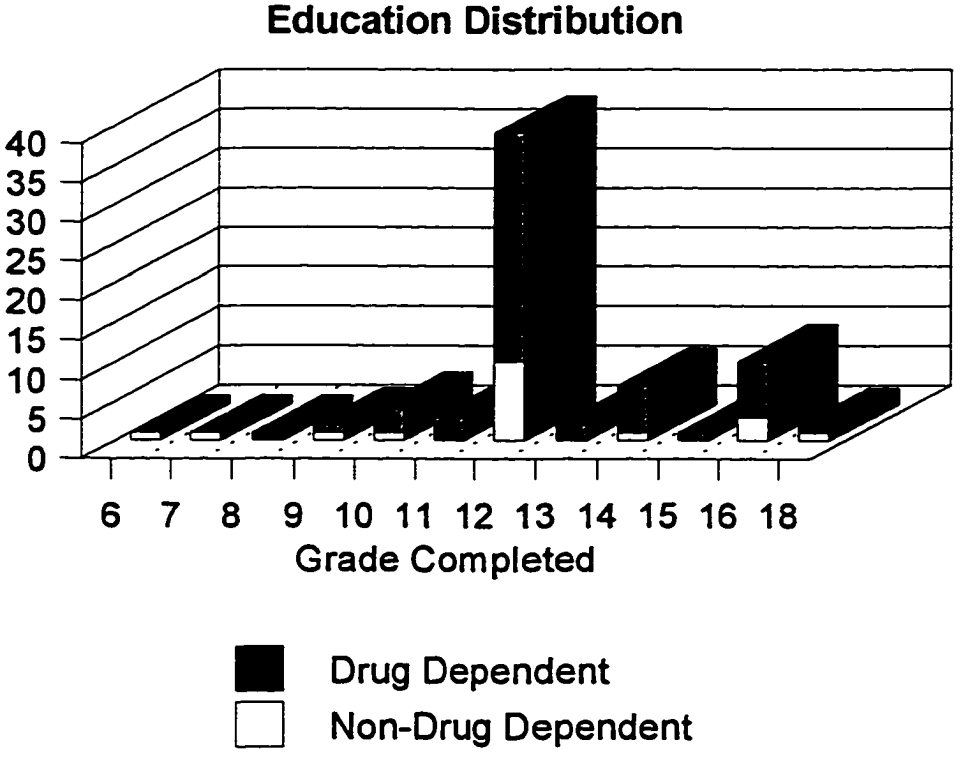
Appendix L

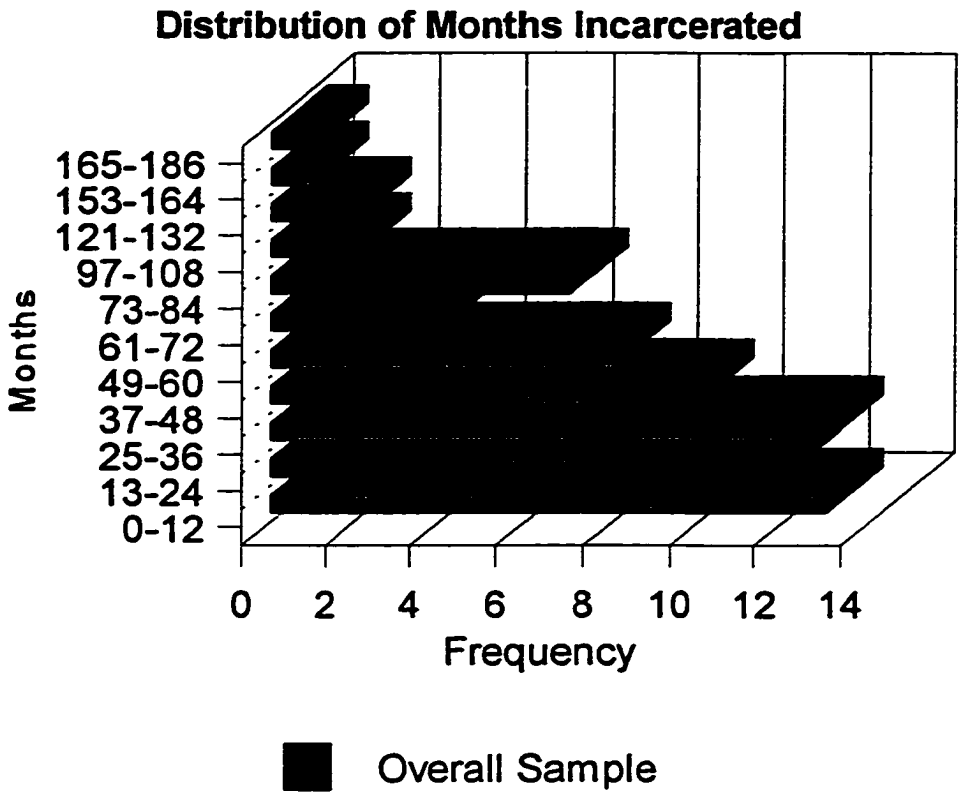
Graphical Representations of Demographic Data

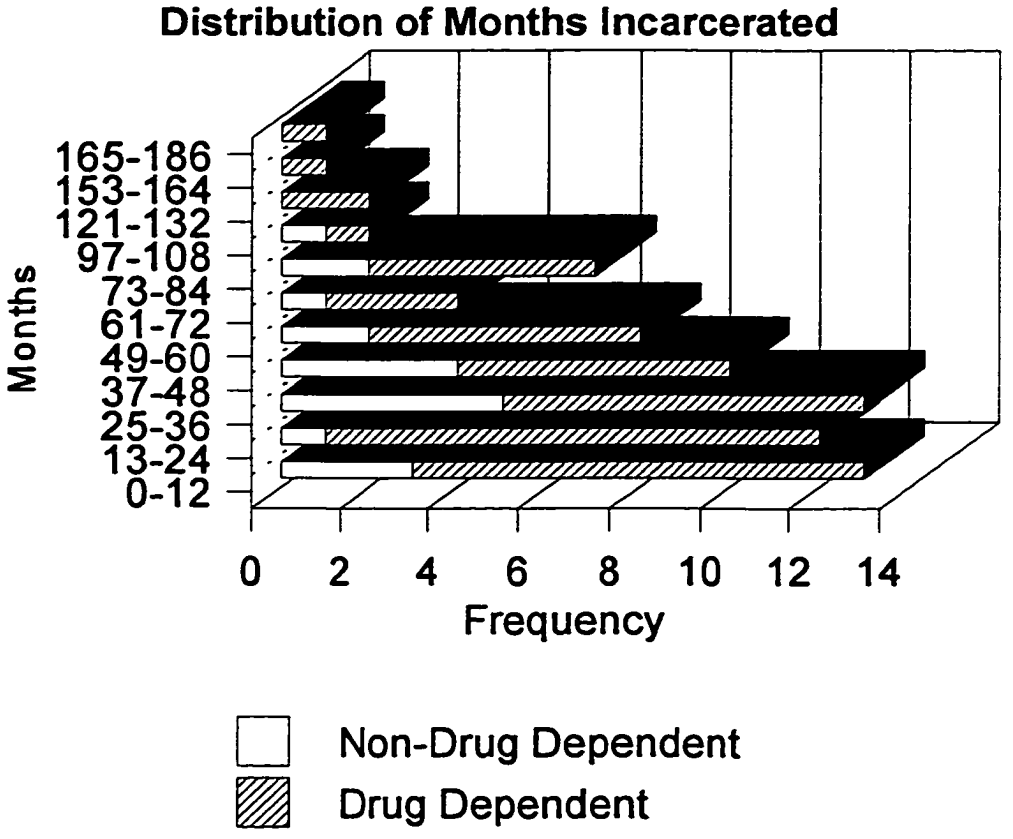


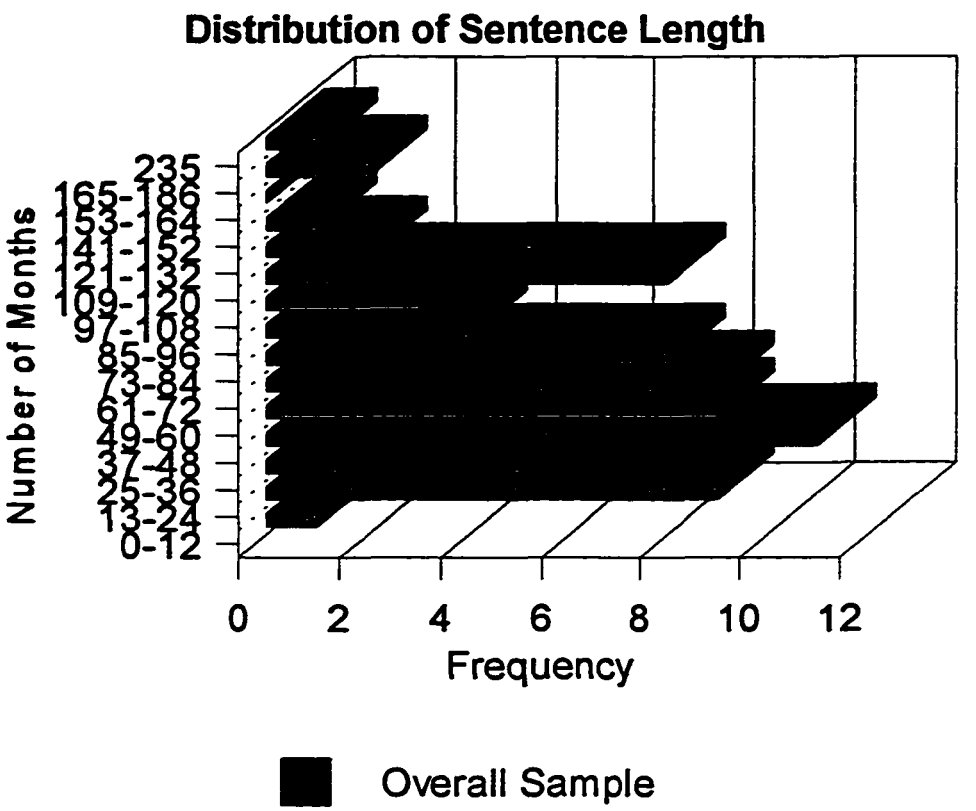


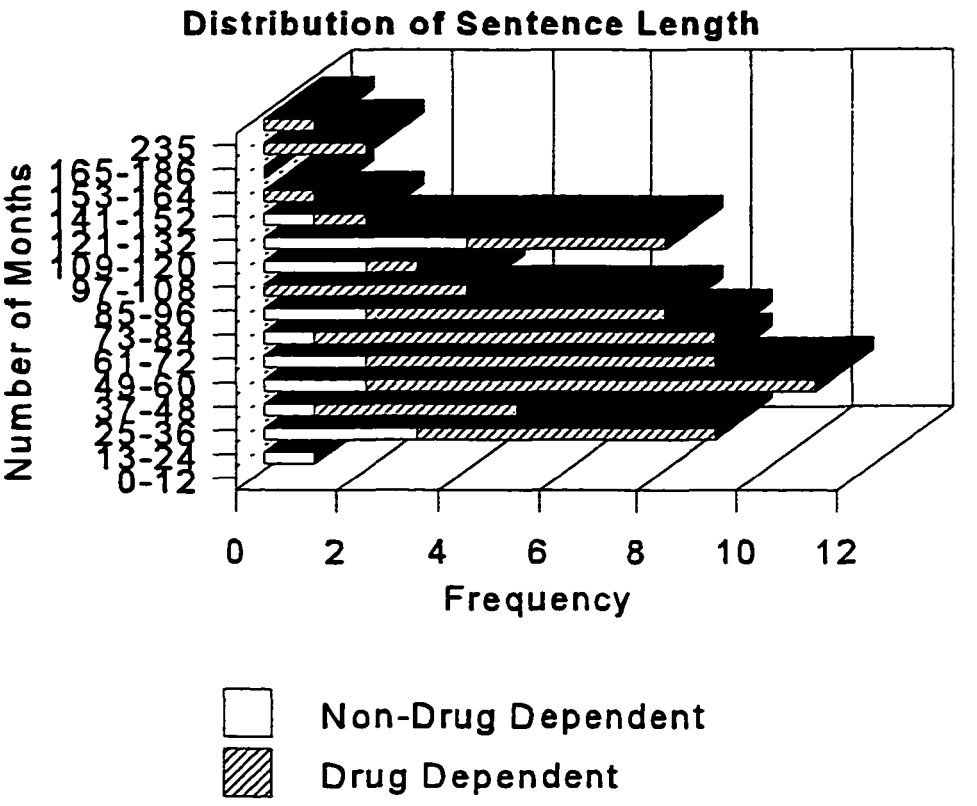




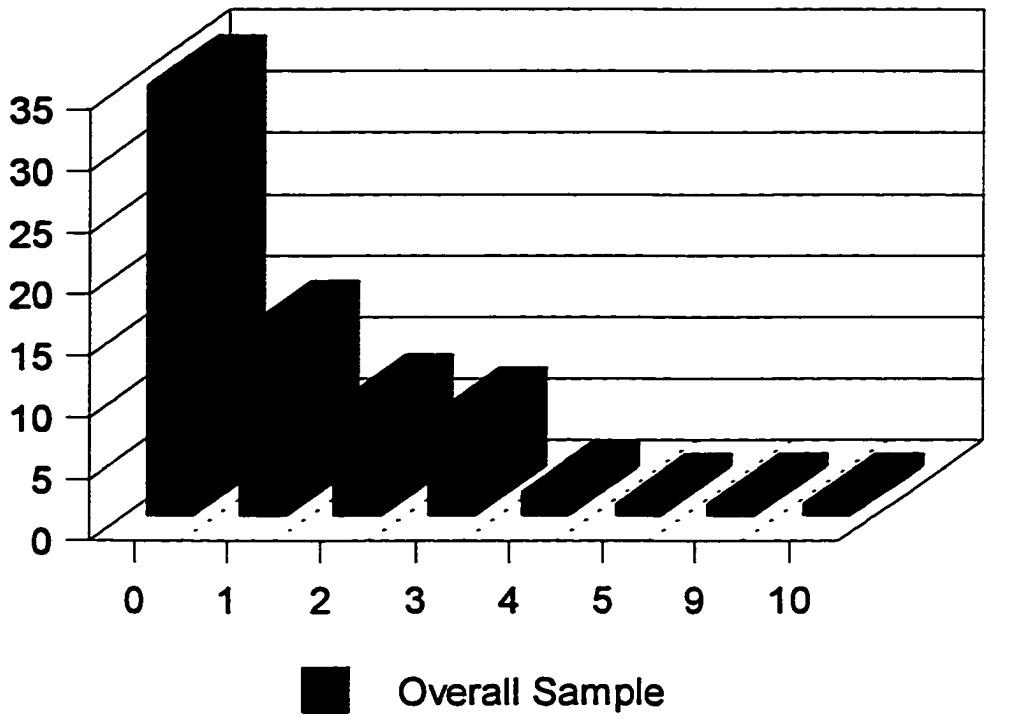








Distribution of Previous Convictions



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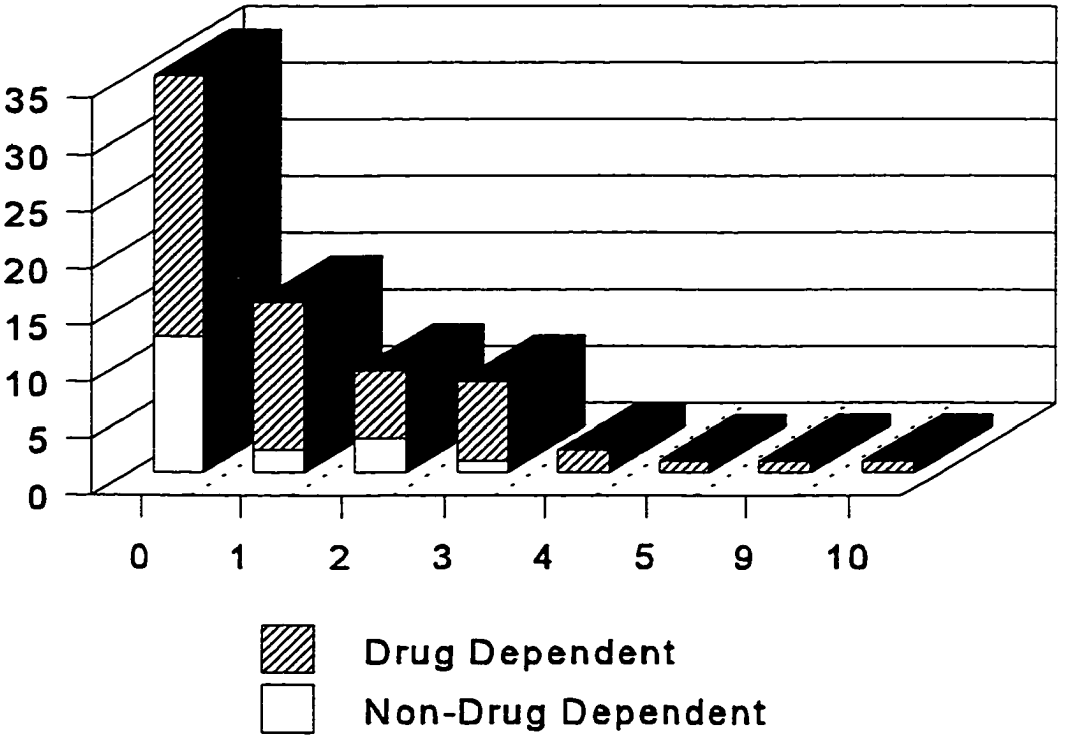
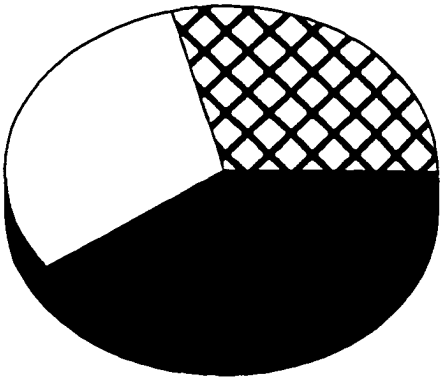
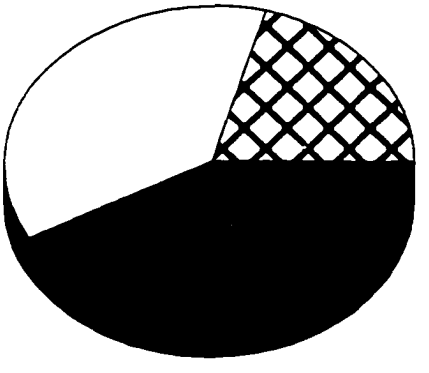


Ethnic Distribution for Overall Sample



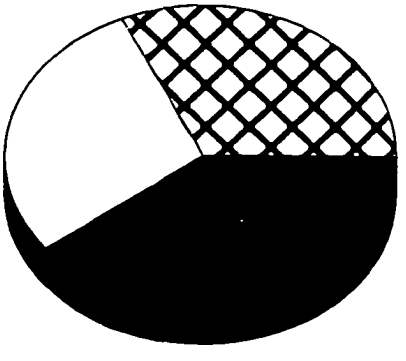
African Amer. Other Minority
White

Ethnic Distribution for Non-Drug Dependent



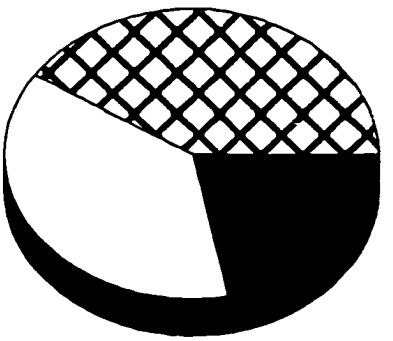
African Amer. Other Minority
White

Ethnic Distribution for Drug Dependent



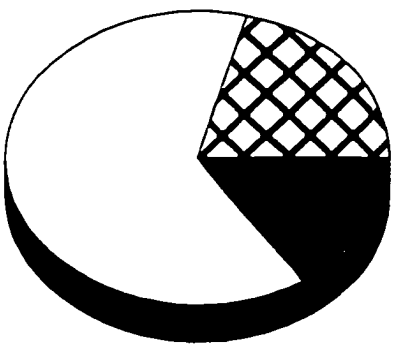
African American
Other Minority
White

Distribution of Marital Status for Overall Sample



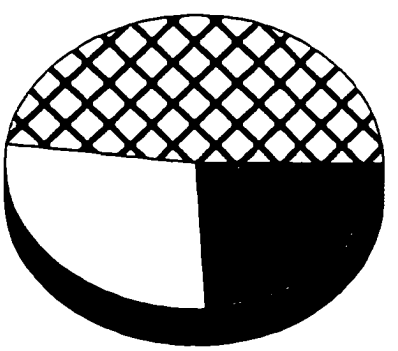
Single
Married
Other-Separated, Divorced & Widowed

Distribution of Marital Status for Non-Drug Dependent



Single
Married
Other-Separated, Divorced & Widowed

Distribution of Marital Status for Drug Dependent



Single
Married
Other-Separated, Divorced & Widowed

Appendix M

Stepwise Statistics From the Discriminant Analysis

Stepwise Statistics From the Discriminant Analysis

Step 1. Variables Entered or Removed

Step	Scale Entered	Statistic	Degrees of Freedom	Statistic	Degrees of Freedom	Significance
1	AAS	.653	1, 1, 71	37.709	1, 71	.000
2	APS	.594	2, 1, 71	23.885	2, 70	.000

Step 2. Variables in the Analysis

Step	Scale Entered	Tolerance	F to Remove	Wilks' Lambda
1	AAS	1.000	37.709	
2	AAS	.951	21.088	.773
	APS	.951	6.918	.653

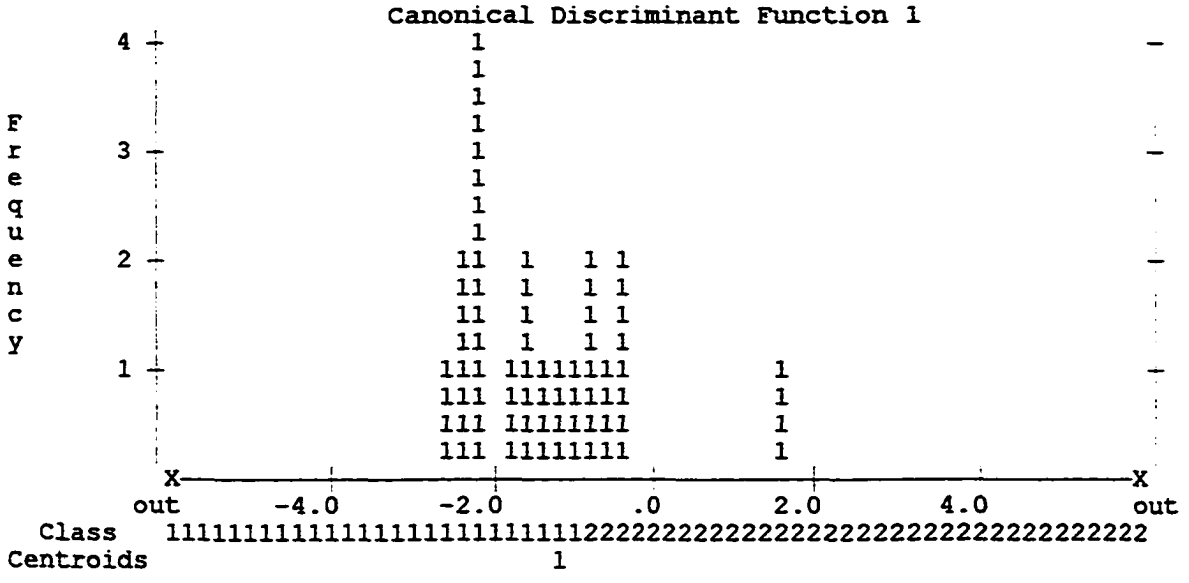
Step 3. Variables Not in the Analysis

Step	Scale	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
0	AAS	1.000	1.000	37.709	.653
	APS	1.000	1.000	20.798	.773
	MAC-R	1.000	1.000	6.509	.916
1	APS	.951	.951	6.918	.594
	MAC-R	.955	.955	1.054	.643
2	MAC-R	.750	.746	.042	.594

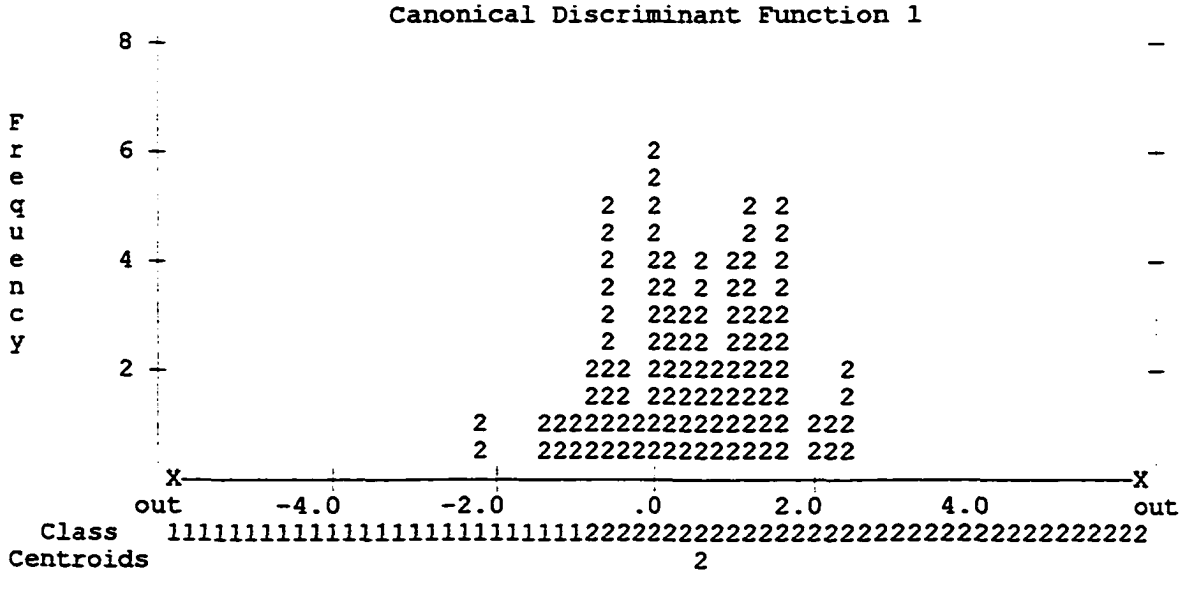
Appendix N

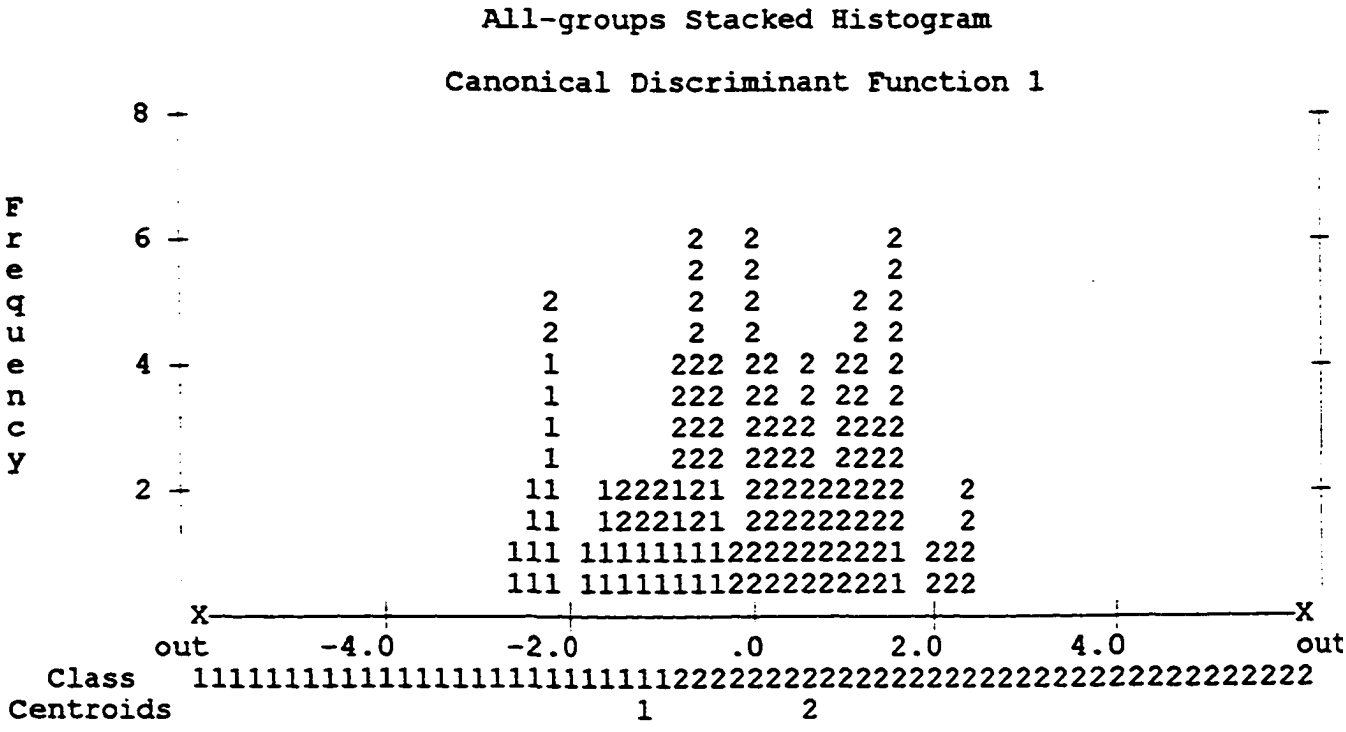
Histograms of the Canonical Discriminant Function for Non-Chemically Dependent, Chemically Dependent, and Overall Sample

Histogram for group 0



Histogram for group 1





Appendix O

Casewise and Cross-Validation Statistics

Casewise and Cross-Validation Statistics

Case Number	Actual Group	Original Predicted Group	Cross-Validated Predicted Group	Discriminant Score
1	1	1	1	-.035
2	1	1	1	.038
3	1	1	1	.313
4	1	1	1	.588
5	1	1	1	.961
6	1	1	1	1.561
7	1	1	1	.214
8	1	1	1	2.009
9	1	1	1	.188
10	1	1	1	.687
11	1	1	1	.313
12	1	1	1	.588
13	1	1	1	2.133
14	1	1	1	.038
15	1	1	1	1.111
16	1	1	1	-.559
17	1	1	1	.214
18	1	1	1	-.709
19	1	1	1	.987
20	1	1	1	1.236
21	1	1	1	-.534
22	1	0**	0**	-2.105
23	1	1	1	-.035
24	1	1	1	2.459
25	1	1	1	1.661
26	1	1	1	-.610
27	1	1	1	-.534
28	1	1	1	.463
29	1	1	1	-.559
30	1	1	0**	-.984
31	1	1	1	1.536
32	1	1	1	.089
33	1	1	1	1.635
34	1	1	1	-.310
35	1	1	1	1.360
36	1	1	1	1.261

Case Number	Actual Group	Original Predicted Group	Cross-Validated Predicted Group	Discriminant Score
37	1	1	1	.188
38	1	1	1	-.460
39	1	1	1	.961
40	1	1	1	1.086
41	1	1	1	.712
42	1	1	1	1.335
43	1	0**	0**	-1.134
44	1	0**	0**	-1.332
45	1	1	1	.687
46	1	1	1	.738
47	1	1	1	-.834
48	1	1	1	-.061
49	0	1**	1**	-.684
50	0	1**	1**	-.958
51	0	0	0	-1.757
52	0	1**	1**	1.536
53	0	0	0	-2.654
54	0	1**	1**	-.735
55	1	1	1	2.459
56	1	1	1	1.261
57	1	1	1	1.137
58	1	1	1	1.360
59	1	1	1	1.511
60	1	1	1	-.185
61	0	1**	1**	-.709
62	0	0	0	-2.131
63	0	0	0	-1.383
64	0	0	0	-1.108
65	0	0	0	-2.380
66	0	1**	1**	-.435
67	0	0	0	-2.255
68	0	0	0	-1.559
69	0	0	0	-2.380
70	0	0	0	-2.255
71	0	0	0	-2.281
72	0	1**	1**	-.336
73	0	0	0	-1.632

Appendix P

Measures of Discriminative Accuracy for AAS

Measures of Discriminative Accuracy for the AAS*

Score	OA (%)	TP (n)	TN (n)	FP (n)	FN (n)	Sen (%)	Spe (%)	PPP (%)	NPP (%)
0	73.0	54	0	19	0	100	0.0	74.0	NA[a]
1	74.3	54	0	18	0	100	5.3	75.0	100
2	77.0	54	3	16	0	100	15.8	77.1	100
3	**86.5**	**53**	**11**	**8**	**1**	**98.2**	**57.9**	**86.9**	**91.7[b]**
4	85.1	50	13	6	4	92.6	68.4	89.3	76.5
5	81.1	44	16	3	10	81.5	84.2	93.6	61.5
6	68.9	33	18	1	21	61.1	94.7	97.1	46.2
7	48.7	18	18	1	36	33.3	94.7	94.7	33.3
8	40.5	12	18	1	42	22.2	94.7	92.3	30.0
9	31.1	5	18	1	49	9.3	94.7	83.3	26.9
10	29.7	3	19	0	51	5.6	100	100	27.1
11	28.4	2	19	0	52	3.7	100	100	26.8

*Adapted from Gripshover and Dacey (1994)

[a]Not applicable due to division by zero.

[b]Cutscore with greatest overall accuracy.

Notes: Optimal cutting score (OCS); overall accuracy (OA); true positives (TP); true negatives (TN); false positives (FP); false negatives (FN); sensitivity (Sen); specifity (Spe); positive predictive power (PPP); negative predictive power (NPP).

Appendix Q

Measures of Discriminative Accuracy for APS

Measures of Discriminative Accuracy for the APS

Score	OA (%)	TP (n)	TN (n)	FP (n)	FN (n)	Sen (%)	Spe (%)	PPP (%)	NPP (%)
13	73.0	54	0	19	0	100	0.00	74.0	NA[a]
14	71.6	53	0	19	1	98.2	0.00	73.6	0.00
15	74.3	53	2	17	1	98.2	10.5	75.7	66.7
16	78.4	53	5	14	1	98.2	26.3	79.1	83.3
17	**79.7**	**53**	**6**	**13**	**1**	**98.2**	**31.6**	**80.3**	**85.7[b]**
18	75.7	50	6	13	4	92.6	31.6	79.4	60.0
19	78.2	50	8	11	4	92.6	42.1	82.0	66.7
20	78.4	48	10	9	6	88.9	52.6	84.2	62.5
21	75.7	44	12	7	10	81.5	63.2	86.3	54.6
22	74.3	41	14	5	13	75.9	73.7	89.1	51.9
23	70.3	37	15	4	17	68.5	79.0	90.2	46.9
24	64.9	32	16	3	22	59.3	84.2	91.4	42.1
25	58.1	25	18	1	29	46.3	94.7	96.2	38.3
26	50.0	19	18	1	35	35.2	94.7	95.0	34.0
27	43.2	14	18	1	40	25.9	94.7	93.3	31.0
28	39.2	10	19	0	44	18.5	100	100	30.2
29	33.8	6	19	0	48	11.1	100	100	28.4
30	29.7	3	19	0	51	5.6	100	100	27.1
31	28.4	2	19	0	52	3.7	100	100	26.8

*Adapted from Gripshover and Dacey (1994)

[a] Not applicable due to division by zero.

[b] Cutscore with greatest overall accuracy.

Notes: Optimal cutting score (OCS); overall accuracy (OA); true positives (TP); true negatives (TN); false positives (FP); false negatives (FN); sensitivity (Sen); specifity (Spe); positive predictive power (PPP); negative predictive power (NPP).

Appendix R

Measures of Discriminative Accuracy for the MAC-R

Measures of Discriminative Accuracy for the MAC-R*

Score	OA (%)	TP (n)	TN (n)	FP (n)	FN (n)	Sen (%)	Spe (%)	PPP (%)	NPP (%)
16	73.0	54	0	19	0	100	0.00	74.0	NA[a]
18[b]	74.3	54	1	18	0	100	5.3	75.0	100
19	74.3	54	1	18	0	100	5.3	75.0	100
20	75.7	54	2	17	0	100	10.5	76.1	100
21	**77.0**	**52**	**5**	**14**	**2**	**96.3**	**26.3**	**78.8**	**71.4[c]**
22	73.0	49	5	14	5	90.7	26.3	77.8	50.0
23	73.0	48	6	13	6	89.0	31.6	78.7	50.0
24	67.6	43	7	12	11	79.6	36.8	78.2	38.9
25	60.8	35	10	9	19	64.8	52.6	79.6	34.5
26	56.8	31	11	8	23	57.4	57.9	79.5	32.4
27	54.1	24	16	3	30	44.4	84.2	88.9	34.8
28	51.4	22	16	3	32	40.7	84.2	88.0	33.3
29	47.3	19	16	3	35	35.2	84.2	86.4	31.4
30	43.2	15	17	2	39	27.8	89.5	88.2	30.4
31	41.9	13	18	1	41	24.1	94.7	92.9	30.5
32	35.1	8	18	1	46	14.8	94.7	88.9	28.1
33	32.4	5	19	0	49	9.3	100	100	27.9
35[b]	28.4	2	19	0	52	3.7	100	100	26.8
37[b]	27.0	1	19	0	53	1.9	100	100	26.4

*Adapted from Gripshover and Dacey (1994)

[a] Not applicable due to division by zero.

[b] Notice break in scores because no subjects scored at prior interval.

[c] Cutscore with greatest overall accuracy

Notes: Optimal cutting score (OCS); overall accuracy (OA); true positives (TP); true negatives (TN); false positives (FP); false negatives (FN); sensitivity (Sen); specifity (Spe); positive predictive power (PPP); negative predictive power (NPP).

Appendix S

Measures of Discriminant Accuracy at the Optimal Cutscore (OCS) for Each MMPI-2 Substance Abuse Scale

Measures of Discriminative Accuracy at the Optimal Cutscore (OCS)* for Each MMPI-2 Substance Abuse Scale

Scale	OCS	OA	TP (%)	TN (n)	FP (n)	FN (n)	Sen (n)	Spe (%)	PPP (%)	NPP (%)
MAC-R	21	77.0	52	14	5	2	96.3	26.3	78.8	71.4
APS	17	79.7	53	13	6	1	98.2	31.6	80.3	85.7
AAS	3	86.5	53	11	8	1	98.2	57.9	86.9	91.7

*Adapted from Gripshover and Dacey (1994)
Notes: Optimal cutting score (OCS); overall accuracy (OA); true positives (TP); true negatives (TN); false positives (FP); false negatives (FN); sensitivity (Sen); specifity (Spe); positive predictive power (PPP); negative predictive power (NPP).

Appendix T

Means and Standard Deviations for Ethnic Groups on the MMPI-2 Substance Abuse Scales

Means and Standard Deviations for Ethnic Groups
on the MMPI-2 Substance Abuse Scales

Ethnic Group	Means and (SDs) AAS	APS	MAC-R
Entire Population (n=72)	5.25 (2.39)	22.70 (4.38)	26.14 (4.19)
African American (n=21)	6.10 (2.55)	22.90 (3.56)	27.00 (3.62)
Other Minority (n=22)	4.83 (2.48)	20.87 (5.14)	25.43 (5.12)
White (n=29)	4.97 (2.10)	24.00 (3.86)	26.07 (3.77)
Breakdown of Other Minority Category:			
Hispanic (n=9)	2.33 (.87)	17.67 (4.30)	22.78 (4.27)
Native American (n=9)	6.78 (1.79)	22.67 (4.50)	27.22 (4.12)
Multiracial (n=3)	6.33 (1.53)	26.33 (4.16)	30.33 (7.02)
Other (n=1)	6.00 NA[a]	22.00 NA[a]	24.00 Na[a]

[a] Figure is not applicable due to one subject in the cell.
Note: One subject did not disclose ethnic background. Therefore, the data above is completed on the remaining 72 subjects.

REFERENCES

Aaronson, A. L., Dent, O. B., & Kline, C. D. (1996). Cross-validation of MMPI and MMPI-2 predictor scales. Journal of Clinical Psychology, 52(3), 311-315.

Apfeldorf, M., & Hunley, P. J. (1981). The MacAndrew Scale. A measure of the diagnosis of alcoholism. Journal of Studies on Alcoholism, 42(1), 80-86 (1992).

Blake, D.D., Penk, W.E., Mori., D.L., Kleespies, P.M., Walsh, S.S., & Keane, T.M. (1992). Validity and clinical scale comparisons between the MMPI and MMPI-2 with psychiatric inpatients, Psychological Reports, 70, 323-332.

Bureau of Justice Statistics (1994, September). Comparing Federal and State Prison Inmates, 1991. Rockville, MD: Author.

Burke, H. R., & Marcus, R. (1977). MacAndrew MMPI Alcoholism Scale: Alcoholism and drug addictiveness. Journal of Psychology, 96, 141-148.

Butcher, J. N., Dahlstrom, W. G., Graham, J. R., Tellegen, A., & Kaemmer, B. (1989). Minnesota Multiphasic Personality Inventory-2 (MMPI-2): Manual for administration and scoring. Minneapolis: University of Minnesota Press.

Butcher, J.N., Graham, J.R., & Ben-Porath, Y.S. (1995). Methodological problems and issues in MMPI, MMPI-2 and MMPI-A research. Psychological Assessment, 7(3), 320-329.

Butcher, J. N., & Pancheri, P. (1976). Handbook of cross-national MMPI research. Minneapoilis: University of Minnesota Press.

Button, A. D. (1956). A study of alcoholics with the MMPI. Quarterly Journal of Studies on Alcohol, 17, 263-281.

Chick, G. E., Loy, J. W., & White, W. E. (1984). Differentiating violent and nonviolent opiate-addicted reformatory inmates with the MMPI. Journal of Clinical Psychology, 40(2), 619-623.

Clopton, J. R. (1978). Alcoholism and the MMPI. A review. Journal of Studies on Alcohol, 39(9), 1540-1558.

Dahlstrom, W. G., Welsh, G. S., & Dahlstrom, L. E. (1972). An MMPI handbook. Vol. 1: Clinical interpretation (rev. ed.). Minneapolis: University of Minnesota Press.

Davis, L. J., Colligan, R. C., Morse, R. M., & Offord, K. P. (1987). Validity of the MacAndrew Scale in a general medical population. Journal of Studies on Alcohol, 48(1), 202-206.

Decker-Roman, D., & Gerbing, D. W. (1989). The mentally disordered criminal offender: A description based on demographic, clinical and MMPI data. Journal of Clinical Psychology, 45(6), 983-990.

Edwards, D.W., Morrsion, T.L., & Weisman, H.N. (1993). The MMPI and MMPI-2 in an outpatient sample: Comparisons of code types, validity scales, and clinical scales. Journal of Personality Assessment, 61, 249-254.

Eshbaugh, D. M., Tosi, D. J., & Hoyt, C. (1978). Some personality patterns and dimensions of male alcoholics: A multivariate description. Journal of Personality Assessment, 42, 409-417.

Goldstein, S. G., & Linden, J. D. (1969). Multivariate classification of alcoholics by means of the MMPI. Journal of Abnormal Psychology, 6, 661-669.

Graham, J. R. (1990). MMPI-2. Assessing Personality and Psychopathology. New York: Oxford University Press.

Graham, J. R., & Strenger, V. E. (1988). MMPI characteristics of alcoholics: A review. Journal of Consulting and Clinical Psychology, 56(2), 197-205.

Grande, T. P., Wolf, A. W., Schubert, D. S. P., Patterson, M. B., & Brocco, K. (1984). Associations among alcoholism, drug abuse, and antisocial personality: A review of literature. Psychological Reports, 55, 455-474.

Greene, R. L. (1987). Ethnicity and MMPI performance: A review. Journal of Consulting and Clinical Psychology, 55(4), 497-512.

Greene, R. L., Gwin, R., & Staal, M. (1997). Current status of MMPI-2 research: A methodologic overview. Journal of Personality Assessment, 68(1), 20-36.

Greene, R. L., Weed, N. C., Butcher, J. N., Arrendondo, R., & Davis, H. G. (1992). A cross-validation of MMPI-2 substance abuse scales. Journal of Personality Assessment, 58(2), 405-410.

Gripshover, D. L., & Dacey, C. M. (1994, May). Discriminative validity of the MacAndrew Scale in setting with a high base rate of substance abuse. Journal of Studies on Alcohol, 303-308.

Hargrave, G.E., Hiatt, D., Ogard, E. M., & Karr, C. (1994). Comparison of the MMPI and the MMPI-2 for a sample of peace officers. Psychological Assessment, 6, 27-32.

Hawk, G. L., & Cornell, D. G. (1989). MMPI profiles of malingerers diagnosed in pretrial forensic evaluations. Journal of Clinical Psychology, 45(4), 673-678.

Herkov, M.J., Gynther, M.D., Thomas, S., & Myers, W.C. (1996). MMPI differences among adolescent inpatients, rapists, sodomists and sexual abusers. Journal of Personality Assessment, 66(1), 81-90.

Hoyt, D. P., & Sedlacek, G. M. (1958). Differentiating alcoholics from normals and abnormals with the MMPI. Journal of Clinical Psychology, 14, 60-74.

Isenhart, C.E., & Silversmith, D.J. (1996). MMPI-2 response styles: Generalization to Alcoholism Assessment. Psychology of Addictive Behaviors, 10(2), 115-123.

Ladd, J. S. (1996). MMPI-2 critical item norms in chemically dependent inpatients. Journal of Clinical Psychology, 52(3), 367-372.

Legan, L., & Craig, R. J. (1996). Correspondence of MMPI and MMPI-2 with chemically dependent patients. Journal of Clinical Psychology, 52(5), 589-597.

Lewis, C. E., & Bucholz, K. K. (1991). Alcoholism, antisocial behavior and family history. British Journal of Addiction, 86, 177-194.

Litz, B.T., Penk, W.E., Walsh, S., Hyer, L., Blake, D.D., Marx, B., Keane, T., & Bitman, D. (1991). Similarities and differences between MMPI and MMPI-2 applications to the assessment of Posttraumatic Stress Disorder. Journal of Personality Assessment, 57, 238-246.

Loper, R. G., Kammeier, M. L., & Hoffmann, H. (1973). MMPI characteristics of college freshman males who later became alcoholics. Journal of Abnormal Psychology, 82, 159-162.

MacAndrew, C. (1965). The differentiation of male alcoholic outpatient from nonalcoholic psychiatric outpatients by means of the MMPI. Quarterly Journal of Studies on Alcohol, 26, 238-246.

MacAndrew, C. (1967). Self-reports of male alcoholics: A dimensional analysis of certain differences from non-alcoholic male psychiatric patients. Quarterly Journal of Studies on Alcohol, 28, 43-51.

MacAndrew, C. (1978). Women alcoholics' responses to Scale 4 of the MMPI. Journal of Studies on Alcohol, 39, 1841-1954.

MacAndrew, C. (1981). What the MAC Scale tells us about men alcoholics. An interpretive review. Journal of Studies on Alcohol, 42(7), 604-625.

MacAndrew, C., & Geertsma, R. H. (1963). An analysis of responses of alcoholics to Scale 4 of the MMPI. . Quarterly Journal of Studies on Alcohol, 24, 23-28.

MacAndrew, C., & Geertsma, R. H. (1964). A critique of alcoholism scales derived from the MMPI. Quarterly Journal of Studies on Alcohol, 25, 68-76.

McCreary, C., & Padilla, E. (1977). MMPI differences among black, Mexican-American, and white male offenders. Journal of Clinical Psychology, 33, 171-177.

Meehl, P. E., & Rosen, A. (1955). Antecedent probability and the efficiency of psychometric signs, patterns, or cutting scores. Psychological Bulletin, 52(3), 194-216.

Megargee, E. I. (1997). Using the Megargee MMPI-based classification system with the MMPI-2s of female prison inmates. Psychological Assessment, 9(2), 75-82.

Miller, H. R., & Streiner, D. L. (1990). Using the Millon Clinical Multiaxial Inventory's Scale B and the MacAndrew Alcoholism Scale to identify alcoholics with concurrent psychiatric diagnoses. Journal of Personality Assessment, 54(3 & 4), 736-746.

Nerviano, V. J., & Gross, H. W. (1983). Personality types of alcoholics on objective inventories: A review. Journal of Studies on Alcohol, 44, 837-862.

Nerviano, V. J., McCarty, D., & McCarty, S. M. (1980). MMPI profile patterns of men alcoholics in two contrasting settings. Journal of Studies on Alcohol, 41, 1143-1152.

Nichols, D. S., & Greene, R. L. (1997). Dimensions of deception in personality assessment: The example of the MMPI-2. Journal of Personality Assessment, 68(2), 251-266.

Otto, R. K., Lang, A. R., Megargee, E. J., & Rosenblatt, A. I. (1988). Ability of alcoholics to escape detection by the MMPI. Journal of Consulting and Clinical Psychology, 56(3), 452-457.

Page, R. D., & Bozlee, S. (1982). A cross-sultural MMPI comparison of alcoholics. Psychological Reports, 50, 639-646.

Pfost, K. S., Kunce, J. T., & Stevens, M. J. (1984). The relationship of MacAndrew Alcoholism scale scores to MMPI profile type and degree of elevation. Journal of Clinical Psychology, 40, 852-857.

Preng, K. W., & Clopton, J. R. (1986). The MacAndrew Scale: Clinical application and theoretical issues. Journal of Studies on Alcohol, 47(3), 228-236.

Roman, D. D., Tuley, M. R., Villanueva, M. R., & Mitchell, W. E. (1990). Evaluating MMPI validity in a forensic psychiatry population. Distinguishing between malingering and genuine psychopathology. Criminal Justice and Behavior, 17(2), 186-198.

Ruff, C. F., Ayers, J., & Templer, D. I. (1975). Alcoholics' and crime. The similiarity of scores on the MacAndrew Alcoholism Scale. Psychological Reports, 36, 921-922.

Ryan, J. J., Dunn, G. E., & Paolo, A. M. (1995). Temporal stability of the MMPI-2 in a substance abuse sample. Psychotherapy in Private Practice, 14(3), 33-41.

Schwartz, M. F., & Graham, J. R. (1979). Construct validity of the MacAndrew Alcoholic Scale. Journal of Consulting and Clinical, 47, 1090-1095.

Shea, S.J., & McKee, G.R. (1996). MMPI-2 profiles of men charged with murder and other offenses. Psychological Reports, 78, 1039-1042.

SPSS Base 7.5 Applications Guide. (1997). Chicago, IL: SPSS, Inc.

Svanum, S., & Ehrmann, L. C. (1992). Alcoholic subtypes and the MacAndrew Alcoholism Scale. Journal of Personality Assessment, 58(2), 411-422.

Svanum, S., & Ehrmann, L. C. (1993, November). The validity of the MMPI in identifying alcoholics in a university setting. Journal of Studies on Alcohol, 54, 722-729.

Svanum, S., & Hoffman, R. G. (1982). Brief Report: The factor structure of the MacAndrew Alcoholism Scale. Addictive Behaviors, 7, 195-198.

Svanum, S., McGrew, J., & Ehrmann, L. (1994). Validity of the substance abuse scales of the MMPI-2 in a college student sample. Journal of Personality Assessment, 62(3), 427-439.

Swarie, S. M., Kabat, M. H., Dietz, C. B., Greene, R. L., Arredondo, R., & Mann, A. W. (1996). Internal structure of the MMPI-2 Addiction Potential Scale in alcoholic and psychiatric inpatients. Journal of Personality Assessment, 66(1), 177-193.

Uecker, A. E., Boutilier, L. R., & Richardson, E. H. (1980). "Incianism" and MMPI scores of men alcoholics. Journal of Studies on Alcohol, 41, 357-362.

Vaillant, G. E. (1994). Evidence that the Type 1/Type 2 dichotomy in alcoholism must be re-examined. Addiction, 89, 1049-1057.

Velasquez, R.J., Gonzales, M., Butcher, J.N., Castillo-Canez, I., Apodaca, J.X., & Chavira, D. (1997, April). Use of the MMPI-2 with Chicanos: Strategies for counselors. Journal of Multicultural Counseling & Development, 25(2), 107-120.

VonCleve, E., Jemelka, R., & Trupin, E. (1991). Reliability of psychological test scores for offenders entering a state prison system. Criminal Justice and Behavior, 18(2), 159-165.

Walters, G. D., White, T. W., & Greene, R. L. (1988). Use of the MMPI to identify malingering and exaggeration of psychiatric symptomatology in male prison inmates. Journal of Consulting and Clinical Psychology, 56(1), 111-117.

Ward, L. C., & Jackson, D. B. (1990). A comparison of primary alcoholics, secondary alcoholics, and nonalcoholic psychiatric patients on the MacAndrew Alcoholism Scale. Journal of Personality Assessment, 54(3 & 4), 729-735.

Weed, N. C., Butcher, J. N., McKenna, T., & Ben-Porath, Y. S. (1992). New measures for assessing alcohol and drug abuse with the MMPI-2: The APS and AAS. Journal of Personality Assessment, 58(2), 389-404.

Whitelock, P. R., Overall, J. E., & Patrick, J. H. (1971). Personlity patterns and alcohol abuse in a state hospital population. Journal of Abnormal Psychology, 78, 9-16.

Wolf, A. W., Schubert, D. S. P., Patterson, M. B., Grande, T. P., Brocco, K. J., & Pendleton, L. (1988). Associations among major psychiatric diagnoses. Journal of Consulting and Clinical Psychology, 56(2), 292-294.

Zager, L. D., & Megargee, E. I. (1981). Seven MMPI alcohol and drug abuse scales: An empirical investigation of their interrelationships, convergent and discriminant validity, and degree of racial bias. Journal of Personality and Social Psychology, 40, 532-544.

IMAGE EVALUATION TEST TARGET (QA-3)

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6"

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