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Comparative Validity of MMPI-A Scales Scores in African American and Caucasian Male Juvenile Delinquents

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COMPARATIVE VALIDITY OF MMPI-A SCALES SCORES IN AFRICAN AMERICAN AND CAUCASIAN MALE JUVENILE DELINQUENTS

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ABSTRACT

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This study examined comparative validity of the MMPI-A scale scores of African American and Caucasian male juvenile delinquents utilizing a step down hierarchical regression procedure proposed by Laughtenschlager & Mendoza (1986). The MMPI-A (Butcher et al., 1992) was administered to 281 African American and Caucasian juvenile delinquents while their caretakers filled out the CBCL (Achenbach, 1991; Achenbach & Rescorla, 2001) and DBRS (Barkley & Murphy, 1998), which were used as extra-test measures. Significant overall prediction bias was detected in 15 out of 56 regressions. Statistically significant prediction bias was found for a subset of criterion variables for Clinical Scales 2, 4, and 9, as well as Content Scales *A-dep, A-hea, A-ang,* and *A-con* and Supplementary Scale IMM. Slope bias was found for *A-hea* with "DSM-Oriented Somatic Problems". Statistically significant intercept bias was demonstrated for 13 out of 56 criterion variables. Overall, when statistically significant intercept bias was found, none exceeded a small effect size. Possible practical implications and directions for future research are presented.

This dissertation is dedicated to the women in my life who have given me hope when hope was lost, guidance when I had no direction and the will to persevere: Floretta Wilson, Alessandra LeGeros, Siobhan Dumas, Kenya White, and my baby girl Mikaylah.

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Introduction

With the ever-increasing diversity of a modern society, it continues to be psychology's goal that individuals obtain unbiased assessment regardless of ethnic background or social standing. This is particularly important within the areas of Clinical and Forensic psychology where assessment outcomes may inform treatment, have legal ramifications or both. If analysis of test structures indicate that there are differential outcomes for different groups based on gender, racial or cultural differences, it is important to determine whether these differences are simply based on group membership rather than the possibility that different constructs are being measured (American Educational Research Association, American Psychological Association, and The National Council on Measurement in Education, 1999).

Test bias exists when there is systematic error in the prediction of scores between two or more subgroups of a population that are matched on an underlying construct being measured (Anastasi & Urbana, 1997). Test bias may be assessed by the use of a multiple regression procedure pioneered by T.A. Cleary. The Cleary Rule (Cleary, 1968) states that test bias can be evaluated by testing two hypotheses with respect to the linear equation between a predictor and a criterion measure; first by looking at the equality of the slopes, then equality of the intercepts. If there is a difference in the slope it suggests that one group's performance is predicted less well than another based on the criterion measure. If there is an intercept difference, this suggests a difference in the level of estimated performance between the groups. Laughtenschlager & Mendoza (1986) established a comparable measure of test bias that assumes greater statistical power and

reduces the chance of a Type II error in concluding the absence of bias. This method will be discussed in more detail in another section of this paper.

The MMPI-2 (Butcher et al., 2001) and MMPI-A (Butcher et al., 1992) are the most widely used broadband measures of personality and psychopathology for adults and adolescents, respectively (Camara, Nathan & Puente, 2000; Archer & Newsom, 2000). There have been more studies on ethnicity using the MMPI (Hathaway & McKinley, 1993) and the MMPI-2 (Butcher et al., 2001) than any other psychological measure (Hall, Bansal, & Lopez, 1999). The greatest amount of research conducted with the original MMPI (Hathaway & McKinley, 1943) was with African American populations (Greene, 1987). A majority of the research with the MMPI (Hathaway & McKinley, 1943) and subsequently the MMPI-2 (Butcher et al., 2001) has focused on normative differences between African Americans and Caucasians. In its infancy, research with the original MMPI focused on ways in which scale elevations differed between African Americans and Caucasians (Greene, 1987; Gynther, 1989; Pritchard & Rosenblatt, 1980). Early research focused on normative comparisons that indicated that African Americans typically had more elevated mean scale scores than Caucasians on scales L (Lie), F (Infrequency), 8 (Sc) and 9 (Ma) (Ball, 1960; Butcher, Ball, & Ray, 1964; Hokanson & Calden, 1960; McDonald & Gynther, 1962, 1963). The results of early ethnicity studies (e.g. Gynther, Fowler, & Erdberg, 1971), using the MMPI raised concerns that test bias may exist via differential scale elevations, MMPI profiles, or item endorsement rates, and that these differences may not reflect the presence of true external criterion differences (Pritchard & Rosenblatt, 1980).

The results of these early studies brought several important issues into question. For example, were there confounding external variables (e.g., level of education, social discrimination) contributing to mean scale score differences between African Americans and Caucasians? Was the use of the original MMPI normative sample not appropriate for African Americans? In response to these questions, research on ethnicity and the original MMPI focused on two primary areas; the use of the MMPI to highlight possible psychopathological differences between African American and Caucasian populations (e.g., frequencies of MMPI scale elevations, differences in mean T-scores between ethnicities) and the examination of sources of bias with the MMPI (Dahlstrom & Gynther, 1986). Research with the original MMPI (and subsequently the MMPI-2 and MMPI-A) has occurred within a variety of settings. The focus of this study will be on adolescents. A review of these studies has been divided into forensic and non-forensic (e.g., psychiatric, nonclinical populations and substance abuse issues) adolescent populations for ease of discussion.

MMPI Ethnicity Research in Non-Forensic Samples

Before the development of the MMPI-A (Butcher, et al.1992), the original MMPI was used to assess adolescents. When examining a sample from a school setting, Ball (1960) found that African Americans and Caucasian males had similar mean scale scores, which were less divergent than their female counterparts. In addition, results across males and females were comparable to the findings of Hathaway and Monechisi (1963) who noted mean profile elevations for both groups on Scales F (Infrequency), 4 (Pd), 8 (Sc), and 9 (Ma).

McDonald and Gynther (1962) published a study similar to Ball (1960) but had a much larger sample size. They found that African Americans scored significantly higher than Caucasians on Scales L (Lie), F (Infrequency), 1(Hs), 2 (D) and 9 (Ma).

Moore and Handal (1980) questioned whether racial differences in MMPI scores were due to possible confounding variables such as intelligence, education, SES, and degree of psychological adjustment, or to broader cultural variables unrelated to individual psychopathology. The MMPI was administered to matched participants, and African Americans overall had higher scores on Scales L (Lie), F (Infrequency), and Cynicism (scale based on MMPI- items developed by the authors) than their Caucasian peers. There were no significant differences between African Americans and Caucasian males on the Clinical Scales. These results suggested that cultural differences may serve as the moderator of mean scale elevations versus the participant's level of racial adjustment and/or acculturation. Baughman and Dahlstrom (1968) examined seventh and eighth graders and found that African American boys and girls had higher mean elevations on Scales F, 2, 6, and 8 than did the corresponding Caucasian boys and girls.

MMPI Ethnicity Research in Forensic Samples

Mean score differences have been found when examining the use of the MMPI with African American and Caucasian forensic adolescents. Pancoast and Archer (1988) in their review of several studies, found that differences between African American and Caucasian adolescents on the MMPI were small and likely not clinically significant.

MMPI-2

In terms of ethnicity, the MMPI-2 (Butcher et al., 2001) normative sample is a more representative sample of the U.S. population in comparison to the MMPI normative sample, which was entirely Caucasian. Nevertheless, a more ethnically diverse normative sample does not ensure that a test is bias free.

Timbrook and Graham (1994) conducted two studies to investigate possible ethnic differences on MMPI-2 Clinical and Validity scales. Their sample consisted of 116 African American men, 176 African American women, 116 Caucasian men, and 176 Caucasian women. Results indicated that for males, Scale 8 was statistically significantly higher for African Americans, but the mean difference was less than the 5 T-score points typically used to indicate a clinically significant difference (Greene, 1987). For women, the means for Scales 4 (Pd), 5 (Mf) and 9 (Ma) were higher for African Americans than Caucasians, with all mean differences less than 5 T-score points, indicating small to medium effect sizes.

Next, Graham and Timbrook examined regression prediction errors. Here, participants included 72 African American men, 64 African American women, 72 Caucasian men, and 64 Caucasian women. Results showed no statistically significant differences in the mean error of partner predicted scores for Caucasian or African American men. With regard to women, Timbrook and Graham (1994) found that Scale 7 (Pt) showed a statistically significant difference in the error between African American and Caucasian women, with the underprediction of anxiety in African American women compared to Caucasian women.

McNulty, Graham, Ben-Porath, and Stein (1997) examined the comparative validity of MMPI-2 scale scores using a therapist rating scale with a sample of psychiatric outpatients. McNulty and colleagues found no statistically significant differences between mean MMPI-2 scale scores for African American and Caucasian patients from a community mental health center. Results indicated that African American males scored statistically significantly higher than Caucasian males on Scale L (Lie) and Content Scale FRS (Fears). These had medium effect sizes that were clinically significant, as they exceeded a difference of 5 T-score points (Greene, 1987). African American females scored higher than Caucasian females on Scale 9 (Ma), but the difference was not clinically significant. The authors found no statistically significant differences between African Americans and Caucasians for correlations between MMPI-2 scale scores and therapists' ratings. The results of McNulty et al. (1997) suggested that the type of test bias sometimes referred to as slope bias (Anastasi & Urbina, 1997) was not present. *Slope Bias (*Anastasi & Urbina, 1997) may be present if there is a failure to produce validity coefficients of similar magnitude between groups. That is, the test or scale yields a significantly higher validity coefficient for one group over another and is therefore less valid for one group than the other.

Schinka, LaLone, and Greene (1998) examined the effects of demographic variables such as marital status, occupation, ethnicity, and gender using a combined sub-sample of the MMPI-2 normative sample as well as an inpatient clinical sample diagnosed with alcohol or drug dependence. The final sample consisted of 500 subjects evenly divided from each sub-sample. The researchers, utilizing multiple linear regression, found that demographic variables did not have an effect on Clinical, Validity,

or Content Scale scores with the exception of the Fears (FRS) and Antisocial Practices (ASP) scales of the MMPI-2 (Schinka et al., 1998).

Hall et al. (1999) completed a meta-analytic review of research examining ethnic differences on the MMPI/MMPI-2. They discovered that although aggregate effect sizes were small (d = -.11 to .44), overall, African Americans had higher scores than Caucasians on Scales L (Lie), F (Infrequency), K (Correction), 1 (Hs), 7 (Pt), 8 (Sc), and 9 (Ma). Caucasians received higher scores on Scales 2 (D), 3 (Hy), 4 (Pd), 5 (Mf), and 0 (Si). The researchers stated that the small effect sizes found were less than 5 T-score points on any of the MMPI scales, deeming findings not clinically significant (Greene, 1987). Overall, the findings of Hall et al. (1999) suggested that the addition of ethnic minorities in the re-standardized normative sample of the MMPI-2 did not completely eliminate racial differences, particularly since effect sizes across studies did not vary as a function of research setting, socioeconomic variables, or use of the MMPI versus the MMPI-2. Hall et al.'s meta analysis was limited by the fact that no external criterion variables were examined.

Although ethnicity research on the original MMPI was voluminous, Handel & Ben-Porath (2000) noted that this body of research largely failed to address the most important issue in MMPI and MMPI-2 interpretation. That is, do the empirical correlates of MMPI (and MMPI-2/MMPI-A) scales generalize across ethnicities? Handel and Ben-Porath (2000) stressed that future research efforts in this area should be directed toward investigating whether or not MMPI-2 scales produce correlation coefficients (i.e., validity coefficients) of similar magnitude between African American and Caucasian populations when utilizing identical extra-test criteria.

In 2002, Arbisi, Ben-Porath, and McNulty investigated MMPI-2 validity of African American and Caucasian psychiatric inpatients. Two hundred and twenty nine African Americans (159 men, 70 women) and 1,558 Caucasians (1,233 men, 325 women) inpatients were examined via the MMPI-2 and a record review form developed for the study. The record review form was based on information that was obtained from the subject's psychiatric intake report, mental status exam and discharge summary. The form details specific information regarding demographic data, multiaxial diagnosis upon admission and discharge based on the Diagnostic and Statistical Manual of Mental Disorders, revised third and fourth editions (DSM III-R, DSM- IV; American Psychiatric Association, 1987, 1994, respectively), treatment information and disposition. The authors assessed bias in two ways; 1) a systematic difference in the slope of the regression line between the predictor and criterion variable (slope bias) and 2) when the predictor variable systematically over or underpredicts the criterion variable for a particular group (intercept bias). Both were investigated by using a step-down hierarchical multiple regression procedure (Laughtenschlager & Mendoza, 1986).

In terms of mean scale scores, *t* –tests indicated that African American men scored significantly higher on Scales F (Infrequency), 4 (Pd), 6 (Pa), 8(Sc), and 9 (Ma), than Caucasian men, exceeding the 5 T–score point threshold for clinical significance outlined by Greene (1987) on Scales F (Infrequency), 6 (Pa), 8 (Sc), and 9 (Ma). Caucasian men scored higher than African American men on the K (Correction) scale. With regard to the Content and Supplementary Scales, African American men scored significantly higher than Caucasian men on the Fears (FRS), Depression (DEP), Health Concerns (HEA), Bizarre Mentation (BIZ), Anger (ANG), Cynicism (CYN), Antisocial

Practices (ASP), Family Problem (FAM), Negative Treatment Indicators (TRT), MacAndrew Alcoholism Scale-Revised (MAC-R), and the Addiction Acknowledgment Scale (AAS). Results indicated that when bias was found, it was usually in the direction of underprediction of psychopathology in African Americans.

Overall, for the vast majority of criterion variables investigated, the findings of Arbisi et al. (2002) were generally inconsistent with the assumptions that the MMPI-2 may overpredict psychopathology in African Americans.

Increasingly, researchers are utilizing regression procedures as outlined by Laughtenschlager & Mendoza (1986) to explore racial differences in MMPI-2 samples. Castro, Gordon, Brown, Anestis, & Joiner Jr. (2008) used hierarchical regression and hierarchical logistic regression procedures to explore racial differences on the MMPI-2 within an outpatient sample. Similarly to Arbisi et al. (2002), these researchers found no support for race as a function of differential predictor of symptomatology, thus being consistent with earlier studies examining racial bias in the MMPI-2. In 2009, Monnot, Quirk, Hoerger, & Brewer examined bias in the prediction of psychiatric diagnoses of African American and Caucasian chemically dependent inpatients. The researchers found that African Americans had higher mean scale scores than Caucasians on almost all Clinical scales with clinically meaningful differences on 3 of these scales (African Americans having higher scores on Scale 9-Mania, and lower scores on Scales 2 – Depression and 3-Hysteria). African Americans also had higher mean scale scores than Caucasians on five RC Scales (Tellegen et al., 2003; RC3, RC4, RC6, RC8, and RC9) as well as Content Scales CYN, FRS, and ASP. However, with the exception of RC9, no mean scale score differences reached clinical significance (i.e., 5 T-score points). Step-

down hierarchical regressions revealed predictive bias for a majority of the scales examined with small to moderate effect sizes. Some scales overpredicted psychopathology for African Americans across the range of scores (e.g. Clinical Scales 1, 3 and 8 with criterion variable PTSD), whereas other scales underpredicted psychopathology for African Americans. These results were inconsistent with other study findings.

MMPI-2 Ethnicity Research in Forensic Samples

Ben-Porath, Shondrick, and Stafford (1995) studied the association between race and MMPI-2 scale scores in 137 Caucasian and 47 African American men who completed the MMPI-2 as part of a court-ordered forensic psychological evaluation. Statistically significant differences between the two groups were found only on the Content Scales CYN (Cynicism) and ASP (Antisocial Practices), with African Americans scoring higher than Caucasians. Overall, Caucasian and African American participants produced highly comparable MMPI-2 profiles.

Development of the MMPI-A

Prior to the development of the MMPI-A, a version of the MMPI designed specifically for use with adolescents, the original MMPI had been the most widely used objective instrument for assessing adolescents (Archer, Maruish, Imhof, & Piotrowski, 1991). Inherent problems included the use of adult norms for adolescents (tending to over pathologize illness) or adolescent norms (which tended to under pathologize disturbed adolescents in clinical settings). The solution was the development of the MMPI-A with a new set of norms for this assessment. The normative sample consisted of 805 boys and 815 girls, ranging in age from 14-18, who were randomly selected from

seven schools across the United States (Graham, 2006). The normative sample was representative of the ethnic and socioeconomic make up of the American population. The MMPI-A (Butcher et al.,1992) retained much of the original MMPI's Validity and Clinical Scales, but uniform T scores using pooled variances replaced linear T scores on scales 1-4 and 6-9. The 10 standard Clinical Scales for the MMPI-A were adopted from the original MMPI. Some scales have fewer items than the original MMPI and include some slightly rewritten items which correspond to the scales of the MMPI/MMPI-2, all of which have not been K corrected. The alpha coefficients for the clinical scales ranged from .34 to .85 for males and from .37 to .87 for females in the normative sample (Butcher et al., 1992).

Background of the Study

Development of the MMPI-A Content Scales

Butcher, Graham, Williams, & Ben-Porath (1990) developed these scales using a combination of rational and statistical methods (see Graham, 2006). They identified 22 categories of pathology using items taken from Form AX of the MMPI. Items on the scales were included based on inter-rater reliability, and item correlation in psychiatric and college populations. Weakly correlated items were removed from the provisional scales. Additionally, items that correlated highly with those on other provisional scales were also removed or placed on a different scale to reduce item overlap. In the final step, an item that met statistical requirements, but did not reflect the concept of the scale on which it was placed was deleted. The result was 15 scales that were deemed representative of the content dimensions of the MMPI-2 pool of items (Graham, 2006). The alpha coefficients of the Content Scales in the normative sample range from .72 to .86 for males and .68 to .86 for females (Graham, 2006). Content Scales that have a T-score greater than 60 are considered sufficiently elevated for interpretation.

Development of the MMPI-A Supplementary Scales

The MMPI-A Supplementary Scales were developed from a variety of sources including the MMPI item pool and new scales created from the MMPI-A item pool (Graham, 2000) via factor analysis. Welsh's (1956) Anxiety and Repression and the MacAndrew Alcoholism (MAC-R) scales (MacAndrew, 1965) were adopted from the MMPI. The Immaturity, Alcohol-Drug Problem Acknowledgement, and the Alcohol-Drug Problem Proneness scale are measures developed from the MMPI-A. These scales

were created with the intention of refining interpretation of the MMPI-A basic scales (Archer, 2005).

MMPI-A Ethnicity Research

MMPI-A research focusing on ethnicity is extremely limited. In preliminary studies of the clinical correlates of the MMPI-A, Cashel, Rogers, Sewell and Holliman (1998) found that Caucasian delinquent boys scored significantly higher than African American and Hispanic boys on scales 4 and 9, but relationships to variables external to the test were not examined by ethnicity.

Goals of the Study

The goal of this study was to explore whether or not scores on selected MMPI-A scales have comparable validity for African Americans and Caucasians in a forensic sample.

Although there have been three published studies to date (Arbisi et al., 2002, Castro et al., 2008, and Monnot et al., 2009) that examined possible test bias utilizing procedures detailed in Lautenschlager and Mendoza (1986), there have been none based on ethnicity using the MMPI-A . Further, as noted earlier in this document, while mean scale score differences have been identified between African Americans and Caucasians on the MMPI-A in some studies (e.g., Cashel, Rogers, Sewell, & Holliman,1998), other studies have failed to find statistically significant scale differences between the two groups (e.g., Archer, Bolinskey, Morton, & Farris, 2003). Further, as only a handful of researchers have explored the issue of slope bias on the MMPI-2, none with the MMPI-A, and only three studies (Arbisi et al., 2002; Castro et al., 2008; Monnot et al., 2009) incorporated intercept bias, this analysis attempts to explore the presence of bias within

the MMPI-A utilizing omnibus, slope and intercept bias. Due to the very limited nature of MMPI-A ethnicity research, data do not exist to form meaningful hypotheses for the present study.

Method

Participants

Data were collected from the records of adolescents who were court-ordered to undergo a forensic evaluation at an outpatient community mental health center between the years of 1999 and 2007. The preliminary dataset consisted of 761 boys and girls who received services at the center. One hundred and eleven boys and girls were removed from the data set that had a history of legal charges but no current charges. Also, 50 protocols produced by 12- and 13–year olds were removed.

Of the remaining 600 adolescents, 496 (315 boys, 181 girls) met the following MMPI-A validity criteria: L, K, VRIN, TRIN (T-scores) < 80; F, F1 and, F2 (T-scores) < 90; or Cannot Say < 30. Of these, 310 individuals were African American (62.5 %), 134 were Caucasian (27.0 %), 10 were Hispanic (2.0 %) , 21 were of mixed race (4.2 %), 1 Samoan (.2%), 1 Puerto Rican (.2%), 3 Asian (.6%), 2 Native American (.4 %) and 13 were Unknown (2.6%). One hundred and eighty one girls and 34 Non-Caucasian and Non-African American participants were removed from the final sample, as these groups were not large enough to provide a meaningful comparison utilizing hierarchical multiple regression analysis. As such, African American and Caucasian boys are the focus of this study.

The final sample consisted of valid MMPI-A protocols produced by 281 adolescent boys (197 African-American; 84 Caucasian). The mean age of the sample was 15.8 years (SD = 1.1). Of this sample, 71.1 % were African-American and 29.9% were Caucasian. Ninety-nine percent of adolescents in the sample received at least one DSM-IV diagnosis. The most common primary Axis I diagnoses were Impulse Control/

Behavioral Disorders (79.0%: including Antisocial Behavior, Conduct Disorder, Disruptive Behavior Disorder, Impulse Control Disorder, Intermittent Explosive Disorder, Oppositional Defiant Disorder, and Pyromania), Substance Abuse or Dependence Disorder (47.3%: including Alcohol Dependence, Cocaine Dependence, Cannabis Dependence, Polysubstance Dependence, Alcohol Abuse, Cannabis Abuse, Hallucinogen Abuse, and Substance Abuse), and Depressive Disorders (35.2%: including Major Depressive Disorder, Dysthymic Disorder, and Depressive Disorder NOS).

The most common reasons for these adolescents involvement with the legal system included; Current Violent Crime (47.0%), Assault (27.4%), Theft (24.9%) and, Child in Need of Services [CHINS (23.8%)]. Child in Need of Services reflects a petition from the child's caregiver to the court to receive the court's assistance in the behavior management of the child. CHINS petitions are usually granted only after an adolescent has had multiple legal offenses. As shown in Table 1, African Americans and Caucasians were comparable on most variables. The sole exception being that Caucasians were more likely to be diagnosed with Bipolar Disorders. See Table 1 for a full description of demographic characteristics.

Instruments

MMPI-A (Butcher et al., 1992). The MMPI-A consists of 478 true-false items and was developed to assess personality and psychopathology of individuals between the ages of 14 and 18. Extensive information regarding the psychometric properties of this measure has been presented in Butcher et al. (1992) and Archer (2005). The primary

Table 1

Frequencies of Demographic Variables

	Total Sample	African Americans	Caucasians
N	281	197	84
Mean Age	15.8 (*SD* = 1.1)	15.82 (SD=1.13)	15.90 (SD=1.18)
Grade:			
6th	3 (1.1%)	3 (1.5%)	-------
7th	17 (6.0%)	13 (6.6%)	4 (4.8%)
8th	44 (15.7%)	31 (15.7%)	13 (15.5%)
9th	96 (34.2%)	65 (33.0%)	31 (36.9%)
10th	43 (15.3%)	33 (16.8%)	10 (11.9%)
11th	29 (10.3%)	19 (9.6%)	10 (11.9%)
12th	14 (5.0%)	6 (3.0%)	8 (9.5%)

Table 1 (continued)

Graduated	2 (0.7%)	1 (0.5%)	1 (1.2%)
GED Program	24 (8.5%)	19 (9.6%)	5 (6.0%)
Unknown	2 (0.7%)	1 (0.5%)	1 (1.2%)
Ethnic Group:			
African-American	197 (70.0%)		
Caucasian	84 (29.9%)		
Axis I Diagnoses:			
Impulse Control/ Behavior			
Disorders	222 (79.0%)	159 (80.7%)	63 (75.0%)
Substance Use Disorders	133 (47.3%)	91 (46.2%)	42 (50.0%)
Depression Disorders	99 (35.2%)	74 (37.6%)	25 (29.8%)
ADHD Disorders	61 (21.7%)	37 (18.8%)	24 (28.6%)
Adjustment Disorders	29 (10.3%)	20 (10.2%)	9 (10.7%)
Relational Problems	27 (9.6%)	20 (10.2%)	7 (8.3%)

Table 1 (continued)

Abuse Disorders	18 (6.4%)	10 (5.1%)	8 (9.5%)
Bipolar Disorders	26 (9.3%)	7 (3.6%)	19 (22.6%)
Anxiety Disorders	14 (5.0%)	8 (4.1%)	6 (7.1%)
Learning Disorders	24 (8.5%)		
Current Legal Charges:			
CHINS Charge	67 (23.8%)	44 (22.3%)	23 (27.4%)
Assault Charge	77 (27.4%)	60 (30.5%)	17 (20.2%)
Miscellaneous Charge	72 (25.6%)	54 (27.4%)	18 (21.4%)
Theft Charge	70 (24.9%)	46 (23.4%)	24 (28.6%)
Drug/Alcohol Charge	48 (17.1%)	34 (17.3%)	14 (16.7%)
Property Charge	51 (18.1%)	35 (17.8%)	16 (19.0%)
Status-Offense	27 (9.6%)	20 (10.2%)	7 (8.3%)
Sexual Offense	31 (11.0%)	21 (10.7%)	10 (11.9%)
Weapons Charge	20 (7.1%)	14 (7.1%)	6 (7.1%)

Table 1 (continued)

Violent Offense	132 (47.0%)	97 (49.2%)	35 (41.7%)
Non-violent Offenses only	149 (53.0%)	100 (50.8%)	49 (58.3%)

History of Legal Charges (N=281; 197 African Americans and 84 Caucasians*):

Theft Charge	88 (31.3%)	64 (32.5%)	24 (28.6%)
Assault Charge	59 (21.0%)	39 (19.8%)	20 (23.8%)
Bad Conduct	48 (17.1%)	31 (57.7%)	17 (20.2%)
Status-Offense	39 (13.9%)	31 (15.7%)	8 (9.5%)
Property Charge	51 (24.1%)	33 (16.8%)	18 (21.4%)
CHINS Charge	33 (11.7%)	25 (12.7%)	8 (9.5%)
Drug/Alcohol Charge	34 (12.1%)	22 (11.2%)	12 (14.3%)
Weapons Charge	13 (4.6%)	11 (5.6%)	2 (2.4%)
Sexual Offense	11 (3.9%)	8 (4.1%)	3 (3.6%)
Violent Offense	95 (33.8%)	58 (29.4%)	25 (29.8%)

Table 1 (continued)

Non-violent offenses only	83 (29.5%)	68 (34.5%)	27 (32.1%)
No historical charges	102 (36.3%)	70 (35.5%)	32 (38.1%)
Unknown	1(0.4%)	1 (.5%)	----------

Note. CHINS = Child in Need of Services. * Percentages for historical charges represent percentage of individuals possessing a historical charge.

focus of this research was on the Clinical, Content (Williams, Butcher, Ben-Porath, & Graham, (1992)). In the MMPI-A normative sample, alpha coefficients range from .40 to .89 for the Clinical Scales, .55 to .83 for the Content Scales and .45 to .89 for the Supplementary Scales. In the present data set, alpha coefficients for the entire sample of 281 ranged from .29 to 74 for the Clinical Scales, .52 to .80 for the Content Scales and .43 to .80 for the Supplementary Scales. Alpha coefficients for African American males ranged from .32 to .90, .46 to .79, and .48 to.83 for the Clinical, Content and Supplementary Scales, respectively. Alpha coefficients for Caucasian males ranged from .25 to .89, .62 to .83, and .31 to .86, respectively (See Table 2).

Child Behavior Checklist (CBCL; Achenbach, 1991, Achenbach & Rescorla, 2001). The CBCL is completed by the adolescent's caregiver who evaluates the child's competence and adaptive functioning by rating his/her functioning in six areas of the

Table 2

Internal Consistency of the Child Behavior Checklist

Scale	Whole Sample N=281	African American N=197	Caucasian N=84
Syndrome Scales			
Anxious/Depressed	.84	.82	.86
Withdrawn/Depressed	.80	.80	.77
Somatic Complaints	.78	.77	.76
Social Problems	.82	.78	.75
Thought Problems	.78	.77	.76
Attention Problems	.86	.84	.80
Rule-Breaking Behavior	.86	.86	.86
Aggressive Behavior	.94	.92	.93
Internalizing	.90	.91	.91
Externalizing	.94	.94	.95
Total Problems	.97	.97	.97
DSM-Oriented			
Affective Problems	.82	.67	.71
Anxiety Problems	.72	.67	.73
Somatic Problems	.75	.72	.72
ADHD Problems	.84	.80	.80
Oppositional Defiant Problems	.86	.87	.89
Conduct Problems	.91	.87	.89

youth's life (sports, hobbies, clubs, work, interpersonal functioning, and academic functioning) and on 113 dimensions. A 0-1-2 (0 = not true, 1= somewhat or sometimes true, 2=very true or often true) scale is utilized to describe behavior observed within the past 6 months. Individual item scores are used to rate the adolescent on a variety of scales, including 8 Syndrome Scales and 3 Broad Dimension Scales. These syndrome scales have been described by Achenbach and Rescorla (2001) as "empirically based". The measure also includes a set of six "DSM-Oriented" scales designed to mirror DSM criteria. Data collection for this study began in the late 1990's, prior to the release of the CBCL/6-18 (Achenbach & Rescorla, 2001), therefore, the sample includes two versions of this measure: the CBCL/6-18 and CBCL/4-18 (Achenbach and Rescorla, 1991). For this study, all the earlier CBCL/4-18 protocols were re-scored with the new CBCL/6-18 (Achenbach & Rescorla, 2001) scales in accordance with the procedure outlined in Achenbach and Rescorla (2001). The authors reported adequate reliability for the instrument. Alpha coefficients for the Syndrome Scales and DSM-Oriented Scales of the normative sample, ranged from .63 (School) to .78 (Total Problems) with a mean alpha of .97 (Achenbach & Rescorla, 2001). In the present data set, alpha coefficients ranged from .78 to .97 for Syndrome Scales and from .72 to .91 for DSM-Oriented Scales in the total sample (See Table 3). Alpha coefficients for the Syndrome Scales ranged from .77 to .97 for African Americans and .75 to .97 for Caucasians, while alpha coefficients for DSM-Oriented Scales ranged from .67 to .87 and .71 to .89 for African Americans and Caucasians, respectively.

Table 3

Internal Consistency of Minnesota Multiphasic Personality Inventory –Adolescents Validity, Clinical, Content and Supplementary Scales

Scale	Whole Sample N=281	African American N=197	Caucasian N=84
Clinical			
L	.58	.58	.55
F1	.73	.76	.63
F2	.86	.86	.84
F	.90	.90	.85
K	.67	.67	.68
Hs	.74	.73	.76
D	.55	.54	.56
Hy	.57	.58	.56
Pd	.53	.53	.53
Mf	.29	.32	.25
Pa	.60	.62	.55
Pt	.86	.86	.87
Sc	.90	.90	.89
Ma	.55	.53	.59

Table 3 (continued)

Si	.74	.72	.75
Content			
ANX	.72	.68	.79
FRS	--	--	--
OBS	.72	.70	.76
DEP	.79	.79	.80
HEA	.80	.79	.80
BIZ	.78	.79	.74
ANG	.73	.73	.74
CYN	.78	.76	.80
ALN	.73	.71	.75
CON	.78	.75	.83
LSE	.78	.78	.79
LAS	.52	.46	.62
SOD	.76	.74	.79
FAM	.80	.79	.83
SCH	.69	.69	.74
TRT	.77	.77	.76

Table 3 (continued)

Supplementary			
MAC-R	.43	.48	.31
ACK	.59	.61	.52
PRO	.71	.67	.76
IMM	.84	.83	.86

Note: Hs = Hypochondriasis; D = Depression; Hy = Hysteria; Pd = Psychopathic Deviate; Mf = Masculinity-Femininity; Pa = Paranoia; Pt = Psychasthenia; Sc = Schizophrenia; Ma = Hypomania; Si = Social Introversion; ANX = Adolescent-Anxiety; OBS = Adolescent-Obsessiveness; DEP = Adolescent-Depression; HEA = Adolescent-Health Concerns; ALN = Adolescent-Alienation; BIZ = Adolescent-Bizarre Mentation; ANG= Adolescent-Anger; CYN = Adolescent-Cynicism; CON = Adolescent-Conduct Problems; LSE = Adolescent-Low Self-Esteem; LAS = Adolescent-Low Aspirations; SOD= Adolescent-Social Discomfort; FAM = Adolescent-Family Problems; SCH = Adolescent-School Problems; TRT = Adolescent-Negative Treatment Indicators; MAC-R = MacAndrew Alcoholism-Revised; ACK = Alcohol/Drug Problem Acknowledgement; PRO = Alcohol/Drug Problem Proneness; IMM = Immaturity; A = Anxiety; R = Repression.

Procedure

Data for this study were archival and obtained from records of psychological evaluations conducted between 1999 and 2007. These evaluations were court-ordered by

the Juvenile and Domestic Relations Court in order to assist with diagnosis, treatment planning, and future recommendations for delinquent youths. The adolescents in this study resided within the community for the most part, but a small percentage were transported from a juvenile detention facility for their evaluation.

All evaluations were conducted by a Licensed Clinical Psychologist, or pre-doctoral psychology intern, post-doctoral trainee, or pre-doctoral student directly supervised by a Licensed Psychologist.

The standard assessment battery administered included: a diagnostic interview with the adolescent, face to face interview with the parent or guardian, phone interview with probation or CHINS officer (if under their jurisdiction), review of court documents, e.g. (Witness Statements, court-ordered Social History, Probable Cause Statements,), The MMPI-A (Butcher et al, 1992), Youth Self Report (YSR; Achenbach, 1995; Achenbach & Rescorla, 2001), CBCL (Achenbach, 1991; Achenbach & Rescorla, 2001) and the Disruptive Behavior Rating Scale (DBRS; Barkley & Murphy, 1998). The CBCL and DBRS were completed by the adolescent's parent or guardian. A small number of adolescents also completed the Substance Abuse Subtle Screening Inventory (SASSI; Miller, 1990).

Disruptive Behavior Rating Scale –Parent Form (DBRS: Barkley & Murphy, 1998). The DBRS is a 31 item parent inventory that assesses ADHD, Oppositional Defiant Disorder and Conduct Disorder symptoms in their child. 26 items assessing ADHD and ODD are rated on a four-point scale (Never or Rarely, Sometimes, Often, Very often). 15 items based on DSM-IV criteria for Conduct Disorder are rated either yes or no. Parents respond based on whether their child has engaged in particular

behavior within the past 12 months. Although Barkley & Murphy (1998) only provides psychometric data for 5 year old to 13- year old children with ADHD, the ODD and Conduct Disorder criteria for this instrument maintains face validity as it is comprised of DSM-IV criteria i.e. stealing, truancy, or initiation of aggressive/assaultive behaviors.

Analyses

This study employed a regression procedure for examining hypotheses about test bias in prediction termed *step-down hierarchical regression* (Lautenschlager & Mendoza, 1986). This procedure has been used in various studies exploring possible ethnic bias in prediction using a variety of psychological instruments (e.g., Arbisi et al., 2002; Castro et al., 2008; Halpin, Simpson, & Martin, 1990; Monnot, Quirk, Hoerger & Brewer 2009; Rotundo & Sackett, 1999). Although step-up hierarchical regression procedures exist for the investigation of possible test bias (e.g., Bartlett, Bobko, Mosier, & Hannan, 1978), Lautenschlager & Mendoza (1986) reported that their procedure is more statistically powerful when testing for the possible existence of bias. The step-down hierarchical regression procedure employs three predictor variables and four regression models (Lautenschlager & Mendoza, 1986). The predictor variables consist of a test or scale score (X), a subgroup variable (S) to indicate ethnic group, and an interaction term (XS) that is derived by multiplying X and S for each case. In the current study, X was the MMPI-A scale under investigation, S was a dummy coded ethnicity variable (i.e., African American = 1, Caucasian = 2), and XS represented the cross product of the MMPI-A scale under investigation and the ethnicity variable. In the regression equations, the first variable (X) was used to determine if the MMPI-A scale under investigation was useful in predicting scores on the criterion. The second variable in this study (S, the ethnicity

variable) addresses the question of whether there are any intercept differences. Finally, the third variable (XS, the cross-product of the MMPI-A scale score and ethnicity) addresses the question of possible slope differences. The following regression models will be used to test hypotheses about bias in prediction:

1) $Y = b_1 + b_2X$

2) $Y = b_3 + b_4X + b_5S + XS$

3) $Y = b_6 + b_7X + b_8XS$

4) $Y = b_9 + b_{10}X + b_{11}S$

In each case, the Y (dependent) variable consisted of a CBCL or DBRS scale. The sequential (i.e., step down) strategy for investigating possible test bias outlined in Lautenschlager & Mendoza (1986) was utilized. The procedure was as follows:

Step 1. Was there reason to suspect test bias?

To answer this question, first the null hypothesis indicated in Model 1 was tested to determine if a common regression line accounted for the relation of MMPI-A scale scores and scores on the criterion measure. That is, the MMPI-A scale scores (X) were entered in the first block of the regression equation. Then, the increment in R^2 (R^2 change) was examined by adding the S and XS variables into the second block of the regression. If the resulting model (Model 2 listed above) did not indicate a significant increment in prediction (i.e., a significant increment in R^2) over the MMPI-A scale (X) alone (see model 1 above), bias was not suggested and the procedure was terminated. However, if bias was suggested by a significant increment in R^2, additional tests were conducted to determine the nature of the bias (i.e., slope bias, intercept bias, or both). If that was the case, step #2 in the procedure was implemented.

Step 2. Are the slopes different?

In this case, model 4 was compared to model 2. Specifically, X and S were entered in the first block of the regression equation (model 4), and the cross product term (XS) was entered in the second block. Here, a significant increment in R^2 in the second block of the regression suggested slope bias. In this case, an additional test (step 3a) was conducted to test for intercept bias in addition to slope bias. If model 2 did not provide a significant increment in prediction in step 2, slope bias was not suggested, but intercept bias may still be present in the absence of slope bias. In this case, step 3b was employed to test for intercept bias in the absence of slope bias.

Step 3a. Are the intercepts different (slope bias present)?

For this test, model 3 was compared to model 2. In other words, the variables in the first block of the regression equation consisted of X and XS, and the variable S was entered in the second block. If model 2 provided a significant increment in prediction, both intercept and slope bias were suggested. If this was not the case, only slope bias was suggested (from Step 2).

Step 3b. Are the intercepts different (slope bias not present)?

This was a test of model 1 versus model 4. That is, in this case the first block of the regression consisted solely of the MMPI-A scale scores (X). The ethnicity subgroup variable (S) was entered in block 2. Here, a significant increment in R^2 suggested intercept bias in the absence of slope bias.

Results

For the initial analyses, shown in Table 4, mean T-scores were compared for the Validity, Clinical, Content, Supplementary, and CBCL scales. For the calculation of mean MMPI-A T-scores, I used the procedure recommended by Tellegen and Ben-Porath (2008) for the MMPI-2- Restructured Form (MMPI-2-RF; Tellegen & Ben-Porath, 2008). Specifically, all T-score means were calculated based on unrounded, untruncated T-scores. Table 4 also includes an index of effect size, Hedges unbiased estimator for g (Hedges & Olkin, 1985), with 95% confidence intervals. Effect sizes and confidence intervals were calculated using Zumastat (Jaccard, 2006).

In terms of traditional null hypothesis significance testing, any confidence interval in Table 4 that does not include a value of zero is statistically significant at $p \leq .05$. As seen in Table 4, African Americans scored higher than Caucasians to a statistically significant degree on Validity Scales F1, F2, F, and VRIN. African Americans scored higher that Caucasians on Clinical Scales Hs, D, and Si. African Americans also had higher mean scale scores than Caucasians on multiple Content Scales including *A-hea*, *A-biz*, *A-aln* and *A-sod*. African Americans had higher mean scale scores than Caucasians on Supplementary Scale Welsh's R. Importantly, none of the mean scale score differences were large enough to reach clinical significance (i.e., a 5 T-score point difference) as defined by Greene (1987) for the original MMPI.

With regard to the CBCL, scores were somewhat contrary to those found with the MMPI-A. Caucasians tended to have higher mean scale scores than African Americans which were statistically significant on Syndrome Scales, "Rule-Breaking Behavior", "Aggressive Behavior" and "Externalizing". Comparable results were noted when

Table 4

Mean Scores, Standard Deviations and Effect Sizes of MMPI-A and CBCL Scales by Race

Basic Profile

	Scale	L	F1	F2	F	K	VRIN
African American	*M (SD)*	58.1 (10.7)	57.8 (10.6)	53.4 (11.2)	55.7 (10.8)	53.8 (9.2)	53.5 (10.0)
Caucasian	*M (SD)*	55.9 (9.8)	53.9 (8.0)	48.8 (9.2)	51.1 (8.0)	53.8 (9.4)	48.9 (7.5)
	g (95%CI)	0.21 (-.05,.47)	0.39 (.14,.65)	0.43 (.17,.69)	0.46 (.20,.72)	0 (-.26,.26)	0.49 (.23,.75)
	Scale	TRIN	Hs	D	Hy	Pd	MF
African American	*M (SD)*	51.7 (11.5)	52.8 (9.3)	56.6 (9.3)	53.0 (9.7)	59.6 (10.9)	45.4 (9.3)
Caucasian	*M (SD)*	51.5 (8.8)	49.3 (9.1)	54.2 (8.8)	51.6 (8.9)	60.9 (10.7)	44.1 (8.6)
	g (95%CI)	0.02 (-.24,.27)	0.38 (0.12,.64)	0.26 (.01,.52)	0.15 (-.11,.40)	0.12 (-.38,.14)	0.14 (-.11,.40)

Table 4 (continued)

	Scale	Pa	Pt	Sc	Ma	Si
African American	*M (SD)*	53.5 (11.5)	48.2 (10.2)	51.8 (11.3)	53.2 (10.6)	49.8 (8.4)
Caucasian	*M (SD)*	52.6 (9.9)	47.5 (10.1)	49.0 (10.6)	51.5 (10.3)	45.9 (8.8)
	g (95%CI)	0.08 (-.17,.34)	0.07 (-.19,.32)	0.25 (-.01,.51)	0.16 (-.09,.42)	0.46 (.20, .72)

Content

	Scale	ANX	OBS	DEP	HEA	BIZ	ANG	CYN	ALN
African American	*M (SD)*	50.1 (8.8)	46.6 (8.6)	51.5 (9.9)	54.0 (9.8)	52.3 (11.4)	49.3 (10.8)	52.3 (10.6)	51.3 (10.6)
Caucasian	*M (SD)*	49.3 (10.1)	47.7 (9.4)	50.5 (10.7)	50.0 (9.2)	48.4 (9.3)	49.6 (11.2)	50.7 (10.8)	47.9 (10.2)
	g (95%CI)	0.09 (-.17,.34)	0.12 (-.38,.13)	0.10 (-.16,.35)	0.41 (.16-,67)	0.36 (.10,.62)	-0.03 (-.28,.23)	0.15 (-.11,.41)	0.32 (.07-.58)

Table 4 (continued)

	Scale	CON	LSE	LAS	SOD	FAM	SCH	TRT
African American	*M (SD)*	52.4 (11.1)	49.4 (11.2)	51.5 (9.7)	49.5 (9.3)	53.3 (10.3)	55.7 (11.5)	50.0 (11.2)
Caucasian	*M (SD)*	51.4 (12.9)	49.5 (11.5)	50.8 (10.7)	45.7 (9.4)	52.5 (11.2)	56.7 (12.3)	47.6 (10.6)
	g (95%CI)	0.09 (-.17,.34)	-0.01 (-.26,.25)	0.07 (-.19,.33)	0.41 (.15,.66)	0.08 (-.18,.33)	-0.09 (-.34,.17)	0.22 (-.04,.47)

Table 4 (continued)

		Supplementary					
	Scale	Welsh's A	Welsh's R	MACR	ACK	PRO	IMM
African American	*M (SD)*	47.8 (9.1)	54.1 (9.6)	59.0 (9.7)	51.3 (9.6)	55.3 (10.5)	52.2 (10.6)
Caucasian	*M (SD)*	47.5 (10.5)	51.5 (8.2)	58.0 (8.5)	50.3 (8.1)	57.5 (12.2)	50.4 (11.4)
	g (95%CI)	0.03 (-.22,.29)	0.28 (.03,.54)	0.11 (-.15,.36)	0.11 (-.15,.36)	-0.2 (-.46,.06)	0.17 (-.09,.42)

		CBCL Scales					
	Scale	Withdrawn/ Depressed	Somatic Complaints	Anxious/ Depressed	Social Problems	Thought Problems	Attention Problems
African American	*M (SD)*	60.5 (8.0)	58.5 (8.2)	57.2 (8.6)	57.5 (8.1)	59.3 (8.6)	58.7 (7.5)
Caucasian	*M (SD)*	60.9 (8.4)	59.7 (8.5)	59.5 (9.6)	59.2 (7.7)	61.1 (8.7)	58.7 (5.9)
	g (95%CI)	-0.06 (-.33,.22)	-0.15 (-.42,.13)	-0.26 (-.54,.01)	-0.21 (-.48,.07)	-0.20 (-.48,.07)	0.00 (-.27,.28)

Table 4 (continued)

		CBCL Scales					
	Scale	Rule-Breaking Behavior	Aggressive Behavior	Internalizing	Externalizing	CBCL total score	DSM Affective
African American	*M (SD)*	64.3 (8.7)	61.9 (10.2)	57.6 (10.6)	62.7 (10.3)	60.2 (10.4)	59.5 (9.2)
Caucasian	*M (SD)*	67.0 (8.0)	66.0 (11.6)	59.8 (11.0)	66.6 (9.5)	63.3 (9.0)	63.6 (10.1)
	g (95%CI)	-0.32 (-.60,-.05)	-0.38 (-.66,-.10)	-0.21 (-.48,.07)	-0.39 (-.66,-.11)	-0.23 (-.49,.02)	-0.44 (-.72,-.16)
	Scale	DSM Anxiety	DSM Somatic	DSM ADHD	DSM Oppositional	DSM Conduct	
African American	*M (SD)*	57.2 (7.5)	58.0 (8.2)	56.3 (6.7)	62.0 (9.6)	64.3 (8.7)	
Caucasian	*M (SD)*	57.6 (7.5)	58.3 (8.3)	57.4 (6.5)	64.6 (9.2)	67.5 (9.0)	
	g (95%CI)	-0.04 (-.32,.23)	-0.04 (-.31,.23)	-0.16 (-.44,.11)	-0.27 (-.55,.00)	-0.36 (-.64,-.09)	

Note. CBCL= Child Behavior Checklist (Achenbach & Rescorla, 2001); indicates the effect size between African American and Caucasians in the sample. *M (SD)* = scores with invalid protocols removed. CI= Confidence Interval. Intervals that do not include zero are statistically significant at $p < .05$ (g = Hedge's g: Hedges & Olkin, 1985).

examining, DSM-Oriented Scale "Conduct". Overall, CBCL T-scores were higher than MMPI-A T-scores likely due to the fact that the CBCL uses truncated T-scores (i.e., T-scores below 50 are set to 50).

In order to ascertain the presence of bias, fifty six moderated multiple regressions were run and of these, significant overall prediction bias was detected in 15 regressions (See Table 5). Alpha was set at .05 for all analyses because Type II errors were deemed to be more serious than Type I errors. Further, MMPI-A raw scores were centered as recommended by West and Aiken (1991). For the 15 regression equations that showed overall prediction bias, effect size point estimates (ΔR^2) ranged from .024 to .046. Statistically significant prediction bias for a subset of criterion variables was found for Clinical Scales 2,4, and 9; Content Scales A-*dep*, A-*hea*, A-*ang*, and A-*con*. With regard to Clinical Scale 2, significant prediction bias was limited to criterion variable "DSM-Oriented Affective Problems" (ΔR^2 =.046, p<.01) on the CBCL. For Scale 4, CBCL "Aggressive Behavior", (ΔR^2 = .028, p< .05) and "Externalizing", (ΔR^2 = .026, p< .05) showed statistically significant bias. Scale 9 was statistically significant with CBCL "Externalizing", (ΔR^2 =.033, p<.05) and the DBRS "Hyperactivity" scale (ΔR^2 = .029, p< .05). With regard to Content scales *A-dep, A-hea, A-ang*, and *A-con*, overall bias was found for A-*dep* with "DSM-Oriented Affective Problems" (ΔR^2 =.046, p<.01), A- *hea* with " DSM-Oriented Somatic Problems" (ΔR =.027, p<.05), A-*ang* with "Aggressive Behavior" (ΔR^2 =.030, p<.05), "Externalizing" (ΔR^2 =.028, p<.05) and, "DSM-Oriented Conduct Problems" (ΔR^2 =.024, p<.05), respectively. *A-con* had overall prediction bias with "Aggressive Behavior: (ΔR^2 =.036, p<.05), "DSM-Oriented Conduct Problems" (ΔR^2 =.029, p<.05), and "Externalizing" (ΔR^2 =.034, p<.05) variables. Supplementary

Table 5

Regression Analyses of Dependent Variables on selected Minnesota Multiphasic Personality Inventory-Adolescent (MMPI-A) Clinical Content and Supplementary Scales, Ethnicity and Scale x Ethnicity Interaction Term (Boys only n= 281)

	Full model							
	b							
MMPI-A Scale Dependent Variable	Intercept	IV	Ethnicity	IV x Ethnicity	R^2	Prediction bias ΔR^2	Slope bias ΔR^2	Intercept bias ΔR^2
Scale 1 (Hs)								
CBCL-Somatic Complaints	2.522	.010	.601	.167	.027	.020		
	(.223)	(.049)	(.409)	(.090)				
CBCL-DSM Somatic Problems	1.747	-.010	.241	.140	.024	.020		
	(.161)	(.036)	(.297)	(.065)				
Scale 2 (D)								
CBCL-Anxious/Depressed	4.024	.178	1.358	.059	.069**	.022		
	(.316)	(.065)	(.574)	(.116)				
CBCL-Withdrawn/Depressed	4.006	.090	.325	.009	.022	.002		
	(.243)	(.050)	(.441)	(.089)				
CBCL-Internalizing	10.540	.318	2.187	.143	.051**	.014		
	(.664)	(.136)	(1.206)	(.244)				

Table 5 (continued)

MMPI-A Scale Dependent Variable	Full model							
	b							
	Intercept	IV	Ethnicity	IV x Ethnicity	R^2	Prediction bias ΔR^2	Slope bias ΔR^2	Intercept bias ΔR^2
CBCL- DSM Affective	3.855	.111	1.989	.097	.066**	.046**	.003	.044**
	(.323)	(.066)	(.587)	(.119)				
Scale 3 (Hy)								
CBCL- Somatic Complaints	2.523	.011	.484	.102	.017	.012		
	(.223)	(.039)	(.404)	(.077)				
CBCL- DSM Somatic	1.748	-.015	.134	.072	.007	.007		
Problems	(.162)	(.029)	(.294)	(.056)				
Scale 4 (Pd)								
CBCL-Rule-breaking	8.893	.299	1.595	.027	.082***	.016		
Behavior	(.435)	(.090)	(.786)	(.168)				
CBCL- Aggressive Behavior	10.597	.319	2.770	.091	.076***	.028*	.001	.028**
	(.581)	(.121)	(1.049)	(.224)				
CBCL- Externalizing	19.490	.618	4.364	.118	.090***	.026*		
	(.941)	(.196)	(1.701)	(.363)				
CBCL- DSM Oppositional	4.834	.135	.872	.023	.071**	.018		
	(.226)	(.047)	(.409)	(.087)				
CBCL- DSM Conduct	8.694	.242	1.963	.067	.066**	.023		
	(.462)	(.096)	(.835)	(.178)				

Table 5 (continued)

MMPI-A Scale Dependent Variable	Full model							
	b							
	Intercept	IV	Ethnicity	IV x Ethnicity	R^2	Prediction bias ΔR^2	Slope bias ΔR^2	Intercept bias ΔR^2
DBRS- ODD	2.876	.086	.761	.096	.058**	.021		
	(.220)	(.045)	(.393)	(.084)				
DBRS-Conduct	3.103	.148	.574	.033	.096***	.011		
	(.198)	(.041)	(.352)	(.075)				
Scale 6 (Pa)								
CBCL-Thought Problems	3.636	.041	.846	.234	.035*	.023		
	(.290)	(.065)	(.524)	(.130)				
Scale 7 (Pt)								
CBCL-Thought Problems	3.637	.072	.784	.071	.050**	.014		
	(.287)	(.038)	(.519)	(.067)				
CBCL-Internalizing	10.637	.192	1.779	.146	.056**	.012		
	(.660)	(.088)	(1.192)	(.153)				
CBCL-Anxious/Depressed	4.078	.118	1.142	.039	.074***	.017		
	(.315)	(.042)	(.568)	(.073)				
CBCL-DSM Anxiety	1.950	.044	.126	.029	.041**	.003		
	(.161)	(.021)	(.290)	(.037)				
Scale 8 (Sc)								
CBCL Thought Problems	3.607	.045	.968	.058	.046*	.018		
	(.289)	(.027)	(.525)	(.049)				

Table 5 (continued)

MMPI-A Scale Dependent Variable	Full model *b*							
	Intercept	IV	Ethnicity	IV x Ethnicity	R^2	Prediction bias ΔR^2	Slope bias ΔR^2	Intercept bias ΔR^2
Scale 9 (Ma)								
CBCL- Externalizing	19.330	.380	4.957	.076	.053**	.033*	.000	.032**
	(.961)	(.208)	(1.737)	(.355)				
DBRS-Hyperactivity	7.315	.010	2.290	.123	.029	.029*	.002	.027*
	(.490)	(.109)	(.880)	(.181)				
Anxiety								
CBCL- Anxious/Depressed	4.048	.221	1.180	.053	.064**	.017		
	(.316)	(.089)	(.571)	(.141)				
CBCL- Internalizing	10.618	.400	1.850	.141	.049**	.010		
	(.663)	(.186)	(1.197)	(.297)				
CBCL-DSM Anxiety	1.946	.078	.142	.045	.033*	.003		
	(.161)	(.045)	(.291)	(.072)				
Obsessiveness								
CBCL-Thought Problems	3.650	.060	.702	.100	.017	.009		
	(.293)	(.094)	(.530)	(.159)				
CBCL- Anxious/Depressed	4.092	.052	1.045	.143	.024	.017		
	(.323)	(.104)	(.585)	(.176)				

Table 5 (continued)

MMPI-A Scale Dependent Variable	Full model							
	b							
	Intercept	IV	Ethnicity	IV x Ethnicity	R^2	Prediction bias ΔR^2	Slope bias ΔR^2	Intercept bias ΔR^2
Depression								
CBCL-Withdrawn/Depressed	4.019 (.239)	.125 (.054)	.300 (.431)	.075 (.092)	.051**	.004		
CBCL-Internalizing	10.596 (.655)	.369 (.148)	1.982 (1.183)	.276 (.252)	.072**	.015		
CBCL-DSM Affective	3.898 (.318)	.173 (.072)	1.911 (.574)	.129 (.122)	.096***	.046**	.004	.042**
CBCL- Anxious/Depressed	4.056 (.314)	.204 (.071)	1.234 (.567)	.078 (.120)	.080***	.020		
Health Concerns								
CBCL-Somatic Complaints	2.535 (.223)	-.013 (.041)	.610 (.412)	.161 (.077)	.026	.023		
CBCL-DSM Somatic Problems	1.758 (.161)	-.023 (.030)	.261 (.298)	.142 (.056)	.029	.027*	.027*	.002

Table 5 (continued)

MMPI-A Scale Dependent Variable	Full model							
	b							
	Intercept	IV	Ethnicity	IV x Ethnicity	R^2	Prediction bias ΔR^2	Slope bias ΔR^2	Intercept bias ΔR^2
Adolescent Alienation								
CBCL- Social Problems	3.142	.114	.917	.125	.039*	.018		
	(.251)	(.075)	(.460)	(.132)				
CBCL- Withdrawn/Depressed	4.018	.054	.465	.247	.037*	.018		
	(.242)	(.072)	(.442)	(.126)				
Bizarre Mentation								
CBCL-Thought Problems	3.599	.123	1.020	.156	.032	.016		
	(.292)	(.083)	(.537)	(.170)				
Anger								
CBCL-Aggressive Behavior	10.576	.550	2.854	.115	.102***	.030*	.001	.029**
	(.572)	(.167)	(1.033)	(.291)				
CBCL-Externalizing	19.447	.990	4.528	.153	.112***	.028*	.000	.027**
	(.930)	(.271)	(1.678)	(.473)				
CBCL- DSM Oppositional	4.826	.256	.910	-.064	.096***	.021		
	(.223)	(.065)	(.403)	(.114)				

Table 5 (continued)

MMPI-A Scale Dependent Variable	Full model							
	b							
	Intercept	IV	Ethnicity	IV x Ethnicity	R^2	Prediction bias R^2D	Slope bias R^2D	Intercept bias R^2D
CBCL- DSM Conduct	8.679	.443	2.020	.107	.100***	.024*	.001	.023*
	(.454)	(.132)	(.819)	(.231)				
DBRS- ODD	2.879	.222	.809	-.089	.070**	.019		
	(.218)	(.066)	(.390)	(.113)				
DBRS- Conduct	3.091	.186	.637	-.058	.060**	.014		
	(.202)	(.061)	(.359)	(.104)				
Conduct Problems								
CBCL-Rule-Breaking Behavior	8.800	.316	1.902	-.014	.075***	.023		
	(.437)	(.105)	(.789)	(.169)				
CBCL- Aggressive Behavior	10.514	.235	3.122	.146	.060**	.036*	.002	.034**
	(.586)	(.141)	(1.059)	(.227)				
CBCL- DSM Conduct	8.614	.281	2.252	.025	.069**	.029*	.000	.029**
	(.462)	(.111)	(.835)	(.179)				
CBCL- Externalizing	19.314	.551	5.024	.132	.074***	.034*	.000	.033**
	(.950)	(.228)	(1.717)	(.368)				
DBRS-ODD	2.857	.109	.857	-.024	.042*	.019		
	(.222)	(.053)	(.396)	(.085)				
DBRS- Conduct	3.067	.129	.684	-.057	.048**	.017		
	(.203)	(.048)	(.361)	(.077)				

*p<.05 ** p<.01 *** p<.001

Note. DSM= DSM-Oriented

Scale IMM had statistically significant overall prediction bias with criterion, "Rule-Breaking Behavior" (ΔR^2 =.026, p<.05), and "Externalizing" (ΔR^2 =.037, p<.01).

Standard regression assumptions and regression diagnostics were evaluated for each regression model. Standard regression diagnostics were explored with an emphasis on cook's distance values and P-P plots. No significant problems were noted in the regression diagnostics.

Each statistically significant omnibus test mentioned above was followed with tests for slope and intercept bias as described in Lautenschlager and Mendoza (1986).

Slope bias was found for one variable: "DSM-Oriented Somatic Problems", (ΔR^2 =.027, p<.05), a criterion variable for A-*hea*. The zero-order correlations between these two variables were -.024 for African Americans and .293 for Caucasians.

Intercept bias was demonstrated for 14 criterion variables, with 13 of these being statistically significant. Statistically significant intercept bias was found for Clinical Scale 2 with the criterion variable "DSM-Oriented Affective Problems", (ΔR^2=.044, p<.01) and Scale 4 for criterion variables "Aggressive Behavior", (ΔR^2 =.028, p<.01) and "Externalizing", (ΔR^2 = .026, p < .05). Scale 9 also had statistically significant intercept bias with criterion variables CBCL "Externalizing", (ΔR^2 =.032, p<.01) and DBRS "Hyperactivity", (ΔR^2 =.027, p<.05).

For the Content Scales, intercept bias was detected for *A-dep* with "DSM-Oriented Affective Problems" (ΔR^2 =.042, p<.01), *A-ang* with "Aggressive Behavior" (ΔR^2 =.029, p<.01), "DSM-Oriented Conduct Problems" (ΔR^2 =.023, p<.05) and "Externalizing" (ΔR^2 =.027, p<.01.), *A-con* with "Aggressive Behavior" (ΔR^2 =.034, p<.01), " DSM-Oriented Conduct Problems" (ΔR^2 =.029, p<.01), and "Externalizing" (ΔR^2 =.033, p<.01). Supplementary Scale IMM was statistically significant with criterion variables "Rule-Breaking

behavior" (ΔR^2 =.024, p<.05), and "Externalizing" (ΔR^2=.035, p<.01). Overall, when statistically significant intercept bias was found, none exceeded a small effect size.

Next, regression equations for Caucasians and African Americans were plotted separately to compare these lines to the common regression line for each case of intercept bias. In all cases, intercept bias was in the direction of overprediction of psychopathology for African Americans relative to the common regression line. In other words, the use of a common regression line (i.e. including both Caucasians and African Americans) to predict criterion scores resulted in higher predicted scores for African Americans than those based solely on the regression line for African Americans.

Discussion

This investigation is the first to examine the possibility of test bias in the MMPI-A utilizing caregiver extra-test data. Although statistically significant prediction bias was noted for a few Clinical, Content, and one Supplementary Scale, effect sizes in terms of ΔR^2 were generally small. Of the 13 relationships indicating statistically significant intercept bias, 10 of them indicated overprediction of psychopathology in preadjudicated African American adolescents across the entire range of MMPI-A scores. These biases are suggestive of differential accuracy of the MMPI-A in predicting caregiver ratings.

Of the 2 relationships that did not systematically overpredict over the entire range of scores for African American males, 1 underpredicted at the lowest range of scores (Scale 8 with "Thought Disorder") while one relationship underpredicted at the highest range of scores (IMM with "Externalizing"), otherwise following a trend of overprediction for African American adolescents. In addition, in a few of these relationships, the range of scores which were overpredicted for African Americans was outside the range of possible test scores, making analytical conclusions impractical.

The results in this study are in contrast to those of Arbisi et al. (2002) who generally found underprediction of pathology in the African American men when utilizing similar design methodology with the MMPI-2. However, the results of a recent study conducted by Monnot et al. (2009) found a mixture of underprediction and overprediction of psychiatric diagnoses in African American men when examining predictive bias in an adult clinically dependent inpatient

population. There may be many reasons for these differential findings including the age of this population (adult vs. adolescent), treatment status (e.g., inpatient vs. outpatient), and identified context (treatment vs. legal involvement), and, very importantly, sampling error. These results further indicate the importance of considering predictive validity when examining the outcomes of the MMPI-A to inform disposition for juvenile delinquent populations. Some of these decisions may mean the difference between psychological rehabilitation or incarceration, thus impacting that individual's future.

Similar to other studies of predictive bias, when intercept and slope bias was found in the present study it was generally in the range of a small effect size (Cohen, 1988). Interestingly, significant slope bias was indicated in only one scale pair (*A-hea* and CBCL-DSM-Oriented Somatic Problems) which displayed the greatest disparity in scores between African American and Caucasian counterparts. The size of the discrepancy between these two groups increased dramatically as test scores increased. With regard to intercept bias, the Clinical Scale with the greatest amount of disparity for overprediction of pathology in African American boys was Scale 2 and for the Content Scale it was *A-dep*. When overprediction for African Americans across test scores was found, the disparity in scores for underprediction in Caucasian counterparts was always greater. Although these differences may lack clinical significance in a general sense, it is important to consider what these findings may mean with regard to practical application. To explore the possible implications of the over-prediction of psychopathology, T-score predictions using a regression line for African Americans were compared to similar predictions using a common regression line in a range of MMPI-A T-scores (i.e., 55 to 65) that would appear to be most critical in terms of applied assessment. In other words, clinicians begin to apply MMPI-A

scale descriptors in the 60 to 65 T-scores range, so overprediction is potentially of greatest concern in this region. Two examples that showed statistically significant intercept bias in the moderated multiple regression analyses were used to illustrate the magnitude of overprediction. For DEP using DSM-Oriented Affective Problems as the dependent variable, DEP T-scores of 55, 60, and 65 predicted Affective Problems T-scores of 60, 61, and 62, respectively. For the regression line based only on African Americans, corresponding Affective Problems T-scores were 59, 60, and 60, respectively. A similar analysis for ANG using Aggressive Behavior as an outcome variable resulted in Aggressive Behavior T-scores of 63, 64, and 65 using the common regression line versus T-scores of 61, 63, and 64 for the regression line based on African Americans only. Therefore, in these two examples, the use of a common regression line would result in the overprediction of psychopathology in African Americans by 1 to 2 T-score points in a range of MMPI-A T-scores where clinicians are likely to begin to apply MMPI-A descriptors to individuals.

Unexpected scores were found when examining scores on the CBCL for the Caucasian participants in the sample. Caucasians had elevated mean scores when looking at overt aggressive behaviors (e.g. getting into fights) and behavior/mood disturbances. CBCL scores reflect the adolescents perceived and observed behavior over the past 6 months and do not include criteria for duration of problems or extra-test factors which contribute to some DSM diagnoses. Similar differences between ethnic groups were mirrored in scores obtained on corresponding scales of the CBCL. The writer examined issues with violence as a possible cause for differential scores, but chi-square analysis yielded no statistical difference between ethnic groups. This may indicate that there are confounds that were not controlled for in this study.

These scores were contrary to previous research in which African American participants tended to have more elevated scores than their Caucasian counterparts. Mean scale scores did not attain statistical significance, but anecdotally indicate important differences in this sample. Possible hypotheses may include a positive correlation between the caregiver's level of pathology and that of the adolescent.

Previous studies have found similar confounding variables when examining caregiver reports. For example, Towle & Schwarz (1987) and Chi & Hinshaw (2002) found that a mother's level of depression predicted negative biases with regard to their child's behavior. Additionally, Berg-Nielsen,Vika and Dahl, Norwegian researchers, found in 2003 that maternal depression was a statistically significant variable in the discrepancy of perceived adolescent pathology between the parent (via CBCL) and adolescent (via the YSR; Achenbach, 1995). Sixty eight mother-adolescent pairs (adolescents aged 11-17 yrs) participated in this study. As the mothers' level of depression increased, they tended to report more internalizing problems than were reported by the adolescents. In other studies of parent-child agreement on pathology, parents tended to report more behavioral and conduct problems than did children (Edelbrock, Costello, Dulcan & Connover, 1986). When moderated multiple regression techniques to assess bias are used, the assumption is that the criterion variable is a fair standard across groups. In the present study, the extent to which CBCL and DBRS ratings are equally valid across groups is unknown. It is possible that evidence of score bias in the present study actually reflects bias in the CBCL and DBRS scale scores rather than the MMPI-A, given the above research findings. Another weakness of the present study is that information about the caregivers' mental health status was not available.

Future research may include the examination of family structure (foster vs. biological parent) as well as a measure of caregiver pathology (e.g. SCID-I; First et al., 1997) when including caregiver reports as a correlate of predictive validity. In addition, the examination of female adolescent juvenile delinquents may be able to ascertain the presence of bias based on gender differences.

In sum, 41 out of 56 scale criterion relationships did not show evidence of overall bias whereas 15 of 56 did. When bias was found the effect size was within the small range. The results of these findings were in contrast to other researchers (e.g., Arbisi et al. (2002) and Monnot, et al. 2009)) which may indicate differences in predictive validity based on varied research variables, demographic characteristics or testing instrument used. The present study represents the first study to investigate comparative validity of MMPI-A scale scores using moderated multiple regression, therefore, additional studies should be conducted in a wide range of samples with a variety of well-validated criterion measures.

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VITA

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I began my career in 1995, after graduating from Long Island University where I obtained a Bachelor of Science degree in Psychobiology. Since then, my work experience has been varied including: special needs populations, dually-diagnosed patients with mental health and substance abuse disorders, as well as severely mentally ill populations. Years later, I graduated from Queens College with a master's degree in Clinical and Behavioral applications in Mental Health Settings, which aided me in completing research briefly with children diagnosed with autism. My continued education within the Consortium has allowed for a well-rounded experience, working with children and adults diagnosed with a range of affective, behavioral and psychotic disorders.

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