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Development of a K-correction Factor for the MMPI-A

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by

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ABSTRACT

DEVELOPMENT OF A K-CORRECTION FACTOR FOR THE MMPI-A

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In 1992, the Minnesota Multiphasic Personality Inventory - Adolescent (MMPI-A) was developed to meet the unique experiences and needs of adolescents. Despite evidence that adolescents often demonstrate response biases in taking the MMPI-A, currently there is no method to systematically "correct" for the effect of test-taking attitude on profile configuration with this age group. The K-correction factor has been widely used to correct for defensiveness or underreporting of symptomatology on the MMPI among adult respondents, although results of cross-validation research on the effectiveness of the K-correction factor have been inconclusive. The present study derived age-appropriate K-weights to determine the degree to which adoption of those weights could improve test accuracy in the identification of psychopathology. This study also examined the accuracy of the MMPI-A clinical scales in classifying adolescent normals and psychiatric patients. Discriminant analyses were performed to determine the K-weight scale score combination which best predicted normal versus clinical status for each of the eight clinical scales. Hit rate analyses were used to assess whether the adoption of these K-weights would result in improved classification accuracy. Results indicated that adoption of a K-correction

factor did not improve test accuracy and did not support future use of a K-correction factor in scoring MMPI-A protocols.

Dedication

To my parents, Martha and James Jacobson

for their love and support

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CHAPTER 1

INTRODUCTION

Expression of Psychopathology in Adolescence

The expression of psychopathology in adolescence has been discussed from a broad range of perspectives. In 1904, G. Stanley Hall introduced the Storm and Stress model of adolescent development, a concept which was later incorporated into significant segments of the psychoanalytic literature. This model suggested that adolescence was a time of marked emotional and behavioral variability.

Consistent with the Storm and Stress model, Anna Freud (1958) believed that it was difficult to draw a line between adolescent psychopathology and normal development because "adolescence is by its nature an interruption of peaceful growth" and "the upholding of a steady equilibrium during the adolescent process is in itself abnormal" (p. 275). She thought that adolescent turmoil is necessary for proper development and in fact, so called "good children," i.e. passive and compliant children, may experience subsequent delays in normal development. Furthermore, adolescent turmoil is highly unpredictable. Blos (1967) talked about the task of individuation, or decreasing dependency on the family. This is characterized by diminishing "infantile object ties" and "disengagement from internalized objects." For Blos, failure to complete this maturational task results in psychopathology. However, ego regression and deviant

behaviors during adolescence must be seen as efforts to achieve individuation. Erikson (1956) discussed the importance of gains in ego identity during adolescence in order to be ready for the developmental tasks of adulthood and described adolescence as a "normative crisis, i.e., a normal phase of increased conflict" (p. 72). All of these writers shared the belief that normal adolescent development is turbulent and characterized by deviant behaviors that are not indicative of psychopathology.

Other authors have not agreed with the Storm and Stress model and the concept that aberrant behavior among adolescents is normal and healthy. Weiner and Del Gaudio (1976) looked at patterns of psychopathology among 1,334 adolescent patients. At a ten-year follow up, 54% of the patients demonstrated relative diagnostic stability when diagnoses were classified into broad categories (e.g., personality disorder, neurosis, organic brain syndrome). Furthermore, relationships between adolescent diagnosis and factors such as treatment facility, sex, and socioeconomic class were similar to those of adults. Weiner and Del Gaudio concluded that "aspects of the data demonstrate continuity in adolescent and adult psychopathology, the mythical nature of 'normative adolescent turmoil,' and what appears to be excessive use of situational disorder in diagnosing adolescent patients" (p. 187).

Many researchers have studied the occurrence of

psychopathology in adolescence. However, prevalence studies are difficult to conduct. Brandenburg, Friedman, and Silver (1990) discussed some of the reasons for reported differences among studies. These include sampling methods, the type of measures employed, and case definition. Furthermore, variability in sampling can affect response rate (and, consequently, sample size) and demographic characteristics of the obtained sample. Research on prevalence has also differed by type of instrumentation used (Brandenburg et al., 1990). Studies have used information from adolescents, parents, and teachers. Different assessment instruments have included symptom and problem checklists and structured diagnostic instruments. Finally, criteria used to define cases has varied (Brandenburg et al., 1990). In addition to the classification of subjects into specific psychiatric disorders, severity, need for treatment, and concordance of multiple informants' symptom reports have been considered (Brandenburg et al., 1990). Gould, Wunsch-Hitzig, and Dohrenwend (1981) pointed out that classification systems for diagnosing children are not well developed.

Despite the fact that the research has employed widely differing samples and methodology, studies of prevalence of psychopathology among adolescents have yielded very similar estimates. Brandenburg et al. (1990) reported that most of these estimates ranged from 14 to 20%. Furthermore, Archer

(1992) stated that, "...the debate surrounding the stability of adolescent symptomatology appears to center on the distinction between psychopathology as defined by DSM-III categories, and terms such as "turbulence" and "Storm and Stress" (pp. 21-22). He suggested that prevalence studies probably accurately report DSM-III disorder rates, but many more teenagers' emotional and behavioral lability reflect the temporary adaptation required to master tasks of normal adolescent development.

Adolescent psychopathology does exist and must, therefore, be distinguished from healthy adolescent behavior which appears turbulent and aberrant. The accurate identification of psychological disturbance among adolescents is crucial for their subsequent treatment and the prevention of serious developmental damage in these individuals. In contrast, for teenagers who display normal emotional and behavioral lability, treatment is unnecessary and may even be deleterious. Therefore, useful assessment requires the accurate identification of normal range functioning.

Use of the MMPI with Adolescents

The Minnesota Multiphasic Personality Inventory (MMPI) is one of the most widely used assessment instruments for assessing psychopathology in adolescents (Archer, Imhof, Maruish, & Piotrowski, 1991). Archer et al. reported the results of a survey of 165 clinicians who routinely perform assessments with adolescents. They found that the MMPI was the most widely used objective instrument, and the 6th most widely used instrument overall with adolescents.

Hathaway and Monachesi (1963) gathered the largest MMPI data set ever obtained on adolescents. From 1947 to 1957, they collected original and follow-up data on various samples of adolescents, including what was termed the Statewide Sample. While they intended to determine the risk factors for the development of delinquent behaviors, their research was valuable in other ways (Archer 1992). It demonstrated crucial differences in item endorsements for males and females, adolescents and adults, and identified important longitudinal test-retest differences between middle and late adolescence. The data has been used in other normative data samples and follow-up studies. Finally, Hathaway and Monachesi developed clinical correlates for high and low scores on each of the clinical scales, separately for males and females.

Until the late 1960's, clinicians were forced to use adult norms in producing MMPI profiles of adolescents. In

1967, Marks and Briggs developed the first set of adolescent norms which were later published in Dahlstrom, Welsh, and Dahlstrom (1972, pp. 388-399). The norms were based on the responses of approximately 1,800 normal adolescents selected from the Hathaway and Monachesi (1963) Minnesota Statewide Sample and adolescent cases gathered between 1964 and 1965 from 6 states. Norms were presented separately for males and females, at age categories of 14 and below, 15, 16, and 17. The Marks and Briggs norms are the most frequently used norms with the original MMPI and most research on use of the MMPI with adolescents has been based on their normative data (Archer, 1992).

Klinge and Strauss (1976) compared the profiles of adolescent patients using standard adult norms with K-correction and the Marks and Briggs age-appropriate norms. Each of the validity and clinical scales, except scale Hs, showed higher elevations on adult norms than adolescent norms. Comparing codetypes on both sets of norms, Klinge and Strauss found that only 26% and 32% of males and females, respectively, had identical codes using both norms. Finally, they found only a moderate degree of concordance (58%) between classification of profiles into psychotic, neurotic, and characterological disorders using adult and adolescent norms. Of greatest concern is that profiles appeared more psychotic when scored using adult norms. Consequently, differences between adult and adolescent norms

will likely produce different clinical interpretation (Archer, 1984).

Gottesman, Hanson, Kroeker, and Briggs (cited in Archer, 1987) also developed a set of adolescent norms, though they too relied on data gathered thirty years ago. These norms were based on the responses of 15-year-olds from the Hathaway and Monachesi (1963) sample and 18-year-olds from the Minnesota Statewide Sample (Hathaway & Monachesi, 1963). They excluded some of the sample based on validity and age criteria, resulting in a final sample of 16,445 adolescents. Archer (1987) reported that normative raw scores generally fell between those reported by Marks et al. and the expected values for adults. Archer further suggested that, while the Marks et al. norms may overreport psychopathology relative to the Gottesman et al. norms, differences in exclusion criteria and the two samples may account for these differences.

In an attempt to provide a more contemporary set of norms, Colligan and Offord (1989) gathered data from 1,315 adolescents. They randomly selected households from telephone directories in the midwest area. Households containing an adolescent with no potentially biasing mental or physical condition were identified and mailed the MMPI. Eighty-three percent of the females and 71% of the males returned tests resulting in a final sample of 691 girls and 624 boys ranging in age from 13 to 17 years of age.

Colligan and Offord (1991) compared their norms with those of contemporary adults and found significant differences between them, emphasizing the need for separate norms. They also compared their adolescent norms with those obtained by Marks and Briggs between 1964 and 1965. Significant differences were also found.

By 1990, several sets of adolescent norms had been developed for the MMPI, leading Klinefelter, Pancoast, Archer, and Pruitt (1990) to compare how Marks and Briggs (1967/1972), Gottesman et al. (1987), and Colligan and Offord (1989) norms would affect clinical interpretation. In a study of 300 adolescents (normals, outpatients, and inpatients), they found significant group differences on all scales except Mf and Ma. Profiles produced using the more modern Colligan and Offord norms seemed to best represent normal subjects, and profiles produced using either the Marks and Briggs or Gottesman et al. norms seemed to best represent inpatients and outpatients. As only the Marks and Briggs norms offer empirically based clinical correlates, Klinefelter et al. recommended continued clinical use of Marks and Briggs norms.

Overview of the MMPI-A

Test Development

Despite the heavy use of the MMPI with adolescents and recent attempts to update age-appropriate MMPI norms for adolescents, many felt that the MMPI was inappropriate for use with this population. In their survey of clinicians, Archer et al. (1991) asked respondents to discuss the strengths and weaknesses of MMPI use with adolescents. Respondents cited as the primary advantages of the MMPI its accuracy, comprehensiveness, and intensive research base. The most frequently cited disadvantages were its length, outdated or poorly constructed norms, and its requirement for too high a reading level. These criticisms suggested a need to develop an improved personality instrument for the assessment of teenagers.

In 1989, the University of Minnesota Press appointed the MMPI Adolescent Project Committee to consider an adolescent form of the MMPI. Its members were Robert P. Archer, James N. Butcher, Beverly Kaemmer, and Auke Tellegen. Committee goals, not directly effected by Archer et al.'s findings (1991), included: developing a national normative sample of adolescents, shortening the length of the MMPI without losing important clinical information, and maintaining continuity between adult and adolescent MMPI forms. Because adolescent response patterns to the F scale have typically differed markedly from those of adults,

specific efforts were made to improve the item composition of this validity scale, based on response frequency data from the adolescent normative sample. In addition, items and scales were added, deleted, or modified to represent those experiences relevant to adolescent development and psychopathology.

An experimental test booklet for adolescents, called MMPI Form Tx, was created to collect normative data and determine the feasibility of producing an adolescent form. The booklet contained 550 items from the original MMPI form and 154 new items. Thirteen percent of the original items were reworded to enhance understanding of item content. The 16 repeated items on the original MMPI were eliminated. New items involved such content areas as "negative peer group influence, alcohol and drug abuse, family relationship difficulties, school and achievement problems, eating disorders, and identity problems" (Archer, 1992, p. 52). In addition to the experimental form, adolescents were administered a Biographical Information form and a Life Events form to obtain information about demographics, family characteristics, parental occupation, residence, family history, and the occurrence of stressful life events.

Based on preliminary analyses of these data, the MMPI Adolescent Project Committee recommended development of the MMPI-A in 1990. In August, 1992 the instrument was completed and released, accompanied by an extensive manual

discussing test administration, scoring and interpretation (Butcher et al., 1992).

Normative and Clinical Groups

Junior and senior high school students in eight states (Minnesota, Ohio, California, Virginia, Pennsylvania, New York, North Carolina, and Washington) were solicited by mail for participation in the collection of the MMPI-A normative sample. Adolescents were evaluated with the MMPI Form TX in group sessions, generally within school settings, and were paid for their voluntary participation (except in New York).

Approximately 2,500 subjects were administered the MMPI Form TX. Exclusion criteria were applied to these data leading to removal of the following cases: "(a) subjects with incomplete data; (b) Carelessness scale values > 35; (c) original F scale value > 25; (d) subject age < 14 or > 18" (Archer, 1992, p. 52). Using these criteria, the resulting normative sample consisted of 805 males and 815 females.

School sites for MMPI-A restandardization were chosen with the expectation that the sample obtained would be balanced in terms of geographic location, rural-urban residence, and ethnicity. However, as the manual notes, the normative sample underrepresents adolescents who drop-out or are frequently absent from school (Butcher et al., 1992). Geographic region is well represented by the normative sample. The ethnic minority distribution is generally

similar to that of U.S. census figures except that Hispanics are underrepresented. Age and grade are well distributed, except that 18-year-olds are underrepresented. Finally, parents with higher education levels are overrepresented.

In addition to a normative sample, a clinical sample of adolescents were concurrently tested from a variety of treatment settings in the Minneapolis area. These included inpatient alcohol- and drug-treatment programs, inpatient mental health facilities, day-treatment programs, and a special school program. Subjects answered the Biographical Information form and the Life Events form, as well as two self-report instruments, the Child Behavior Checklist and the Devereux Adolescent Behavior Rating Scale. A Record Review form requested information from parents, treatment staff, and hospital and school records. The same exclusionary criteria applied to the normative group sample was applied to this group, resulting in a clinical sample of 420 boys and 293 girls.

Demographics were different for the clinical sample than for the normative sample. While all of the adolescents attended school of some sort, grade levels ranged from 7 to 12. Minority groups were underrepresented, particularly Blacks and Hispanics. Fewer of the adolescents in this sample came from intact homes. Despite differences in demographics and setting between this sample and the Marks et al. (1974) clinical group, the two samples responded very

similarly when scored on the original MMPI norms (Butcher et al., 1992). This suggests that continuity between the original version of the MMPI and the MMPI-A was maintained.

There was some attempt to gather normative data on individuals younger than 14. In fact, 65 boys and 108 girls were tested in the normative sample, and 25 boys and 20 girls were tested in the clinical sample. In addition, Archer (1992) studied 130 13-year-olds and found that, in comparison with the older individuals, the 13-year-olds consistently produced higher elevations on F and the clinical scales. The MMPI Adolescent Project Committee, therefore, decided that inclusion of individuals below the age of 14 was questionable and limited norms to ages 14 through 18.

Test Structure

The final form of the MMPI-A consists of 478 items, compared to 550 on the original MMPI. Administration of the first 350 items permits scoring of scales L, F1, and K and all of the clinical scales. A full administration of all items is required to score scales VRIN, TRIN, F2, the supplementary scales, and the content scales. Thirteen standard scales, 4 new validity scales, 15 content scales, 6 supplementary scales, and 31 subscales comprise the MMPI-A.

Of the basic scales, all but 58 of the original MMPI items were retained. Deleted items were mostly from F, Mf, and Si. Thirteen of these items were also deleted in the

development of the Minnesota Multiphasic Personality Inventory - 2 (MMPI-2). Deleted items dealt with "religious attitudes and practices, sexual preferences, bowel and bladder functioning, or items deemed inappropriate in terms of adolescents' life experiences" (Archer, 1992, p. 56).

The new validity scales are F1 and F2 subscales of the F scale, the True Response Inconsistency scale (TRIN), and the Variable Response Inconsistency scale (VRIN). In addition to the original MMPI supplementary scales, Immaturity (IMM), Alcohol/Drug Problem Acknowledgement (ACK), and Alcohol/Drug Problem Potential (PRO) were added to the MMPI-A. Four new content scales were added to the eleven content scales carried over from the original MMPI. These include Low Aspirations (A-las), School Problems (A-sch), Conduct Problems (A-con), and Alienation (A-aln). With the exception of item deletions resulting from the removal of items on the basic scales, the composition and structure of Harris-Lingoes and Si subscales were carried over from the MMPI-2.

Issues of Validity

Response Bias

With respect to response bias, Meehl and Hathaway (1946) wrote that "the existence of a distorting influence in test-taking attitude is so obvious that it has been thought hardly necessary to establish it experimentally..." (p. 84). The MMPI was one of the first assessment instruments to measure the respondent's test-taking attitudes (Greene, 1991).

Five MMPI response bias patterns have been identified for adults and adolescents. These are all false, all true, random, underreporting (fake-good) and overreporting (fake-bad) profiles. Archer, Gordon, and Kirchner (1987) compared the validity response patterns of adolescents on the original MMPI with those of adults. They found that teenagers demonstrated some response patterns that are similar to adults, including all true and all false. Random profiles produced by adolescents, however, appeared to be different from those produced by adults. Adolescents' fake-bad profiles were much like those of adults and were rather easy to detect, whereas, their fake-good profiles were not like those produced by adults and may not be easily detected.

Archer (1992) has endorsed Greene's (1991) stage model of validity assessment for detecting these response bias patterns in MMPI-A profiles. Greene proceeds through a

series of sequential steps. After administration of the MMPI, the first step involves assessing the number of item omissions by looking at the Cannot Say (?) scale. The omission of 30 or more items would require the test to be readministered.

The second step involves evaluating the consistency of item endorsement. On the MMPI-A, consistency is evaluated by the True Response Inconsistency scale (TRIN), the Variable Response Inconsistency scale (VRIN), and a comparison of scales F1 and F2. As in step one, substantial inconsistency would require readministration of the test.

The final stage of Greene's (1991) model, prior to traditional codetype interpretation, requires assessment of the accuracy of item endorsement, that is, the tendency to overreport or underreport symptoms of psychopathology. Greene suggested use of the terms overreporting and underreporting rather than fake-good or fake-bad, because the motivation to distort responses may range from "being very conscious and intentional to being out of awareness and unconscious" (p. 77).

Greene (1991) discussed several additional issues regarding response accuracy. First, he suggested that overreporting and underreporting represent end points on a continuum, and the responses of all individuals may be placed somewhere along this dimension. Second, patients will overreport or underreport psychopathology in a general

way rather than specifically focusing on a small set of symptoms. Third, actual psychopathology cannot be inferred from the identification of an overreporting or underreporting response pattern. Finally, scales to assess consistency (VRIN or TRIN) cannot be used to assess accuracy. Archer (1992) also stated that there is insufficient data to support use of the Wiener-Harmon Subtle-Obvious subscales or the Lachar-Wrobel critical items to assess accuracy. He supported use of the traditional validity scales to assess accuracy of item endorsement on the MMPI-A.

Validity Scales

The traditional validity scales and derivative subscales on the MMPI-A used to assess accuracy of item endorsement are F (Frequency) Scale and the F1 and F2 Subscales, Lie (L) Scale, and K (Defensiveness) Scale. Archer (1992) suggested that it is particularly important to assess the technical validity of adolescent profiles because invalid profiles probably occur more frequently in this population.

The original MMPI F scale was derived by selecting items answered deviantly by 10% or less of the Minnesota normative adult sample. As adolescents typically give more frequent deviant responses (Archer, 1984), the F scale was modified on the MMPI-A to include items answered deviantly by 20% or less of the MMPI-A normative sample. Also,

changes in the F scale were made because some items asking about religious beliefs and sexual beliefs were considered inappropriate. The revised F scale consists of 66 items. Archer (1992) stated that

> adolescents who produce marked or extreme elevations on the MMPI-A F scale may be suffering from severe psychiatric illnesses, may be attempting to "fake bad" or overreport symptomatology, or may be engaging in a random response pattern either through conscious intent or as a result of inadequate reading ability. (p. 109).

The first 33 items of the F scale make up the F1 subscale and the last 33 items make up the F2 subscale. Information about the validity of the basic scales can be assessed from the F1 subscale and information about the validity of the adolescent's responses to the latter part of the test can be gotten from the F2 subscale. A random response pattern during the latter half of the test booklet may be indicated if F1 is within a normal range, and F2 is extremely elevated (Archer, 1992). In such cases, it might be possible to interpret data on the basic scales (Archer, 1992). However, if F1 and F2 are both highly elevated, the entire test should be considered invalid and data should not be interpreted (Archer, 1992).

Items for the Lie scale were rationally selected to identify respondents deliberately attempting to lie, or to avoid answering items honestly. The MMPI-A L scale consists

of 14 items, and item content includes the denial of common human failings. Because all of the items are keyed in the false direction, extreme elevations on this scale, combined with an elevated TRIN score, may indicate an all false response set.

The K scale consists of empirically selected items that identified individuals with known or established psychopathology who produced normal profiles. It consists of 30 items covering a diverse range of content areas and all except one are scored in the false direction. The mean raw score for K appears lower for adolescents than adults (Archer, 1992). However, similar clinical correlate patterns have been demonstrated (Archer, 1992). Elevations on K probably indicate defensiveness or underreporting and very low scores on K may be produced by adolescents who are overreporting or faking bad.

Archer (1992) discussed the traditional validity scale configurations which may be used to identify test-taking attitudes. Significantly elevated scores on L and K, and a T-score on F of less than 50, also called a "most closed" validity configuration, is often manifested by an individual who is attempting to present himself in a extremely good light and denying psychological problems. The "most open" validity configuration, that is an elevated F scale and T-scores below 50 on L and K, may be produced by an adolescent who is exaggerating psychological problems and unconsciously

or consciously asking for help.

K-Correction Factor

Development of the K-Correction Factor

An early attempt to systematically correct for response bias on the MMPI was made by Paul Meehl (1945) for his doctoral dissertation. He developed a generalized correction scale called N to adjust for "plus-getting," or the "tendency to get high scores on personality tests of the MMPI variety" (p. 56). It was derived by contrasting normals who had abnormal profiles with abnormals who had matched profiles. Meehl constructed the N scale by comparing which items significantly differentiated the two groups.

Use of the N scale reduced the number of false positives in the identification of psychiatric cases. However, it seemed to identify only those profiles with misleading elevations on the neurotic triad and was less effective for patients with elevations on the psychotic triad (Dahlstrom et al., 1972). Also, Meehl and Hathaway (1946) reported that the scale was "long and loaded with genuine psychiatric factors which led to an undesirable under-interpretation of profiles belonging to grossly abnormal profiles" (p. 93-94). Meehl and Hathaway developed the L6 scale, a precursor to the K scale, which performed better than the N scale and, therefore, replaced it.

L6 was derived by an item analysis of responses from 25 males and 25 female psychiatric patients with diagnoses of

psychopathic personality, alcoholism, or other behavior disorders. Each of them had obtained normal profiles and also had a T score of 60 or higher on the L scale. It was expected that these patients would be most likely to be defensive. Responses from this group were then compared with responses from the original normative sample. Items were included in the L6 scale if they showed at least a 30 percent difference in the response rates of the two samples. Twenty-two items were chosen. A high score indicated that the patient had presented himself in a favorable manner.

Meehl and Hathaway (1946) went back through hospital records in order to determine the adequacy of the scale in detecting defensiveness among patients with normal profiles. In addition, they looked through the records of normals who had deviant profiles. Low scores on L6 would indicate a "plus-getting" tendency, that is a tendency to portray oneself in a bad light when answering scale items.

The L6 scale appeared to work adequately for detecting response bias in normals and most patients. However, psychotic patients showing severe schizophrenic or depressive reactions tended to score low and profiles tended to be underinterpreted. Meehl and Hathaway (1946) attempted to partly correct for this phenomena. Items which remained stable when a normal group of men trained in psychology were instructed to fake good or bad were considered. Eight items which differentiated between schizophrenic and depressed

patients and normals were added to L6 to form the current 30-item K scale.

The original function of the K scale was to correct the other scales for response bias. In addition, Meehl and Hathaway (1946) believed that K could best operate on "borderline" profiles, or profiles containing T scores between 65 and 80. They stated that normals rarely showed elevations above 80 and when they did it was not possible to correct the profiles to the extent that the profiles would accurately represent their nonpatient status. When there were no elevations above 65, clinicians could not accurately determine which scales would be elevated.

In an attempt to cross-validate the K scale, Meehl and Hathaway (1946) conducted a couple of studies in which abnormals and normals with borderline profiles were guessed to be abnormal or normal based on an arbitrary cutting score for K. Profiles with $K > 50$ were assumed to be abnormal and those with $K < 50$ were assumed to be normal. In one study, 72 percent of abnormal males and 61 percent of the normal males were correctly identified. Sixty-six percent of abnormals and 59 percent of normals were correctly classified for females. Another study yielded a overall hit rate of 85 percent. In addition to demonstrating the efficacy of K as a correction scale, Meehl and Hathaway found that K was more effectively used with some scales than with others. They suggested, however, that an arbitrary

cutting score was not ideal and that an "optimal mathematical procedure" was needed (p. 106).

The methodic development of a correction factor using the K scale was made by McKinley, Hathaway, and Meehl (1948). To correct for a defensive pattern of test taking, they decided that K or some proportion of K should be added to the raw score of each scale. They attempted to determine the optimal weight for K with respect to each scale.

McKinley et al. (1948) utilized a trial and error method to determine the best K-weights for discriminating between inpatient psychiatric patients and the Minnesota normative group. Abnormals were separated into criterion groups by diagnosis, like those used in the creation of basic clinical scales, rather than grouped into abnormals as a whole. Different K-weights were then plugged into a deviation formula to determine the weight which best differentiated between the normal group and criterion group appropriate to each scale. For some scales, proportions of K did not improve the discrimination between abnormals and normals. K-weights which maximally discriminated between groups and were finally adopted for five of the scales are:

Hs + .5K Pt + 1.0K Ma + .2K

Pd + .4K Sc + 1.0K

Subsequent to McKinley et al.'s derivation of these K-weights, Psychological Corporation modified its printed profile sheets in 1948 to provide for routine K-correction

of the five clinical scales using these values.

McKinley et al. (1948) emphasized that "these weights are optimal within our sample, for the differentiation of largely inpatient psychiatric cases of full-blown psychoneurosis and psychosis from a general Minnesota 'normal' group. For other clinical purposes it is possible that other values would be more appropriate" (p. 127). Dahlstrom and Welsh (1960) also warned against the use of standard K-weights in different settings. They suggested that optimal K-weight values may be subject to the effects of fluctuating base rates used in comparison samples.

Several developmental stages were involved in the creation of the K scale and K-correction procedure. These stages are summarized in Table 1.

Insert Table 1 about here

Cross-validation and Utility

Despite McKinley et al.'s (1948) and Dahlstrom and Welsh's (1960) warnings about it's appropriate use, the K-correction has been routinely used and most of the correlate literature on the MMPI has utilized the K-correction procedure. However, the number of studies cross-validating use of the K-correction factor have been few (Greene, 1991). Furthermore, the research has yielded mixed results (Hsu, 1986). Jenkins (1984) formulated four questions to be

answered regarding cross-validation of the K-correction factor.

> First, do K-corrections produce significant changes in scale scores or configurations? Second, do the corrected scores or configurations more accurately predict external criteria? Third, for what populations, if any, are the K-corrections appropriate? Fourth, are the specific weights chosen by McKinley et al. most appropriate? (p. 85)

Several studies have looked at the first of these questions, i.e. whether the K-correction factor produces significant changes in profile elevation or configuration. Schmidt (1948) looked at a group of soldiers who had been discharged from the Army with a diagnosis of "psychoneurosis, severe." These patients were administered an MMPI upon admission to the hospital and some months later with instructions to respond as they believed a healthy person would. Soldiers' profiles, K- and non-K-corrected, did not differ between those produced by the original administration and by the instructions to "fake good". While Schmidt suggested that K contributes little to differential diagnosis, conclusions from this study may have been limited by the possible limitation in the patient's ability to respond in an effective manner when instructed to simulate normalcy. Also, Nakamura (1960) suggests that instructions to simulate "fake good" responses may not be

comparable to conditions in which the MMPI is given under standard instructions and the respondent answers in a defensive manner.

Comparing psychiatric outpatients, normals, and medical patients, Hsu (1986) looked at the means of T-scores with and without K-corrections. He found that the means of T-scores on corrected profiles were higher than the means on noncorrected profiles in all three populations. Hsu reasoned that using the K-correction increased false positives with normals, and decreased false negatives with abnormals. Hsu observed that total hit rate is dependent upon the percentage of normals and abnormals in the experimental samples.

Tyler and Michaelis (1953) found that only one of the profiles of 56 normal college women had a T-score raised from below 70 to above 70 when the K-correction was used. However, Jenkins (1984) points out that Tyler and Michaelis provided no evidence on the relative external validity of the K-corrected versus the non-K-corrected profiles.

Nakamura (1960) conducted a rather elaborate study of college students divided into an experimental group composed of students referred for disciplinary problems, and a control group. Subjects in the experimental group were tested under two conditions, a relatively non-stressful condition, upon entrance to college in a battery of tests routinely administered, and a condition in which students

would be motivated to fake good, when referred to a disciplinary committee for violating university regulations. The control group was tested two times in conditions similar to that of the nonstressful condition of the experimental group. Results showed no difference in test-retest for experimental or control groups using the K-corrected profiles. For non-K-corrected profiles test-retest differed significantly for the experimental group but not for the control group. These results support use of the K-correction factor with college students, however, it is not known whether experimental subjects responded accurately during the first administration.

Jenkins (1984) evaluated the MMPI profiles of normals, pain patients, outpatients, inpatients, and schizophrenics. He found that the application of the K-correction to each of these groups resulted in at least a minor interpretive change, based on his observations of differences between K-corrected and non-K-corrected descriptive statements produced by Greene's computer-generated interpretive system.

In answer to Jenkins (1984) second question, several authors have compared K-corrected profiles with external criteria. For example, some researchers have looked at the utility of the K-correction factor in improving the diagnostic or classification ability of the MMPI. These studies included those by Wooten (1984) with Air Force Trainees, Colby (1989) with patients and normals, Hunt,

Carp, Cass, Winder, and Kantor (1948) with inpatients, Silver and Sines (1962) with inpatients and Jenkins (1984) with normals, pain patients, outpatients, inpatients, and schizophrenics.

Wooten (1984) studied a group of Air Force Trainees to determine the degree to which K-corrected scales vs. non-K-corrected scales could appropriately classify trainees with emotional/behavioral problems in a referral group and trainees with none of these problems in a normal group. Using a T-score of 70 as a cutoff for making the classification, Wooten found that use of the K-correction yielded a hit rate of 80.2% for the referral group and improved upon an overall hit rate of 78.3% for noncorrected profiles. In contrast, he also found that the noncorrected profiles produced a greater overall hit rate for normals than K-corrected profiles by about the same amount. The K-correction factor minimized false negatives in the referral group, but both the K-corrected and non-K-corrected profiles produced a high percentage of false positives among normals. Wooten concluded that this evidence suggests a small difference in favor of using the K-correction among adults.

Colby (1989) studied a group of inpatients and normals and found that corrected and noncorrected profiles predicted patient versus normal group membership equally well. Among patients, use of the K-correction factor decreased false negatives and among normals, omitting the K-correction

decreased false positives. Furthermore, Colby concluded that because profile shape was affected, routine use of the K-correction may not be prudent. A large proportion of normals (30.45%) produced profiles with clinical elevations when K was not used, however, raising the possibility that psychiatrically disturbed individuals were included in the normal population sampled, thereby confounding estimates of test specificity and sensitivity.

Hunt et al. (1948) classified K-corrected and noncorrected profiles of inpatients into groups labeled "psychosis," "psychoneurosis," and "conduct disorder" according to MMPI diagnostic classification rules developed by Meehl (as cited in Hunt et al., 1948). For example, psychosis was suggested by a markedly elevated profile, F > L, neurotic and psychotic end of the profile approximately equal or psychotic end higher, spike on D, or Sc equal to or greater than Pt. They then compared the degree to which profiles were correctly classified based on a criterion of hospital diagnosis. Classification did not significantly improve when the K-correction was used. Also, when one of the authors sorted the profiles of these inpatients into "abnormal" and "normal," based on whether profiles contained a least one clinical scale with a T-score greater than 70 (excluding Mf), the K-correction procedure did not significantly decrease false negatives. These results do not support use of the K-correction factor. However,

several methodological problems limit the usefulness of these results. Validity of the diagnostic rules used to sort corrected and uncorrected profiles is questionable and the reliability of the hospital diagnoses that were used as the major criterion was not evaluated.

In another study on the diagnostic efficiency of the MMPI with the K-correction, Silver and Sines (1962) studied a group of inpatients holding various diagnoses. Judges were asked to sort corrected and noncorrected profiles into different diagnostic categories: neurotic, personality disorder, affective psychotic, and schizophrenic. The judges' accuracy of classification, based on a comparison to diagnoses determined by psychiatric staff with no knowledge of the patient's MMPI profile, was unaffected by use of the K-correction. The results provide additional evidence questioning the incremental utility of the K-correction. However, the extent to which individuals were diagnosed correctly by staff psychiatrists was not evaluated in this study, weakening the utility of this external criterion (Jenkins, 1984).

In Jenkins (1984) study of normals, pain patients, outpatients, inpatients, and schizophrenics, he found that the degree of interpretive change produced by changes in the K-corrected profile was highly dependent on group membership. Normals demonstrated significantly less interpretive change than abnormals. However, the K-

correction did not significantly reduce the rate of false negative profiles in the clinical sample, i.e., profiles having no clinical scale T-score elevation > 70.

Several authors have compared the MMPI scores, K- and non-K-corrected with concurrent measures of maladjustment. Weed, Ben-Porath, and Butcher (1990) found reduced correlations between spouse ratings and MMPI scales when the K-correction was added to the T-scores for both normal individuals and individuals engaged in marital counseling.

In a normal sample of adults, McCrae et al. (1989) found that correlations between the MMPI clinical scales and the NEO Personality Inventory (NEO-PI) decreased when the K-correction was used. Similarly, Yonge (1966) found that the K-correction reduced the correlation between the MMPI and the Omnibus Personality Inventory (OPI) for normal college students. Both studies suggest that the K-correction may not be appropriate for use with normal individuals. However, Jenkins (1984) suggested that the lack of an appropriate correction factor on the OPI may be responsible for Yonge's disappointing results. This might similarly be argued for the NEO-PI. It is also possible that measures of "normal" personality traits are not appropriate criteria for the MMPI, a measure of psychopathology. However, this latter observation would not explain diminished correlations between the MMPI and these measures when the K-correction is applied.

No one has ever tested whether McKinley et al.'s (1948) K-weights are correct. However, Heilbrun (1963) computed K-weights utilizing a college students to determine the appropriateness of the standard weights with this population. He conducted a discriminant function analysis to determine the optimal K-weights to differentiate adjusted and maladjusted college students. While scales D, Mf, Pa, and Si continued to remain unweighted, on the other clinical scales he found different weights than those traditionally used with adults. Specifically, major differences occurred for scales Hs, Pd, Ma, and Hy. In fact, Heilbrun found that his analysis resulted in a negative weighting for Hy. Lesser changes were found for Pt and Sc. Cross-validation demonstrated the effectiveness of these revised K-weights.

Differences in sample subjects and base rates, as well as differences in methodologies are probably responsible for inconsistent results of the research on use of the K-correction with adults. Greene (1991) also suggested that clinical and behavioral differences may occur for subjects whose K-corrected profiles are similar. For example, two individuals can achieve the same K-corrected raw score by endorsing a different number of clinical scale and K scale items. Variable results from cross-validation studies may reflect these kinds of differences in the components of raw score totals for the subjects sampled. Widespread use of the K-correction with adults continues despite the

inconclusive results of this research.

Appropriateness of the K-Correction Factor for use with Adolescents

McKinley et al. (1948) have suggested that different K-weights might be appropriate for individuals who differ from the adult psychiatric sample on which the original K-corrections were developed. A reasonable extension of this statement is that the original K-weights may be inappropriate for use with adolescents. Several researchers have recommended that the K-correction factor not be applied with this population using either the original MMPI or the MMPI-A.

Marks, Seeman, and Haller (1974) stated three reasons why the K-correction factor should not be used in plotting adolescent profiles. First, K was created on a small group of adults and therefore, its application to teenagers is at best questionable. Second, they cited Dahlstrom, Welsh, and Dahlstrom's (1972) caution of using the K-correction with samples on other that which it had been originally developed. Finally, they presented previous research demonstrating a reduced relationship between external criteria and adolescent profiles scored using the K-correction factor.

Furthermore, evidence has demonstrated that profiles of adolescents from diverse ethnic backgrounds are differentially affected by the standard K-correction. Moore

and Handal (1980) found in a sample of urban black and white adolescents that normal black adolescents obtained elevations on the original MMPI when the K-correction was applied but not when the non-K-corrected norms were employed. They cautioned against use of the K-correction with adolescents.

Despite the warnings that the K-correction factor not be used with adolescents, clinicians have continued to plot these profiles on the standard profile form using adult norms and the K-correction factor. Minimizing the impact of doing this, Colligan and Offord (1991) stated that "adolescents seldom carry significant elevations on K, so profiles from such patients are likely to be similar, whether scored with or without K correction" (p. 618). In fact, Colligan and Offord produced a set of adolescent norms with the K-correction factor.

In their large scale effort to gather adolescent norms, Colligan and Offord (1991) produced a set of norms with the K-correction using the standard weighting procedure used with adults and deriving normalized T scores. They encouraged clinicians to score MMPI profiles using both the standard procedure and using K-corrected adolescent norms. They warned, however, that "further empirical studies will be required in order to determine the optimal proportion of K-weighting and to determine whether K-weighting should be used at all" (p. 629). Archer (1984, 1987) argued against

the use of standard K-weights with adolescents, stating that the empirical development of the K-correction procedure with adolescents would likely produce very different weighting patterns than those used with adults.

The MMPI-A manual does not recommend use of a K-correction factor. "The K correction used on the original MMPI and the MMPI-2 is not used on the MMPI-A because it was developed for adults and its generalizability to adolescents has not been demonstrated" (Butcher et al., 1992, p. 32). The MMPI-A Adolescent Project Committee apparently made no attempt to investigate or develop a K-weight procedure in the development of the MMPI-A.

Statement of the Problem and Hypotheses

The potentially dramatic effects of test-taking attitudes on MMPI response patterns has been acknowledged since the original development of this instrument (Meehl & Hathaway, 1946). More specifically, response bias has been shown to affect profile configurations produced by adolescent test-takers (Archer et al., 1987). Furthermore, there is reason to suspect that adolescent populations are particularly likely to produce profiles having an underreporting response style. Archer, Gordon, and Klinefelter (cited in Archer, 1992) reported code-type frequencies for 1,762 adolescents receiving inpatient or outpatient mental health treatment who took the original MMPI. They found that 30% of teenagers whose responses were rescored with the MMPI-A norms, and approximately 26% of teenagers whose responses were scored on the Marks and Briggs norms, produced no-code profiles. A no-code profile was defined as a profile containing no clinical T-score equal to or greater than 60 for the MMPI-A norms and 65 for the Marks and Briggs norms. Given the difficulty in distinguishing between normal adolescents who display transitory deviant behaviors and adolescents with significant and enduring psychopathology, it is possible that some of the adolescents identified in Archer et al.'s study were misdiagnosed, i.e., were normals misclassified as psychiatric patients. However, it is unlikely this could

fully account for these researchers' results because of the severity of psychopathology generally seen in the types of inpatient settings used in this study. The data indicate that the MMPI and MMPI-A may have limitations in terms of test sensitivity in accurately detecting psychopathology among adolescent patients.

The K-correction factor was developed to correct for underreporting or defensiveness and it is widely used in both clinical and research settings among adults. In fact, most of the clinical correlate literature is based on MMPI data scored with the K-correction. For this reason, the K-correction factor should continue to be used for assessing adults despite the inconclusive results of cross-validation research. The K-correction factor has been used with populations other than that on which it was developed despite cautions against such use by McKinley et al. (1948) and Dahlstrom and Welsh (1960). Inconsistent results of cross-validation research on the K-correction factor may reflect differences in the sample subjects and base rates, as well as differences in methodologies used.

Though the standard K-correction procedure has been used with adolescents, several researchers have adamantly argued against the use of the standard K-correction factor derived from adults with adolescents (Marks, Seeman, & Haller, 1974; Archer, 1984, 1987, 1992; Butcher et al., 1992). There has been no research to support use of the

original adult K-weights with this population. However, Heilbrun (1963) demonstrated the utility of new specifically derived K-weights with college students which suggests that K-weights developed on an adolescent population may be effective. Further, there is currently no way to systematically correct for defensiveness on the MMPI-A. Given the likelihood that the MMPI-A produces a high percentage of false negatives, it is probable that a K-correction factor specifically derived with adolescents would improve test accuracy. The following study will develop a K-correction factor for use with the MMPI-A to correct for underreporting and improved test accuracy in classifying normal adolescents and adolescents with psychopathology.

Hypotheses

1. The MMPI-A will show significant limitation in test sensitivity using standard non-K-corrected T-scores, i.e., relatively low rates of accurate detection of psychopathology among adolescents with documentable psychiatric disorders.

2. The addition of a K-weight constant to one or more clinical scales will improve the sensitivity of the MMPI-A in the detection of psychopathology.

3. The optimal K-weights found for adolescents will likely differ significantly from those established by McKinley et al. (1948) for adults with the original MMPI.

4. The subtraction of a K-weight constant to one or more clinical scales may result in improvements in the specificity and hit rate of the MMPI-A.

CHAPTER 2

METHOD

Subjects

Normal control subjects were made up of subjects from the MMPI-A normative group. This sample included 805 males and 815 females. Subjects ranged in age from 14 to 18 years, and in grade from 7th to 12th. Subjects came from Minnesota, Ohio, California, Virginia, Pennsylvania, New York, North Carolina, and Washington. The ethnic composition of the sample was approximately 76% White, 12% Black, and 12% from other ethnic groups. A majority of the adolescent's parents were well-educated and held professional or managerial jobs, indicating that higher educational and occupational levels were overrepresented. Approximately two-thirds of the subjects reported living with both biological parents.

The clinical group included 58 boys and 64 girls from an inpatient psychiatric hospital. Ages ranged from 11 to 18 years and grade levels ranged from 5th to 12th grade. Approximately 83% of these subjects were white, 7% were black, and 10% were from different ethnic backgrounds. In contrast to the findings for the normative sample, a majority of the clinical group adolescents' parents received less education (e.g., received a high school diploma) and worked at lower occupational levels. Also, only about half of the clinical subjects lived with both biological parents.

Procedure

Subjects in the normative sample voluntarily consented (both child and parent) to be tested. Adolescents were tested in group sessions, generally within school settings, and were paid for their participation. Subjects were excluded if they were younger than age 14 or older than age 18 or had incomplete data. Profiles with Carelessness scale raw score values > 35 or original F scale raw score values > 25 were also eliminated. The total number of subjects eliminated from the normative sample was not reported.

The clinical sample were adolescents who were admitted for inpatient treatment at the Psychiatric Institute, a psychiatric teaching facility affiliated with the Eastern Virginia Medical School. Subjects were consecutive admissions to the residential treatment units in the hospital and were administered the MMPI-A within 72 hours after admission. Following step one of Greene's (1991) stage model of validity assessment, cases were eliminated if they contained Cannot Say (?) raw scores > 30. Consistent with step two of the model, inconsistent profiles containing VRIN T-scores > 80 were dropped from the sample. Only one subject did not meet these criteria and had to be dropped from the clinical sample.

Statistical Analysis

Hit rate, sensitivity, and specificity, were computed to determine the test accuracy of the MMPI-A clinical

scales. Because a specific T-score has not been designated as a cutoff between normal range scores and clinically elevated scores, two sets of analyses were performed to reflect the "gray zone." Normal subjects with any one of the basic scales, excluding Mf and Si, with T-scores greater than or equal to 60 and 65 were identified as false positives. Clinical subjects with all of the basic scales (excluding Mf and Si) below 60, and below 65, were designated false negatives.

Discriminant function analyses were performed to determine the K-weight scale score combination which best predicted the criterion of normal versus clinical status for each of the 8 clinical scales. K-weights of 0K, .1K, .2K, .3K, .4K, .5K, .6K, .7K, .8K, .9K, and 1K were added to the raw scale scores and forced into the two-group discriminant function analyses. Analyses were performed separately for scales, Hs, D, Hy, Pd, Pa, Pt, Sc, and Ma. For each K-weight used in the discriminant function analysis, classification accuracy rates were computed. The investigator then chose the lowest K-weight which maximized the sensitivity of each scale without sacrificing specificity.

McKinley et al. (1948) used the original MMPI diagnostic criterion groups to determine the K-weights which best discriminated between the normal group and criterion groups for each scale. To determine the utility of this

method, as compared to the use of a general clinical group, a forced entry two-group discriminant function analysis was performed separately for scales D and Pd. The normative group and either a depressed subsample or a conduct disordered subsample of the clinical group were used, respectively to determine classification outcome findings.

Finally, hit rate, sensitivity, and specificity were used to determine the accuracy of the MMPI-A clinical scales when the K-weights were added to them. New uniform T-scores were derived using a computer package developed by Tellegen and Hoeglund (1994) for the MMPI-2 and modified to incorporate the K-weights of this study. As in the initial analyses, a T-score equal to or greater than 60 and 65 on any of the eight clinical scales was identified as false positive for normals and no T-score above 60 and 65 on any of the eight clinical scales was identified as false negative for patients. Hit rate, specificity, and sensitivity were also performed separately for scales D and Pd.

CHAPTER 3

RESULTS

Preliminary Assessment of Classification Accuracy

Sensitivity, specificity, and hit rate of the MMPI-A were computed in two separate analyses to reflect the T-score ≥ 60 and T ≥ 65 criterion levels for definition of normal range versus clinically elevated scores. In each analysis, false positives were normal subjects with T-scores greater than or equal to 60 or 65 on any one of the basic clinical scales, excluding Mf and Si,. False negatives were clinical subjects with all of the basic scales, excluding Mf and Si, below 60 or 65. A summary of classification accuracy is provided in Table 2. Findings indicate that

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Insert Table 2 about here

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when a criterion score of T ≥ 60 is used, sensitivity (.79) of the MMPI-A is substantially greater than specificity (.55) and hit rate (.57). At T ≥ 65, the MMPI-A appears to accurately identify approximately the same percentage of true positives as it does true negatives, and a better balance is achieved between sensitivity (.71) and specificity (.70). Overall, results indicate that sensitivity is greater using a criterion score of T ≥ 60 than a criterion score of T ≥ 65. In contrast, specificity and hit rate improve when the criterion is moved from T ≥ 60

to T $\geq$ 65.

Development of K-weights

Discriminant function analyses were performed separately for each of the 8 clinical scales, Hs, D, Hy, Pd, Pa, Pt, Sc, and Ma, to determine the K-weight which, when combined with the basic scale raw score, would best predict normal versus clinical status. K-weights of 0K, .1K, .2K, .3K, .4K, .5K, .6K, .7K, .8K, .9K, and 1K were added to the raw scale scores and forced into the two-group discriminant function analyses. Classification accuracy was then computed for each K-weight scale score combination (See Tables 3, 4, 5, 6, 7, 8, 9, and 10). For each scale, the optimal K-

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Insert Tables 3, 4, 5, 6, 7, 8, 9, 10 about here

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weight selected was that weight which maximized sensitivity while minimizing the associated loss in specificity. If several weights produced approximately equivalent sensitivity and specificity results, the lowest K-weight which met the selection criteria above was adopted. To summarize results, the weights which were chosen for each scale are as follows:

Hs + .3K	D + .4K	Hy + .2K	Pd +.4K
Pa + .6K	Pt + .8K	Sc + .4K	Ma +.6K

To determine if the use of specific diagnostic criterion groups would produce different K-weights than

those produced using a general clinical group, a forced entry two-group discriminant function analysis was performed separately for scales D and Pd. The normative group and either, 1) a depressed subsample of the clinical group for Scale D, or 2) a conduct disordered subsample of the clinical group for Scale Pd were used, respectively. Classification accuracy rates of these K-corrected scales were derived for these specific outcome groups and are shown in Tables 11 and 12. Criteria used to select K-weights for

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Insert Tables 11 and 12 about here

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these groups were the same as for comparisons with the general clinical group. However, selected K-weights for the specific criterion groups did not meaningfully differ from those chosen for the general clinical group. K-weights derived from the general clinical group were, therefore, used in all further analyses.

Classification Accuracy of the MMPI-A following K-correction

Using a computer package developed by Tellegen and Hoeglund (1994) for the MMPI-2 and modified to incorporate the K-weights derived in this study, new uniform T-scores were created for the MMPI-A. (See the Appendix for look-up tables of K-corrected uniform T-scores for the MMPI-A.) Figure 1 provides standard and K-corrected mean T-scores for the clinical group. A visual comparison of the two sets

Insert Figure 1 about here

of scores did not show clinically meaningful differences in profile elevation or configuration. A multivariate analysis of variance (MANOVA) also did not show a statistically significant difference between K- and non-K-corrected scores [$F = (8,43) = .59$, $p < .7839$].

Sensitivity, specificity, and hit rate of the MMPI-A were recomputed using the K-corrected uniform T-scores. As with the preliminary analyses, classification accuracy was computed in two separate analyses to reflect the $T \geq 60$ and $T \geq 65$ T-score level criterion for normal range versus clinically elevated scores. Classification accuracy rates are provided in Table 13. Trends in the data are similar to

Insert Table 13 about here

those found for data produced from the original analysis of classification accuracy based on standard non-K-corrected MMPI-A norms. Using a criterion score of $T \geq 60$ produced significantly better sensitivity (.81) than specificity (.53) and hit rate (.55). However, when a criterion of $T \geq 65$ was used, sensitivity (.72), specificity (68), and hit rate (.68) were approximately equal. Findings also indicate sensitivity was better with a criterion of $T \geq$

60 than with a criterion of T ≥ 65 is used. The opposite pattern was found for specificity and hit rate, i.e., higher values were observed when the criteria was T ≥ 65.

To determine the utility of a K-correction factor for the MMPI-A, classification accuracy rates using standard non-K-corrected uniform T-scores were compared to classification accuracy rates of K-corrected uniform T-scores. Differences in sensitivity, specificity and hit rate were minimal at both criterion levels of T ≥ 60 and T ≥ 65.

Post-hoc Analyses

Two-way analyses of variance (ANOVAs) were used to determine the presence of group effects (normal vs. clinical) and gender differences (male vs. female) on K-corrected T-scores for each of the basic clinical scales. Significant group effects were found for each of the basic clinical scales, Scale Hs [F (1,1740) = 33.55, p < .0001), Scale D [F (1,1740) = 51.15, p <. 0001), Scale Hy [F (1,1740) = 40.31, p <. 0001), Scale Pd [F (1,1740) = 116.01, p <. 0001), Scale Pa [F (1,1740) = 37.92, p < .0001), Scale Pt [F (1,1740) = 37.35, p < .0001), Scale Sc [F (1,1740) = 41.56, p < .0001), Scale Ma [F (1,1740) = 15.08, p <.0001). On each of these scales, the clinical group showed higher mean scale score elevation than the normative group. There were no main effects for gender, however, a significant gender by group interaction was found for Scale Hs [F

(3,1738) = 5.64, $p < .05$], Scale D [F (3,1738) = 7.02, $p <$ .01], Scale Hy [F (3,1738) = 10.99, $p <.001$], Scale Pa [F (3,1738) = 5.42, $p < .05$], and Scale Pt [F (3,1738) = 5.50, $p < .05$]. Gender differences were found in the clinical group only, with males achieving higher mean scale score elevation than females on each of these scales except Pa.

CHAPTER 4

DISCUSSION

Hathaway and McKinley were aware of the effects of test-taking attitudes on response patterns and sought to provide scales to evaluate these issues in their original construction of the MMPI. In an attempt to remove the bias created by underreporting or defensiveness, the K-correction factor was developed, and has become a standard part of scoring and interpreting profiles of adult respondents. Currently, there is no way to systematically correct for defensiveness on the MMPI-A, despite evidence which suggests that adolescent respondents underreport symptomatology (Archer, Gordon, & Klinefelter as cited in Archer, 1992). The purpose of this study was to evaluate the degree to which improvements could be achieved in test accuracy by developing a K-correction factor for use with the MMPI-A.

Results Related to Classification Accuracy

Given the research which suggests that adolescents underreport on the MMPI, it was hypothesized (Hypothesis 1) that the MMPI-A would show significant limitation in test sensitivity using standard non-K-corrected T-scores, i.e., relatively low rates of accurate detection of psychopathology would be found among adolescents with documentable psychiatric disorders. This hypothesis was tested by measuring the degree to which the MMPI-A accurately identified a group of adolescent inpatients among

normative subjects.

Hypothesis 1 was not strongly supported in that the MMPI-A accurately classified 79 percent of the clinical sample (true positives) when a T-score of 60 was used as the criterion for normal range versus clinically elevated scores. This criterion cut score also correctly classified 55 percent of normal subjects (true negatives) for an overall hit rate of 57 percent. These ratings indicate that a criterion score of 60 produced the largest problems in test specificity, rather than test sensitivity, i.e., a trend toward misclassification of normal subjects, not clinical subjects as was expected. The MMPI-A did a reasonably effective job of classifying adolescent inpatients with this cut score since it produced a sensitivity rate of 79 percent. Therefore, using a $T \geq 60$ cutoff resulted in the correct identification of almost 8 out of 10 clinical subjects.

When a T-score of 65 was used as the criterion level cut score, the MMPI-A correctly identified 71 percent of the clinical sample (true positives). As would be expected, the percentage of true negatives, or correct classification of normal subjects, increased to 70 percent when the cut score was raised from 60 to 65. This produced an overall hit rate of 70 percent. Thus, a criterion level of 65 produced a more effective balance in test sensitivity and specificity than that achieved by the $T \geq 60$ criterion. These data

suggest that a T-score of 65 be designated as the cutoff between normal range scores and clinically elevated scores when the relative cost of misclassifying adolescents with and without psychopathology is equal. Given the severity of psychopathology of the clinical population used in this study, as reflected by their inpatient status, further research will be needed to determine the utility of the "gray zone" in the identification of patients with less severe psychopathology (e.g., outpatients).

Development of K-weights

A "trial-and-error" method of inserting K-weight constants into a regression equation was used to determine the "best" K-weight for each scale. The following K weights were selected:

Hs + .3K D + .4K Hy + .2K Pd +.4K

Pa + .6K Pt + .8K Sc + .4K Ma +.6K

As hypothesized, these K-weights differ substantially from those established by McKinley et al. (1948) for adults with the original MMPI. The weights adopted for use with adult profiles are as follows:

Hs + .5K Pt + 1.0K Ma + .2K

Pd + .4K Sc + 1.0K

The discrepancy between K-weights derived in this study and the standard K-weights developed by McKinley et al. (1948) is consistent with warnings by previous researchers that K-weights developed using an adult inpatient

psychiatric population might not be appropriate for use with other populations (Dahlstrom & Welsh, 1960; McKinley et al., 1948). In fact, previous research found that K-weights derived utilizing a college student population were dissimilar to those developed for use with adults (Heilbrun, 1963).

McKinley et al. (1948) derived K-weights using criterion groups defined by specific diagnoses, rather than grouping psychiatric patients into an abnormal group as was the case in the current study. To determine if K-weights would differ if abnormals were separated into diagnostic groups, distinct analyses were run utilizing a depressed subsample and a conduct-disordered subsample. These analyses resulted in the selection of very similar K-weights to those derived using the general clinical sample.

Hypothesis four which stated that the subtraction of a K-weight constant to one or more clinical scales would result in improvements in specificity and hit rate of the MMPI-A was not supported. Prior to the "trial-and-error" method used in this study to derive K-weights for the MMPI-A, a multiple regression equation was used to determine the K-weight which, when added to the raw scale score, would best predict normative versus clinical group status. This method frequently resulted in giving the K scale greater weight than the clinical scale and was, therefore, abandoned. However, this procedure resulted in the

selection of uniformly positive K-weights and consequently, only positive K-weights were entered into the discriminant function analyses used to derive weights in this study. This method demonstrated that only the addition of a K-weight constant to raw scale scores produced increases in sensitivity for each of the clinical scales, and the use of negative K-weights did not improve prediction.

Effect of K-correction on Classification Accuracy

It was predicted (Hypothesis 2) that the addition of a K-weight constant to one or more clinical scales would improve the sensitivity of the MMPI-A in the detection of psychopathology. This hypothesis was not supported. Use of a K-correction factor with the MMPI-A resulted in the accurate classification of 81 percent of the clinical sample when a T-score of 60 was used as the cutoff between normal range and clinically elevated scores. Fifty-three percent of normal subjects were correctly classified with this cut score producing an overall hit rate of 55 percent. This is compared to sensitivity (.79), specificity (.55), and hit rate (.57) for non-K-corrected MMPI-A scores.

Similar results were found when a T-score of 65 was used as the criterion level cut score. The MMPI-A accurately identified 72 percent of the clinical sample and 68 percent of the normative sample when K-weights were used, as compared to 71 percent and 70 percent, respectively when scores were unweighted. The overall hit rate (i.e., .68 for

K-corrected versus .70 for non-K-corrected) was also not substantially different for K- and non-K-corrected scores.

A comparison of standard and K-corrected mean T-scores for the clinical group further illustrates that the K-correction did not significantly alter the mean profile for the clinical group (see Figure 1). While the addition of a K-weight constant to each of the clinical scales did not alter the mean clinical group profile, individual profiles were affected. Adolescent respondents with identical raw score values for each of the eight clinical scales produced different profiles with and without K-correction procedure. Figure 2 illustrates three separate profile configurations for an adolescent male, including K-corrected with a low K raw score value, K-corrected with a high K raw score value, and non-K-corrected, each with identical raw score values on the eight clinical scales.

Insert Figure 2 here

It should be emphasized that the current study of the correction factor did not examine the effects of this K-correction procedure on the validity of individual profiles beyond the normal versus clinical group placement issue. It is possible that the addition of K-weights produces changes in profile elevation and consequently, reduces the accuracy of actuarial statements for some profiles as compared to

interpretive statements produced without use of the K-correction factor. In other cases, K-correction may result in improved interpretation accuracy. We also did not test for changes in configuration of individual profiles, i.e., systematic changes in codetype frequency as a result of K-correction procedures.

Summary and Limitations

The major findings of this study indicate that adoption of a K-correction factor for use with the MMPI-A does not appear to improve test accuracy as defined by consistent improvements in test sensitivity. Current results do not support future use of a K-correction factor in scoring MMPI-A protocols.

Limitations in this research, particularly with the sampling procedure, may partly account for results which were different than those expected. The present study utilized a clinical population obtained from a single clinical setting, i.e., an inpatient psychiatric hospital. Hence, subjects in this study represented an extreme clinical sample and probably expressed more severe psychopathology in relation to other clinical populations including outpatient samples. While it might be expected that the current clinical sample would produce uniformly and dramatically elevated profiles, this was not the case. The greatest elevation on the non-K-corrected mean profile was found for Scale Pd which was only 9 T-score points higher

than the mean scale score of 50 for the normative sample. Since the standard error of measurement on the MMPI-A is 5 T-score points (Butcher et. al, 1992), this difference is not clinically striking, even though one would expect there to be marked differences given the extreme psychopathology of the sample used in this study. Results from the MANOVA comparing the normative and clinical groups represent a statistically significant difference, but not a clinically meaningful difference. These results are consistent with previous research by Archer, Gordon, and Klinefelter (cited in Archer, 1992) which also found that about a third of adolescent inpatients and outpatients did not produce profiles with clinical elevations on the original MMPI.

Based on this research showing that many adolescent patients produce non-clinically elevated profiles, it might be concluded that teenagers tend to underreport on the MMPI. It is possible that the problem of lack of elevation in the profiles of adolescent patients, however, does not result from underreporting but from the difficulty in distinguishing between adolescent psychopathology and the transitory deviant behavior produced by normal teenagers (Archer, 1987; Archer, 1992). Also, given the lack of information about inpatients not included in the clinical group, it is possible that severely disturbed adolescents may have refused or been unable to take the MMPI. Hence, the MMPI-A scores produced by the clinical sample may not

substantially differ from scores produced by adolescents in the normative sample. Since the mean T-score on Scale K was similar for both the clinical (M = 51.03; SD = 10.54) and normative groups (M = 50.01; SD = 9.97), and similar raw score values were also apparent (i.e., M = 12.70 and SD = 4.74 for the clinical group, and M = 12.11 and SD = 4.60 for the normative group) the K-correction factor may have resulted in simply elevating mean profiles in both groups rather than improving test discrimination between groups.

To test whether the K-correction factor can improve the accuracy of protocols produced by adolescents who underreport, further research on use of the K-correction factor should be conducted with adolescents under conditions in which they are highly motivated to underreport. Future investigations should also be conducted with patients demonstrating less severe symptomatology, particularly outpatient samples. Subsequent research might also consider another method of comparing the effect of the K-correction on classification accuracy by comparing individual profiles before and after K-correction and looking at the rate of congruence for each subject. Given that the clinical population sampled was restricted geographically, research with a more diverse sample would be desirable.

Another sampling issue which should be noted concerns the composition of the MMPI-A normative group. These subjects were not screened for a history of psychiatric

illness or treatment, and it is probable that a significant percentage of adolescents in this group were receiving outpatient therapy at the time of data collection. Subjects did not represent a "pure" normative sample, which may partially account for limitations in test specificity because some normative subjects receiving outpatient psychotherapy may have produced clinically elevated profiles.

Finally, it should be noted that the outcome of this study and its clinical meaning are affected by base rates. Hit rate, which is used to measure overall test accuracy, is a function of base rates. In this study, clinical subjects made up only 7% of the sample. Therefore, hit rate estimates were largely a function of specificity, or the ability of the MMPI-A to accurately classify normative subjects, since they made up a much greater proportion of the subjects studied. For example, using a criterion score of $T \geq 60$, the MMPI-A achieved a hit rate of .57 in this study. However, the hit rate would have increased to .67 if the base rate of clinical and normative subjects was equal in number.

The utility of the MMPI-A in predicting clinical vs. normative status is also a function of base rates. Paul Meehl cautioned against trying to predict low and high base rate behaviors because of the relatively small improvements made over a priori base rates (Meehl, 1973). The effect of

measuring low base rate behaviors is apparent in this study if you compare the ability of the MMPI-A to improve upon the base rate in predicting normative versus clinical status. Using a criterion score of $T \geq 65$, 68 percent of all of the subjects were correctly classified. With a base rate of only 7%, this represents a 25% decline in accuracy over a hit rate of 93% if you predicted that all protocols were generated by normal subjects.

One final note about base rates concerns the relative cost of false positives and false negatives. No differential value was placed on either sensitivity or specificity in this study. In clinical settings, it is likely that the misclassification of patients or normals could result in large financial costs and ethical concerns. If the MMPI-A is going to be used in a treatment facility, as is often the case, than false negatives may be more serious errors than false positives since failure to provide appropriate treatment is a more serious error in this setting than providing treatment to someone who doesn't need it. While this study provided data on the accuracy of the MMPI-A, a determination as to how "good" these rates are will be dependent upon the setting in which the test is used. Current findings suggest, however, that the addition of a K-correction factor will not change accuracy rates sufficiently to justify adaptation in most assessment tasks.

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TABLES

Table 1
Stages in the Development of the K scale and the K-correction Factor

Stage I **Paul Meehl (1945) developed the N scale, a forerunner of the K scale, which was designed as a measure of identifying false positives.**

Step 1 Forty-two normals with abnormal profiles were contrasted with 42 abnormals with matched profiles to determine items which differentiated between the two groups. These 78 items were incorporated into the N scale.

Step 2 Results supported the effectiveness of the N scale to identify some false positives (i.e., false positive elevations on the neurotic triad) but not others (i.e., false elevations on the psychotic triad). Hathaway and Meehl (1947) also concluded that the scale was probably loaded with "genuine psychiatric" traits. Work on the N scale was, therefore, abandoned.

Stage II **Meehl and Hathaway (1946) derived L6 to identify false negatives.**

Step 1 An item analysis of responses from 50 psychiatric patients with normal profiles and a T-score of 60 or higher on the L scale was performed.

Step 2 Twenty-two items which showed at least a 30 percent difference between psychiatric group and normative sample endorsement frequencies were included, excluding any items from the L scale.

Step 3 High scores on L6 did identify accurately false negatives. Furthermore, low scores were obtained by normals exaggerating psychopathology, i.e. false positives. However, low scores were also found for psychotic patients showing severe depressive or schizophrenic reactions. Thus, the meaning of low scores was unclear.

Table 1 (continued)

Stage III Eight items were added to L6 to form the current 30 item K scale.

Step 1 To correct for the low scores obtained by psychotic patients, items not affected by test-taking attitudes were identified. Items which remained stable when nonpsychiatric men were instructed to fake good or bad were chosen.

Step 2 Those items which differentiated between psychotic patients with schizophrenic and depressive features, and normals were added to L6 to form the K scale.

Stage IV McKinley, Hathaway, and Meehl (1948) developed a systematic way to "correct" for defensiveness and empirically derived K-correction values.

Step 1 A trial and error method of plugging in different K weights into a deviation formula for each scale was used to determine the K weights which best discriminated between the psychiatric and normative groups.

Step 2 In 1948, Psychological Corporation added the K-correction factor derived by McKinley et al. (1948) to five scales on the basic profile sheet.

Table 2

Classification Accuracy of MMPI-A Clinical Scales for the General Clinical Group versus the Normative Group

	Classification Criterion	
Classification Accuracy Indices	60	65
Sensitivity	.79	.71
Specificity	.55	.70
Hit Rate	.57	.70

Table 3

Scale Hs Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	56.56	61.23	60.91
.1	56.56	64.20	63.66
.2	56.56	64.75	64.18
.3	58.20	65.43	64.93
.4	57.38	65.86	65.27
.5	60.66	64.69	64.41
.6	58.20	65.19	64.70
.7	58.20	65.25	64.75
.8	58.20	65.12	64.64
.9	58.20	64.32	63.89
1.0	54.92	66.42	65.61

Table 4

Scale D Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	59.02	65.25	64.81
.1	57.38	66.79	66.13
.2	57.38	66.30	65.67
.3	59.02	66.85	66.30
.4	60.66	67.16	66.70
.5	60.66	65.99	65.61
.6	58.20	66.85	66.25
.7	59.02	66.30	65.79
.8	57.38	66.60	65.96
.9	57.38	66.05	65.44
1.0	54.92	67.78	66.88

Table 5

Scale Hy Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	57.38	63.83	63.38
.1	58.20	64.57	64.12
.2	59.02	64.69	64.29
.3	59.84	64.32	64.01
.4	58.20	64.20	63.78
.5	59.02	63.89	63.55
.6	58.20	64.07	63.66
.7	57.38	63.27	62.86
.8	55.74	63.46	62.92
.9	55.74	62.78	62.28
1.0	57.38	60.25	60.05

Table 6

Scale Pd Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	68.03	69.14	69.06
.1	71.31	68.89	69.06
.2	72.95	69.20	69.46
.3	74.59	69.26	69.63
.4	77.05	69.38	69.92
.5	74.59	70.06	70.38
.6	74.59	69.57	69.92
.7	73.77	69.20	69.52
.8	73.77	69.63	69.92
.9	72.95	68.58	68.89
1.0	73.77	66.67	67.16

Table 7

Scale Pa Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	57.38	58.83	58.73
.1	54.10	63.02	62.40
.2	55.74	62.96	62.46
.3	56.56	63.27	62.80
.4	56.56	64.57	64.01
.5	55.74	65.00	64.35
.6	59.02	62.90	62.63
.7	58.20	62.41	62.11
.8	57.38	61.36	61.08
.9	56.56	61.48	61.14
1.0	55.74	63.15	62.63

Table 8

Scale Pt Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	59.02	55.80	56.03
.1	59.02	56.60	56.77
.2	59.02	56.79	56.95
.3	59.84	57.53	57.69
.4	59.84	57.96	58.09
.5	60.66	57.53	57.75
.6	60.66	58.64	58.78
.7	59.84	59.57	59.59
.8	61.48	60.31	60.39
.9	62.30	59.75	59.93
1.0	59.84	62.53	62.34

Table 9

Scale Sc Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	60.66	61.30	61.25
.1	63.11	60.68	60.85
.2	62.30	61.11	61.19
.3	62.30	61.30	61.37
.4	63.11	62.10	62.17
.5	63.11	61.42	61.54
.6	60.66	62.72	62.57
.7	60.66	63.02	62.86
.8	62.30	63.46	63.38
.9	60.66	64.69	64.41
1.0	59.84	64.44	64.12

Table 10

Scale Ma Classification Accuracy with Varying K-correction Weights for the General Clinical Group versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	50.82	56.67	56.26
.1	55.74	54.20	54.31
.2	56.56	53.21	53.44
.3	55.74	55.86	55.86
.4	55.74	55.99	55.97
.5	56.56	55.37	55.45
.6	59.84	55.43	55.74
.7	57.38	56.42	56.49
.8	57.38	55.62	55.74
.9	58.20	54.63	54.88
1.0	59.02	54.81	55.11

Table 11

Scale D Classification Accuracy with Varying K-correction Weights for the Depressed Subsample versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	64.81	70.99	70.79
.1	62.96	73.09	72.76
.2	61.11	73.15	72.76
.3	61.11	73.70	73.30
.4	62.96	73.02	72.70
.5	66.67	71.48	71.33
.6	61.11	72.65	72.28
.7	62.96	72.35	72.04
.8	64.81	71.79	71.57
.9	62.96	71.79	71.51
1.0	61.11	73.15	72.76

Table 12

Scale Pd Classification Accuracy with Varying K-correction Weights for the Conduct Disordered Subsample versus the Normative Group

K-weight	Sensitivity	Specificity	Hit Rate
0	66.67	69.14	69.07
.1	69.05	67.65	67.69
.2	73.81	67.78	67.93
.3	76.19	68.33	68.53
.4	76.19	68.27	68.47
.5	76.19	67.59	67.81
.6	73.81	67.47	67.63
.7	71.43	68.15	68.23
.8	71.43	68.15	68.23
.9	73.81	67.22	67.39
1.0	69.05	66.67	66.73

Table 13

Classification Accuracy of K-corrected MMPI-A Clinical Scales for the General Clinical Group versus the Normative Group

	Classification Criterion	
Classification Accuracy Indices	60	65
Sensitivity	.81	.72
Specificity	.53	.68
Hit Rate	.55	.68

FIGURES

Figure 1. Non-K-corrected and K-corrected Mean T-scores for the Adolescent General Clinical Group (n = 122).

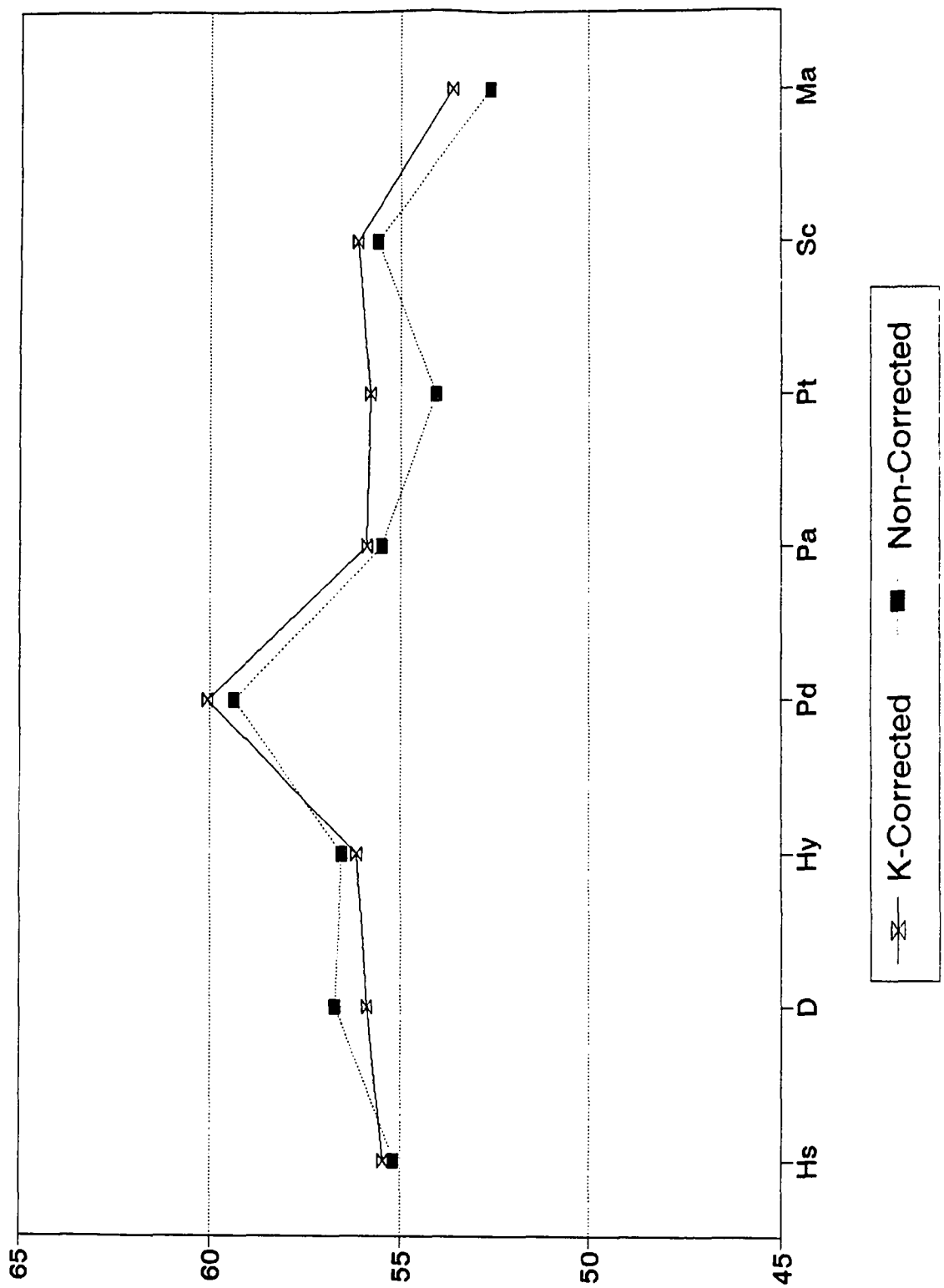
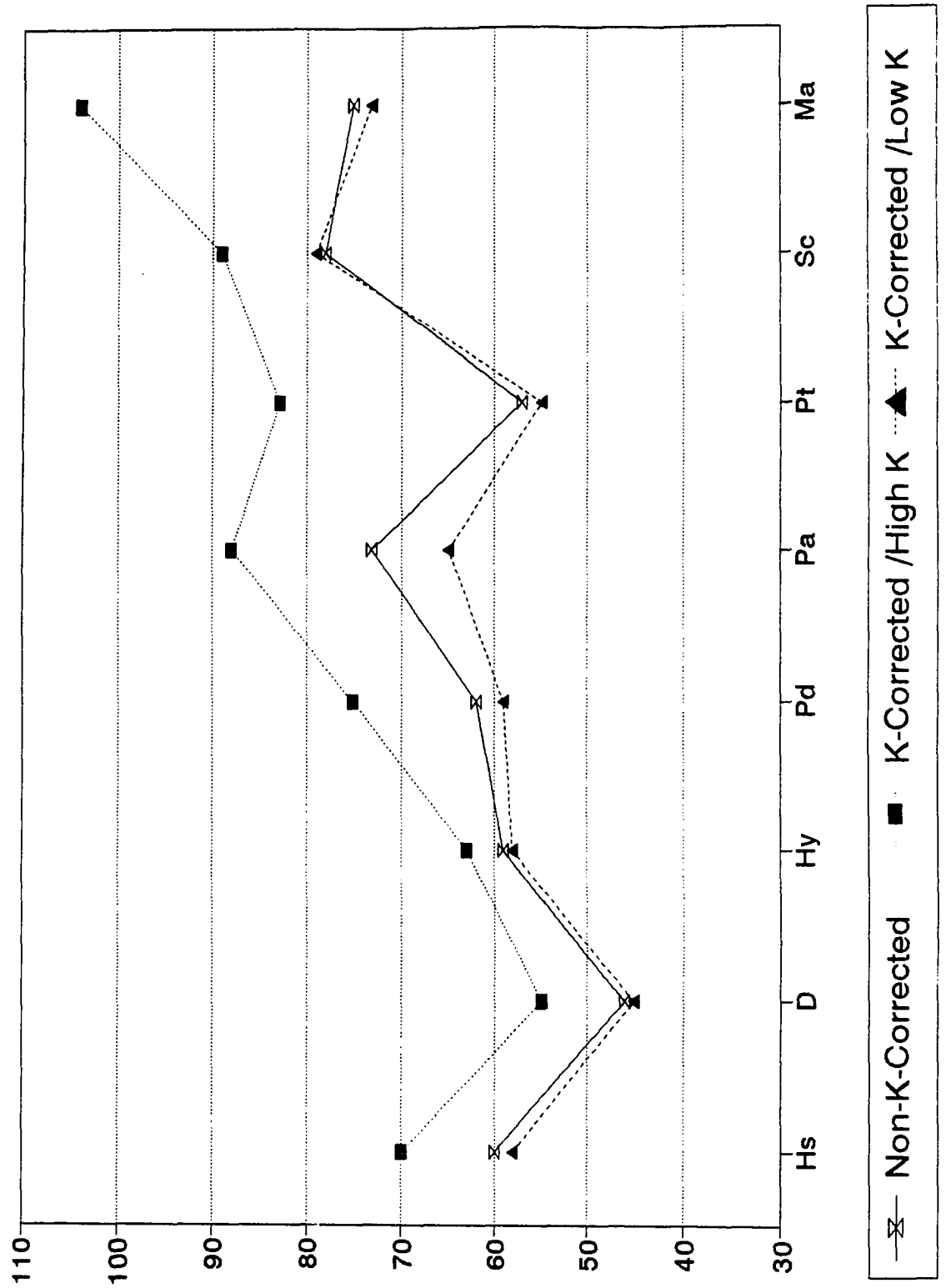


Figure 2. Non-K-corrected and K-corrected Profile Configurations for an Adolescent Male with Low (K = 10) and High (K = 25) Values of K.



APPENDIX

Appendix

Look-up table of K-corrected Uniform T-Scores for the MMPI-A

To use the look-up table you must use K-corrected raw scores. A K-corrected raw score is a combination of the raw scale score and a weighted percentage of the raw score of K.

Males

RAW SCORE	HS	D	HY	PD	PA	PT	SC	MA
0	30	30	30	30	30	30	30	30
1	30	30	30	30	30	30	30	30
2	30	30	30	30	30	30	30	30
3	30	30	30	30	30	30	30	30
4	32	30	30	30	30	30	30	30
5	35	30	30	30	30	30	30	30
6	38	30	30	30	30	30	30	30
7	41	30	31	30	30	30	30	30
8	43	30	31	30	30	30	30	30
9	45	30	31	30	30	30	30	30
10	47	30	32	30	30	30	31	30
11	49	30	32	30	32	30	33	30
12	51	30	33	30	34	30	35	30
13	53	32	34	30	36	30	36	30
14	54	34	35	31	38	30	37	30
15	56	35	36	34	40	30	39	30
16	58	37	37	36	42	32	40	30
17	61	38	39	37	43	34	41	30
18	63	40	40	39	45	35	42	31
19	65	42	42	41	47	37	43	33
20	68	43	44	42	49	38	44	35
21	70	45	46	43	51	40	44	36
22	70	46	48	45	53	41	45	38
23	74	48	49	46	55	42	46	39
24	77	50	51	48	57	43	47	40
25	79	51	53	49	59	44	47	42
26	81	53	55	51	62	46	48	43
27	84	55	57	53	65	47	49	45
28	86	56	58	55	67	48	50	46
29	88	58	60	57	70	50	50	48
30	90	60	61	59	73	51	51	50
31	93	62	63	62	75	53	52	53
32	95	63	64	65	78	55	53	56
33	97	65	66	67	80	57	54	59
34	100	67	67	70	83	59	55	62
35	102	69	69	73	86	61	56	66
36	104	71	70	75	88	64	58	69

RAW SCORE	HS	D	HY	PD	PA	PT	SC	MA
37	106	72	71	78	91	66	59	73
38	109	74	73	81	94	69	61	76
39	111	76	74	83	96	71	62	80
40	113	78	76	86	99	73	64	83
41	116	79	77	89	101	76	65	87
42	***	81	79	91	104	78	67	90
43	***	83	80	94	107	81	68	94
44	***	85	82	96	109	83	70	97
45	***	87	83	99	112	86	72	101
46	***	88	85	102	115	88	73	104
47	***	90	86	104	117	90	75	108
48	***	92	88	107	120	93	76	111
49	***	94	89	110	120	95	78	115
50	***	96	91	112	120	98	79	119
51	***	97	92	115	120	100	81	120
52	***	99	93	118	120	103	83	120
53	***	101	95	120	120	105	84	120
54	***	105	96	120	120	107	86	120
55	***	105	98	120	120	110	87	120
56	***	106	99	120	120	112	89	120
57	***	108	101	120	120	115	90	120
58	***	110	102	120	***	117	92	120
59	***	112	104	120	***	119	94	120
60	***	114	105	120	***	120	95	120
61	***	115	107	120	***	120	97	120
62	***	117	108	***	***	120	98	120
63	***	119	110	***	***	120	100	120
64	***	120	111	***	***	120	101	***
65	***	120	113	***	***	120	103	***
66	***	120	114	***	***	120	105	***
67	***	120	***	***	***	120	106	***
68	***	120	***	***	***	120	108	***
69	***	120	***	***	***	120	109	***
70	***	***	***	***	***	120	111	***
71	***	***	***	***	***	120	112	***
72	***	***	***	***	***	***	114	***
73	***	***	***	***	***	***	116	***
74	***	***	***	***	***	***	117	***
75	***	***	***	***	***	***	119	***
76	***	***	***	***	***	***	120	***
77	***	***	***	***	***	***	120	***
78	***	***	***	***	***	***	120	***
79	***	***	***	***	***	***	120	***

Females

RAW SCORE	HS	D	HY	PD	PA	PT	SC	MA
0	30	30	30	30	30	30	30	30
1	30	30	30	30	30	30	30	30
2	30	30	30	30	30	30	30	30
3	30	30	30	30	30	30	30	30
4	30	30	30	30	30	30	30	30
5	33	30	30	30	30	30	30	30
6	35	30	30	30	30	30	30	30
7	38	30	30	30	30	30	30	30
8	40	30	30	30	30	30	30	30
9	43	30	30	30	30	30	30	30
10	45	30	30	30	31	30	31	30
11	46	30	30	30	33	30	32	30
12	48	30	30	30	34	30	34	30
13	50	30	31	30	36	30	35	30
14	52	30	33	31	38	30	37	30
15	54	32	34	33	40	30	38	30
16	56	33	35	34	41	30	39	30
17	58	35	37	36	43	31	40	31
18	60	37	38	38	45	33	41	32
19	63	38	39	39	47	34	42	34
20	65	40	41	41	49	36	43	35
21	68	42	42	43	51	37	44	36
22	70	43	44	44	54	38	45	37
23	72	45	45	46	56	40	45	39
24	75	47	47	48	59	41	46	40
25	77	49	48	49	62	42	47	41
26	80	51	50	51	65	44	48	43
27	82	53	52	53	68	45	48	45
28	84	54	54	55	71	46	49	47
29	87	56	56	57	74	47	50	49
30	89	58	59	59	77	49	51	51
31	92	60	61	61	80	50	51	53
32	94	62	64	64	83	52	52	56
33	97	64	66	66	86	53	53	59
34	99	66	69	68	89	55	54	62
35	101	68	71	70	92	57	55	66
36	104	70	74	73	95	59	56	69
37	106	72	76	75	98	61	58	72
38	109	74	79	77	101	63	59	76
39	111	76	81	79	104	65	61	79
40	114	78	84	82	107	67	62	82
41	116	80	87	84	110	69	64	85
42	***	82	89	86	113	71	65	89
43	***	84	92	88	116	73	67	92
44	***	86	94	91	118	75	68	95
45	***	89	97	93	120	78	70	99
46	***	91	99	95	120	80	71	102
47	***	93	102	98	120	82	73	105

RAW SCORE	HS	D	HY	PD	PA	PT	SC	MA
48	***	95	104	100	120	84	74	108
49	***	97	107	102	120	86	76	112
50	***	99	109	104	120	88	78	115
51	***	101	112	107	120	90	79	118
52	***	103	114	109	120	92	81	120
53	***	105	117	111	120	94	82	120
54	***	107	120	113	120	96	84	120
55	***	109	120	116	120	99	85	120
56	***	111	120	118	120	101	87	120
57	***	113	120	120	120	103	88	120
58	***	115	120	120	***	105	90	120
59	***	117	120	120	***	107	91	120
60	***	119	120	120	***	109	93	120
61	***	120	120	120	***	111	94	120
62	***	120	120	***	***	113	96	120
63	***	120	120	***	***	115	97	120
64	***	120	120	***	***	117	99	***
65	***	120	120	***	***	119	101	***
66	***	120	120	***	***	120	102	***
67	***	120	***	***	***	120	104	***
68	***	120	***	***	***	120	105	***
69	***	120	***	***	***	120	107	***
70	***	***	***	***	***	120	108	***
71	***	***	***	***	***	120	110	***
72	***	***	***	***	***	***	111	***
73	***	***	***	***	***	***	113	***
74	***	***	***	***	***	***	114	***
75	***	***	***	***	***	***	116	***
76	***	***	***	***	***	***	117	***
77	***	***	***	***	***	***	119	***
78	***	***	***	***	***	***	120	***
79	***	***	***	***	***	***	120	***

Autobiographical Statement

Jody Jacobson Alperin was born on October 28, 1968 in Miami Beach, Florida. She received a Bachelor of Arts degree in May, 1990 from Oberlin College where she graduated with honors in psychology. In 1991, Jody entered the Virginia Consortium for Professional Psychology to pursue a Doctor of Psychology degree in Clinical Psychology. Her area of concentration during her third year of training was personality assessment. She co-authored an article entitled "Are critical items 'critical' for the MMPI-A?" in the Journal of Personality Assessment and a book entitled MMPI-A Casebook. In July, 1995, Jody will complete a clinical internship at Eastern Virginia Medical School as part of her doctoral training.