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An Examination of Racial Differences on the MMPI-2 Profiles of Incarcerated Women

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THE FLORIDA STATE UNIVERSITY
COLLEGE OF ARTS AND SCIENCES

AN EXAMINATION OF THE RACIAL DIFFERENCES ON MMPI-2 PROFILES
OF INCARCERATED WOMEN

By
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Department of Psychology
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The members of the Committee approve the thesis of Yezzennya Castro defended on August 11, 2004.

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ABSTRACT

The present study examined whether or not differential MMPI-2 profile elevations would appear between African American and Caucasian incarcerated women. MANOVAs followed by discriminant function analyses found support for differential profile elevations, replicating previous findings. In addition the current study investigated whether or not experience of racial discrimination may account for these differential profile elevations between African Americans and Caucasians. This hypothesis was not supported in the current study, however, age and educational level did appear to account for differential profile elevations. Implications and future directions are discussed.

CHAPTER 1

INTRODUCTION

Possibly the most widely utilized objective personality test, in both research and practice, is the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943) and its revised version, the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). Its original purpose was to aid in the assessment and diagnosis of individuals with psychological disorders. More recently, it has come to be viewed as a measure of personal tendencies and personality traits, and is used more generally as an aid in the description of the test taker. It has several different scales, and each is associated with certain personality traits (most of them undesirable) or certain psychopathology. An elevation of a scale past a certain point indicates endorsement of more items in the same way as individuals known to possess that trait or psychopathology than would be expected by chance. It then becomes highly likely that the test taker possesses that trait. The higher a scale is elevated the scale the critical point the greater the degree to which the test taker is likely to possess that trait.

Use of the MMPI-2 has expanded from mostly psychiatric settings and is now also commonly used in employment screenings, correctional facilities, and with military personnel, and it has been translated into many languages for use in other cultures (Dahlstrom, Lachar, & Dahlstrom, 1986). Because the MMPI and MMPI-2 have become commonplace in diverse settings, the appropriateness of its use with diverse groups of people has become a major concern. Studies of the MMPI and MMPI-2's suitability with several minority populations have been conducted, including studies with Hispanic/Latino American (Boscan, et al, 2000; Velasquez & Callahan, 1990; Whitworth & McBlaine, 1993), Asian American (Stevens, Kwan & Graybill, 1993; Tsai & Pike, 2000; Tsushima & Onorato, 1982), and Native American participants (Butcher, Braswell, & Raney, 1983; Kline, Rozytko, Flint, & Roberts, 1973; Venn, 1988). However, examination of the research on racial and ethnic differences on the MMPI and MMPI-2 reveals that no racial or ethnic group has received more attention than the African American population (Dahlstrom, Lachar, & Dahlstrom, 1986).

MMPI research with African American participants began to appear shortly after its publication (Fry, 1949), although until the 1970s these studies were few and far between. Gynther (1972) first expressed concern that the MMPI, with its exclusively Caucasian normative sample, might be an inappropriate assessment tool to use with the African American population. In his summary of 15 studies on racial differences between African Americans and Caucasians on the MMPI, Gynther found that African Americans were consistently scoring higher (that is, in the more pathological direction) than Caucasians on scales 8 and 9. These scales are known to be indicators of severe psychopathology. Scale 8 (Schizophrenia) is associated with diagnosis of schizophrenia, can be elevated by individuals who experience hallucinations, and is the scale most commonly elevated in severely mentally ill persons. Scale 9 (Hypomania) is associated with symptoms of hypomania, including hyperactivity, grandiosity, and aggression, and is commonly elevated in individuals experiencing a hypomanic episode (see Table 1 for a more detailed description of these scales). Gynther concluded that use of the MMPI with African Americans, for which it was not normed, was inappropriate as it could lead to inaccurate assessment and over-pathologizing of African Americans.

One might argue that the MMPI-2 is not susceptible to the same criticism regarding its use with racial and ethnic minorities because of its ethnically diverse normative sample. Where the normative sample of the MMPI consisted of 724 participants who were all white, rural Minnesotans, the normative sample of the MMPI-2 consists of 2,600 participants from seven regions of the country, and the racial/ethnic composition of the sample is proportional to the 1980 U.S. Census (Butcher, et al, 1989) In fact, some ethnic minority groups are proportionally over represented. For example the 1980 U.S. Census reported that African Americans made up 10.5% of the population, and they made up 12% of the MMPI-2 restandardization sample. However, this translates into 314 of the 2,600 participants in the restandardization sample. Compare this number to 2,117, the number of Caucasian participants in the MMPI-2 normative sample, and it becomes necessary to question the impact African Americans may have actually had on MMPI-2 normative data. Therefore, since in this case, the representativeness of a normative sample may not mean that a test is free from bias, it is still necessary to examine the effect of race on MMPI-2 profiles.

Gynther and Green (1980) later reviewed 11 studies of non-psychiatric samples, 20 studies of psychiatric and incarcerated samples, and 5 studies using samples of drug users. They concluded that consistently higher mean elevations on scales F (see Table 1 for a description), 8, and 9 of the MMPI were appearing for the African American non-psychiatric and incarcerated/psychiatric samples. However, these differences were more striking in the non-psychiatric samples. Results were different for the drug user samples. Here, Caucasians were generally scoring higher than African Americans on scales 2 and 7 of the MMPI (see Table 2 for a description of these and remaining MMPI-2 scales). Thus, Gynther and Green also found support for the idea that the racial differences on MMPI elevations might differ in degree or pattern, depending on the population being sampled.

Additional research on the MMPI that has focused on differential scale elevations between African Americans and Caucasians has also generally reported higher elevations for African Americans on Scales F, 8, and 9. For example, in their review of 16 MMPI studies, Pritchard and Rosenblatt (1980) reported the mean effect size of each scale for these studies and noted that scales F, 8, and 9 all had small effect sizes (.26, .20, and .28, respectively) and that the L scale produced a moderate effect size (.53). In the only meta-analytic study of the MMPI/MMPI-2 and race, Hall, Bansal, and Lopez (1999) examined studies that met their inclusion criteria of having reported group comparisons with a Caucasian sample and having reported on all clinical and validity scales. Regarding the 25 studies that examined African American men, the authors found small aggregate effect sizes for scales L (.18), F (.21), 8 (.17), and 9 (.21). For the 12 studies that examined African American women, small effect sizes were found for scales 5 (.19) and 9 (.24).

While there appears to be a general consensus regarding what scales are differentially elevated, researchers have yet to investigate why these differences in mean elevations exist between African Americans and Caucasians. One explanation offered by Gynther (1972) is that they “reflect differences in values, perceptions and expectations” (p. 39) between the races. He noted that the most striking value exhibited by African Americans might be “distrust of White society” (p. 39). Dahlstrom and colleagues (1986) made a similar argument; that African Americans’ experience of deprivation and exclusion from mainstream American life results in feelings of alienation and persecution that accurately reflects their history of discrimination and

segregation. Thus, it is possible that these beliefs are reflected in the MMPI-2 profiles of African Americans.

In addition to a lack of research on possible causes for differential scale elevations, there is a dearth of research on race in female samples. Hall and colleague's (1999) meta analysis makes this clear, as the authors were able to collect only a barely adequate number of studies using women, and were only able to do this for one minority group. Only one study to date has examined an exclusively female sample for racial differences on the MMPI (Harrison & Kass, 1967). The female incarcerated population is particularly neglected in this area of research, as only one study of prison inmates has included female inmate in their sample (Sutker & Moan, 1973); however, theirs was a small sub-sample of 36 women that were included as part of a larger study that included 136 male prison inmates.

Consider the implications of a dearth of MMPI-2 racial differences research in light of the following statistics. A comprehensive survey of 830 correctional psychologists found that 42% of the time spent on psychological testing was used for personality assessment, and 87% of its respondents reported using the MMPI-2 in their assessment work, making it the most widely used assessment tool in U.S. state and federal prisons (Boothby & Clements, 2000). Black persons make up 46% of the inmate population in the United States, compared to 12.3% of Black or African American persons in the general population (United States Census Bureau, 2000). U.S. Census data on women mirror these numbers; African American women make up 12.7% of the general female population, yet comprise 44% of the female incarcerated population. Given the widespread use of the MMPI-2 as an assessment tool in U.S. prisons and the overrepresentation of African Americans in this setting, and the virtual absence of any research on the MMPI-2 and racial differences in incarcerated women, there results the potential for a substantial number of African American incarcerated women to be evaluated, treated or classified according to information that presents them as more pathological than is actually the case. Ethical use of the MMPI-2 in correctional settings, which are overpopulated with minorities, should therefore require examination of potential causes of differential elevation patterns between races.

The current study therefore examined whether or not incarcerated African American women score higher than incarcerated Caucasian women on Scales F, 8 and 9 of the MMPI-2

and Gynther's (1972) and Dahlstrom et al's (1986) hypotheses. This study proposed that differential elevations on Scales F, 8, and 9 of the MMPI-2 would appear in a sample of incarcerated women and that they would be the result of feelings of social and emotional alienation and a general sense of mistrust in society on the part of African Americans. In addition this study proposed that these feelings are influenced by African Americans' experience of racial discrimination in American society.

Although Hall et al's (1999) findings suggest that scales L and 5 of the MMPI and MMPI-2 are also elevated differentially between African American and Caucasian men and women, these scales were not be investigated in the current study in relation to experience of racial discrimination. This was due to the fact that these two scales are not considered measures of severe psychopathology or distress, but reflect relatively more benign characteristics of the test-taker. For example, the L scale reflects the test-takers stated claims of virtue, and is used to assist in detecting an overly positive self-presentation. Scale 5 reflects the extent to which the test-taker's interests and characteristics are in line (or conflict) with society's traditional and stereotypical beliefs about the test-taker's gender. Given that these scales are not measures of severe psychopathology or distress, it was not considered appropriate to test these scales against the current hypotheses.

Experience of Discrimination and Health

There exists a body of research suggesting that experience of discrimination is highly prevalent and related to poor mental health. For example, using the Schedule of Racist Events, Landrine and Klonoff (1996) found that 100% of their sample of 153 African Americans reported experiencing discrimination at some point in their lives and 98% reported experiencing discrimination in the last year. Kessler, Mickelson, and Williams (1999) examined the prevalence and correlates of perceived discrimination in a sample of 3,032 African Americans recruited by telephone. The authors found that perceived discrimination was very common, with one third of the sample reporting an experience of major discrimination and two thirds reporting experience of smaller acts of discrimination. Kessler and colleagues also found a weak correlation of discrimination with symptoms of anxiety and depression. Klonoff, Landrine, and Ullman (1999) examined the effects of perceived discrimination, generic stressful life events, and status variables (gender, education, income and age) on reported psychological symptoms in

a sample of 520 African Americans. Using multiple regression, they found that perceived experience of discrimination uniquely accounted for 6-10% of the variance in symptomatology.

Clark, Anderson, Clark, and Williams (1999) proposed a model of how perceived discrimination may have deleterious effects on physical and psychological health. They proposed that perception of an interpersonal event as discriminatory causes stress and coping responses in the individual. Both of these stress and coping responses are influenced by environmental or personal factors that cause experience of discrimination to take a greater toll on the mental health of African Americans. For example, Clark and colleagues argued that African Americans exposed to stressful environmental interpersonal events have greater reason to perceive a stressor as a discriminatory event, and so are more likely to experience stress due to racism. Therefore, African Americans may have to employ coping responses more often, and this may put a strain on coping resources, which will ultimately affect one's health.

Socio-economic status (SES) may also influence the relationship between experience of discrimination and health. Clark and colleagues (1999) note that experience of discrimination is reported at all levels of SES, but SES is disproportionately distributed within the African American population, such that more African Americans fall into the low SES category. Therefore, in addition to more frequently experiencing stress due to discrimination, it may be that African Americans have fewer resources with which to adaptively cope with stress (money for mental and physical health expenses, social support, etc.). These factors in turn, may result in poorer physical and mental health outcomes in African Americans.

Clark and colleagues (1999) note that the experience of an event as discriminatory can prompt stress responses such as frustration, anger, resentment, fear or paranoia. It is suggested here that repeated experience of these stress responses may result in the development of a general sense of mistrust in or cynicism toward American society and feelings of alienation, (as posited by Gynther, 1972) and that this view is reflected in the MMPI-2 profiles of African Americans.

Contributions of Previous MMPI and MMPI-2 Research on Racial Differences

Previous research on race and the MMPI/MMPI-2 has uncovered small but consistent and significant differences in score elevations, particularly on scales F, 8 and 9 (Gynther, 1972; Gynther & Green, 1980; Hall, et al., 1999; Pritchard & Rosenblatt, 1980). In addition, previous

research has been concerned with uncovering the influence of demographic variables other than race on MMPI and MMPI-2 scores of African Americans and Caucasians, and has investigated the clinical significance of these differences.

Controlling for demographic variables. McCreary and Padilla (1977) used an all male sample of African American, Mexican American, and Caucasian misdemeanor offenders to determine whether score differences might be a function of SES. They first examined an unmatched sample of 267 Caucasian, 40 African American, and 36 Mexican American offenders. The African American and Mexican American participants were then matched with Caucasian participants on educational level and occupation. McCreary and Padilla argued that if any apparent racial differences were really a function of SES, these differences should attenuate from the unmatched to the matched samples. Regarding the African American-Caucasian participant comparisons, analysis of the non-matched sample revealed significantly higher scores for Caucasians on scales 3 and 5. In the matched sample, the difference in scale 3 remained, but significantly higher scores for African Americans on scale 9 appeared, as well as higher elevations for Caucasians on the K scale. The authors simply concluded that socioeconomic factors alone could not explain differential scale elevations.

Bertleson, Marks, and May (1982) sought to investigate whether or not differences between African Americans and Caucasians would appear in an inpatient sample after controlling for various demographic variables. Four hundred and sixty-two African American and Caucasian psychiatric inpatients were matched on sex, age, place of residence (urban or rural), employment, education, marital status, hospital status, and date of testing with the MMPI. Patients were grouped by age as either adolescent (under 18), young adult (18-31) or adult (over 31). Controlling for all of these demographic variables resulted in no differential elevations between the groups.

Ingram, Marchioni, Hill, Caraveo-Ramos, and McNeil (1985) sought to determine whether or not race, recidivism, and type of crime would interact with scores on the MMPI in an all-male incarcerated sample. The authors created four groups representing each combination of race (African American and Caucasian) and rate of recidivism (recidivists and non-recidivists). All groups were matched on age, level of intellectual functioning, and SES. The authors examined all clinical and validity scales, as well as the special scales. No significant differences

were found for the clinical scales. Regarding the validity scales, African American recidivists scored higher than the three other groups on the F scale, and African American non-recidivists scored higher than the other three groups on the L scale.

In sum, researchers have investigated whether or not controlling for or matching certain populations on variables such as IQ, age, sex, diagnosis, type of criminal offense, history of recidivism, or SES, would result in a reduction or disappearance of any observed differences. Matching procedures and statistical control have generally resulted in a decrease or disappearance of differential elevations. Status variables seem to most consistently account for some of the variance in scores, but still leaves some variance unexplained.

Addressing clinical significance. Another major focus of previous research on racial differences on the MMPI is related to Greene's (1987) statement that the model study for investigation of racial group differences should include more than a comparison of mean elevations between the groups in question. He stated that, while comparison of means may be useful in that it provides preliminary support for racial bias, these analyses should be accompanied by analysis of racial differences in symptomatology related to MMPI scale elevations. According to Greene, this second step is necessary in order to determine the clinical significance of racial differences; or rather, whether or not differences in scores reflect a real difference in rate or severity of symptomatology or if they merit qualitatively different interpretations. Currently there exists no evidence for differential rates of the disorders associated with scales 8 and 9, (schizophrenia and bipolar spectrum disorders respectively) between different cultures or races (APA, 2002). In addition, research does not support the argument that differential MMPI scale elevations in African Americans are accompanied by differential rates of psychopathology. (Butcher, Braswell, & Raney, 1983; Frueh, Hamner, Bernat, Turner, Keane, & Arana, 2002).

Butcher, Braswell, and Raney (1983) made comparisons of MMPI clinical and validity scale elevations between Caucasian, African American, and Native American participants. Using an unmatched sample and a sample matched on sex, education, and occupational level, the authors compared each group for differences in presenting symptom complaints. For the unmatched sample (454 Caucasian and 97 African American participants) the authors found that Caucasians presented with significantly more depressive symptoms, and that African Americans

presented with significantly more aggression related symptoms and paranoid-type symptoms. There were no significant differences between the groups on other symptoms measured (anxiety related symptoms, alcohol related problems, or confused/psychotic symptoms). Similar results were found for the matched sample (97 Caucasians, 97 African Americans). Post hoc analyses revealed that African Americans scored higher, on average, than Caucasians and Native Americans on scales F, 6, 8, and 9 for both the matched and unmatched samples.

Frueh and colleagues (2002) examined scale 8 in a group of combat veterans diagnosed with Post Traumatic Stress Disorder (PTSD). Scale 8 was compared to clinician ratings of psychotic symptoms using the Psychotic Screen module from the Structured Clinical Interview for the DSM-III-R (Spitzer, Williams, Gibbon, & First, 1990). The authors found no racial differences in elevations of scale 8; however, African Americans endorsed significantly more symptoms of psychosis as measured by the SCID Psychotic Screen.

The findings from these two studies are inconsistent with what would be expected if higher MMPI scores were actually a function of African Americans presenting with greater psychiatric symptomatology. Butcher et al (1983), found only weak support for this possibility, because they found differential levels of paranoid symptomatology as well as higher scale 6 scores for African Americans. The authors could argue that scale score differences were accompanied by actual differences in symptomatology only for Scale 6, but not for three other scales that were differentially elevated. In addition, they pointed out that there was no differential elevation of scale 2 despite the fact that significantly more Caucasians presented with depressive symptoms. Frueh and colleagues (2002) found no support for differential levels for symptoms between African Americans and Caucasians, at least for scale 8. This suggests that differential MMPI-2 scores between African Americans and Caucasians are not a function of differences in severe psychiatric symptomatology between African Americans and Caucasians.

Limitations of Previous MMPI and MMPI-2 Research

Most of the existing studies of racial differences on the MMPI and MMPI-2 have considerable methodological limitations. The current study sought to specifically address three of these limitations. The first limitation of previous research is the lack of hypothesis testing in MMPI and MMPI-2 research on racial differences. The second limitation of previous research is

that it has neglected a priori examination of subscales. The last concern regards the absence of research on racial differences on the MMPI-2 using female populations.

Hypothesis testing. Previous research on racial differences on the MMPI and MMPI-2 has focused primarily on testing the statement that differential elevations exist. This involves comparing the mean scale elevations of African American and Caucasian groups. While this strategy is useful in finding support for the existence of differential elevations, it lacks the ability to provide either an explanation as to why these differential elevations may exist, or how these differential patterns of elevations affect the interpretation of scales. Previous studies have been largely exploratory and have posed no a priori hypotheses regarding patterns of differential elevations. In addition, no studies have tested hypotheses regarding why African Americans score higher on average than Caucasians on Scales F, 8, and 9 of the MMPI-2.

Studies that have used either a difference-in-means approach, either alone or accompanied by a test of empirical correlates as suggested by Greene (1987), have been largely exploratory. No a priori hypotheses regarding what scales would be differentially elevated or what extra-test criteria would be differentially correlated were posed in these tests. Exploratory analyses have served well to establish a consistent pattern of differential elevations, and can assist in generating hypotheses as to why these patterns may exist. Now, tests of a priori hypotheses regarding what accounts for these differences are necessary to significantly add to the current knowledge base.

Examination of subscale elevations. Accurate interpretation of an MMPI-2 profile requires that when a scale is elevated into the clinical range (at or above a T score of 65) and merits interpretation, the clinician must examine the relative contributions of each subscale to the total elevation of a given parent scale (Butcher & Williams, 2000). Depending on the pattern of the subscales elevated, different interpretations of the same parent scale can be made. For example, Scale 8 consists of six subscales, and each is associated with different traits in the test-taker (see Table 1). An MMPI-2 profile with an elevation on Scale 8 achieved primarily through endorsement of items on subscales Sc₁ and Sc₂ would require a very different interpretation than one with an elevation on Scale 8 achieved primarily through endorsement of items on subscales Sc₃ and Sc₆. The first profile would suggest feelings of being misunderstood, mistreated, despair, and loneliness, while the second profile suggests feelings of loss of control over thoughts,

unusual thought patterns, and experience of hallucinations. A similar argument can be made for scale 9, which has four subscales (Table 1). It is possible that African Americans' elevations on scales 8 and 9 are accompanied by particular subscale elevations; ones that reflect feelings of alienation and distrust in others. However, this possibility has never been examined, and currently there is only one documented exploration of subscale elevations in MMPI-2 research on racial differences (Butcher, Braswell & Raney, 1983, described earlier). In their examination of subscales, the authors found that, for scale 6, most of the differences could be accounted for by subscales Pa₁ (Persecutory Ideas) and Pa₃ (Naiveté). For Scale 8, most of the differences in elevations could be accounted for by subscales Sc₁ (Social Alienation), Sc₄ (Lack of Ego Mastery, Conative), and Sc₆ (Bizarre Sensory Experiences). For Scale 9, the subscales Ma₁ (Amorality) and Ma₃ (Imperturbability) accounted for most of the difference. Five of the seven noted subscale elevations (Pa₁, Sc₁, Sc₄, Ma₁, Ma₃) are consistent with the present hypotheses. Each of these five subscales is related to feeling misunderstood, a sense of distrust or despair, or a pessimistic view of others, all of which seem conceptually relevant to the perception that one has been discriminated against.

Research with female populations. It is interesting to note that, while many studies on racial/ethnic differences on the MMPI have used exclusively male samples (Ben-Porath, Shondrick, & Stafford, 1995; Holcomb & Adams, 1982; Holcomb, Adams & Ponder, 1984; Ingram, et al., 1985) and others have used data from both sexes (Arbisi, Ben-Porath, & McNulty, 2002; Bertelson, Marks, & May, 1982; Butcher, Braswell, & Raney, 1983; McNulty, Graham, Ben-Porath, & Stein, 1997; Smith & Graham, 1981; Sutker & Moan, 1973; Timbrook & Graham, 1994) only 1 study has addressed the topic of racial differences using an exclusively female sample (Harrison & Kass, 1967). In a study of racial differences on the MMPI in a sample of young, low SES pregnant women, the authors found African American women to score higher than Caucasian women on scales F, 1, 8 and 9. While this study found the expected differences in scale elevations, it is still reasonable to say that the female minority population has received very little attention in this area. This is particularly true for incarcerated samples. In fact, only one study on racial differences on the MMPI or MMPI-2 using an incarcerated sample has included women in their sample. Sutker and Moan (1973) examined differential scale elevations in a sample of 136 incarcerated men (56 African American and 80 Caucasian) and 36

incarcerated women (18 African American and 18 Caucasian). In the male sample, differential elevations appeared on scales 6, 8, and 9. No differences appeared in the female sample but, given the small sample size, it is highly possible that this is due to a lack of power. Additional research with female samples is necessary in order to determine whether or not African American women will consistently show the same pattern of elevations.

No study using an incarcerated sample has investigated racial differences on the MMPI or MMPI-2 in an all-female sample. This is particularly troublesome due to fact that the MMPI-2 is regularly used in forensic and correctional settings for a variety of purposes, including classification, evaluation of competency, sentencing, and treatment planning. Previous research with incarcerated populations has focused largely on male samples (Holcomb & Adams, 1982; Holland, 1979; McCreary & Padilla, 1977; Rosenblatt & Pritchard, 1978). While it is interesting to note that these studies have generally found differential elevations on scales F, 8 and 9, the generalizability of findings to the female incarcerated population remains largely unknown until now.

The Current Study

The current study made a complex set of predictions based on the research described above. First, it predicted that the general findings of research on differential elevations on the MMPI and MMPI-2 would be replicated in the MMPI-2's of a sample of incarcerated women. That is, it was predicted that African American incarcerated women would produce a higher mean elevation than Caucasian incarcerated women on Scales F, 8, and 9 of the MMPI-2. Second, it sought to test the hypotheses offered by Gynther (1972) and Dahlstrom, et al (1986) that differential elevations between African Americans and Caucasians on the MMPI-2 are the result of feelings of social and emotional alienation and a general sense of distrust or cynicism toward mainstream American society on the part of African Americans caused by a history of discrimination. Therefore, experience of discrimination was expected to mediate the relationship between race and scores on scales F, 8, and 9 in this sample.

Finally, because the current study proposed that elevations on scales 8 and 9 should reflect feelings of alienation, distrust, or cynicism, only certain subscale elevations should be related to experience of discrimination. Therefore, it was predicted that there would be a differential pattern of subscale elevations on scales 8 and 9, such that differences on subscales

Sc₁ and Sc₂ of scale 8 would account for differential elevations on the parent scale. Elevations of these subscales are generally indicative of feelings of being misunderstood or mistreated and sadness or despair and it was thought that these feelings are conceptually related to experience of discrimination. Differences on subscales Ma₁ and Ma₃ of scale 9 were predicted to account for differences on the parent scale. Elevations of these subscales are generally indicative of beliefs of others as untrustworthy or selfish, and impatience toward others, and it was thought that feelings are also conceptually related to experience of discrimination. In addition, it was predicted that experience of racial discrimination would mediate the relationship between race and subscales Sc₁, Sc₂, Ma₁, and Ma₃. Because previous research has found a relationship between certain demographic variables and MMPI-2 scores, additional exploratory analyses were conducted, including examination of education level and age as covariates on MMPI-2 scores. Experience of racial discrimination was also investigated for its possible effects as a moderating variable.

CHAPTER 2

METHODOLOGY

Participants

Participants in this study were 275 Caucasian and African American women incarcerated in a southeastern state prison at the time of data collection for a larger study. One hundred and twenty-six of these women comprised the Caucasian group, and the remaining 149 women comprised the African American group. All participants were treated in accordance with the ethical guidelines outlined by the American Psychological Association.

Caucasian sample. At the time of data collection, the mean age of these 126 women was 35.6 (SD=8.7). The mean highest grade completed of this group was 10.7 years (SD=2.05). The mean number of prior offenses was 6.58 (SD=7.5). Forty-four (34.9%) of these women were classified as minimum custody, 37 (29.4%) as medium custody, 16 (12.7%) as close custody, and data on this variable is missing for the remaining 29 (23.0%) women. Forty-eight (38.1%) of these women were incarcerated for a violent crime (i.e., murder, robbery, sexual offense or other personal offense).

African American sample. At the time of data collection, the mean age of these 149 women was 32.3 (SD=7.7). The mean highest grade completed of this group was 10.7 years (SD=1.52). The mean number of prior offenses was 8.14 (SD=7.2). Fifty (33.6%) of these women were classified as minimum custody, 44 (29.5%) as medium custody, 21 (14.1%) as close custody, and data on this variable is missing for the remaining 34 (22.8%) women. Sixty-five (43.6%) of these women were incarcerated for a violent crime (i.e., murder, robbery, sexual offense or other personal offense).

The two groups were compared on each of these five variables using chi square tests or independent samples t-tests where applicable, with a Bonferroni corrected p-value of .01. The two groups differed significantly only in regard to age. The mean age of the Caucasian sample is significantly higher than the mean age of the African American sample ($t(273)=3.27, p<.01$).

Instruments

Minnesota Multiphasic Personality Inventory-2. The MMPI-2 (MMPI-2; Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) is a 567 item true/false inventory that is designed to objectively assess the presence of psychopathology, as well as individual personality characteristics. The MMPI-2 was normed on 2,600 participants, 1,462 of which were women. For the F scale, internal consistency reliability for women is .69, and the test-retest reliability is .64. For scale 8, internal consistency reliability for women is .86 and test-retest reliability is .80. For scale 9, internal consistency reliability for women is .61 and test-retest reliability is .68.

The MMPI-2 consists of 8 validity scales and 10 clinical scales, all of which were developed using the empirical scale construction strategy. It also consists of many content and special scales, each developed independently and with a variety of development methods. The validity scales are generally used to assess whether or not a given profile is interpretable and, if it is not, to assess what test taking strategy was being used by the test taker to produce an invalid profile. The clinical scales are used to help assess the presence of a variety of psychological problems and concerns. The content and special scales also serve this function, but in addition, many of the content and special scales assess the presence of personal characteristics and tendencies. This study was particularly concerned with scales F, 8 and 9, of the MMPI-2. Table 1 describes scales F, 8 and 9, and Table 2 describes the remaining clinical scales.

The Quickview Social History. The Quickview Social History Questionnaire (Gianetti, 1987) is a 235-item, multiple-choice survey, designed to gather general information on one's social history. The Quickview was normed on 437 participants, with the internal consistency reliability ranging from .61 to .96, cross-validation reliability ranging from .55 to .97, and the test-retest reliability ranging from .77 to .89. Breakdown by gender was not available for the Quickview. The Quickview is a self-report inventory and, to date, there is little validity information available. Therefore, it may be subject to distortion by the participants.

This study was concerned with item number 11 of the Quick view, which asks, "On what basis have you experienced discrimination? Mark any that apply." Eight options are listed for this question: 1) sex, 2) race, 3) ethnic background, 4) sexual orientation, 5) handicap, 6) age, 7) weight, and 8) other. Written instructions allow the test taker to skip any questions that do not

apply to her. This item was treated as a dichotomous variable, so it was noted whether or not the participant endorsed experience of racial discrimination (option 2).

Procedure

At the time of data collection, prison staff randomly selected women to be placed on a “call out” list, such that every third name from an alphabetical list of the prison’s residents was pulled to be called out. If these women were available (i.e., “inside the fence”, or not in lockdown), they met with an experimenter and were asked to participate in the study, and informed that their participation in the study was voluntary. Informed consent was obtained.

The MMPI-2 and Quickview Social History Questionnaire were administered in groups of up to 10, along with other measures used as part of a larger study. These measures were administered over several days, but length of administration depended on the time it took each participant to complete the measures. Over the course of data collection, several inmates were either moved or transferred to other facilities, and no notice was given to the experimenters regarding these changes. Therefore, some Quickview or MMPI-2 data is missing or absent for some participants and thus, these individuals were excluded from the current study. Chi square tests and independent samples t-tests revealed no significant differences between those who did and did not complete a Quickview and those who did and did not complete an MMPI-2 in terms of race, level of custody, current offense, age, highest grade completed, or number of past criminal offenses (Bonferroni corrected p-value of .01).

Participants in this study were obtained from a larger sample of incarcerated women because they identified themselves as African American or Caucasian, completed a Quickview Social History Questionnaire, and completed the MMPI-2. Individuals who did not meet one or more of these criteria were excluded from the study. In addition, individuals were excluded from this study if they produced MMPI-2 profiles that met the following criteria: 1) a Cannot Say raw score greater than 20; 2) a Variable Response Inconsistency (VRIN) scale T score greater than 80 (cut scores recommended in Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989).

Although an F scale T score greater than 110 and an L scale T score of 85 is also normally used as exclusion criteria for incarcerated samples, this criterion was not applied when participants were selected for the proposed study. This is because it is believed that applying

these criteria to this study would restrict the range of scores on the clinical scales so that any racial differences in scores might be obscured.

CHAPTER 3

RESULTS

Scale Level Analyses

A one-way between groups multivariate analysis of variance was performed to investigate racial differences on the MMPI-2 profiles of incarcerated women. Race was a between groups factor (two levels) and all MMPI-2 clinical scales and the F scale were the dependent variables (11 levels). There was a statistically significant difference between African American and Caucasian women on the combined dependent variables: $F(11, 263)=3.871$, $p<.0001$; Wilk's Lambda=.861; partial eta squared=.139 .

In order to investigate which MMPI-2 scales were responsible for the significant differences between African Americans and Caucasians, a discriminant function analysis (DFA) was performed as a follow-up test. DFA is used to determine which variables in a set best discriminates between two or more groups. In the case of the current study, DFA was used to determine which MMPI-2 scales best discriminated between African Americans and Caucasians; or rather, which MMPI-2 scales best accounted for the differential profile pattern between the two groups. DFA uses canonical correlation analysis (CCA: an analysis of the relationship between two sets of variables) to answer this question. In the current study, a CCA was used to assess the relationship between race (a set of two variables) and MMPI-2 scores (a set of 11 variables). CCA uncovered a significant correlation between race and MMPI-2 scales ($R_c=.373$, $p<.0001$; Wilk's Lambda=.861, eigenvalue=.162) for which the canonical factor loadings (the correlation between the individual variable in a set and the weighted sum of the variable set) are presented in Table 3. Canonical weights (the weight given to a variable toward the weighted sum, represented in z-cores) are presented in Table 4. Examination of these tables reveals that the largest canonical factor loadings exist for scales 9, 8, and 5. The greatest canonical weights exist for scales 8 and F.

Next, a one-way between groups multivariate analysis of covariance (MANCOVA) was performed using only scales F, 8, and 9, in order to investigate the effect of experience of discrimination on these scales. There was a statistically significant difference between African

American and Caucasian women on the combined dependent variables: $F(3, 271)=5.596, p<.001$; Wilk's Lambda=.942; partial eta squared=.058. When this analysis was repeated using experience of discrimination as a covariate, the statistically significant differences remained, and the amount of variance accounted for remained virtually the same: $F(3, 262)=4.821, p<.003$; Wilk's Lambda=.948; partial eta squared=.052.

Subscale Level Analyses

A one-way between groups multivariate analysis of variance (MANOVA) was next performed to investigate racial differences on the subscales of scales 8 and 9. Race was a between groups factor (two levels) and the six subscales of scale 8 and four subscales of scale 9 were the dependent variables (10 levels). There was a statistically significant difference between African American and Caucasian women on the combined dependent variables: $F(10, 264)=4.043, p<.001$; Wilk's Lambda=.867; partial eta squared=.133.

In order to investigate which MMPI-2 scales were responsible for the significant differences between African Americans and Caucasians on the subscales of scales 8 and 9, a DFA was performed as a follow-up test. This analysis uncovered a significant canonical correlation between race and subscales ($R_c=.363, p<.001$; Wilk's Lambda=.867, eigenvalue=.153) for which the canonical factor loadings are presented in Table 5 and the discriminant function coefficients are presented in Table 6. Examination of these tables reveals that the largest canonical factor loadings exist for subscales $Ma_4, Sc_5, Sc_1,$ and Sc_6 . The greatest discriminant function coefficients exist for subscales Sc_4, Ma_4, Ma_2 and Sc_3 . This study's hypotheses predicted differential elevations for scales $Sc_1, Sc_2, Ma_1,$ and Ma_3 . As this study's hypotheses were clearly not supported at the subscale level, no further analyses were conducted at the subscale level.

Exploratory Analyses

A question that might be asked is whether or not experience of racial discrimination might have a moderating effect on scales F, 8, and 9. That is, do MMPI-2 scores elevate differentially depending on whether or not test takers report experience of discrimination? To answer this question, a multivariate analyses of variance was conducted using race and experience of racial discrimination as independent variables, and MMPI-2 scales as dependent variables. This creates a 2 (race) X 2 (experience of racial discrimination) X 3 (MMPI-2 scale)

multivariate analysis of variance. Due to the study's large sample size and the many analyses that were run, all exploratory analyses were run with an alpha level of .01. Results indicate neither a main effect of experience of discrimination ($F(3, 261)=2.357, p=.072$; Wilk's Lambda=.974; partial eta squared=.026) nor an interaction ($F(3,261)=1.346, p=.260$; Wilk's Lambda=.985; partial eta squared=.015).

Because previous research has found a relatively consistent effect of SES on differential scale elevations between African Americans and Caucasians, the current data was searched for any variables relevant to SES that could also be examined as covariates. Highest grade completed was used as an indicator of education level and was examined as a covariate for its effect on those scales that were found through DFA to account most for the differential profile pattern between the groups (scales F, 5, 8, and 9). In addition, because the two groups were significantly different in terms of age, the effect of this variable as a covariate was also examined. A MANOVA using these four scales again revealed the expected significant omnibus: $F(4, 270)=6.354, p<.001$; Wilk's Lambda=.914, partial eta squared=.086. When education and age were entered as covariates, the relationship between race and scores on scales F, 5, 8 and 9 of the MMPI-2 disappeared: $F(4, 216)=3.151, p=.015$, Wilk's Lambda=.945; partial eta squared=.055. In addition, education was found to account for 8.7% of the variance in scores on F, 5, 8 and 9 above and beyond race and age. Age was found to account for 7.9% of the variance in scores on F, 5, 8, and 9 above and beyond race and education.

Finally, univariate tests for each scale were conducted to examine their correspondence with the previously conducted CCA. Results of univariate analyses are summarized in Table 7 and profile patterns for the two groups are presented in Figure 1. Results indicate significant differences between the groups on scales 5, 8, and 9.

CHAPTER 4

DISCUSSION

Scale Level Analyses

Results of the present study indicate that African American and Caucasian incarcerated women in this sample showed a differential pattern of scale elevations on the MMPI-2, with an effect size of .139. In addition, results indicate that this differential pattern was accounted for primarily by higher mean elevations on scales F, 5, 8, and 9 for African American incarcerated women compared to Caucasian incarcerated women. A DFA revealed that scales 8 and F appear to account for the most unique variance in the relationship between race and MMPI-2 scales, while scales 9, 8 and 5 appear to be the most highly related to race, overall.

These findings are consistent with prior research on racial differences on the MMPI and MMPI-2. Thus, results from previous research on racial differences have been replicated in a sample of a previously unexamined population. That African American and Caucasian incarcerated women show differential pattern of scale elevations should be important and useful information in a setting that frequently relies on the MMPI as a source of information and is overpopulated with African Americans. Consistent with Greene's (1987) suggestions, a possible next step might be to examine the correlates of MMPI-2 scales in a female incarcerated sample, in order to answer the question of whether or not African Americans in this population actually present with more relevant symptomatology. However, it should be reiterated that previous studies investigating this question in other populations have not supported this hypothesis. Until this question is investigated, clinicians who work with this population should at least be aware of the possibility of test bias being present in the MMPI-2 profiles of African American incarcerated women.

Results of a MANCOVA using scales F, 8 and 9 as dependent variables indicate that experience of racial discrimination does not mediate the relationship between race and MMPI-2 scales, and thus has failed to find support for Gynther's (1972) hypothesis. It is possible that the lack of a relationship between experience of racial discrimination and MMPI-2 scores could be

the result of an inadequate measure of experience of discrimination. A single dichotomous item is unlikely a sensitive enough measure to adequately assess experience of discrimination. Given that the current hypotheses argued that experience of racial discrimination explains differential profile elevations, it is likely necessary to assess not only the perceived experience of discrimination, but also the perceived intensity, frequency, and pervasiveness and/or emotional and psychological responses to having these perceptions. This way, the researcher may be more likely to measure elements of experience of racial discrimination that may more strongly affect characteristics that are thought to be reflected by the differential profile elevations on scales F, 8 and 9. Measuring merely the presence/absence of experience of discrimination may have resulted in a loss of important additional information, and future tests of Gynther's hypothesis should include a more sensitive measure of experience of discrimination.

Subscale Level Analyses

Subscale level analyses did not reveal the presence of a pattern of subscale elevations on scales 8 or 9 that reflects many of the worldviews thought to be conceptually related to experience of discrimination. Recall that Butcher and colleagues (1983) found, post hoc, a pattern of subscale elevations related to feeling misunderstood, a sense of distrust or despair, or a pessimistic view of others; a pattern that seemed to support the idea that scale elevations in African Americans are related to experience of racial discrimination against. These results were not replicated in the current study.

If it is the case that experience of discrimination does not affect scale elevations on the MMPI-2, then the lack of relevant subscale elevations is not surprising. However, other explanations should also be considered. For example, some of these subscales are composed of as few as eight items, and it may be that the lack of findings at the subscale level are a function of low reliability. It is also problematic to interpret subscale scores when elevations on the parent scales are not in the clinical range, (i.e., a T score of 65 or more) as was the case in this sample (see Table 7) because both the reliability and utility of interpretations of scores below the clinical range is low (Butcher & Williams, 2000). Therefore, it is possible that MMPI-2 scores in this sample were not deviant enough to provide useful information. In the future, it may be useful to limit subscale examinations to participants who produce elevations on parent scales high enough to provide reliable interpretations. Also, as noted earlier, it may be necessary to

reexamine experience of racial discrimination using a more comprehensive measure of the construct, to determine if the lack of hypothesized subscale elevations are a function of low reliability, or if it is actually because experience of discrimination bears no relationship to scale elevations. If it is the case that experience of racial discrimination does not affect MMPI-2 scores even with a stronger measure, then it might be reasonable to abandon Gynther's (1972) hypothesis and examine other variables as mediators of the effect of race on MMPI-2 scores.

Exploratory Analyses

The current study found that education level and age together account for the effect of race on scales F, 8, and 9, with education accounting for slightly more unique variance in scores than age. This finding is consistent with the research reviewed earlier, which showed racial differences on the MMPI and MMPI-2 disappear or are attenuated when SES variables are controlled.

Regarding the variable of age in this sample, it appears that the significant difference in mean age between the groups accounts for some of the variance in scores. Previous research on the MMPI and MMPI-2 has found that scores on the right side of the MMPI/MMPI-2 profile tend to decrease with age (Groth-Marnat, 2003). This is particularly the case with scale 9, and it is thought this trend reflects a decrease in energy and activity levels that occur with age. The current findings, which show the younger group with more deviant scores, is consistent with this explanation.

Regarding the variable of education level, the findings are somewhat perplexing. In spite of the fact that the two groups did not differ significantly in mean highest grade completed, education showed a significant effect on scores. This may imply a differential effect of education on the MMPI-2 scores of African Americans and Caucasians in this sample. Unfortunately, it is difficult to explain why African Americans would require more education than Caucasians to produce less deviant scale elevations. Perhaps it is the case that, in spite of equal levels of education, African Americans still have a harder time gaining access to health resources, a possibility consistent with differential experience of discrimination on the part of African Americans. Another possibility could be that the experience of gaining equal status on socioeconomic variables causes stress that is reflected on MMPI-2 profiles.

Conclusions

The current study was successful at replicating the findings of previous research on racial differences on the MMPI-2 with a previously unexplored population: incarcerated women. In addition, through exploratory analyses, previous findings regarding the mediating effects of education and age were also replicated. This study was not able to find support for the idea that experience of racial discrimination also has moderating effects on MMPI-2 scores. It would be worthwhile to examine experience of racial discrimination using a stronger measure of the construct in order to more confidently rule out experience of racial discrimination as a mediator. In regard to the unexpected effect of education found in this sample, it would be worthwhile to examine constructs such as acculturative stress as an explanation to why African Americans with equal levels of education as Caucasians would score higher on MMPI-2 scales. In sum, the question of why African Americans score higher, on average, than Caucasians on MMPI-2 scales remains to be answered. The current study has begun to rule out Gynther's (1972) hypothesis as an answer to this question, and has introduced other interesting issues to be examined and clarified.

Table 1. Description of scales being investigated and their respective subscales (Adapted from Butcher & Williams, 2000)

F (Infrequency)	Generally reflects distress, disordered thinking or other severe psychopathology. High endorsement of the items suggests the individual may be trying to exaggerate psychological distress or symptomatology, or is indeed experiencing severe psychopathology. May also reflect random responding.
Scale 8 (Schizophrenia)	Originally designed to differentiate individuals with a diagnosis of schizophrenia from those with no known psychopathology. Items reflect a variety of concerns and are divided into six subscales. Each subscale contains different content, so Scale 8 must be interpreted in light of the relative contributions of the subscales to the elevation of the parent scale. Elevation of Scale 8 is associated with diagnosis of schizophrenia, and is the most commonly elevated scale in samples of severely mentally ill persons.
Sc ₁ (Social Alienation)	Reflects feelings of being misunderstood, mistreated, or loneliness.
Sc ₂ (Emotional Alienation)	Reflects feelings of despair, sadness, and hopelessness.
Sc ₃ (Lack of Ego Mastery, Cognitive)	Reflects strange or disordered thought processes or feelings of loss of control over thoughts.
Sc ₄ (Lack of Ego Mastery, Conative)	Reflects experience of extreme strain in one's life and an inability to cope with daily stressors.
Sc ₅ (Lack of Ego Mastery, Defective Inhibition)	Reflects feelings of loss of control over one's emotions.
Sc ₆ (Bizarre Sensory Experiences)	Reflects experience of hallucinations, unusual thoughts, or ideas of external reference.
Scale 9 (Hypomania)	Originally designed to differentiate individuals who were experiencing manic episodes from individuals with no known psychopathology. Elevations of this scale are associated with hyperactivity, grandiosity, and aggression.
Ma ₁ (Amorality)	Reflects a general view of others as selfish and untrustworthy and a tendency to justify one's own behavior by these terms.
Ma ₂ (Psychomotor Acceleration)	Reflects reported experience of pressured speech and thought processes, agitation, need for excitement and impulsivity.
Ma ₃ (Imperturbability)	Reflects impatience toward others, and lack of concern over the opinions of others.
Ma ₄ (Ego Inflation)	Reflects unrealistically high self-appraisal.

Table 2. Other MMPI-2 validity and clinical scales (Adapted from Butcher & Williams, 2000)

VRIN (Variable Response Inconsistency)	Indicates inconsistent random responding that invalidates an MMPI-2 profile.
TRIN (True Response Inconsistency)	Indicates inconsistent responding due to “yea” or “nay-saying”
L (Lie)	Indicates profile invalidity due to an overly virtuous self-presentation.
K	Indicates possible defensive responding or an attempt to present oneself as very well adjusted.
S (Superlative Self-presentation)	Indicates possible defensive responding or an attempt to claim only very positive personal characteristics.
Scale 1 (Hypochondriasis)	Associated with excessive bodily concerns without a physical basis, being selfish or self-centered a pessimistic outlook on life, attention demanding, and indirect expression of hostility.
Scale 2 (Depression)	Associated with dysphoric mood, self-depreciation, guilt-proneness, self-seclusion and the presence of a mood disorder.
Scale 3 (Hysteria)	Associated with immaturity, and egocentrism, social extroversion, friendliness, enthusiasm, and superficial interpersonal relationships.
Scale 4 (Psychopathic Deviate)	Associated with family or behavior problems of an aggressive, interpersonally manipulative, or impulsive nature.
Scale 5 (Masculinity-Femininity)	Associated with interests, values and personality characteristics traditionally or stereotypically linked to the opposite gender of the test taker.
Scale 6 (Paranoia)	Associated with suspiciousness, mistrust, delusional beliefs, excessive interpersonal sensitivity, rigid thinking, and externalization of blame.
Scale 7 (Psychasthenia)	Associated with feelings of anxiousness and agitation, and a ruminative or obsessive-compulsive nature.
Scale 0 (Social Introversion)	Associated with shyness and social avoidance at high scores, and extroversion and sociability at low scores.

Table 3. Canonical Factor Loadings for the Predictor Variables (Scale Level)

Variable	Canonical Factor Loading
Predictor Set	
F (Infrequency)	.304
1 (Hypochondriasis)	-.100
2 (Depression)	-.144
3 (Hysteria)	-.289
4 (Psychopathic Deviate)	-.100
5 (Masculinity-femininity)	.474
6 (Paranoia)	.332
7 (Psychasthenia)	.255
8 (Schizophrenia)	.478
9 (Hypomania)	.518
0 (Social Introversion)	.244

Table 4. Canonical Weights for the Predictor Variables (Scale Level)

Variable	Canonical Weight
Predictor Set	
F (Infrequency)	-.832
1 (Hypochondriasis)	-.231
2 (Depression)	-.219
3 (Hysteria)	-.245
4 (Psychopathic Deviate)	-.368
5 (Masculinity-femininity)	.348
6 (Paranoia)	.184
7 (Psychasthenia)	-.225
8 (Schizophrenia)	1.5
9 (Hypomania)	.253
0 (Social Introversion)	.303

Table 5. Canonical Factor Loadings for the Predictor Variables (Subscale Level)

Variable	Canonical Factor Loading
Sc₁	.586
Sc ₂	.313
Sc ₃	.470
Sc ₄	.342
Sc₅	.597
Sc₆	.561
Ma ₁	.247
Ma₂	.195
Ma ₃	.164
Ma₄	.753

Table 6. Canonical Weights for Predictor Variables (Subscale Level)

Variable	Canonical Weight
Predictor Set	
Sc ₁	.345
Sc ₂	.076
Sc ₃	.474
Sc₄	-.712
Sc ₅	.354
Sc ₆	.231
Ma ₁	-.045
Ma₂	-.522
Ma ₃	.350
Ma₄	.667

Table 7. Univariate Tests

Scale	Mean (SD) African Americans	Mean (SD) Caucasians	F	Sig.	Partial Eta Squared
F	71.8 (21.5)	66.7 (20.8)	4.082	.044	.015
1	52.3 (12.4)	53.3 (13.0)	.444	.506	.002
2	52.5 (10.4)	53.8 (12.5)	.911	.341	.003
3	47.2 (11.4)	49.9 (12.1)	3.704	.055	.013
4	65.7 (11.6)	66.7 (13.5)	.440	.508	.002
5	60.8 (11.0)	56.6 (11.0)	9.937	.002	.035
6	65.0 (17.1)	60.7 (14.9)	4.873	.028	.018
7	57.4 (12.7)	54.8 (13.3)	2.885	.091	.010
8	65.4 (15.1)	59.6 (15.4)	10.096	.002	.036
9	67.4 (13.4)	62.0 (12.6)	11.847	.001	.042
0	54.6 (8.1)	52.6 (11.7)	2.633	.106	.010

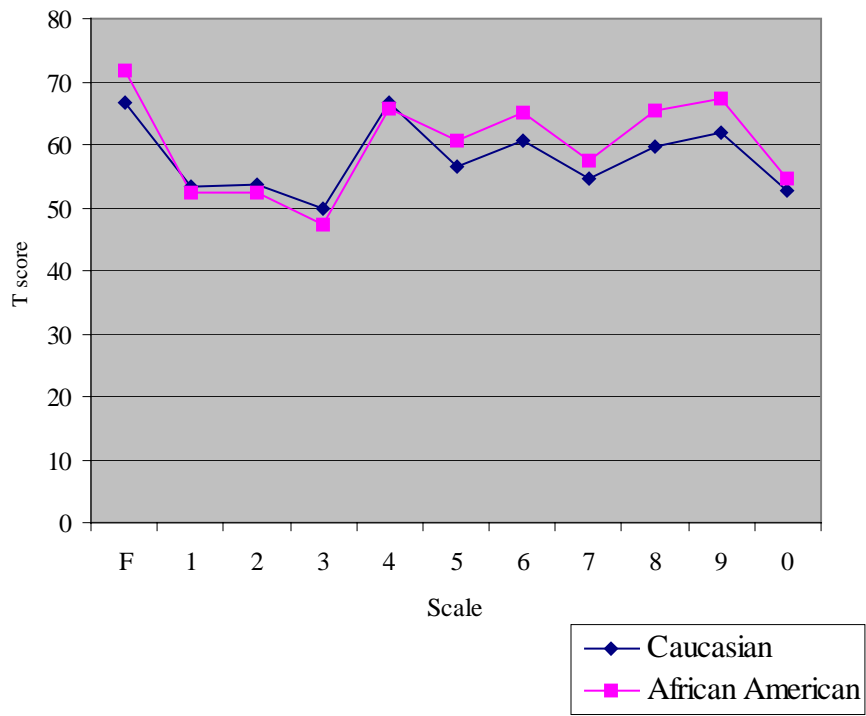


Figure 1. Mean Profile Elevations

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