DMDC TECHNICAL REPORT 94-001

INITIAL OPERATIONAL TEST AND EVALUATION OF FORMS 20, 21, AND 22 OF THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB)

Gary L. Thomasson, Bruce Bloxom, and Lauress Wise
Defense Manpower Data Center

JANUARY 1994

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Personnel Testing Division
DEFENSE MANPOWER DATA CENTER

NOTE

This report, *INITIAL OPERATIONAL TEST AND EVALUATION OF* FORMS 20, 21, AND 22 OF *THE ARMED SERVICES VOCATIONAL APTITUDE BATTERY(ASVAB)*, has been produced in two sections to facilitate review.

The front section contains the preface, the executive summary, the text that discusses the procedures and analysis, the appendixes, and a list of references.

The back section, titled ASVAB *20, 21, AND 22* IOT&E SUPPLEMENT, contains all tables and figures that provide information to support the discussion of procedures and analyses.

Reviewed by:

Bert F. Green, Jr.
Johns Hopkins University

This report was prepared for the Directorate for Accession Policy, Office of the Assistant Secretary of Defense (Personnel and Readiness). The technical project officer for this report was Dr. Bruce Bloxom, Quality Control and Analysis Branch, Personnel Testing Division, Defense Manpower Data Center. The views, opinions, and findings contained in this report are those of the authors and should not be construed as an official Department of Defense position, policy, or decision, unless so designated by other official documentation.

DEFENSE MANPOWER DATA CENTER
99 Pacific Street, Suite 155-A • Monterey, CA 93940-2453
Telephone: (408) 655-0400 Telefax: (408) 656-2087

INITIAL OPERATIONAL TEST AND EVALUATION

OF FORMS 20, 21, AND 22

OF THE ARMED SERVICES VOCATIONAL

APTITUDE BATTERY

(ASVAB)

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PREFACE

The completion of this work would not have been possible without the efforts of many persons at the Defense Manpower Data Center (DMDC) and elsewhere. Dr. Linda Curran, formerly at Air Force Human Resources Laboratory, and Dr. Pamela Palmer at Operational Technologies developed the items used in the new test forms. Mr. John Harris at DMDC and Dr. Wayne Shore at Operational Technologies developed the final forms of the new test booklets. Mr. Richard Branch and others at the Military Entrance Processing Command provided both leadership and day-to-day assistance in the distribution and special administration of the test forms as required for the study. Mr. Robert Hamilton at DMDC meticulously developed and documented the data base for the analyses. Dr. Bert F. Green, Jr., at Johns Hopkins University, provided thoughtful and detailed comments on an earlier version of this report. And Ms. Norma Vishneski at DMDC provided careful attention to all of the necessary details in the final editing and production of the report.

Special recognition must be made of the contributions of Dr. D.R. Divgi at the Center for Naval Analyses. This project was one of the first equating studies conducted entirely at DMDC. Through his generous and extensive counsel on the data analysis plans and procedures for the project, Dr. Divgi provided DMDC with invaluable support, sharing with the authors the benefits of his keen analytic insights and his extensive experience with equating and related statistical issues.

EXECUTIVE SUMMARY

The Armed Services Vocational Aptitude Battery (ASVAB) is a multiple-choice test battery administered to all applicants for active-duty and reserve enlistment in the United States Armed Services. In addition, it is administered to approximately one million students each year as part of the Department of Defense (DoD) Student Testing Program. The battery consists of the ten subtests listed in Table 1. In addition, Verbal (VE) -- which is the sum of two subtests, Word Knowledge (WK) and Paragraph Comprehension (PC) -- is treated like a separate subtest in many analyses and applications. Various combinations of the subtest standard scores form composites that are used by DoD and the Services for determining eligibility for enlistment and for classification into military occupations.

ASVAB Forms 15, 16, and 17 were implemented for use in the Enlistment Testing Program in January 1989. New items for ASVAB Forms 20, 21, and 22 were developed by the Armstrong Laboratory in the Air Force Human Resources Directorate to replace ASVAB 15, 16, and 17 (Palmer, Curran, and Haywood, 1990). Items were then selected for the new forms by a contractor for Defense Manpower Data Center (Shore, Welsh, and Palmer, 1990). For each of the ten subtests, the items in the new forms were selected to make forms that were parallel to the corresponding subtest of the ASVAB reference form, 8a.

Although ASVAB Forms 20, 21, and 22 were designed to be parallel to the reference form, their item contents and statistical properties could not be assumed to have distributions that are identical to the reference form or to each other. Therefore, it was necessary to equate them to the reference form, so that their scores would have the same interpretation as scores on the latter form.[1] Being able to use this same score scale for all ASVAB forms serves three purposes. First, examinees can receive some assurance that they will have comparable scores for military enlistment, regardless of which ASVAB form is administered to them. Second, DoD and the Military Services can receive some assurance that similar numbers of military applicants will be eligible for enlistment regardless of which ASVAB form is administered. Third, policy makers can use ASVAB scores of cohorts of military recruits to study trends in the aptitude of persons entering the military, even when the cohorts differ in the ASVAB forms that are administered to them.

The present study had three purposes. The first was to develop conversion tables for ASVAB Forms 20, 21 and 22. These tables convert subtest raw scores for each form to equated standard scores. The subtest scores would then be on the 1980 standard score scale, the same as the reference form and other forms used operationally in the Enlistment Testing Program. The second purpose was to provide at least a partial check of the use of these conversion tables for constructing composites of subtests in the Enlistment Testing Program. If the test forms are sufficiently parallel in content, and if the conversion tables are correct, then the composites for the new forms should have the same distributions as the composites for the reference form and current operational forms.

[1] For each subtest, the reference-form score scale is defined by a standard-score transformation (mean = 50 and standard deviation = 10) of the number-right score. Standard scores are based on the mean and standard deviation of the subtest in a sample from the 1980 18-23-year-old American youth population (Department of Defense, 1982). See Table 1 for the normative mean and standard deviation of the number-right scores of each subtest.

The third purpose of the study was to adjust the conversion tables for effects of using the new answer sheet implemented in February 1992. Scores on the two speed subtests, NO and CS, can vary across answer-sheet formats (Ree and Wegner, 1990). Specifically, scores have been found to be lower with the new answer sheet than with the one for which norms are available (Bloxom, McCully, Branch, Waters, Barnes, and Gribben, 1991; Bloxom, Thomasson, Wise, and Branch, 1992). Therefore, obtaining accurate conversion tables for these two subtests in this study required score- scale adjustments based on combining the new ASVAB form equating with a prior answer-sheet calibration. The latter calibration was provided in Bloxom et al. (1992).

The design of this study was to administer eight ASVAB forms to randomly equivalent groups of at least 12,000 military applicants each. The eight forms were versions a and b of ASVAB forms 20, 21, and 22 -- plus ASVAB 15g (a current operational form) and ASVAB 15h. Except for its cover, the latter was identical to ASVAB Form 8a, the reference form that was used to collect the normative data (Department of Defense, 1982). The forms were administered as part of the normal processing of military applicants, with scores based on a preliminary equating (Thomasson and Bloxom, 1992) being used to determine eligibility for enlistment and for assignment to military specialties.

The data analyses consisted of data quality-control procedures, checks on the equivalence of the groups taking the eight test forms, a check for item-order effects before pooling the results for different forms having the same items administered in different orders, an equating of subtests on the new forms to subtests on the reference form, the development of subtest conversion tables, and an assessment of the effect of subtest equatings on the equatings of operational composites of subtests.

Analyses of the gender, race, and education of the groups taking the eight test forms showed only slight differences (in gender) between the groups. Also, the sample size varied across test forms in a way that indicated the administration of the forms was not spiralled; but the effects of this on the operational composites were shown to be slight and nonsystematic. However, significant item-order effects were found on forms 21a and 21b of the Coding Speed (CS) subtest. Consequently, even though these two forms of CS contained the same items (in different orders), they were not pooled before being equated to the reference form.

Subtests of the new forms were equated to the reference form using equipercentile equating. The procedure employed subtest distributions that were smoothed by fitting a model with as few parameters as necessary to provide no statistically significant departure from the unsmoothed distributions. The equatings did not produce a perfect match of the new-form AFQT composite distribution to the reference-form AFQT composite distribution or to the AFQT composite distribution of a current operational form. However, the precision of its match to the distributions of those forms was comparable to the match obtained in the IOT&E of ASVAB forms 15, 16, and 17 and in the IOT&E of ASVAB 18/19. Similar patterns of results were found for the Services' specialty composites.

Conversion tables based on the equatings developed here were provided for operational use.

INITIAL OPERATIONAL TEST

AND EVALUATION OF FORMS 20, 21, AND 22

OF THE ARMED SERVICES

VOCATIONAL APTITUDE BATTERY

Introduction

The Armed Services Vocational Aptitude Battery (ASVAB) is a multiple-choice test battery administered to all applicants for active-duty and reserve enlistment in the United States Armed Services. In addition, it is administered to approximately one million students each year as part of the Department of Defense (DoD) Student Testing Program. The battery consists of the ten subtests listed in Table 1. In addition, Verbal (VE) -- which is the sum of two subtests, Word Knowledge (WK) and Paragraph Comprehension (PC) -- is treated like a separate subtest in many analyses and applications. Various combinations of the subtest standard scores form composites that are used by DoD and the Services for determining eligibility for enlistment and for classification into military occupations.

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Although ASVAB Forms 20, 21, and 22 were designed to be parallel to the reference form, their item contents and statistical properties could not be assumed to have distributions that were identical to the reference form or to each other. Therefore, it was necessary to equate them to the reference form, so that their scores would have the same interpretation as scores on the latter form.[2] Being able to use this same score scale for all ASVAB forms serves three purposes. First, examinees can receive some assurance that they will have comparable scores for military enlistment, regardless of which ASVAB form is administered to them. Second, DoD and the Military Services can receive some assurance that similar numbers of military applicants will be eligible for enlistment regardless of which ASVAB form is administered. Third, policy makers can use ASVAB scores of cohorts of military recruits to study trends in the aptitude of persons entering the military, even when the cohorts differ in the ASVAB forms that are administered to them.

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The present study had three purposes. The first was to develop conversion tables for ASVAB Forms 20, 21, and 22. These tables convert subtest raw scores for each form to equated standard scores. The subtest scores would then be on the 1980 standard score scale, the same as the reference form and other forms used operationally in the Enlistment Testing Program. The second purpose was to provide at least a partial check of the use of the conversion tables for constructing composites of subtests in the Enlistment Testing Program. If the test forms are sufficiently parallel in content, and if the conversion tables are correct, then the composites for the new forms should have the same distributions as the composites for the reference form and current operational forms.

The third purpose of the study was to adjust the conversion tables for effects of using a new answer sheet that was implemented in February 1992. Scores on the two speed subtests, NO and CS, can vary across answer-sheet formats (Ree and Wegner, 1990). Specifically, scores were found to be lower with the new answer sheet than with the one for which norms are available (Bloxom, McCully, Branch, Waters, Barnes, and Gribben, 1991; Bloxom, Thomasson, Wise, and Branch, 1992). Therefore, obtaining accurate conversion tables for these two subtests in this study required score- scale adjustments based on combining the new ASVAB form equating with a prior answer-sheet calibration. The latter calibration was provided in Bloxom et al. (1992).

Method

Design

The design of this study was to administer eight ASVAB forms to randomly equivalent groups of at least 12,000 military applicants each. The eight forms were versions a and b of ASVAB forms 20, 21, and 22 -- plus ASVAB 15g (a current operational form) and ASVAB 15h. Except for its cover, the latter was identical to ASVAB Form 8a, the reference form that was used to collect the normative data (Department of Defense, 1982). The forms were administered as part of the normal processing of military applicants, with scores based on a preliminary equating being used to determine eligibility for enlistment and for assignment to military specialties.

Subjects

The subjects in this study were applicants for military enlistment who were scheduled for aptitude testing between 1 October 1992 and 15 January 1993. The total number of persons tested at the sites used for this study was 140,062. The only sites excluded were those associated with the Military Entrance Processing Stations (MEPS) at San Diego, California; Los Angeles, California; and Jackson, Mississippi. There, special studies were being conducted that could not be interrupted.

Procedure

The subjects were tested in groups that varied in size according to the number of applicants needing to be tested. The test administrators were employees of a MEPS or were persons hired by the Office of Personnel Management (OPM) to administer the test at Mobile Examining Team (MET) sites.

Each subject was provided with the currently operational answer sheet (circular response spaces), an ASVAB test booklet, two pencils, and two pieces of scratch paper. To provide equivalent conditions and frequency of administration for the eight test forms, the forms were to be distributed in a "spiralled" order, that is, a given form was administered to every eighth subject in a test session. Furthermore, the cycle of distribution of forms in each session was to begin where it stopped in the test administrator's previous session. The resulting number of cases administered each of the eight ASVAB forms is shown in the first column of Table 2.

Before the administration of the ASVAB subtests, subjects were given standard ASVAB instructions (Department of Defense, 1990) for providing identifying information and for signing a Privacy Act statement on the answer sheet. The subtests were then administered as specified in the standard ASVAB instructions. Following the test administration, the answer sheets were scanned and scored at MEPS. Number-right (raw) scores and identifying information were electronically transmitted to Headquarters, U.S. Military Entrance Processing Command (MEPCOM). At the end of the study, the data were sent by tape to Defense Manpower Data Center. In addition, item response data were obtained from the scanning of the answer sheets at the METS; these data were mailed to MEPCOM for concatenation into a single file.

Data Quality Control

Editing

In addition to range checks, three procedures were used for editing. The first was to eliminate cases with all subtest scores equal to zero. Such cases were assumed to represent erroneous entries in the data set. Only one such case was found in the data for this study.

The second procedure for editing was to eliminate cases known to have previously taken an ASVAB[3]. Such cases were assumed to be performing in ways not representative of cases in the normative sample (Department of Defense, 1982). This editing resulted in the elimination of 21,796, or 15.6%, of the cases tested. The remaining cases were distributed across test forms as shown in the second column of Table 2.

The third procedure for editing was to delete sessions and sites where the sample sizes for the eight test forms were severely out of balance. As can be seen in the second column of Table 2, the number of cases of initial tests varied from 15,959 for ASVAB 15g to 13,007 for ASVAB 22b. An inspection of the distribution of the eight test forms by test site (defined by a two-digit MEPS code and an additional two-digit site-within-MEPS code) and test date revealed that (a) for some dates at some sites, only a subset of the test forms was administered and (b) for some test sites, one or more of the test forms was never administered during the study.

In the first stage of the third edit, test sessions were defined as severely out of balance when the number of cases that were administered the most frequently used form differed by more than two from the number of cases that were administered the least frequently used form[4]. Deleting these sessions resulted in the deletion of 21,306 cases. Because applying this criterion did not exclude sessions at the large number of low-volume sites, the second stage of the third edit was to apply a similar criterion to the totals across all sessions at test sites where the number of cases was 16 or less during the entire data

[3] Information about previous ASVAB testing was provided by recruiters who brought or sent the subjects to be tested.

[4] As can be seen from the first two columns of Table 2, the least frequently administered forms were those with the highest form-identification numbers and, therefore, were located lowest in a spiralled set of forms to be administered.

collection.[5] Deleting these out-of-balance test sites resulted in the elimination of 1,302 cases. Following the third edit, the number of cases for each test form was as shown in the third column of Table 2.

As can be noted from the final percentages in Table 2, the edited samples are out of balance to nearly the same extent as the unedited samples. An inspection of data from a number of test sites and sessions suggested that the imbalance was occurring as a result of lack of careful spiralling of test forms across large numbers of small test sessions as well as within those sessions; test administrators at the large number of low-volume test sites tended to consistently use lower-numbered ASVAB forms more often than higher-numbered forms. To evaluate the effect of this imbalance on the utility of the equatings developed in this study, supplemental analyses were conducted using data selected with additional edits to further balance the number of cases administered each form. (See Appendix A.) The results of these analyses are provided in a later section of this report. (See "Comparisons of Results for Three Subsets of Data.")

Equivalence of Groups

During the data collection, the eight test forms were to have been distributed in a spiralled manner to subjects in each testing session. This procedure was intended to provide eight randomly equivalent groups of subjects. However, as noted in the preceding section, the sample sizes differed substantially across the eight test forms. (See Table 2.) If the eight groups also differed on demographic characteristics that are typically correlated with test performance, then the assumption that the groups have the same aptitude distribution would be questionable. If this were the case, then using the data for equipercentile equating would require adjustments of the distributions. Therefore, as a check on group equivalence, the eight groups were compared with respect to three background characteristics (gender, race, and education) that were indicated by the examinees on their answer sheets. Also, the groups were compared with respect to their distribution across the 65 MEPS, because the aptitude distributions of military applicants processed at the MEPS are known to vary.

Table 3 provides frequencies and percentages at each level of gender, race, and education. The group-by-test-form Pearson chi-squares were statistically significant ($p < .05$) for only one of the three background characteristics: gender. As is indicated by cell percentages and contributions to the chi-square, ASVAB 20b had a slightly higher representation of females than did the other forms.

A 65-MEPS-by-8-test-form Pearson chi-square of the number of persons tested was not statistically significant (chi-square = 271.932, d.f. = 448). This provided some assurance that whatever

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[5] If forms were perfectly spiralled at a site, then the maximum number of test forms having zero number of administrations would equal the total number of forms (eight) minus the total number of tests administered at the site (for sites administering fewer than eight tests). For sites administering eight or more tests, the maximum number of forms with zero administrations would be zero. To permit the inclusion of data from some small sites where spiralling was not perfect, the requirement of perfect spiralling was replaced by computing the maximum permissible number of zero administrations (MAXZERO) from the total number of test administered at a site (NTOT) as follows:

MAXZERO = (7.5 - 0.5*NTOT) , if NTOT < 16
MAXZERO = 0 , if NTOT >= 16

Sites with the number of forms having zero administrations greater than MAXZERO were deleted.

differences there were in the aptitude distributions of the 68 MEPS was not directly associated with differences in the sample sizes of the eight test forms.

The results of the group comparisons provided sufficient indication of group equivalence to support proceeding with equating without making adjustments to the distributions. Table 4 provides the resulting subtest means, standard deviations, skewness and kurtosis of the reference form (15h), the current operational form (15g), and the six new ASVAB forms (20a/b, 21a/b and 22a/b) being equated to the reference form.

Item-Order Effects

For the subtests that are not in the AFQT composite (GS, NO, CS, AS, MC, EI), each pair of same-numbered forms contains the same items (i.e., forms 20a and 20b contain the same items; forms 21a and 21b contain the same items; and forms 22a and 22b contain the same items). However, the subtests that are in the AFQT (AR, WK, PC, MK, and thus VE) contain unique sets of items in each ASVAB form; this provides somewhat greater protection against the compromise of tests in the composite that is used to determine eligibility for enlistment.

In each pair of the same-item, non-AFQT subtests (excluding NO), the items differ slightly in the order of their administration in the two forms. (For the NO subtest, item order was constant across the a and b versions of each form.) The purpose of this slight scrambling of the item order is to make it unlikely that an examinee could obtain correct answers by copying responses from the answer sheet of another person who is administered another ASVAB form.

Two forms of a subtest with the same items but slightly different item orders may not have the same distribution of scores, and may, therefore, require separate equatings to the reference form. For example, the distributions for MC might have been affected by the order of item administration if examinees were using strategies developed on one question to formulate answers for subsequent questions.

A statistical test was used to assess item-order effects for each subtest on each pair of forms containing scrambled orderings of the same items. If the test statistics were found to be significant for a pair of same-item forms, then separate equatings were to be done for each separate form. Otherwise, the distributions of the two same-item forms were to be combined and a single equating developed for use with either form.

A procedure developed by Hanson (1991) that uses log-linear modeling and provides a likelihood ratio chi-square statistic was used to test the differences in test-score distributions of the pairs of same-item different-order subtests. The first step in this procedure, which is also a part of the equipercentile equating of smoothed distributions (see below), is to fit each of the separate distributions using the log-linear model (see Holland and Thayer, 1987) with polynomials of varying degrees. In this study, the upper limit for the degree of polynomial was the smaller of 10 and $M/2$, where M is the number of items in the subtest. This limit was to restrict overfitting the distribution by further limiting the number of parameters in the polynomial. The next step in the procedure was to determine the degree of polynomial to use for the log-linear fit for each of the separate forms. (See the discussion below on the modified "Haberman's Rule" used to determine the degree of the fitted polynomial.) The higher degree of the two fitted polynomials was chosen to be the "comparison test degree" (CTD). The comparison was then made of the log-linear fit to the combined distribution at degree CTD versus the log-linear fit to the separate distributions at degree CTD. A likelihood ratio chi-square test was made to determine if the fit of the separate distributions was significantly better than the fit to the combined distribution. In this analysis, an alpha level of 0.05/15 = 0.0033 was used for each statistical test, so that the expected number of Type I errors for the 15 statistical tests would be 0.05.

Table 5 contains the results of the likelihood ratio chi-square tests for item-order effects for each pair of tested forms. For subtests GS, NO, CS, AS, MC, and EI, 20a/b denotes the combination of forms 20a and 20b; 21a/b denotes the combination of forms 21a and 21b; and 22a/b denotes the combination of forms 22a and 22b. Except for CS on forms 21a/b, the chi-square statistic was nonsignificant (alpha = 0.0033). Thus, except for CS on ASVAB 21a/b, the forms could be combined when computing their equating functions for same-item forms for subtests GS, CS, AS, MC, and EI. Same-item forms for the NO subtest were combined because the item order did not vary for that subtest. For the AFQT subtests, all equatings were separate because each form of each AFQT subtest contained unique items.

Equating of Subtests

Equating Methods

The use of ASVAB forms 20, 21, and 22 to obtain scores for use in military enlistment or for comparison with national norms requires that score scales for these forms be given an equating transformation, to enable their scores to be placed on the same standard score scale as the reference form, ASVAB 8a (or 15h).

Several methods of equating were selected from alternatives reported in the research literature. Appendix B provides a discussion of the approaches that were considered and the reasons for selecting the methods -- including smoothing distributions -- used in these analyses. The methods were ones used in previous ASVAB equating studies (e.g., Bloxom and McCully, 1992): linear-identity, linear-rescaling, raw equipercentile, and polynomial-log-linear equipercentile. Linear-rescaling equating was the conventional linear procedure for converting number-right scores on the new test forms to have the same mean and standard deviation as scores on the reference form (e.g., see Angoff, 1971). Linear-identity equating used the scores from the new form without changing them. It was a special case of linear equating, where equal means and standard deviations are assumed. Both the linear-identity and linear-rescaling equating were included for comparative purposes, but neither one was considered for subsequent operational use. Divgi (1988) showed that, for the sample size and population used in this study, linear equatings have a higher cross-validation root- mean-squared error than do equipercentile equatings.

Equipercentile equatings were obtained from each of two estimates of the subtest cumulative frequency distributions. Raw equipercentile equating was an equipercentile equating obtained from the unsmoothed frequency distribution for each test form; this was obtained for reference only and was not considered for operational use because of its lack of smoothness, its large number of parameters, and its consequently greater sampling variability. Polynomial log-linear equating was an equipercentile equating obtained from a log-linear smoothing that included all polynomial terms up through the highest-order statistically significant term (less than the 11th term); the number of terms was based on a decision rule suggested by Haberman (see Holland and Thayer, 1987), with an upper bound placed on the number of terms in the polynomial; the upper bound was the smaller of M/2 and 10, where M was the number of items in the subtest; Table 6 shows the resulting number of terms selected for each of the distributions.

Prior to each equipercentile equating, two modifications were made in the estimates of the cumulative distribution functions. First, the extreme lower tail of each distribution was smoothed in a way that would make the equating smooth and would result in an identity equating at the bottom of the number-right score scale. The major concern was that equipercentile equating is unstable where the score frequencies are small. The reason for making the lower end of the equating converge on an identity equating instead of some other function was that equipercentile equating provides no alternative to assuming parallel measurement where the test contents are parallel, score levels are below the level expected under random responding, and the score frequencies are small. The mechanism for making the lower end of the equating converge on an identity equating here was to substitute a power function (Appendix D) for the estimated cumulative distribution below the 0.5th percentile. The parameters of the function were chosen to preserve both the estimated frequency and cumulative distribution functions where the power function was attached. Such a procedure results in a relatively smooth equating function and does not affect the equating at scores above the .5th percentile. This mechanism is a modification of one used by Kolen and Brennan (1990); those authors used a linear function with a zero intercept instead of the more general power function, resulting in an equating that may not be very smooth at the .5th percentile if the test is short.

The second modification of the cumulative distributions prior to equipercentile equating was to add .5 to the number-right score associated with each cumulative frequency and to create a new origin (X= -.5, F(X)= .0) at the lower end of the function. This was done so that the cumulative distribution could have the conventional interpretation as a continuous-score distribution that is linear from .5 below each number-right score to .5 above each number-right score (Kolen and Brennan, 1990).

After the distributions were smoothed and the equipercentile equatings were computed, the final step was to check the differences between the raw and polynomial log-linear equatings. Specifically, this step required comparing the equatings in the score metric (i.e., in terms of differences between their score scales) and in the frequency metric (i.e., in terms of differences between distributions of the equated scores). These comparisons were measured both in terms of the algebraic distance between functions (root mean square difference) and in terms of the practical impact of those differences (i.e., percent of cases affected). Appendix E provides further details on these criteria and indices.

Subtest Distributions and Equatings

Figures 1 through 11 show raw and polynomial log-linear smoothed distributions for each of the 11 subtests. Figure 12 shows the standard-score contrast of the raw, linear-rescaling and polynomial log-linear equatings with a linear identity equating for GS. Figures 14, 16, ... , 32 show these results for the other subtests, AR, WK, PC, NO, CS, AS, MK, MC, EI, and VE, respectively. In each case, the contrast is plotted as a function of the number-right score on the new test form; also shown is the raw frequency distribution of the new test. The means and standard deviations in Table 6 were used to compute the linear-rescaling equatings. The polynomial log-linear smoothings of the distributions were used to compute the corresponding equipercentile equatings. The means and standard deviations from the Youth Population (Table 1) were used to convert the equated scores to the standard scores being contrasted in Figures 12, ..., 32. Tables 7 and 8 summarize the differences between the equating functions in terms of their root mean squared differences and in terms of the practical impact of using one equating versus another. (See Appendix E.) For comparative purposes, these tables also include results from a re-equating of the current operational form, 15g.

Figure 13 shows the contrast (i.e., arithmetic difference) of the cumulative distributions of the new forms' raw and polynomial log-linear equated scores with the cumulative distribution of the reference-form scores for GS. Figures 15, 17, ... , 33 show these results for the other subtests, AR, WK, PC, NO, CS, AS, MK, MC, EI, and VE, respectively. In each case, the contrast is plotted as a function of the number-right score on the reference form; also shown is the frequency distribution of the reference form. Linear interpolation was used to obtain the cumulative distributions of equated scores at these points. None of the cumulative distributions used in these contrasts was smoothed. Tables 9 and 10 summarize the differences between the distribution functions in terms of their root mean squared discrepancy from the reference form distribution and in terms of the practical impact of using one equating versus another. (See Appendix E.) For comparative purposes, these tables also include results from a re-equating of the current operational form, 15g.

Development of Standard Score Conversion Tables

Conversion to Rounded Equated Standard Scores. For the conversion table for each test form, a rounded equated standard score (RESS) (usually called simply "Standard Score") was computed from the fractional equated standard score (FESS) of the polynomial log-linear equating. For all subtests, except CS and NO (see conversions using new "circle" answer sheets below for subtests CS and NO), the conversion was simply a rounding of the fractional equated standard scores to the nearest integer, then truncating below 20 or above 80.

$$\text{RESS} = \begin{cases} 20, & \text{if FESS} <= 20 \\ 80, & \text{if FESS} >= 80 \\ \text{truncate(FESS}+0.5), & \text{otherwise} \end{cases}$$

The rounding followed the convention of rounding up if the decimal remainder is greater than or equal to .5, and rounding down otherwise. The truncation followed the ASVAB convention of limiting the standard score scale to values between and including 20 and 80. (See Maier and Sims, 1986.)

Standard Score Conversion Tables with New "Circle" Answer Sheets. Since the speeded subtests, NO and CS, were found by Bloxom et al. (1991, 1992) to have an answer-sheet effect, an additional transformation was needed to put scores of these speeded subtests using the new "circle" answer sheet on the same score scale as the previous "vertical bar" answer sheet scale.

Four steps were used in the development of NO and CS conversion tables for the use with the new "circle" answer sheet. As with all subtests, the first step was to equate the raw number-right score on the new form to the reference form (15h, aka 8a) number-right score (where the "circle" answer sheets were used for both new and reference forms, and denoted by a subscript c):

$$\text{Equated Number-Right Score}_c = f(\text{Raw Number-Right Score}_c),$$

and where transformation f is the number-right equating for the new form. Second, the equated number-right scores on the "circle" answer sheet (denoted by a subscript c) were converted to equated number-right-equivalent scores on the older "vertical bar" answer sheet (denoted by a subscript b). This was done by using linear interpolation with the appropriate answer-sheet equatings[6] (denoted by function g) selected in the Optical Mark Reader (OMR) study by Bloxom et al. (1992):

$$\text{Equated Number-Right Score}_b = g(\text{Equated Number-Right Score}_c).$$

[6] These answer-sheet equivalents for the reference form (ASVAB 8a) are shown in the second column of Tables 16 (for NO) and Tables 17 (for CS) in Bloxom et al. (1992).

Third, the 1980 Youth Population means and standard deviations (Table 1) were used to convert the reference-form, "vertical-bar"-answer-sheet-equivalent-fractional-number-right score to the standard-score metric producing the fractional equated standard scores (FESS):

$$FESS = 50 + 10(\text{Equated Number-Right Score}_b - M)/S.$$

The fourth step in developing conversion tables for NO and CS was to round the fractional standard score equivalents and truncate them at 20 and 80, paralleling the last step for the nonspeeded subtests, and producing rounded equated standard scores (RESS) or simply "standard scores." The resulting integers provided the standard score values for NO and CS, for the conversion tables designated for use with ASVAB 20a, 20b, 21a, 21b, 22a, and 22b and the new "circle" answer sheets during the implementation in the Enlistment Testing Program. (Appendix F contains the new-form fractional equated standard scores based on polynomial log-linear equatings for all subtests, including standard scores for NO and CS after linking to the OMR answer-sheet transformation.[7])

Comparisons of Equated-Subtest Intercorrelations

In previous equating studies of ASVAB 18/19 (Bloxom and McCully, 1992) and 20/21/22 (Thomasson and Bloxom, 1992), differences were found in the correlations between the power subtests that were indicative of variation in the construct validity of the ASVAB subtests across ASVAB forms. In the effort to explore this in the present study, an investigation of the means, variances, and intercorrelations between the subtests' converted standard scores was made. Table 11 contains the subtest standard score means, standard deviations, and intercorrelations for each form; all statistics are based on analyses of rounded standard scores, i.e., scores obtained from application of the conversion tables. Also in Table 11 are the differences between the new forms' subtest standard score means, standard deviations, and intercorrelations and those of the reference form (15h; middle of the page) and the current operational form (15g; bottom of the page). In addition, Figures 34 and 35 provide plots of the first three unrotated principal components of the power subtests of each of the eight ASVAB forms; the first component is in Figure 34; the second and third components are in Figure 35.

An inspection of Table 11 and Figures 34 and 35 revealed three patterns in the differences between ASVAB forms. The first pattern was that GS was less correlated with the technical subtests on the new forms (ASVAB 20, 21, and 22) than on the reference form and on the current operational form. This pattern was more pronounced in comparisons with the reference form (15h) than with the current operational form (15g); the differences were approximately .05 greater in the comparisons with the reference form. The largest differences were for ASVAB 21a and 21b, where the GS correlation with AS was .23 lower than for ASVAB 15h and where the GS correlation with EI was .18 lower than for ASVAB 15h[8]. Fully understanding this pattern of results requires a study of the correlations between items in GS and the technical subtests. However, in the absence of such a study, it is useful to note that the pattern was consistent with that found in the IOT&E of ASVAB 18/19 (Bloxom and McCully, 1992) and in the previous operational calibration of ASVAB 20/21/22 (Thomasson and Bloxom, 1992). As in

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[7] Appendix F also contains equated standard scores that were re-developed here for the current operational form, ASVAB 15g. However, these equatings were not used for any of the subsequent analyses reported here.

[8] Note that the consistent pattern of results for ASVAB 21a and 21b was due to the fact that both GS and EI had the same items in those two forms.

those studies, the implication here is that the distributions of composites -- such as the Air Force M composite -- containing both GS and technical subtests were more likely to vary across ASVAB forms even if the subtests themselves were accurately equated.

The second pattern in the correlations between subtests was that the new forms were, in general, more like the current operational form than like the reference form. However, a notable exception was in the correlation between VE and EI, which was approximately .10 higher for the new forms than for the current operational form; in contrast, the correlation was slightly smaller (by .02) for the new forms than for the reference form. Although this pattern was reliable and may indicate more of a verbal component to the EI subtest than has been the case in recent operational use, it was not likely to have an impact on the distribution of composites because none of them contains both VE and EI.

The third pattern in the correlations between subtests was that the AFQT subtest scores (VE, AR and MK) had somewhat lower intercorrelations (by approximately .04) for ASVAB 21b than for the reference form, 15h. The pattern was also present in the comparison of 21b with the current operational form, 15g, but the difference was less pronounced (approximately .02-.03). The implication here i the distributions of the AFQT and other composites containing these three subtests were more likel vary across ASVAB forms even if the subtests themselves were accurately equated.

Further analyses -- including item analyses -- are needed to more fully explain the correlational differences between the newer ASVAB forms, the reference form and the current operational form. Wise, Nicewander, and Bloxom (1991) provided analyses of such differences for ASVAB 18/19 and the reference form.

Analyses of Composites of Converted Subtest Scores

The Armed Forces Qualification Test (AFQT) that is used in determining enlistment qualification is based on a weighted sum of three ASVAB standard scores -- VE, AR and MK. For all ASVAB forms, this weighted sum is converted to a percentile score -- the AFQT score -- using norms for ASVAB 8a in the 1980 Youth Population (Department of Defense, 1982). The AFQT score scale is then divided into eight categories having the upper bounds for this composite shown in Table 12. These categories are, from the highest to lowest percentiles, labelled: I, II, IIIa, IIIb, IVa, IVb, IVc, V. AFQT-based enlistment standards and reports of aptitudes of military accessions are typically stated in terms of the AFQT categories (e.g., Department of Defense, 1992).

Other composites of ASVAB standard scores are used by the Services in determining eligibility for training in occupational specialties. Table 12 shows which subtests are used, and how they are combined, in each of these composites for each of the Services. Although the Services each use this general approach for obtaining composites, they differ in the final metric employed in determining training qualification. The Air Force converts the sum of subtest standard scores (SSS) to percentile scores as is done for the AFQT; the Army and the Marine Corps convert SSS to standard scores that have a mean of 100 and a standard deviation of 20 for ASVAB 8a in the 1980 Youth Population; and the Navy uses no further conversion of SSS. Further variability across Services is introduced in the choice of cutting scores that are used to determine training qualifications. (See category boundaries in the right column of Table 20.) For example, the Army has more qualification categories on the EL composite than does the Marine Corps.

Because of the variety and large number of operational composites of the ASVAB subtests, the composites are not separately equated for new ASVAB forms once the subtests of those forms have been equated to the reference form. However, after the subtest equatings have been used to convert their raw scores to standard score equivalents on the reference form, it is important to assess the impact of using the composites of the converted subtest scores -- in terms of the comparability of their composites with those of a current operational form as well as the comparability with those of the reference form. Comparability with a current operational form is important for maintaining continuity of qualification standards for, and rates of flow into, occupational-specialty training schools. Comparability with the reference form is important for maintaining continuity of the AFQT score scale when monitoring long-term trends in qualifications of military applicants and accessions.

To assess the comparability of new-form composites with reference-form composites and current-form composites in this study, converted subtest scores were used to generate composites for all of the forms, with the conversions for the new forms (ASVAB 20/21/22) being based on the equatings described in the preceding section of this report. Then, the distributions of these composite scores for the new forms were compared with the distributions of the corresponding composite scores for the reference form (ASVAB 15h) and with distributions of composites for a current operational form (ASVAB 15g). In the preceding section, comparisons of the subtest intercorrelations across test forms suggested that, even after the subtests were equated, the composites would not necessarily have the same distributions across forms. Therefore, it was thought to be important to assess whether new-form composite distributions differed from the reference form and/or from a current operational form.

Generating the distributions of composite scores for the comparisons required several steps. First, rounded-standard-score conversion tables were generated as described in the preceding section and were applied to all subtest scores from the new test forms. The current standard score conversion table for the reference form, ASVAB 15h, (Department of Defense, 1992; as modified in Bloxom et al., 1992) was applied to all subtest scores from the reference form. The current operational standard score conversion table for ASVAB Form 15g (Department of Defense, 1992; as modified in Bloxom et al., 1992) was applied to all subtest scores from that ASVAB form.

The second step in generating distributions of composites was to sum the standard scores of subtests as indicated in Table 12. These scores were then converted to a percentile or standard score metric, depending on which of those metrics would be used operationally. In the third step, the frequencies at each score level for each composite, plus the category score ranges indicated in Table 12, were used to compute the number of subjects in each category for each test form.

Three types of indices were used to assess differences between the new-form, reference-form, and operational-form distributions of a composite. The first of these was a Pearson chi-square, based on a cross-tabulation of the eight ASVAB forms and the categories defined by operational cut-scores on the composite's score scale. A probability for each chi-square was computed and evaluated without adjusting the alpha level to take into account the number of significance tests; because the chi-squares were computed in the sample used for equating, the true probability of a Type I error was almost certainly below any nominal alpha level applied to the computed probabilities, although the extent of this reduction was unknown. Because the true probability was unknown, the evaluation of these chi-squares included the application of a heuristic; the heuristic was to compare the chi-quare with two times its degrees of freedom.

The second index used to assess differences (across forms) in the distribution of a composite was the standard deviation of the composite. Once the subtests were equated, the means of composites of the subtests were equated. However, because subtest intercorrelations varied across forms, the standard deviations of the composites could vary across forms. For example, because GS and AS had a lower correlation on ASVAB 21b than on the reference form, the standard deviation of a composite containing the sum of these subtests (e.g., the Air Force M composite) could show a lower standard deviation on ASVAB 21b than on the reference form.

The third index used to assess differences (across forms) in the distribution of a composite was the percentage of all cases at or above a cut score; this was computed for each of the operational cut scores on the composite and was done separately for each of the forms used in this study. The expectation was that those forms with lower standard deviations would have smaller percentages of cases scoring above high cut scores and larger percentages of cases scoring above low cut scores. Unlike the chi-square and standard deviation indices, this index also was useful for assessing the potential operational impact of using the form. By comparing the percentages for a composite on a new form with the corresponding percentages on the reference form (15h), the accuracy of the equating to the reference form could be evaluated in an operationally relevant metric. By comparing the percentages for a composite on a new form with the corresponding percentages on the current operational form (15g), it was possible to estimate the operational impact of a transition from the current operational form to an implementation of the new form.

Comparison with Reference and Current Operational Forms

The first step in comparing the distributions of each composite for the equated new forms with its distributions for the reference form and the current operational form was to compute a Pearson chi square measuring the independence of composite score categories and test forms. This was based on an m x 8 frequency table with cells containing the number of cases in each of the m cut-score categories for each of eight test forms (20a, 20b, 21a, 21b, 22a, 22b, the reference form [15h] and the current operational form [15g)]. The resulting chi-squares, degrees of freedom[9] and probability values are shown in the first part of Table 13; the table also indicates which of the chi-squares was more than two times its degrees of freedom -- a conservative criterion, in that it is less likely to be exceeded by chance as the degrees of freedom become large. Fifteen of the 30 composites -- including the AFQT -- had chi-squares that were statistically significant at alpha=.05; 8 of the 15 had chi-squares that were more than two times their degrees of freedom. The second part of Table 13 supplements the first part of the table by showing chi-squares and degrees of freedom for the comparison of each new form and the current operational form with the reference form. The results in the two parts of this table clearly suggested that many composites did not have the same distributions across the new forms, reference form and current operational form. The results did not, however, indicate the nature or practical importance of the differences.

The second step in comparing the eight forms' distributions of each composite was to examine the standard deviations of the composite across the ASVAB forms. Table 14 shows these for all composites and for all ASVAB forms used in this study. As expected from the pattern of correlations between the subtests, the two composites containing both GS and AS -- Air Force G and Army GM -- had lower standard deviations on each of the new forms than on the reference form, 15h; for the Air Force G composite -- which double-weights AS -- it was as much as 1.47 lower. Because the equated subtests had essentially the same standard deviations on all forms, the lower standard deviations for composites on the new forms were due to the lower correlations between GS and AS on the new forms than on the

[9] Note that the degrees of freedom vary considerably across composites because of the wide variation in the number of categories defined by their cutting scores.

reference form. (See Table 11.) However, this pattern was only somewhat sustained in comparisons of the new form with the current operational form, 15g; each of these two composites had notably lower standard deviations on only two of the new forms (21a and 21b) than on 15g. This, too, can be attributed to the correlations between GS and AS, which were notably lower than 15g only for forms 21a and 21b.

Another pattern in the standard deviations in Table 14 was in the composites of subtests used in the AFQT -- VE, AR, and MK. These five composites are AFQT, Army GT and CL, Air Force G, and Navy GT. As expected from the pattern of lower correlations between these subtests for ASVAB 21b, these five composites had lower standard deviations on ASVAB 21b than on either the reference form or the current operational form.

The third step in comparing the eight forms' distributions of each composite was to examine the percentages of cases exceeding each operational cut point. Appendix G shows a table of these percentages for each of the 30 operational composites listed in Table 12. The top of each table in Appendix G shows the percentage of cases at or above each of the cut points for each of the eight ASVAB forms used in this study; the bottom of each table shows the percentage for each form minus the percentage for the reference form, 15h. For each cut point on the AFQT composite, the percentage above the cut point for each of the new forms was within 1.00 of the percentage for the reference form and within 2.00 of the percentage for the current operational form. The largest of these differences were between the Category-I percentages for new forms 20b, 22a, and the current operational form. In contrast to what was expected from the pattern of subtest intercorrelations and composite standard deviations, ASVAB 21b did not show the lowest percentages of all forms in the highest categories of this composite, or the highest percentages in the lowest category.

Although the pattern in the percentages of cases in the AFQT categories did not show the expected differences across forms, the percentages for the Air Force M composite did show the expected pattern. As was the case for that composite in the IOT&E of ASVAB 18/19 (Bloxom and McCully, 1992, Appendix G), all of the new forms had smaller percentages than the reference form in the highest score category and larger percentages than the reference form in the lowest score category; this would be expected from the lower standard deviation of the composite for the new forms than for the reference form.

In comparing the percentages across forms in Appendix G, it is important to consider how much the percentages can vary due to sampling variability. Although confidence intervals were not provided here, an indication of this variability was provided by the results for the Air Force M composite. In that composite, like-numbered new ASVAB forms (20, 21, and 22) used the same items for all three subtests in this composite; thus, differences in percentages between the results for the a and b versions of each form were attributable to variation in the samples of cases for those versions. Across the six score categories and three ASVAB forms, more than two-thirds of the percentages differed by at least .7 and more than one-third of the percentages differed by at least 1.0. In view of this variability, the magnitude of differences obtained between new forms and the comparison forms (15g and 15h) of the AFQT was not greater than would be expected from sampling variation; however, nonrandom patterns of small differences may have been present.

Comparison with IOT&E Results of Other ASVAB Forms

Comparison with IOT&E of ASVAB 15, 16 and 17. To provide a another benchmark for evaluating the comparisons with the reference form in the present study, Table 15 provides the composite-category-by-test-form chi-squares for the ASVAB 15/16/17 IOT&E data, based on the use of the conversion tables obtained from that same data set. Twenty-nine of the 33 chi-squares -- including that of the AFQT -- were statistically significant with alpha = .05. Also, 22 of the 33 chi-squares were more than two times as large as their degrees of freedom, with the AFQT chi-square being nearly four times its degrees of freedom. The composite having a chi-square that was the largest multiple of its degrees of freedom was Army MM. For that composite, the percent of cases in the lowest category was from 0.0 to 1.6 less for forms 15/16/17 than for the reference form, and the percent of cases in the highest category was from .9 more to 2.0 less for the new forms than for the reference form. In general, this pattern of results indicated that equal or larger differences existed between forms in the IOT&E of ASVAB 15/16/17 than in the present study.

In the IOT&E of ASVAB 15/16/17, the new-form distributions of composites containing AS -- not GS -- differed systematically from the corresponding distributions in the reference form. All ten composites containing AS had chi-squares that were statistically significant; nine of these had chi-squares that were more than two times their degrees of freedom. Also, the standard deviations of composites containing AS (see Table 16) were consistently smaller for ASVAB 15/16/17 than for the reference form. For the Air Force M composite, which contains GS and gives AS twice the weight of other subtests, the largest departure of the standard deviations in ASVAB 15/16/17 from the standard deviation in the reference form was .76 (ASVAB 15a in Table 16); for forms 20/21/22 in the present study, the largest difference for this composite was 1.47 (ASVAB 21b in Table 14). These results were consistent with expectation from results reported by Wise, Nicewander, and Bloxom (1991), who found the correlations of AS with other subtests were an average of .06 lower for forms 15/16/17 than for the reference form. Thus, differences in subtest intercorrelations were affecting standard deviations and other distributional indices of composites in the IOT&E of ASVAB 15/16/17 as well as in the present study.

In addition to these systematic differences between standard deviations for forms in the IOT&E of ASVAB 15/16/17, there were nonsystematic differences (in the AFQT distributions) that were of a similar order of magnitude as those obtained in this study. The AFQT standard deviations of new forms ranged from .26 below the reference form to .26 above the reference form in that study (Table 16). In the present study, the standard deviations of the new forms ranged from .16 below the reference form to .40 above the reference form (Table 14).

Comparison with IOT&E of ASVAB 18/19. To provide yet another benchmark for evaluating the comparisons with the reference form in the present study, results reported by Bloxom and McCully (1992) included the composite-category-by-test-form chi-squares for the ASVAB 18/19 IOT&E data, based on the use of the conversion tables obtained from that same data set. Fourteen of the 33 chi-squares -- not including that of the AFQT -- were statistically significant with alpha = .05. Also, seven of the 33 chi-squares were more than two times as large as their degrees of freedom. The composite having a chi-square that was the largest multiple of its degrees of freedom was Air Force M, with a chi-square over seven times its degrees of freedom. For that composite, the percentage of cases in the lowest category was from 1.4 to 2.0 less for the new forms than for the reference form, and the percentage of cases in the highest category was from 2.3 to 3.3 less for the new forms than for the reference form. In general, this pattern of results indicated that at least some differences between forms in the IOT&E of ASVAB 18/19 were of the same order of magnitude as differences between forms in the present study.

In addition to these differences between the frequency tables for forms in the IOT&E of ASVAB 18/19, there were differences in the standard deviations of AFQT distributions that were of the same order of magnitude as those obtained in this study even though the chi-square comparison of AFQT distributions was not statistically significant in the IOT&E of ASVAB 18/19. The AFQT standard deviations of new forms in that study ranged from .01 above the reference form to .41 above the reference form in that study (Table 17). In the present study, the standard deviations of the new forms ranged from .16 below the reference form to .40 above the reference form (Table 14). Also, the new-form standard deviations of the Air Force M composite were as much as 1.36 below the reference-form standard deviation in the IOT&E of ASVAB 18/19; in the present study, the Air Force M new-form standard deviations were as much as 1.47 below the corresponding reference-form standard deviation.

Comparison of Results for Three Subsets of the Data

The preceding sections reported comparisons of distributions of equated new forms with the distribution of the reference form. These analyses provided an assessment of the precision of the computations of equatings and conversion tables and an assessment of the effects of variation in the covariance structure across ASVAB forms. However, the analyses did not indicate the extent to which the equatings -- and the consequent conversion tables and distributions of composites -- were specific to the samples used for the equating. Of particular concern in this study was the possibility of effects of nonequivalent groups, due to the incompletely spiralled administration of test forms. An earlier section of this paper showed that the administration of test forms was not confounded with gender, race, or education. However, to the extent that some nonequivalence of groups was introduced by incomplete spiralling of administration, group differences in aptitude could have been confounded with test-form differences. If this happened, percentile-equivalent scores on different forms could represent different levels of aptitude.

To estimate the effect of incomplete balancing of test-form administration, three subsets of data were selected to simulate various amounts of balancing across data sets. In each set, the composite distributions for the equated new forms were then compared with the corresponding composite distribution for the reference form. To the extent that the match to the reference form distribution was equivalent across the three data sets, it could be inferred that the equating of composites was robust to -- i.e., invariant across -- at least the simulated amount of variation in balancing.

The three data sets used in this analysis were sequentially nested subsets of each other. The first data set consisted of all initial-test cases, with no removal of cases from severely imbalanced sessions or sites; as indicated in the second column of Table 2, this provided from 13,007 to 15,959 cases per test form. The second data set consisted of all cases used in the development of the equating and conversion tables contained in this report, i.e., excluding the cases from severely imbalanced sessions and sites; as indicated in the third column of Table 2, this provided from 10,986 to 13,312 cases per test form. The third data set consisted of cases further selected by the procedures for creating "strongly balanced samples," as described in Appendix A; this provided 7497 cases per test form.

Table 18 shows the results of applying the conversion tables developed in this report to obtain the AFQT-category distribution for each of the new test forms; the top, middle, and bottom sections of the table show the results for the first, second, and third data sets, respectively. As in Appendix G, the percentage of cases at or above the cut score for each category is listed separately for the reference form (15h). For each of the other forms, the percentage above each cut score is contrasted with the corresponding percentage for the reference form (15h) in the same data set; also included for comparative purposes is a contrast of the current operational form (15g) with the reference form.

An inspection of the three AFQT category distributions in Table 18 indicated that the first two samples differed very little in AFQT, with percentages differing by no more than .25. It also indicated that the third sample did have a somewhat higher AFQT distribution, with percentages differing from the first two samples by as much as 2.00 for some categories. However, the <u>contrasts</u> of the other forms' distributions with the reference form distribution did not vary by more than .63 percentage points across the three samples; variation that large was the exception rather than the rule. Furthermore, an inspection of the pattern of differences between samples revealed nothing indicative of an effect of editing (i.e., systematic variation of contrasts across samples).

Tables 19 and 20 show the results of the same kinds of analyses as in Table 18. Table 19 shows comparisons with the reference form for the Air Force M composite. Table 20 shows comparisons with the reference form for the Army GM composite. These two composites were analyzed here because each uses both the AS and GS subtests; this makes them relatively sensitive to changes in distributions across test forms where those changes are due to changes in the AS-GS correlation. In general, contrasts of the other forms' distributions with the reference form distribution did not vary by more than .61 and .86 percentage points across the three samples for the M and GM composites, respectively; and variation that large was the exception rather than the rule. Furthermore, an inspection of the pattern of differences between samples revealed nothing indicative of an effect of editing.

Recommended Conversion Tables

On the basis of the results of this study -- including comparisons of these results with previous IOT&E studies and comparisons across data sets simulating various amounts of balancing of test administration -- it was recommended that conversion tables obtained from the equipercentile equatings in the present study be implemented operationally. These tables are presented in Tables 21-26 and contain rounded and truncated values from Appendix F.

Summary and Conclusions

In October 1993, the Department of Defense planned to begin using ASVAB 20, 21, and 22 in the Enlistment Testing Program. This necessitated equating these forms to the reference form, ASVAB 8a (aka. ASVAB 15h). The results of this study indicated that equipercentile equating of subtests on the new forms to subtests on the reference form resulted in equatings of composites on the new forms that were comparable in accuracy to equatings obtained on previous operational ASVAB forms -- ASVAB 15/16/17 and ASVAB 18/19. The results also indicated that the accuracy of the equatings did not vary as a function of unbalanced form administration, to the extent that such administration could be simulated by editing the data. However, it should be noted that, on some composites other than the AFQT, there were systematic departures from the distributions provided by the reference form. Composites containing the GS subtest in combination with technical subtests -- most notably AS -- tended to have smaller standard deviations on the new forms. Additional analyses showed this also to be true for the subtest equatings currently used operationally with ASVAB 15/16/17 and with ASVAB 18/19. The problem is that the reference form contains some subtests -- most notably, GS -- that are more highly correlated with other subtests than is the case for the ASVAB forms developed in recent years.

Because the results of equating ASVAB 20, 21, and 22 to the reference form showed patterns similar to results previously obtained for equatings of operational ASVAB forms, this study provided a set of conversion tables (Tables 21-26) that were recommended for operational use.

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Appendixes

Appendix A:

Procedure for Balancing Sample Sizes Across ASVAB Forms

Current procedures for operational administration of the ASVAB in an Initial Operational Test and Evaluation (IOT&E) do not result in equal numbers of examinees being administered each of the ASVAB forms, i.e., the test forms are not spiralled within and across test sessions. Although the resulting variation in sample size does not appear to be directly related to the MEPS region, the week or month of testing, or the examinee's Gary L. Thomasson or education, it may still result in a calibration that is specific to the mixture of populations in the IOT&E data collection and not to the population of military applicants under normal operational conditions, when more nearly equal numbers of examinees are administered each of the ASVAB forms. Furthermore, if the aptitude distribution varies across forms as a result of the lack of spiralling, the calibration cannot be viewed as an equating of the forms.

In an effort to obtain balanced samples from an unbalanced IOT&E data set, cases were deleted from various combinations of test forms, testing groups (defined by site and four-week period of testing) and demographic groups (defined by gender, race, and education). Testing groups and demographic groups were used as control variables during the deletion of cases because of their potential relationships to the aptitude distribution. Not controlling these variables during the deletion of cases could introduce -- or exacerbate -- either random or systematic differences in aptitude distributions across test forms.

A major constraint in the balancing of samples was the requirement that the sample size for each form not be reduced below the sample size for the form used least frequently. The purpose of this constraint was to obtain balancing while deleting as few cases as possible. The first application of the constraint was at the level of the overall sample, i.e., such that the sample size for each form not be reduced below the sample size of the form used least frequently in the overall sample. In this study, the form used least frequently overall was ASVAB 22b. This form was, therefore, designated as the "target" form for balancing at the level of the overall sample. Cases for the other seven forms were deleted to provide sample sizes the same as for the target form. Because this resulted in the least loss of data, the resulting samples were called *weakly balanced* samples.

The second application of the balancing constraint was at the level of the testing-group sample, i.e., such that the sample size for each form in a testing group (defined by test site and four-week period) not be reduced below that of the form used least frequently in that testing group. Thus, the "target" form could vary from site to site and from period to period within a site. Because this target form was, for some testing groups, a form used less frequently than ASVAB 22b, the result was a greater loss of data than when ASVAB 22b was the target form for all groups. Thus, the resulting samples were called *strongly balanced* samples.

Weakly Balanced Samples. To specify the deletion procedure for the weakly balanced samples, let $t = 1,\ldots,T$ denote the index of testing groups and $d = 1,\ldots,D$ denote the index of demographic groups. Then let m_{td} be the target form's sample size for testing group t combined with demographic group d, and let $m_{..}$ be the target form's marginal sample size over all testing groups and demographic groups. Similarly, let n_{tdj} and $n_{..j}$ be the td-conditional and marginal sample sizes of ASVAB form j, where j is a form other than the target form.

The object of the deletion procedure was to delete $n_{..j} - m_{..}$ cases for form j. If the TD differences $n_{tdj} - m_{td}$ were all non-negative, then deleting $z_{tdj} = n_{tdj} - m_{td}$ cases from group td for each of the TD groups would result in $n^*_{tdj} = n_{tdj} - z_{tdj} = m_{td}$ cases for form j for each of the TD groups and would meet the objective of obtaining $n^*_{..j} - m_{..} = 0$.

However, it became known that some $n_{tdj} - m_{td} < 0$, i.e., that the target form was used more than form j in some groups. It was therefore necessary to define $z_{tdj} = 0$ for those groups. (Cases could not be added for form j.) This, in turn, would result in the sum of the $z_{..j} > n_{..j} - m_{..}$. To obtain balancing in this situation, the number to be deleted from each group was not $z_{tdj} = n_{tdj} - m_{td}$; instead it was a smaller number, $d_{tdj} = a_j z_{tdj}$, where the scale factor $a_j = (n_{..j} - m_{..}) / z_{..j} < 1$.[10] Summing the d_{tdj} across the TD groups then yielded the total number of deletions for form j, $d_{..j} = a_j z_{..j} = [(n_{..j} - m_{..}) / z_{..j}] [z_{..j}] = (n_{..j} - m_{..})$, which was the number of deletions required to obtain balanced samples.

For each form j, cases could be deleted from the TD groups by either of two approaches. The first was random sampling from a uniform distribution, with a deletion threshold determined by the probability of deletion, $p_{tdj} = d_{tdj}/n_{tdj}$. The second was systematic deletion of one out of every n_{tdj}/d_{tdj} cases[11], using a selected ordering of the cases in the data file. The latter approach was used in this study to better stratify cases by test session and by SSN within test session, the two variables that determined the ordering of cases within groups in the file. Because aptitude distributions tend to vary by date of testing, it was assumed that this would introduce less random variation in the aptitude distribution than would random sampling of cases to be deleted.

The result of applying this procedure in this study -- along with edits of retesters, extreme departures from balancing, and cases with all scores equal to zero -- was to obtain 10,986 cases for each ASVAB form, the number of cases that were obtained for ASVAB 22b before the procedure was used.

Strongly Balanced Samples. To specify the deletion procedure for the strongly balanced samples, again let $t = 1,\ldots,T$ denote the index of testing groups and $d = 1,\ldots,D$ denote the index of demographic groups. Then let m_{td} be the target form's[12] sample size for testing group t combined with demographic group d and $m_{t.}$ be the target form's marginal sample size over all demographic groups for testing group t. Similarly, let n_{tdj} and $n_{t.j}$ be the td-conditional and t-conditional sample sizes of ASVAB form j, where j is a form other than the target form.

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[10] Note that, like z_{tdj}, d_{tdj} is zero when z_{tdj} is zero, whether the latter is due to negative or null differences between n_{tdj} and m_{td}.

[11] Because the ratio, n_{tdj} / d_{tdj}, is not an integer, the probability p_{tdj} was used to define a sequence of non-integers, $s_{tdj} + p_{tdj}$, $s_{tdj} + 2p_{tdj}, \ldots, s_{tdj} + kp_{tdj}, \ldots$, which were used to select cases to be deleted. Specifically, the k-th case was deleted where the following condition held for truncated values of elements of the sequence:
trunc. $[s_{tdj} + kp_{tdj}] >$ trunc. $[s_{tdj} + (k-1)p_{tdj}]$. The start value, $s_{tdj} < 1$, was .5 for the first group ($td = 1$) and was the decimal remainder from the truncation of the last number of the sequence for each successive group; i.e., for all $td > 1$, s_{tdj} = dec.rem. [max. $(s_{(td-1)j} + kp_{(td-1)j})$].

[12] Note that the target form is the form used least frequently in testing group t and so can differ across testing groups.

The object of the deletion procedure for each testing group t was to delete $n_{t.j}$ - $m_{t.}$ cases for form j. If the D differences n_{tdj} - m_{td} were all non-negative, then deleting $z_{tdj} = n_{tdj} - m_{td}$ cases from group td for each of the D groups would result in $n^*_{tdj} = n_{tdj} - z_{tdj} = m_{td}$ cases for form j for each of the D groups and would meet the objective of obtaining $n^*_{t.j} - m_{t.} = 0$.

It was expected, however, that some $n_{tdj} - m_{td} < 0$, i.e., that the target form was used more than form j in some demographic groups. It was then necessary to define $z_{tdj} = 0$ for those groups. (Cases could not be added for form j.) This, in turn, would result in the sum of the $z_{t.j} > n_{t.j} - m_{t.}$. To obtain balancing in this situation, the number to be deleted from each group was not $z_{tdj} = n_{tdj} - m_{td}$; instead it was a smaller number, $d_{tdj} = a_{tj}\, z_{tdj}$, where the scale factor $a_{tj} = (n_{t.j} - m_{t.}) / z_{t.j} < 1$. Summing the d_{tdj} across the D groups then yielded the total number of deletions for form j, $d_{t.j} = a_{tj}\, z_{t.j} = [\ (n_{t.j} - m_{t.}) / z_{t.j}\ ]\ [\ z_{t.j}\ ] = (n_{t.j}-m_{t.})$, which was the number of deletions required to obtain balanced samples.

The procedure for using d_{tdj} to delete cases from each of the TD groups for strongly balanced samples was the same that used to delete cases for the weakly balanced samples. The result of applying this procedure in the present study -- along with edits of retesters, extreme departures from balancing, and cases with all scores equal to zero -- was to obtain 7497 cases per form.

Appendix B:

Alternative Methods of Equating

When equating new-form subtests, so their right-number scores will be on the same score scale as on the reference form, several approaches can be considered. The primary approaches discussed here comprise the following methods of equating: random-groups linear equating, random-groups equipercentile equating, matched-groups linear equating, and matched-groups equipercentile equating. True-score equating is not included here, because of the lack of research and experience related to equating from an item response theory for speed tests, which are two of the ten subtests of the ASVAB. Summary descriptions of these five approaches are provided in Angoff (1971); Braun and Holland (1982); Peterson, Kolen, and Hoover (1989); Kolen and Brennan (1990); and Dorans (1990).

Even though a randomly-equivalent-groups design is typically used for ASVAB equating-data collection, matched-groups equating methods can be considered when the subjects are military recruits. These methods potentially can control for whatever random differences occur between groups. The matching variable in this case would be the pre-enlistment ASVAB score on the subtest being equated. Any association of this score with the score on the test being equated could potentially be exploited to improve the precision of the equating.

In spite of this theoretical advantage of matched-groups equating, the approach is not considered for equating forms of the ASVAB. When forms are being administered operationally (in an IOT&E) to collect equating data, a separate matching variable is not available, unlike when forms are being administered to military recruits. Even when equating data are being collected from recruits -- in which case pre-enlistment scores are available -- using these scores to obtain a more precise equating has not yet been demonstrated. The problem is that the matching variable (pre-enlistment ASVAB) is a measure taken, in some cases, two years prior to the test being calibrated, and under different motivational conditions. This is in contrast to conventional matched-groups equating in which the matching variable is a measure taken in close temporal proximity to, and under similar motivational conditions as, the test being calibrated. Systematic influences between the measurement of the matching variable and the test being calibrated include substantial selection (50% for military enlistment), learning (during the final year of secondary education), and motivational changes (from operational to non-operational conditions of administration). This, plus the highly skewed -- in the case of NO, monotonic -- distributions of ASVAB subtests, make it difficult to assume that the results of previous studies of matched-groups equating (e.g., see Dorans [Ed.], 1990) generalize to the present context. However, there is a need for ASVAB studies of matched-groups equating -- e.g., using the evaluation design employed by Divgi (1988) -- so that any improvements obtainable by this approach could be exploited in future calibrations.

Random-groups linear equating and random-groups equipercentile equating are methods that have been used for equating new forms of the ASVAB. Also, both approaches were used in an answer-sheet calibration study by Ree and Wegner (1990). Divgi (1988a) compared linear and equipercentile equatings from recruit samples and, for each approach, found some subtests in which the approach provided the best prediction of equating in large samples of military applicants. However, Divgi (1988b) found that for sample sizes closer to those used in an IOT&E data collection, linear equatings do not replicate as well as equipercentile equatings.

Equipercentile equating usually employs some form of smoothing, either the test distributions or the equating function, in an effort to reduce the sampling variance of the equating function. Three criteria guide the choice between alternative smoothing methods for use in equipercentile equating. The first criterion is that the method be symmetric, so that the equating can serve as a basis for converting scores on either test form to the score scale provided by the other test form; this is a criterion that has been advocated by Lord (1980); Peterson, Kolen, and Hoover (1989); and Dorans (1990) in support of the idea of interchangeability of equated test forms. The second criterion is that the method of estimating score distributions use a statistical measure of fit to the distributions of scores on the two test forms. The third criterion is that there be a sequence of distributional models, differing primarily in their number of parameters; the objective here is to choose the model with the smallest number of parameters to reduce sampling variability in the estimator of the equating function.

Equipercentile equating based on smoothed distributions, instead of using smoothed equating functions, can be developed in a way that satisfies these three criteria. This approach -- termed presmoothing (Fairbank, 1987) -- provides a symmetric equating by independently smoothing the distribution of scores obtained from each test form instead of risking the regression effects associated with smoothing the equating function directly.

By basing the equating on log-linear-smoothed distributions, the method also provides a statistical measure of fit to the distributions. The smoothing employs the method of maximum likelihood to fit polynomials to the logarithm of the frequency distributions, in a manner suggested by Holland and Thayer (1987). This method is implemented by a computer program (Hanson, 1990), which provides a chi-square fit statistic for polynomials with as many as ten terms.

By basing alternative equatings on a sequence of log-linear-smoothed distributions, it is possible to select an equating obtained from the smallest number of parameters without jeopardizing the fit of the model to the data. The procedure is to obtain as many terms in the polynomial as are necessary to provide a good statistical fit to the non-null bins of a distribution. Sampling variability is then reduced by excluding all terms with a power higher than ten and all other high-order terms that do not improve the fit. (See example of results in Appendix C.) The method has an added advantage of exactly preserving as many moments of a distribution as there are powers of x in the polynomial. Although equipercentile equating is not defined in terms of preserving the moments of a distribution, knowing that the first several moments are preserved provides another check on the extent to which the distribution is preserved. Of course, exactly fitting the first few moments of a distribution is a desideratum only in samples of the size used in equating studies; in smaller samples, this would result in an overfitting -- particularly of the higher moments of the distribution.

Appendix C:

Log-Linear Smoothing of ASVAB Subtest Distributions From the Operational Calibration of ASVAB 15, 16, and 17

Lower/Upper Bounds (Up to 10) of
Polynomial Degree Producing Statistically Significant*
Improvement in Likelihood-Ratio Chi-Square

	ASVAB Form						
Subtest	15a	15b	15c	16a	16b	17a	17b
GS	6/6	6/6	2/6	2/4	2/8	4/4	6/9
AR	4/4	4/10	4/4	3/8	4/6	4/4	4/4
WK	5/8	6/6	3/10	4/4	3/6	2/10	3/8
PC	5/5	6/9	4/4	4/10	4/7	4/4	5/5
NO	4/9	4/6	5/8	4/8	4/9	4/8	4/8
CS	5/5	5/5	5/7	5/7	5/5	5/10	5/7
AS	5/5	4/4	6/6	4/4	6/6	4/4	4/6
MK	4/4	4/7	4/10	4/8	4/8	5/5	4/4
MC	2/4	2/9	4/7	2/4	2/4	2/5	2/4
EI	5/5	5/5	2/4	4/4	4/4	4/10	4/4
VE	8/8	6/6	4/6	4/6	6/10	2/6	4/4

* Alpha = .05 with d.f. = 1. Lower bound is the number of terms including and below which each produces a statistically significant improvement in the fit to the data. Upper bound is the highest-numbered term that produces a statistically significant improvement in the fit to the data; some lower-numbered terms may not produce a significant improvement in the fit.

Appendix D:

Estimation of the Lower Tail of the Subtest Cumulative Distribution for Equipercentile Equating

Let F_i be the proportion of the population at or below test score i, i=0,...,m, where m is the number of items in the test.

Let f_i be the proportion of a population of subjects at test score i, or $f_i = F_i - F_{i-1}$

Let u in $0 < u < m$ be the lowest (integer) score above j, such that F_j .005.

Let the estimated

$$F_i = [(i+1)/(u+1)]^c F_u, \qquad (1)$$

where c is chosen to preserve the slope of F_i over the interval (u-1,u). Then

$$c = \ln [1 - f_u/F_u] / \ln [u/(u+1)]. \qquad (2)$$

Proof:

If i = u, then $[(i+1)/(u+1)] = 1$ and $F_i = F_u$ in (1).

If i = u, then, from (1), $F_{u-1} = [u/(u+1)]^c F_u$ and $f_u = F_u - F_{u-1} = F_u - [u/(u+1)]c F_u = F_u \{1 - [u/(u+1)]^c\}$.

Dividing by F_u, transposing terms, and taking logarithms yields

$$c \ \ln [u/(u+1)] = \ln [1 - f_u/F_u].$$

Dividing by $\ln [u/(u+1)]$ yields (2).

Appendix E:

Choosing Between Alternative Equatings

In their discussion of evaluating an observed-score equating, Braun and Holland (1982) stated that, if there exists a population for which the reference-form distribution differs from the equated new-form distribution, then the forms have not been equated. This implies two metrics in which equatings can be compared. The first is the score metric, in which the (cumulative) frequency is held constant and equated scores are compared. This is a type of comparison often used in a close study of alternative equatings, e.g., to see how different a linear equating is from an equipercentile equating. If various equatings provide similar equated scores, they are considered equally acceptable from the perspective of the examinee.

The second metric implied by Braun and Holland is the frequency metric, in which the score is held constant -- e.g., at integer values on the reference form -- and the cumulative distributions of the equated scores and reference form scores are compared. This is a type of comparison used to assess whether implementing an equated new form will change the score distributions, e.g., to see if there will be a change in the percent of persons qualifying for employment. If various equatings have no effect on the score distributions, they are considered equally acceptable from the perspective of the employing institution (Sympson, 1985).

Two criteria can be used to assess differences between the alternative equatings in the score metric. The first criterion is the root mean squared difference between a pair of equatings, with the difference at each score level weighted by the proportion of cases at that level on the new test form. The second criterion is the proportion of cases (from the new-test-form distribution) for which the two equatings differ by more than .5 standard score points (Department of Defense, 1988). The first criterion is an index of the algebraic difference between two sets of equated scores. The second criterion is an indicator of the practical impact of using one equating instead of the other.

Two criteria can be used to assess differences between alternative equatings in the frequency metric. The first criterion is the root mean squared difference between the cumulative distribution of equated scores (after linear interpolation at integer scores on the reference form) and the cumulative distribution of scores on the reference form, with the difference at each score level weighted by the proportion of cases at that level on the reference form. The second criterion is the proportion of cases (from the reference form distribution) for which the cumulative proportions differ by more than .01. The first criterion is an index of the algebraic difference between the equated-score and reference distributions. The second criterion is an indicator of the practical impact (on the score distribution) of using the equated new test form instead of the reference form.

When two or more methods of equating are being considered for operational use, a procedure for choosing between them is to use the two root-mean-squared-difference indices (in the score metric and in the frequency metric) to select the equating with the best fit to the raw equipercentile equating. Then, the two indices of impact (in the score metric and in the frequency metric) can be used to assess whether an equating with fewer parameters could be employed without having a practical consequence for the equated scores or their cumulative distribution.

The following heuristics implement this procedure for selecting an equating for ASVAB subtests. They specify cutting points on the indices employed to compare equatings. The cutting points have been chosen from a visual inspection of the results of applying them to the data from the OPCAL of ASVAB 15, 16 and 17. (See Appendix C for results of fitting the log-linear model to the distributions from this data set.) In choosing the points, an effort was made to provide some choice between alternative equatings where it seemed reasonable to have a choice, e.g., where two equatings with differing numbers of parameters provided visually similar equatings and visually similar equated-score distributions. An advantage of using cut points as specific as these is that the selection procedure can be replicated and evaluated. A disadvantage of this approach is that the cutting points based on a study of military recruits may not result in the selection of the best equating for population of military applicants, in which equatings are be used. More research is required to assess the inferential validity of the cutting points for selecting the most appropriate equating to use in an applicant population. Until such research provides further reassurances about these cutting points or provides more defensible alternatives, the last step, (e), in the heuristics provides a necessary confirmation that the selected equating is accurate at least for the subtest and sample in which the equating was developed.

The heuristics are:

(a) Select the smooth equating that minimizes the root-mean-squared-discrepancy between the smooth equating (linear or smoothed-equipercentile) and the raw equipercentile equating; then,

(b) Compare the smooth equating from (a) with other smooth equatings that use fewer parameters; select the equating with the fewest parameters if it reduces the root-meansquared-discrepancy in the frequency metric by at least 10% without increasing the root-mean-squared-discrepancy in the score metric by more than 10%; if no such alternative smooth equating exists, use the selection from (a) as the best-fitting alternative; then,

(c) Compare the equating selected in (b) with other smooth equatings that use fewer parameters; find those equatings with fewer parameters that also differ from (b) by more than .5 standard score points for fewer than 10% of the cases; then,

(d) Select that equating from (c) that uses the fewest parameters and that results in fewer than 10% of the cases at scores where the equated cumulative distribution differs from the reference cumulative distribution by more than .01; then,

(e) Graphically inspect the differences between an identity equating, a linear equating and any equipercentile equatings under consideration; also, graphically inspect the differences between the reference-form cumulative distribution and the distributions of equated scores based on the equipercentile equatings under consideration.

Appendix F:

Conversion of GS Raw Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	17.91397	17.83452	17.83452	18.39998	18.39998	18.59734	18.59734
1	19.88265	19.79450	19.79450	20.42185	20.42185	20.64081	20.64081
2	21.79847	21.68481	21.68481	22.49374	22.49374	22.77608	22.77608
3	23.69515	23.54989	23.54989	24.58375	24.58375	24.94459	24.94459
4	25.58435	25.40510	25.40510	26.68083	26.68083	27.12610	27.12610
5	27.46995	27.25558	27.25558	28.78132	28.78132	29.22347	29.22347
6	29.52851	29.27368	29.27368	30.43061	30.43061	30.96139	30.96139
7	31.51705	31.19056	31.19056	31.97861	31.97861	32.57831	32.57831
8	33.47853	33.06695	33.06695	33.53501	33.53501	34.22869	34.22869
9	35.44093	34.93524	34.93524	35.09428	35.09428	35.91191	35.91191
10	37.42388	36.84445	36.84445	36.54449	36.54449	37.62493	37.62493
11	39.43567	38.79329	38.79329	38.10338	38.10338	39.36369	39.36369
12	41.47170	40.77064	40.77064	39.76661	39.76661	41.12347	41.12347
13	43.51519	42.75737	42.75737	41.53483	41.53483	42.85988	42.85988
14	45.54170	44.73010	44.73010	43.40689	43.40689	44.62671	44.62671
15	47.52653	46.66711	46.66711	45.37355	45.37355	46.41880	46.41880
16	49.45260	48.55415	48.55415	47.41423	47.41423	48.23683	48.23683
17	51.31593	50.38886	50.38886	49.49942	49.49942	50.08934	50.08934
18	53.12736	52.18194	52.18194	51.59920	51.59920	51.99303	51.99303
19	54.92116	53.95665	53.95665	53.69433	53.69433	53.97224	53.97224
20	56.74766	55.74806	55.74806	55.78529	55.78529	56.05617	56.05617
21	58.65691	57.60411	57.60411	57.89665	57.89665	58.27118	58.27118
22	60.69924	59.58778	59.58778	60.07465	60.07465	60.62299	60.62299
23	62.90255	61.77491	61.77491	62.37291	62.37291	63.06665	63.06665
24	65.30792	64.23561	64.23561	64.81174	64.81174	65.69345	65.69345
25	67.81637	66.99136	66.99136	67.47499	67.47499	68.06579	68.06579

Conversion of AR Raw Test Scores to 1980 Unrounded Standard Score Equivalents

0	25.43686	25.36979	26.27766	25.49755	25.28033	25.31474	25.61453
1	26.78031	26.70698	27.72933	26.84667	26.60916	26.64678	26.97458
2	28.09621	28.00317	29.28587	28.18040	27.87906	27.92679	28.34267
3	29.40136	29.28338	30.93671	29.50812	29.12600	29.18653	29.71389
4	30.70223	30.55723	32.47386	30.83345	30.36380	30.43819	31.08637
5	31.98745	31.85902	33.79089	32.19897	31.62381	31.88222	32.27819
6	33.26050	33.06552	35.03080	33.53691	32.74028	33.29365	33.43412
7	34.56800	34.10053	36.26829	34.85600	33.91511	34.63283	34.61815
8	35.89854	35.13634	37.50858	36.16024	35.12282	35.89346	35.82789
9	37.24618	36.20257	38.75630	37.44555	36.35047	37.09452	37.05790
10	38.60608	37.29906	40.01554	38.71169	37.59514	38.23470	38.32769
11	39.97323	38.42801	41.28890	39.96696	38.86149	39.41299	39.66551
12	41.34256	39.59185	42.57647	41.22652	40.15968	40.65185	41.06309
13	42.70978	40.84767	43.87529	42.50435	41.50277	41.96448	42.50789
14	44.07206	42.19338	45.18010	43.81010	42.90344	43.34982	43.97500
15	45.42821	43.62146	46.49036	45.14369	44.37062	44.79093	45.44786
16	46.77852	45.11404	47.80404	46.48874	45.90698	46.26124	46.90663
17	48.12424	46.64264	49.12208	47.82542	47.50812	47.73602	48.33643
18	49.46716	48.17759	50.44800	49.13990	49.16295	49.20187	49.73099
19	50.80952	49.70475	51.78697	50.43115	50.85393	50.65908	51.09189
20	52.15410	51.21412	53.14416	51.71141	52.56783	52.11801	52.42607
21	53.50476	52.70677	54.52255	53.00125	54.28099	53.59063	53.74335
22	54.86678	54.19272	55.92007	54.32115	55.95852	55.07734	55.05410
23	56.24691	55.68706	57.32649	55.68107	57.56377	56.56141	56.36708
24	57.65227	57.20468	58.72204	57.07179	59.05227	58.01044	57.68737
25	59.08792	58.75322	60.08033	58.46702	60.39359	59.39129	59.01492
26	60.55314	60.32924	61.37740	59.84426	61.59141	60.69360	60.34549
27	62.03783	61.90186	62.60467	61.21830	62.68290	61.94729	61.67567
28	63.52013	63.43474	63.77926	62.66274	63.73081	63.22243	63.01344
29	64.96509	64.89890	64.95067	64.27496	64.82433	64.60675	64.40053
30	66.31626	66.27991	66.23377	66.02238	66.14606	66.12327	65.99026

Conversion of WK Raw Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	16.03719	16.42861	16.45135	16.13752	16.03736	16.01820	15.85413
1	17.34762	17.78688	17.81240	17.46021	17.34782	17.32632	17.14220
2	18.68217	19.20040	19.21230	18.82903	18.68242	18.65437	18.41418
3	20.02500	20.60255	20.62226	20.21372	20.02532	19.98928	19.68065
4	21.37103	22.04227	22.07070	21.60452	21.37142	21.32684	20.94498
5	22.71858	23.50683	23.54458	22.99825	22.71906	22.66566	22.20829
6	24.06698	24.98832	25.03578	24.38081	24.06754	24.00518	23.47104
7	25.41590	26.48174	26.53918	25.74642	25.41654	25.34512	24.73344
8	26.76514	27.95156	28.01707	27.11297	26.76587	26.68534	25.99563
9	28.02004	29.28012	29.51118	28.50765	28.03126	28.14085	27.42234
10	29.24157	30.52154	30.98398	29.94035	29.22530	29.65044	28.99431
11	30.51196	31.75197	32.45045	31.39759	30.43399	31.16307	30.61743
12	31.82764	32.97045	33.92026	32.86818	31.70984	32.69573	32.24477
13	33.18597	34.17757	35.38748	34.33589	33.08852	34.22436	33.83488
14	34.58174	35.37573	36.83779	35.78205	34.58584	35.72126	35.40214
15	36.00494	36.56882	38.25087	37.18931	36.16047	37.16217	36.91289
16	37.41995	37.76136	39.60646	38.54547	37.75603	38.53224	38.34489
17	38.82431	38.95742	40.89121	39.84560	39.34003	39.82897	39.69132
18	40.20817	40.15970	42.10265	41.09202	40.85558	41.06087	40.95955
19	41.56[illegible]88	41.36914	43.24883	42.29241	42.26738	42.24342	42.16610
20	42.87672	42.58503	44.34451	43.45687	43.56914	43.39435	43.33079
21	44.15449	43.80376	45.40610	44.59549	44.77829	44.52965	44.47200
22	45.39645	45.01115	46.44798	45.71663	45.92435	45.66170	45.60406
23	46.60699	46.22160	47.44454	46.82656	47.03824	46.79081	46.73681
24	47.79195	47.43414	48.44385	47.92995	48.14606	47.94588	47.87632
25	48.95242	48.64892	49.45703	49.03088	49.26690	49.10541	49.02612
26	50.09425	49.86752	50.48311	50.11635	50.41246	50.27621	50.17638
27	51.24339	51.09315	51.51244	51.21768	51.58649	51.45368	51.34529
28	52.41285	52.33067	52.54118	52.34750	52.78228	52.64933	52.53601
29	53.61668	53.58613	53.58892	53.51662	54.00263	53.85970	53.74803
30	54.86814	54.86545	54.66371	54.73662	55.23869	55.08101	54.98052
31	56.17527	56.17188	55.78584	56.01626	56.48817	56.30973	56.23187
32	57.53310	57.50234	56.98862	57.35504	57.75720	57.54357	57.49922
33	58.91394	58.84276	58.31100	58.73434	59.05101	58.78309	58.77798
34	60.25754	60.16239	59.76423	60.10782	60.34121	60.03435	60.06141
35	61.45923	61.40240	61.24335	61.38881	61.49855	61.31586	61.33930

Conversion of PC Raw Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	16.87800	17.74411	16.70272	16.57687	17.48701	16.84402	17.91502
1	19.78418	20.86358	19.56573	19.40888	20.54316	19.74182	21.07657
2	22.61058	24.13180	22.30271	22.08167	23.68023	22.55089	24.43198
3	25.41758	27.43620	25.00905	24.71573	26.83699	25.33838	27.72301
4	28.21129	30.14343	27.68983	27.13869	29.69224	28.16565	30.88016
5	30.80825	32.83856	30.11776	29.44794	32.52641	30.93565	34.17280
6	33.27385	35.67195	33.01228	32.04753	35.44123	33.82882	37.37751
7	35.81754	38.63253	36.47500	34.95562	38.45389	36.86399	40.36813
8	38.57550	41.61454	40.14427	38.17095	41.47969	39.94501	43.15466
9	41.45566	44.47886	43.81707	41.59641	44.42804	42.96623	45.81685
10	44.33192	47.16593	47.24736	45.10604	47.27934	45.89793	48.38909
11	47.19690	49.72706	50.33738	48.58468	50.06668	48.76685	50.80936
12	50.17183	52.28909	53.14200	51.94322	52.82528	51.60197	53.25720
13	53.37785	55.01109	55.80656	55.21571	55.57198	54.39467	55.76763
14	56.75338	58.00048	58.49925	58.30370	58.32051	57.16113	58.39201
15	60.18763	61.16030	61.36069	61.32077	61.19720	60.24030	61.22918

Conversion of NO Raw Test Scores to 1980 Unrounded Standard Score Equivalents Without Linkage to Answer Sheet Calibration

0	15.54694	15.40206	15.40206	15.49707	15.49707	15.44852	15.44852
1	16.48229	16.28219	16.28219	16.41341	16.41341	16.34635	16.34635
2	17.42453	17.12877	17.12877	17.32274	17.32274	17.22362	17.22362
3	18.36811	17.96887	17.96887	18.23070	18.23070	18.09690	18.09690
4	19.31215	18.80673	18.80673	19.13819	19.13819	18.96881	18.96881
5	20.25641	19.62589	19.62589	20.04547	20.04547	19.84009	19.84009

Raw	15G	20A	20B	21A	21B	22A	22B
6	21.20078	20.43725	20.43725	20.95263	20.95263	20.71102	20.71102
7	22.14521	21.25618	21.25618	21.85972	21.85972	21.58175	21.58175
8	23.08969	22.07956	22.07956	22.76677	22.76677	22.44908	22.44908
9	24.03421	22.90576	22.90576	23.67378	23.67378	23.30887	23.30887
10	24.97874	23.73388	23.73388	24.58077	24.58077	24.17091	24.17091
11	25.92330	24.56334	24.56334	25.48775	25.48775	25.03455	25.03455
12	26.80661	25.48029	25.48029	26.41378	26.41378	25.92156	25.92156
13	27.64144	26.50457	26.50457	27.36400	27.36400	26.88244	26.88244
14	28.50168	27.56742	27.56742	28.31824	28.31824	27.90650	27.90650
15	29.38835	28.63614	28.63614	29.28918	29.28918	28.96864	28.96864
16	30.30007	29.70753	29.70753	30.28327	30.28327	30.03020	30.03020
17	31.23343	30.77723	30.77723	31.30104	31.30104	31.09487	31.09487
18	32.18368	31.81827	31.81827	32.33832	32.33832	32.14843	32.14843
19	33.14576	32.84706	32.84706	33.38799	33.38799	33.18127	33.18127
20	34.11505	33.86773	33.86773	34.44186	34.44186	34.18900	34.18900
21	35.08781	34.88090	34.88090	35.48055	35.48055	35.17183	35.17183
22	36.06135	35.88759	35.88759	36.50160	36.50160	36.13314	36.13314
23	37.03387	36.88886	36.88886	37.51404	37.51404	37.07796	37.07796
24	38.00427	37.88550	37.88550	38.51607	38.51607	38.01181	38.01181
25	38.97188	38.87794	38.87794	39.50700	39.50700	38.93987	38.93987
26	39.93624	39.86612	39.86612	40.48695	40.48695	39.86644	39.86644
27	40.89693	40.84967	40.84967	41.45667	41.45667	40.79475	40.79475
28	41.85347	41.82792	41.82792	42.41720	42.41720	41.72674	41.72674
29	42.80532	42.80018	42.80018	43.36972	43.36972	42.66306	42.66306
30	43.75192	43.76573	43.76573	44.31524	44.31524	43.60302	43.60302
31	44.69246	44.72257	44.72257	45.25462	45.25462	44.54485	44.54485
32	45.62669	45.67444	45.67444	46.18845	46.18845	45.48602	45.48602
33	46.55531	46.62248	46.62248	47.11723	47.11723	46.42368	46.42368
34	47.47842	47.56860	47.56860	48.04148	48.04148	47.35527	47.35527
35	48.39645	48.51543	48.51543	48.96198	48.96198	48.27898	48.27898
36	49.31007	49.46616	49.46616	49.88002	49.88002	49.19412	49.19412
37	50.22069	50.42432	50.42432	50.79756	50.79756	50.10118	50.10118
38	51.12982	51.39350	51.39350	51.71734	51.71734	51.00182	51.00182
39	52.03896	52.37662	52.37662	52.64278	52.64278	51.89863	51.89863
40	52.94956	53.37495	53.37495	53.57744	53.57744	52.79494	52.79494
41	53.86292	54.38630	54.38630	54.52385	54.52385	53.69442	53.69442
42	54.77998	55.40258	55.40258	55.48106	55.48106	54.60071	54.60071
43	55.70090	56.40752	56.40752	56.44115	56.44115	55.51651	55.51651
44	56.62433	57.37631	57.37631	57.38589	57.38589	56.44210	56.44210
45	57.54654	58.28064	58.28064	58.28726	58.28726	57.37360	57.37360
46	58.46063	59.10092	59.10092	59.11690	59.11690	58.30181	58.30181
47	59.35716	59.84249	59.84249	59.86550	59.86550	59.21414	59.21414
48	60.22661	60.54351	60.54351	60.56072	60.56072	60.10144	60.10144
49	61.06361	61.22172	61.22172	61.22505	61.22505	60.96783	60.96783
50	61.86973	61.90331	61.90331	61.90083	61.90083	61.83761	61.83761

Conversion of CS Raw Test Scores to 1980 Unrounded Standard Score Equivalents Without Linkage to Answer Sheet Calibration

Raw	15G	20A	20B	21A	21B	22A	22B
0	21.52204	21.55967	21.55967	21.49453	21.52401	21.53872	21.53872
1	22.08792	22.14026	22.14026	22.04967	22.09067	22.11112	22.11112
2	22.63186	22.70942	22.70942	22.57518	22.63594	22.66623	22.66623
3	23.17162	23.27640	23.27640	23.09504	23.17712	23.21805	23.21805
4	23.70992	23.84262	23.84262	23.57531	23.71690	23.76873	23.76873
5	24.23328	24.40851	24.40851	24.07079	24.24497	24.31890	24.31890
6	24.75498	24.97420	24.97420	24.57385	24.76800	24.86481	24.86481
7	25.28140	25.53978	25.53978	25.08087	25.29582	25.40300	25.40300
8	25.81059	26.10529	26.10529	25.59021	25.82644	25.94423	25.94423
9	26.34155	26.67066	26.67066	26.10103	26.35885	26.48741	26.48741
10	26.87371	27.23064	27.23064	26.60138	26.89247	27.03189	27.03189
11	27.40671	27.79165	27.79165	27.10043	27.42694	27.57731	27.57731
12	27.94033	28.35342	28.35342	27.60271	27.96204	28.12341	28.12341
13	28.47441	28.91577	28.91577	28.10735	28.49761	28.67002	28.67002
14	28.97788	29.47289	29.47289	28.66773	29.06059	29.25857	29.25857
15	29.47238	30.03956	30.03956	29.29511	29.65936	29.89275	29.89275
16	29.98750	30.62924	30.62924	29.95355	30.27277	30.53564	30.53564
17	30.51731	31.23960	31.23960	30.63024	30.89257	31.18206	31.18206
18	31.06025	31.87216	31.87216	31.32071	31.52258	31.83493	31.83493
19	31.61865	32.52826	32.52826	32.02750	32.16612	32.49671	32.49671

Raw	15G	20A	20B	21A	21B	22A	22B
20	32.19487	33.20875	33.20875	32.74185	32.82590	33.16926	33.16926
21	32.79111	33.90653	33.90653	33.47310	33.50378	33.85159	33.85159
22	33.40920	34.62358	34.62358	34.22125	34.20061	34.53940	34.53940
23	34.05026	35.35918	35.35918	34.98373	34.91608	35.23678	35.23678
24	34.71445	36.10919	36.10919	35.74456	35.64599	35.94131	35.94131
25	35.40073	36.86313	36.86313	36.50573	36.37877	36.64969	36.64969
26	36.10675	37.60894	37.60894	37.26490	37.11942	37.35804	37.35804
27	36.82736	38.35084	38.35084	38.01542	37.86329	38.05637	38.05637
28	37.54722	39.08386	39.08386	38.73895	38.60524	38.74142	38.74142
29	38.27120	39.80294	39.80294	39.44663	39.32568	39.41543	39.41543
30	38.99420	40.49432	40.49432	40.13635	40.03633	40.07630	40.07630
31	39.71147	41.16992	41.16992	40.80728	40.73492	40.72284	40.72284
32	40.41579	41.82967	41.82967	41.45963	41.42010	41.35470	41.35470
33	41.09860	42.47428	42.47428	42.09448	42.09138	41.97228	41.97228
34	41.76825	43.10508	43.10508	42.71357	42.74904	42.57662	42.57662
35	42.42417	43.72377	43.72377	43.31902	43.39170	43.16915	43.16915
36	43.06651	44.33227	44.33227	43.91314	44.02105	43.75161	43.75161
37	43.69600	44.93254	44.93254	44.49823	44.64196	44.32582	44.32582
38	44.31377	45.52646	45.52646	45.07648	45.25589	44.89361	44.89361
39	44.92117	46.11581	46.11581	45.64990	45.86428	45.45673	45.45673
40	45.51967	46.70222	46.70222	46.22028	46.46853	46.01676	46.01676
41	46.11079	47.28714	47.28714	46.78916	47.06992	46.57517	46.57517
42	46.69593	47.87183	47.87183	47.35787	47.66968	47.13323	47.13323
43	47.27645	48.45743	48.45743	47.92756	48.26889	47.69208	47.69208
44	47.85359	49.04492	49.04492	48.49922	48.86856	48.25271	48.25271
45	48.42844	49.63515	49.63515	49.07369	49.46958	48.81601	48.81601
46	49.00198	50.22887	50.22887	49.65170	50.07274	49.38275	49.38275
47	49.57511	50.82665	50.82665	50.23388	50.67870	49.95358	49.95358
48	50.14862	51.42898	51.42898	50.82079	51.28802	50.52898	50.52898
49	50.72319	52.03616	52.03616	51.41285	51.90110	51.10942	51.10942
50	51.29944	52.64834	52.64834	52.01037	52.51815	51.69546	51.69546
51	51.87790	53.26544	53.26544	52.61354	53.13921	52.28698	52.28698
52	52.45894	53.88717	53.88717	53.22234	53.76411	52.88364	52.88364
53	53.04289	54.51301	54.51301	53.83659	54.39242	53.48489	53.48489
54	53.62986	55.14221	55.14221	54.45584	55.02350	54.08997	54.08997
55	54.21982	55.77379	55.77379	55.07946	55.65648	54.69791	54.69791
56	54.81256	56.40660	56.40660	55.70656	56.29029	55.30770	55.30770
57	55.40764	57.03938	57.03938	56.33604	56.92377	55.91867	55.91867
58	56.00440	57.67081	57.67081	56.96665	57.55565	56.52905	56.52905
59	56.60201	58.30049	58.30049	57.59705	58.18469	57.13752	57.13752
60	57.19945	58.92803	58.92803	58.22586	58.80977	57.74298	57.74298
61	57.79557	59.55095	59.55095	58.85180	59.42993	58.34450	58.34450
62	58.38913	60.16860	60.16860	59.47376	60.04448	58.94155	58.94155
63	58.97888	60.78070	60.78070	60.09203	60.65304	59.53395	59.53395
64	59.56361	61.38739	61.38739	60.70527	61.25556	60.12197	60.12197
65	60.14218	61.98927	61.98927	61.31243	61.85236	60.70631	60.70631
66	60.71361	62.58740	62.58740	61.91351	62.44407	61.28813	61.28813
67	61.27705	63.18326	63.18326	62.50888	63.03164	61.86901	61.86901
68	61.83573	63.77884	63.77884	63.09929	63.61631	62.45251	62.45251
69	62.38763	64.37653	64.37653	63.68584	64.19955	63.03939	63.03939
70	62.93230	64.97907	64.97907	64.27000	64.78299	63.63178	63.63178
71	63.47018	65.58931	65.58931	64.85356	65.36836	64.23200	64.23200
72	64.00209	66.20965	66.20965	65.43989	65.95719	64.84227	64.84227
73	64.52949	66.84112	66.84112	66.02972	66.55049	65.46751	65.46751
74	65.05475	67.48183	67.48183	66.62398	67.14804	66.10960	66.10960
75	65.58170	68.12486	68.12486	67.22312	67.74737	66.76606	66.76606
76	66.11630	68.75639	68.75639	67.82585	68.34249	67.43217	67.43217
77	66.66736	69.35560	69.35560	68.42784	68.92282	68.09829	68.09829
78	67.24699	69.89914	69.89914	69.02053	69.47356	68.74931	68.74931
79	67.87014	70.37237	70.37237	69.59074	69.97932	69.36625	69.36625
80	68.55193	70.78016	70.78016	70.12281	70.43232	69.93170	69.93170
81	69.30156	71.10572	71.10572	70.60496	70.84370	70.43910	70.43910
82	70.11245	71.41065	71.41065	71.03950	71.19578	70.90280	70.90280
83	70.93228	71.63953	71.63953	71.45138	71.52689	71.34303	71.34303
84	71.67150	71.88218	71.88218	71.81321	71.84001	71.77268	71.77268

Conversion of AS Raw Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	24.24820	23.98878	23.98878	23.73053	23.73053	24.01244	24.01244
1	26.05558	25.76372	25.76372	25.47317	25.47317	25.79033	25.79033
2	27.87282	27.49115	27.49115	27.11120	27.11120	27.52595	27.52595
3	29.69342	29.20242	29.20242	28.71364	28.71364	29.24720	29.24720
4	31.51531	30.90747	30.90747	30.06295	30.06295	30.96291	30.96291
5	33.48424	32.73432	32.73432	31.70401	31.70401	32.78815	32.78815
6	35.53017	34.57209	34.57209	33.44998	33.44998	34.66564	34.66564
7	37.55505	36.39416	36.39416	35.28970	35.28970	36.59378	36.59378
8	39.52092	38.18534	38.18534	37.21560	37.21560	38.54380	38.54380
9	41.39533	39.94095	39.94095	39.19109	39.19109	40.47151	40.47151
10	43.21146	41.67194	41.67194	41.16872	41.16872	42.33922	42.33922
11	44.97440	43.40200	43.40200	43.11539	43.11539	44.12939	44.12939
12	46.69551	45.16303	45.16303	45.01814	45.01814	45.84344	45.84344
13	48.39344	46.99079	46.99079	46.90243	46.90243	47.49506	47.49506
14	50.08492	48.91577	48.91577	48.77569	48.77569	49.10632	49.10632
15	51.78196	50.94551	50.94551	50.63625	50.63625	50.70625	50.70625
16	53.49429	53.04764	53.04764	52.47018	52.47018	52.32586	52.32586
17	55.22564	55.15193	55.15193	54.25840	54.25840	53.98732	53.98732
18	56.97043	57.18092	57.18092	55.99108	55.99108	55.69488	55.69488
19	58.71587	59.08809	59.08809	57.67861	57.67861	57.43292	57.43292
20	60.45018	60.87386	60.87386	59.35305	59.35305	59.18229	59.18229
21	62.17278	62.57443	62.57443	61.07195	61.07195	60.94110	60.94110
22	63.90245	64.24240	64.24240	62.88112	62.88112	62.73611	62.73611
23	65.67589	65.93059	65.93059	64.80823	64.80823	64.61600	64.61600
24	67.51643	67.66660	67.66660	66.85254	66.85254	66.62622	66.62622
25	69.34479	69.39836	69.39836	68.94223	68.94223	68.81634	68.81634

Conversion of MK Raw Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	28.79944	28.75840	28.91140	28.62819	28.63338	29.46237	29.21225
1	30.37034	30.32213	30.50185	30.16918	30.17528	31.11880	30.85525
2	31.95057	31.88520	32.12894	31.67775	31.68602	32.81149	32.60824
3	33.53351	33.44807	33.76663	33.17694	33.18775	34.54794	34.30823
4	35.01803	35.15622	35.39126	34.88609	34.90366	36.20146	35.96702
5	36.45125	36.82532	36.96261	36.59361	36.61542	37.72928	37.57352
6	37.87960	38.40034	38.52940	38.21970	38.19901	39.17858	39.15959
7	39.30550	39.93504	40.11149	39.83130	39.69943	40.58687	40.74316
8	40.73446	41.47448	41.71707	41.46455	41.16188	41.97064	42.33150
9	42.17915	43.05038	43.34782	43.13362	42.62684	43.36542	43.92191
10	43.65680	44.67419	44.99906	44.83053	44.12817	44.78772	45.50391
11	45.18228	46.32966	46.66010	46.52658	45.68605	46.22809	47.06449
12	46.76105	47.97754	48.31710	48.18311	47.30022	47.67310	48.59434
13	48.38547	49.57666	49.95817	49.76867	48.95307	49.10776	50.09126
14	50.03884	51.10655	51.57779	51.27156	50.62253	50.52049	51.55952
15	51.70216	52.57521	53.17516	52.70081	52.29485	51.90663	53.00684
16	53.36028	54.01043	54.75060	54.07873	53.96789	53.26939	54.44502
17	55.00447	55.44481	56.30070	55.43277	55.64355	54.61921	55.87885
18	56.63152	56.90089	57.81550	56.79068	57.31524	55.97921	57.30801
19	58.24145	58.37807	59.28006	58.17744	58.95811	57.36703	58.72637
20	59.83532	59.84855	60.68334	59.60937	60.53380	58.79834	60.12526
21	61.41433	61.27463	62.01875	61.08580	62.01564	60.28503	61.50044
22	62.98073	62.64578	63.30741	62.58781	63.42137	61.82948	62.86041
23	64.54070	64.00576	64.59681	64.09482	64.82077	63.43091	64.23124
24	66.11014	65.47025	65.95673	65.62559	66.29819	65.12037	65.66922
25	67.74255	67.28684	67.57153	67.40261	67.85483	67.07131	67.40674

Conversion of MC Raw Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	23.27136	23.58811	23.58811	23.08344	23.08344	23.16597	23.16597
1	25.10520	25.46768	25.46768	24.89014	24.89014	24.98458	24.98458
2	26.88192	27.36337	27.36337	26.59630	26.59630	26.72173	26.72173
3	28.64052	29.26416	29.26416	28.27053	28.27053	28.43301	28.43301
4	30.39226	31.16690	31.16690	29.79674	29.79674	30.13451	30.13451
5	32.14072	32.88061	32.88061	31.68015	31.68015	32.06530	32.06530

Raw	15G	20A	20B	21A	21B	22A	22B
6	33.81222	34.55987	34.55987	33.39263	33.39263	33.92999	33.92999
7	35.37803	36.26301	36.26301	35.02143	35.02143	35.73977	35.73977
8	37.01454	37.98569	37.98569	36.65323	36.65323	37.51073	37.51073
9	38.69640	39.72777	39.72777	38.32408	38.32408	39.26745	39.26745
10	40.40599	41.49148	41.49148	40.05649	40.05649	41.06378	41.06378
11	42.13857	43.27988	43.27988	41.86170	41.86170	42.90404	42.90404
12	43.89918	45.09701	45.09701	43.73464	43.73464	44.78403	44.78403
13	45.70080	46.94859	46.94859	45.65702	45.65702	46.69527	46.69527
14	47.56269	48.84152	48.84152	47.60955	47.60955	48.63178	48.63178
15	49.50738	50.78102	50.78102	49.58389	49.58389	50.59452	50.59452
16	51.55470	52.76504	52.76504	51.58458	51.58458	52.59058	52.59058
17	53.71075	54.77886	54.77886	53.61993	53.61993	54.62228	54.62228
18	55.95399	56.79435	56.79435	55.68590	55.68590	56.67336	56.67336
19	58.22959	58.77900	58.77900	57.75410	57.75410	58.70864	58.70864
20	60.46504	60.71213	60.71213	59.77805	59.77805	60.68869	60.68869
21	62.60458	62.59750	62.59750	61.72315	61.72315	62.59533	62.59533
22	64.64233	64.46341	64.46341	63.60062	63.60062	64.44857	64.44857
23	66.60920	66.35193	66.35193	65.47568	65.47568	66.30553	66.30553
24	68.53920	68.29815	68.29815	67.43545	67.43545	68.23986	68.23986
25	70.39131	70.25777	70.25777	69.70615	69.70615	70.22830	70.22830

Conversion of Raw EI Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	22.08362	22.36199	22.36199	22.32777	22.32777	22.48844	22.48844
1	24.33328	24.66273	24.66273	24.62223	24.62223	24.81238	24.81238
2	26.43345	26.88274	26.88274	26.82751	26.82751	27.08682	27.08682
3	28.35786	29.07996	29.07996	29.00761	29.00761	29.34729	29.34729
4	30.62847	31.38164	31.38164	31.41497	31.41497	31.81506	31.81506
5	33.13286	33.70604	33.70604	33.86816	33.86816	34.22581	34.22581
6	35.69909	36.04048	36.04048	36.29964	36.29964	36.50515	36.50515
7	38.31327	38.41933	38.41933	38.74936	38.74936	38.75724	38.75724
8	41.07538	40.86223	40.86223	41.24003	41.24003	41.07552	41.07552
9	43.90635	43.34468	43.34468	43.74798	43.74798	43.49391	43.49391
10	46.66490	45.80785	45.80785	46.21451	46.21451	45.97281	45.97281
11	49.24618	48.19922	48.19922	48.58860	48.58860	48.43487	48.43487
12	51.63949	50.50373	50.50373	50.85944	50.85944	50.82361	50.82361
13	53.90111	52.74096	52.74096	53.05319	53.05319	53.13005	53.13005
14	56.09285	54.94101	54.94101	55.20753	55.20753	55.37446	55.37446
15	58.23888	57.12111	57.12111	57.34618	57.34618	57.57238	57.57238
16	60.31723	59.27564	59.27564	59.46294	59.46294	59.71419	59.71419
17	62.29207	61.45345	61.45345	61.55569	61.55569	61.77566	61.77566
18	64.17696	63.65869	63.65869	63.68364	63.68364	63.85321	63.85321
19	66.24488	65.98744	65.98744	65.89629	65.89629	66.08959	66.08959
20	68.64922	68.54096	68.54096	68.40442	68.40442	68.57597	68.57597

Conversion of Raw VE Test Scores to 1980 Unrounded Standard Score Equivalents

Raw	15G	20A	20B	21A	21B	22A	22B
0	14.86287	15.23383	14.91123	14.81379	14.84415	14.76109	14.82696
1	15.81132	16.21635	15.86412	15.75774	15.79089	15.70020	15.77212
2	16.76978	17.20711	16.83665	16.70191	16.74389	16.62904	16.72012
3	17.73216	18.22746	17.81688	17.64618	17.69937	17.55385	17.66925
4	18.69611	19.27609	18.80019	18.59048	18.65582	18.47705	18.61882
5	19.66082	20.34410	19.78500	19.53480	19.61275	19.39947	19.56861
6	20.62595	21.42560	20.77063	20.47912	20.56995	20.32145	20.51852
7	21.59134	22.51678	21.75677	21.42346	21.52731	21.24318	21.46850
8	22.55690	23.61507	22.74323	22.36779	22.48477	22.16473	22.41853
9	23.52257	24.71873	23.72993	23.31213	23.44231	23.08616	23.36860
10	24.48832	25.78608	24.71679	24.25647	24.39990	24.00750	24.31869
11	25.45415	26.86019	25.69440	25.20081	25.35753	24.92878	25.26879
12	26.42001	27.95670	26.67185	26.14516	26.31519	25.85001	26.21891
13	27.31598	28.98894	27.66691	27.12827	27.21383	26.82666	27.29398
14	28.19110	29.93425	28.70006	28.15017	28.11959	27.85889	28.52244
15	29.10260	30.85231	29.75185	29.18407	29.11149	28.93043	29.78101
16	30.04099	31.74414	30.81554	30.22351	30.18394	30.03276	31.08002
17	30.99633	32.61455	31.88332	31.26061	31.31471	31.15178	32.35716
18	31.95886	33.47015	32.94826	32.28585	32.43937	32.27124	33.55504
19	32.92041	34.31755	34.00529	33.28769	33.55580	33.35079	34.69325
20	33.87549	35.16233	35.05156	34.27567	34.64733	34.40964	35.76514
21	34.82148	36.00139	36.00038	35.25016	35.70546	35.44423	36.77465

Raw	15G	20A	20B	21A	21B	22A	22B
22	35.75826	36.83628	37.09162	36.21277	36.73068	36.45394	37.73165
23	36.68736	37.67944	38.09366	37.16550	37.72890	37.44021	38.64816
24	37.61106	38.53135	39.08596	38.11019	38.70789	38.40539	39.53579
25	38.53175	39.39154	40.06724	39.04817	39.67457	39.35202	40.40456
26	39.45134	40.25902	41.03561	39.98019	40.63336	40.28243	41.26231
27	40.37096	41.13246	41.98889	40.90632	41.58553	41.19862	42.11472
28	41.29082	42.01038	42.92513	41.82624	42.52940	42.10231	42.96535
29	42.21012	42.89131	43.84304	42.73935	43.46133	42.99516	43.81578
30	43.12727	43.77380	44.74241	43.64506	44.37724	43.87882	44.66601
31	44.04015	44.65656	45.62404	44.54298	45.27425	44.75500	45.51485
32	44.94666	45.53845	46.48954	45.42571	46.15189	45.62540	46.35050
33	45.84513	46.41666	47.33614	46.30033	47.01252	46.49158	47.17718
34	46.73466	47.28494	48.16162	47.16825	47.86091	47.35200	47.99809
35	47.61542	48.15036	48.97679	48.03131	48.70311	48.20256	48.81345
36	48.48857	49.01310	49.78340	48.89162	49.54530	49.05310	49.62435
37	49.35612	49.87356	50.58217	49.75136	50.39273	49.90453	50.43260
38	50.22093	50.73243	51.37302	50.61276	51.24892	50.75728	51.24070
39	51.08118	51.59088	52.15561	51.47818	52.11501	51.61145	52.04900
40	51.94856	52.45085	52.92475	52.35038	52.98687	52.46705	52.86163
41	52.82988	53.31552	53.68874	53.23276	53.86332	53.32438	53.69006
42	53.73047	54.18960	54.45553	54.12932	54.73827	54.18429	54.53726
43	54.65487	55.07927	55.23194	55.04417	55.60464	55.04847	55.40445
44	55.60547	55.99131	56.02819	55.98038	56.45915	55.91930	56.28967
45	56.58057	56.93104	56.85651	56.93826	57.30558	56.79948	57.18699
46	57.57288	57.89995	57.72910	57.91423	58.15613	57.69296	58.08717
47	58.57080	58.89377	58.65402	58.90109	59.02948	58.60348	58.98105
48	59.56409	59.90311	59.62540	59.89095	59.94562	59.53615	59.86480
49	60.55586	60.91737	60.64257	60.88147	60.91696	60.50427	60.75197
50	61.64690	61.93385	61.74924	61.89548	61.93109	61.57779	61.74949

Conversion of NO Raw Test Scores to 1980 Unrounded Standard Score Equivalents After Linkage to Answer Sheet Calibration

Raw	15G	20A	20B	21A	21B	22A	22B
0	15.60598	15.44527	15.44527	15.55226	15.55226	15.49758	15.49758
1	16.56795	16.36168	16.36168	16.49656	16.49656	16.42764	16.42764
2	17.55321	17.24384	17.24384	17.44663	17.44663	17.34300	17.34300
3	18.54276	18.12403	18.12403	18.39859	18.39859	18.25829	18.25829
4	19.53378	19.00318	19.00318	19.35113	19.35113	19.17332	19.17332
5	20.52548	19.86327	19 86327	20.30392	20.30392	20.08822	20.08822
6	21.51753	20.71545	20.71545	21.25685	21.25685	21.00304	21.00304
7	22.50981	21.57575	21.57575	22.20985	22.20985	21.91780	21.91780
8	23.50224	22.44083	22.44083	23.16291	23.16291	22.82910	22.82910
9	24.49390	23.30896	23.30896	24.11601	24.11601	23.73255	23.73255
10	25.47935	24.17915	24.17915	25.06564	25.06564	24.63690	24.63690
11	26.43564	25.04740	25.04740	26.00511	26.00511	25.53699	25.53699
12	27.28283	25.99740	25.99740	26.89828	26.89828	26.43399	26.43399
13	28.14349	26.98392	26.98392	27.85367	27.85367	27.36049	27.36049
14	29.08506	28.06257	28.06257	28.88347	28.88347	28.43330	28.43330
15	30.10912	29.24035	29.24035	29.99459	29.99459	29.62437	29.62437
16	31.20460	30.49192	30.49192	31.18439	31.18439	30.88002	30.88002
17	32.35480	31.79206	31.79206	32.43876	32.43876	32.18389	32.18389
18	33.54048	33.08437	33.08437	33.72829	33.72829	33.49649	33.49649
19	34.70768	34.34556	34.34556	34.99918	34.99918	34.75041	34.75041
20	35.87381	35.57650	35.57650	36.26576	36.26576	35.96250	35.96250
21	37.04026	36.79230	36.79230	37.51065	37.51065	37.14089	37.14089
22	38.20658	37.99818	37.99818	38.73461	38.73461	38.29268	38.29268
23	39.36850	39.19761	39.19761	39.93438	39.93438	39.42047	39.42047
24	40.51353	40.37291	40.37291	41.11949	41.11949	40.52246	40.52246
25	41.66140	41.54947	41.54947	42.29896	42.29896	41.62326	41.62326
26	42.81191	42.72805	42.72805	43.47053	43.47053	42.72844	42.72844
27	43.96080	43.90429	43.90429	44.63003	44.63003	43.83861	43.83861
28	45.09799	45.06785	45.06785	45.76218	45.76218	44.94853	44.94853
29	46.21429	46.20830	46.20830	46.87107	46.87107	46.04857	46.04857
30	47.31266	47.32862	47.32862	47.96266	47.96266	47.14062	47.14062
31	48.39484	48.42933	48.42933	49.03811	49.03811	48.22572	48.22572
32	49.46154	49.51588	49.51588	50.10040	50.10040	49.30145	49.30145
33	50.51643	50.59262	50.59262	51.15371	51.15371	50.36716	50.36716
34	51.56337	51.66566	51.66566	52.20220	52.20220	51.42369	51.42369
35	52.60543	52.74057	52.74057	53.24806	53.24806	52.47198	52.47198
36	53.64418	53.82181	53.82181	54.29168	54.29168	53.51223	53.51223

Raw	15G	20A	20B	21A	21B	22A	22B
37	54.67553	54.90498	54.90498	55.32210	55.32210	54.54087	54.54087
38	55.68380	55.97085	55.97085	56.31701	56.31701	55.54445	55.54445
39	56.64270	56.98463	56.98463	57.24481	57.24481	56.50059	56.50059
40	57.52113	57.90429	57.90429	58.07528	58.07528	57.38186	57.38186
41	58.29717	58.70398	58.70398	58.79616	58.79616	58.16620	58.16620
42	58.96177	59.35645	59.35645	59.39775	59.39775	58.84586	58.84586
43	59.51347	59.87726	59.87726	59.89306	59.89306	59.41642	59.41642
44	59.97913	60.31897	60.31897	60.32278	60.32278	59.89351	59.89351
45	60.38669	60.67300	60.67300	60.67540	60.67540	60.31789	60.31789
46	60.73837	60.97374	60.97374	60.98029	60.98029	60.68068	60.68068
47	61.07878	61.27773	61.27773	61.28717	61.28717	61.02016	61.02016
48	61.41786	61.52662	61.52662	61.53253	61.53253	61.37489	61.37489
49	61.72097	61.78988	61.78988	61.79133	61.79133	61.67923	61.67923
50	62.07560	62.09239	62.09239	62.09115	62.09115	62.05954	62.05954

Conversion of CS Raw Test Scores to 1980 Unrounded Standard Score Equivalents After Linkage to Answer Sheet Calibration

Raw	15G	20A	20B	21A	21B	22A	22B
0	21.50235	21.53661	21.53661	21.47731	21.50415	21.51754	21.51754
1	22.02907	22.07796	22.07796	21.99335	22.03164	22.05074	22.05074
2	22.53475	22.60676	22.60676	22.48212	22.53853	22.56666	22.56666
3	23.03573	23.13297	23.13297	22.96467	23.04084	23.07883	23.07883
4	23.53524	23.65837	23.65837	23.41034	23.54171	23.58981	23.58981
5	24.02082	24.18339	24.18339	23.87007	24.03166	24.10025	24.10025
6	24.50483	24.70821	24.70821	24.33679	24.51692	24.60673	24.60673
7	24.99306	25.23238	25.23238	24.80717	25.00641	25.10569	25.10569
8	25.48319	25.75599	25.75599	25.27908	25.49786	25.60690	25.60690
9	25.97470	26.27948	26.27948	25.75204	25.99071	26.10977	26.10977
10	26.46754	26.79818	26.79818	26.21532	26.48491	26.61406	26.61406
11	26.96130	27.31798	27.31798	26.67755	26.98005	27.11936	27.11936
12	27.45575	27.85094	27.85094	27.14289	27.47587	27.62541	27.62541
13	27.97092	28.41891	28.41891	27.61053	27.99392	28.16487	28.16487
14	28.48461	29.00992	29.00992	28.16260	28.57210	28.78151	28.78151
15	29.00938	29.61845	29.61845	28.82017	29.20989	29.46019	29.46019
16	29.56213	30.25691	30.25691	29.52540	29.87074	30.15512	30.15512
17	30.13529	30.92117	30.92117	30.25800	30.54355	30.85861	30.85861
18	30.72605	31.60838	31.60838	31.00936	31.22886	31.56806	31.56806
19	31.33331	32.31876	32.31876	31.77659	31.92670	32.28461	32.28461
20	31.95783	33.05489	33.05489	32.54995	32.64091	33.01221	33.01221
21	32.60326	33.80821	33.80821	33.34061	33.37377	33.74896	33.74896
22	33.27155	34.58012	34.58012	34.14738	34.12518	34.48958	34.48958
23	33.96323	35.36917	35.36917	34.96667	34.89413	35.23804	35.23804
24	34.67787	36.17024	36.17024	35.78113	35.67576	35.99136	35.99136
25	35.41358	36.97235	36.97235	36.59274	36.45748	36.74566	36.74566
26	36.16764	37.76278	37.76278	37.39854	37.24452	37.49715	37.49715
27	36.93436	38.54606	38.54606	38.19215	38.03157	38.23537	38.23537
28	37.69743	39.31706	39.31706	38.95455	38.81381	38.95715	38.95715
29	38.46213	40.07109	40.07109	39.69787	39.57091	39.66512	39.66512
30	39.22294	40.79322	40.79322	40.42001	40.31547	40.35732	40.35732
31	39.97532	41.49514	41.49514	41.11891	41.04384	41.03131	41.03131
32	40.71135	42.17880	42.17880	41.79545	41.75449	41.68674	41.68674
33	41.42115	42.84580	42.84580	42.45285	42.44964	42.32642	42.32642
34	42.11517	43.49766	43.49766	43.09310	43.12976	42.95157	42.95157
35	42.79395	44.13632	44.13632	43.71853	43.79356	43.56381	43.56381
36	43.45784	44.76385	44.76385	44.33163	44.44292	44.16503	44.16503
37	44.10768	45.38236	45.38236	44.93487	45.08298	44.75720	44.75720
38	44.74478	45.99387	45.99387	45.53058	45.71532	45.34228	45.34228
39	45.37066	46.60025	46.60025	46.12088	46.34147	45.92211	45.92211
40	45.98689	47.20321	47.20321	46.70766	46.96293	46.49837	46.49837
41	46.59508	47.80427	47.80427	47.29254	47.58107	47.07259	47.07259
42	47.19674	48.40477	48.40477	47.87691	48.19716	47.64613	47.64613
43	47.79330	49.00587	49.00587	48.46197	48.81234	48.22017	48.22017
44	48.38604	49.60859	49.60859	49.04874	49.42766	48.79573	48.79573
45	48.97611	50.21381	50.21381	49.63808	50.04403	49.37375	49.37375
46	49.56454	50.82228	50.82228	50.23076	50.66227	49.95499	49.95499
47	50.15224	51.43460	51.43460	50.82742	51.28306	50.54015	50.54015
48	50.74003	52.05124	52.05124	51.42860	51.90693	51.12969	51.12969
49	51.[illegible]863	52.67249	52.67249	52.03473	52.53430	51.72409	51.72409
50	51.[illegible]63	53.29846	53.29846	52.64611	53.16535	52.32390	52.32390

Raw	15G	20A	20B	21A	21B	22A	22B
51	52.51056	53.92905	53.92905	53.26289	53.80009	52.92897	52.92897
52	53.10481	54.56391	54.56391	53.88504	54.43829	53.53892	53.53892
53	53.70166	55.20246	55.20246	54.51230	55.07949	54.15316	54.15316
54	54.30120	55.84387	55.84387	55.14417	55.72294	54.77085	54.77085
55	54.90337	56.48705	56.48705	55.77994	56.36767	55.39099	55.39099
56	55.50788	57.13074	57.13074	56.41863	57.01253	56.01244	56.01244
57	56.11424	57.77358	57.77358	57.05902	57.65623	56.63447	56.63447
58	56.72171	58.41409	58.41409	57.69976	58.29738	57.25520	57.25520
59	57.32936	59.05175	59.05175	58.33933	58.93459	57.87320	57.87320
60	57.93606	59.68601	59.68601	58.97624	59.56659	58.48723	58.48723
61	58.54054	60.31417	60.31417	59.60903	60.19225	59.09628	59.09628
62	59.14144	60.93542	60.93542	60.23640	60.81070	59.69965	59.69965
63	59.73735	61.54926	61.54926	60.85848	61.42137	60.29704	60.29704
64	60.32693	62.15561	62.15561	61.47370	62.02401	60.88856	60.88856
65	60.90887	62.75481	62.75481	62.08078	62.61868	61.47474	61.47474
66	61.48205	63.34761	63.34761	62.67948	63.20575	62.05652	62.05652
67	62.04546	63.93516	63.93516	63.26990	63.78589	62.63523	62.63523
68	62.60214	64.51900	64.51900	63.85249	64.35996	63.21411	63.21411
69	63.14989	65.10100	65.10100	64.42799	64.92902	63.79352	63.79352
70	63.68809	65.68325	65.68325	64.99748	65.49421	64.37509	64.37509
71	64.21696	66.26780	66.26780	65.56225	66.05667	64.96055	64.96055
72	64.73714	66.85612	66.85612	66.12502	66.61730	65.55135	65.55135
73	65.24964	67.44826	67.44826	66.68591	67.17638	66.15141	66.15141
74	65.75621	68.04146	68.04146	67.24512	67.73300	66.76148	66.76148
75	66.26053	68.62848	68.62848	67.80239	68.28426	67.37804	67.37804
76	66.76782	69.19592	69.19592	68.35582	68.82421	67.99557	67.99557
77	67.28570	69.72618	69.72618	68.90093	69.34331	68.60425	68.60425
78	67.82444	70.20026	70.20026	69.42984	69.82907	69.18964	69.18964
79	68.39620	70.61313	70.61313	69.93127	70.27021	69.73547	69.73547
80	69.01249	70.96570	70.96570	70.39539	70.66543	70.22866	70.22866
81	69.67873	71.24576	71.24576	70.81499	71.02035	70.67135	70.67135
82	70.38636	71.50475	71.50475	71.18879	71.32232	71.07120	71.07120
83	71.09656	71.69907	71.69907	71.53933	71.60343	71.44733	71.44733
84	71.72621	71.90294	71.90294	71.84525	71.86766	71.81134	71.81134

Appendix G:

Distributions of Composites by ASVAB Form After Conversion Using Recommended Equatings

AFQT PERCENTILE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score						
	93.00	65.00	50.00	31.00	21.00	16.00	10.00
REF	5.07	35.95	57.62	80.91	91.39	94.53	97.76
15G	4.12	37.04	57.26	80.81	91.31	94.69	97.91
20A	4.91	36.54	57.43	81.86	91.94	94.67	97.59
20B	5.99	36.79	56.76	81.01	91.97	95.02	97.89
21A	5.20	35.73	56.72	81.52	91.87	95.01	97.76
21B	5.48	35.87	57.56	81.86	92.21	95.24	97.94
22A	6.07	36.87	57.15	81.20	91.54	94.58	97.59
22B	5.24	36.06	57.27	81.12	91.85	95.08	97.89

AFQT PERCENTILE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score						
	93.00	65.00	50.00	31.00	21.00	16.00	10.00
15G	-0.96	1.09	-0.36	-0.10	-0.08	0.16	0.15
20A	-0.16	0.58	-0.20	0.95	0.54	0.14	-0.16
20B	0.92	0.84	-0.86	0.10	0.58	0.49	0.13
21A	0.13	-0.22	-0.90	0.61	0.48	0.48	0.00
21B	0.41	-0.08	-0.06	0.95	0.81	0.71	0.19
22A	0.99	0.92	-0.47	0.29	0.15	0.05	-0.17
22B	0.17	0.11	-0.35	0.22	0.46	0.54	0.13

AIR FORCE M PERCENTILE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score					
	89.00	61.00	57.00	51.00	45.00	44.00
REF	9.83	43.98	49.55	56.17	62.58	63.10
15G	9.71	44.29	49.11	55.63	62.25	63.49
20A	9.03	45.38	50.81	57.23	64.05	65.09
20B	8.84	44.55	49.51	56.17	62.75	63.73
21A	8.41	43.54	49.52	56.14	62.71	63.60
21B	7.73	43.85	50.29	57.26	64.20	65.26
22A	9.47	44.70	49.49	56.01	62.44	63.96
22B	9.63	44.08	48.70	55.31	62.06	63.64

AIR FORCE M PERCENTILE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	89.00	61.00	57.00	51.00	45.00	44.00
15G	-0.12	0.31	-0.44	-0.54	-0.33	0.40
20A	-0.80	1.40	1.27	1.07	1.47	1.99
20B	-0.99	0.57	-0.03	0.01	0.17	0.64
21A	-1.42	-0.44	-0.03	-0.03	0.13	0.50
21B	-2.10	-0.13	0.74	1.10	1.63	2.16
22A	-0.36	0.72	-0.06	-0.15	-0.14	0.86
22B	-0.20	0.10	-0.85	-0.86	-0.52	0.54

AIR FORCE A PERCENTILE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	67.00	61.00	51.00	45.00	40.00	32.00	27.00
REF	40.62	47.77	61.32	69.43	74.62	83.40	88.60
15G	40.58	47.59	61.01	68.89	74.34	83.30	88.81
20A	40.59	47.77	61.62	69.62	74.58	82.79	88.16
20B	40.93	47.99	61.55	69.27	74.64	83.11	88.35
21A	40.72	47.57	61.39	69.50	74.89	83.16	88.86
21B	40.02	47.35	60.54	68.63	74.30	83.47	88.60
22A	40.95	47.97	61.03	68.87	74.46	82.92	88.14
22B	40.30	47.41	60.98	69.41	74.60	83.32	88.36

AIR FORCE A PERCENTILE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	67.00	61.00	51.00	45.00	40.00	32.00	27.00
15G	-0.04	-0.18	-0.31	-0.54	-0.28	-0.10	0.21
20A	-0.03	-0.00	0.30	0.19	-0.04	-0.61	-0.44
20B	0.31	0.22	0.23	-0.16	0.02	-0.29	-0.25
21A	0.10	-0.20	0.08	0.07	0.27	-0.25	0.26
21B	-0.59	-0.41	-0.78	-0.80	-0.32	0.06	-0.00
22A	0.33	0.20	-0.29	-0.56	-0.16	-0.48	-0.46
22B	-0.32	-0.36	-0.34	-0.02	-0.02	-0.08	-0.24

AIR FORCE G PERCENTILE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	70.00	69.00	64.00	58.00	56.00	53.00	50.00	48.00	43.00	42.00	39.00	35.00	30.00
REF	31.03	31.03	38.88	44.57	47.00	52.46	57.62	60.26	65.24	67.60	72.09	76.03	82.57
15G	31.67	31.67	39.66	44.32	47.03	52.11	57.26	59.85	64.48	66.92	71.15	75.67	82.38
20A	31.62	31.62	39.25	44.07	46.69	51.80	57.43	59.47	64.81	66.94	72.14	76.16	83.35
20B	31.47	31.47	39.26	44.01	46.94	51.72	56.76	59.44	64.02	66.42	70.91	75.45	82.92
21A	30.79	30.79	38.43	44.13	46.58	51.80	56.72	59.62	64.50	66.63	71.46	75.81	83.23
21B	30.90	30.90	38.75	44.17	46.91	52.57	57.56	60.01	65.01	67.51	72.00	76.14	83.51
22A	31.93	31.93	39.52	44.80	47.44	52.50	57.15	59.94	64.27	66.85	71.16	75.58	82.73

AIR FORCE G PERCENTILE COMPOSITE, Con't.

22B	31.31	31.31	38.70	43.88	46.60	51.88	57.27	59.96	64.82	67.39	71.34	75.76	82.98

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score												
	70.00	69.00	64.00	58.00	56.00	53.00	50.00	48.00	43.00	42.00	39.00	35.00	30.00
15G	0.64	0.64	0.78	-0.25	0.03	-0.34	-0.36	-0.41	-0.76	-0.67	-0.94	-0.36	-0.19
20A	0.59	0.59	0.36	-0.50	-0.31	-0.66	-0.20	-0.79	-0.43	-0.66	0.05	0.14	0.78
20B	0.44	0.44	0.38	-0.56	-0.06	-0.73	-0.86	-0.82	-1.21	-1.18	-1.18	-0.58	0.35
21A	-0.23	-0.23	-0.45	-0.44	-0.42	-0.66	-0.90	-0.63	-0.74	-0.97	-0.63	-0.22	0.67
21B	-0.13	-0.13	-0.14	-0.40	-0.10	0.12	-0.06	-0.25	-0.23	-0.08	-0.09	0.12	0.94
22A	0.90	0.90	0.64	0.23	0.44	0.05	-0.47	-0.32	-0.97	-0.74	-0.93	-0.45	0.16
22B	0.29	0.29	-0.18	-0.68	-0.40	-0.58	-0.35	-0.30	-0.42	-0.21	-0.75	-0.27	0.41

AIR FORCE E PERCENTILE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score										
	81.00	77.00	72.00	67.00	58.00	50.00	46.00	45.00	43.00	39.00	33.00
REF	16.96	21.59	27.94	34.94	46.82	57.75	62.98	64.16	67.96	72.62	80.10
15G	16.62	21.24	27.46	34.13	46.26	57.42	62.68	63.94	67.52	72.14	79.73
20A	17.48	22.26	28.55	35.44	47.31	57.94	63.04	64.30	67.82	72.73	80.18
20B	17.94	22.65	28.49	35.11	46.80	58.11	62.95	64.11	67.55	72.26	79.64
21A	16.75	21.63	27.93	34.01	46.12	58.04	62.95	64.17	67.63	72.34	79.97
21B	16.38	21.31	27.31	34.34	47.30	58.62	63.65	64.83	68.90	73.62	81.21
22A	16.46	21.43	27.93	35.08	47.07	58.45	63.36	64.40	67.58	72.13	79.82
22B	17.09	21.93	28.06	34.70	46.99	58.25	63.08	64.25	67.87	72.80	80.20

AIR FORCE E PERCENTILE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score										
	81.00	77.00	72.00	67.00	58.00	50.00	46.00	45.00	43.00	39.00	33.00
15G	-0.34	-0.36	-0.48	-0.80	-0.56	-0.33	-0.30	-0.22	-0.44	-0.49	-0.38
20A	0.53	0.67	0.61	0.50	0.49	0.19	0.06	0.13	-0.14	0.10	0.08
20B	0.98	1.06	0.55	0.17	-0.02	0.35	-0.03	-0.05	-0.41	-0.37	-0.46
21A	-0.21	0.04	-0.01	-0.93	-0.70	0.29	-0.03	0.01	-0.33	-0.28	-0.13
21B	-0.57	-0.28	-0.64	-0.60	0.48	0.87	0.67	0.67	0.94	1.00	1.11
22A	-0.50	-0.16	-0.01	0.14	0.25	0.70	0.38	0.23	-0.38	-0.49	-0.28
22B	0.14	0.34	0.12	-0.24	0.17	0.49	0.10	0.09	-0.09	0.18	0.10

ARMY GT STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score
	110.00
REF	38.88
15G	39.66
20A	39.25
20B	39.26
21A	38.43
21B	38.75
22A	39.52
22B	38.70

ARMY GT STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score
	110.00
15G	0.78
20A	0.36

ARMY GT STANDARD SCORE COMPOSITE, Con't.

20B	0.38
21A	-0.45
21B	-0.14
22A	0.64
22B	-0.18

ARMY GM STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score				
	105.00	100.00	95.00	90.00	85.00
REF	46.48	58.49	68.11	78.28	85.96
15G	45.55	57.21	67.25	78.46	86.64
20A	47.18	59.40	69.24	78.90	86.49
20B	46.86	58.52	68.00	78.46	85.80
21A	45.85	58.09	68.82	79.36	86.86
21B	46.59	58.98	69.71	80.07	87.70
22A	46.72	58.08	68.41	78.14	86.00
22B	46.41	58.07	68.59	78.68	86.26

ARMY GM STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score				
	105.00	100.00	95.00	90.00	85.00
15G	-0.92	-1.28	-0.86	0.18	0.67
20A	0.70	0.92	1.14	0.61	0.53
20B	0.38	0.04	-0.11	0.17	-0.16
21A	-0.63	-0.40	0.72	1.08	0.89
21B	0.11	0.49	1.60	1.78	1.74
22A	0.24	-0.41	0.30	-0.15	0.04
22B	-0.06	-0.41	0.48	0.40	0.29

ARMY EL STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score							
	120.00	115.00	110.00	105.00	100.00	95.00	90.00	85.00
REF	17.95	26.88	36.22	46.82	57.75	67.96	77.95	86.39
15G	17.45	26.37	35.17	46.26	57.42	67.52	77.48	86.37
20A	18.57	27.43	36.44	47.31	57.94	67.82	78.22	86.38
20B	18.73	27.50	36.12	46.80	58.11	67.55	77.69	85.89
21A	17.71	26.91	35.17	46.12	58.04	67.63	77.69	86.63
21B	17.43	26.14	35.60	47.30	58.62	68.90	79.04	87.74
22A	17.28	26.77	36.41	47.07	58.45	67.58	77.76	86.19
22B	17.92	27.05	35.75	46.99	58.25	67.87	78.11	86.90

ARMY EL STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	120.00	115.00	110.00	105.00	100.00	95.00	90.00	85.00
	Cut Score							
15G	-0.50	-0.51	-1.05	-0.56	-0.33	-0.44	-0.47	-0.02
20A	0.62	0.54	0.21	0.49	0.19	-0.14	0.27	-0.01
20B	0.78	0.62	-0.11	-0.02	0.35	-0.41	-0.26	-0.50
21A	-0.24	0.03	-1.06	-0.70	0.29	-0.33	-0.26	0.24
21B	-0.52	-0.75	-0.63	0.48	0.87	0.94	1.09	1.36
22A	-0.67	-0.11	0.18	0.25	0.70	-0.38	-0.19	-0.20
22B	-0.03	0.17	-0.47	0.17	0.49	-0.09	0.16	0.51

ARMY CL STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	110.00	105.00	100.00	95.00	90.00	85.00
	Cut Score					
REF	39.32	51.13	61.35	72.32	80.06	86.77
15G	39.80	51.14	61.34	72.26	80.60	87.14
20A	39.60	50.92	60.96	71.79	80.42	87.43
20B	39.10	50.64	60.57	71.56	80.05	87.14
21A	39.00	50.62	60.87	71.86	80.26	87.43
21B	38.72	50.97	61.85	72.77	81.18	88.01
22A	39.65	51.38	61.11	72.12	80.14	87.13
22B	39.26	51.08	61.24	71.71	80.42	87.19

ARMY CL STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	110.00	105.00	100.00	95.00	90.00	85.00
	Cut Score					
15G	0.47	0.02	-0.01	-0.06	0.54	0.37
20A	0.28	-0.21	-0.39	-0.53	0.36	0.66
20B	-0.23	-0.48	-0.78	-0.76	-0.00	0.37
21A	-0.33	-0.50	-0.48	-0.47	0.20	0.66
21B	-0.60	-0.16	0.50	0.45	1.12	1.24
22A	0.33	0.26	-0.24	-0.20	0.09	0.36
22B	-0.07	-0.04	-0.11	-0.61	0.36	0.42

ARMY MM STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	105.00	100.00	95.00	90.00
	Cut Score			
REF	49.43	60.24	72.01	80.79
15G	47.62	58.89	71.60	81.42
20A	50.13	61.61	72.64	81.87
20B	49.95	60.95	71.90	81.05

ARMY MM STANDARD SCORE COMPOSITE, Con't.

21A	49.37	60.60	71.87	81.69
21B	49.89	61.29	73.28	81.81
22A	49.24	60.40	71.99	80.87
22B	49.71	60.00	72.26	81.08

ARMY MM STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	--------- Cut	Score -------		
	105.00	100.00	95.00	90.00
15G	-1.81	-1.34	-0.40	0.63
20A	0.69	1.37	0.64	1.08
20B	0.52	0.71	-0.11	0.26
21A	-0.06	0.37	-0.13	0.90
21B	0.46	1.05	1.27	1.02
22A	-0.19	0.16	-0.01	0.08
22B	0.28	-0.23	0.25	0.29

ARMY SC STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	--------- Cut	Score -------		
	105.00	100.00	95.00	90.00
REF	49.86	59.96	70.50	79.47
15G	49.75	60.23	70.97	80.27
20A	50.78	60.82	71.05	80.18
20B	49.62	59.84	70.28	79.29
21A	49.55	59.87	70.66	80.39
21B	50.82	61.17	72.11	81.30
22A	50.36	60.64	70.81	79.64
22B	50.05	59.74	70.20	79.51

ARMY SC STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	--------- Cut	Score -------		
	105.00	100.00	95.00	90.00
15G	-0.10	0.27	0.47	0.81
20A	0.93	0.86	0.56	0.71
20B	-0.24	-0.12	-0.21	-0.18
21A	-0.31	-0.09	0.16	0.92
21B	0.96	1.21	1.61	1.83
22A	0.51	0.69	0.31	0.17
22B	0.20	-0.22	-0.30	0.04

ARMY CO STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 100.00	95.00	90.00	85.00
REF	60.61	70.94	80.21	87.67
15G	61.37	71.78	80.98	88.41
20A	61.49	72.02	80.86	87.86
20B	61.17	71.29	80.25	87.67
21A	61.00	71.76	80.93	88.52
21B	62.41	72.81	81.85	89.17
22A	61.41	71.51	80.86	88.26
22B	61.03	70.85	80.48	88.15

ARMY CO STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 100.00	95.00	90.00	85.00
15G	0.75	0.85	0.77	0.74
20A	0.87	1.09	0.65	0.19
20B	0.55	0.36	0.04	0.00
21A	0.38	0.82	0.72	0.85
21B	1.80	1.87	1.64	1.51
22A	0.80	0.57	0.65	0.59
22B	0.42	-0.08	0.27	0.48

ARMY FA STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 100.00	95.00	90.00	85.00
REF	61.71	72.98	81.90	89.07
15G	62.09	73.80	82.47	89.53
20A	61.77	73.20	81.63	88.68
20B	61.50	73.26	81.97	88.85
21A	61.93	73.31	82.13	88.91
21B	62.65	73.75	82.93	89.67
22A	62.22	73.42	82.19	89.14
22B	61.82	73.24	82.59	89.48

ARMY FA STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 100.00	95.00	90.00	85.00
15G	0.38	0.82	0.58	0.46
20A	0.06	0.22	-0.27	-0.39
20B	-0.22	0.28	0.07	-0.22
21A	0.22	0.33	0.23	-0.16
21B	0.94	0.77	1.03	0.60

ARMY FA STANDARD SCORE COMPOSITE, Con't.

22A	0.50	0.44	0.29	0.07
22B	0.10	0.26	0.69	0.40

ARMY OF STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	---------- Cut	Score	------	
	105.00	100.00	95.00	90.00
REF	53.10	64.78	75.52	84.67
15G	52.38	65.26	76.55	86.19
20A	54.20	65.97	75.96	84.94
20B	53.18	64.96	74.97	84.56
21A	53.00	65.29	76.18	85.60
21B	53.22	65.66	76.88	86.21
22A	53.69	65.26	75.47	85.18
22B	52.84	64.46	75.41	84.95

ARMY OF STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	---------- Cut	Score	------	
	105.00	100.00	95.00	90.00
15G	-0.72	0.47	1.03	1.51
20A	1.09	1.19	0.44	0.26
20B	0.07	0.17	-0.54	-0.11
21A	-0.10	0.51	0.66	0.93
21B	0.11	0.88	1.37	1.54
22A	0.58	0.48	-0.04	0.51
22B	-0.26	-0.32	-0.10	0.28

ARMY ST STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	------------------	------------------	Cut Score	------------------	------------------	------------------	------------------
	115.00	110.00	105.00	110.00	95.00	90.00	85.00
REF	27.46	39.07	50.83	61.09	71.90	81.34	88.11
15G	28.28	39.56	51.16	61.52	72.96	82.35	89.27
20A	28.44	39.50	50.87	61.25	71.83	81.03	88.39
20B	28.20	38.82	50.73	60.88	71.40	80.75	88.29
21A	27.96	38.80	50.15	60.49	71.57	81.18	88.68
21B	28.13	39.40	50.85	61.25	72.31	82.14	89.09
22A	28.25	39.96	51.85	61.83	71.92	81.00	88.16
22B	28.07	39.05	51.09	61.69	72.39	81.18	88.47

ARMY ST STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	115.00	110.00	105.00	110.00	95.00	90.00	85.00
	Cut Score						
15G	0.82	0.49	0.33	0.44	1.05	1.01	1.16
20A	0.98	0.43	0.04	0.16	-0.07	-0.31	0.27
20B	0.74	-0.25	-0.10	-0.21	-0.51	-0.59	0.18
21A	0.50	-0.26	-0.68	-0.59	-0.34	-0.16	0.56
21B	0.67	0.33	0.01	0.17	0.40	0.80	0.97
22A	0.79	0.89	1.02	0.74	0.02	-0.34	0.05
22B	0.61	-0.02	0.26	0.60	0.49	-0.16	0.35

MARINE CORPS MM STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score			
	115.00	105.00	95.00	85.00
REF	27.12	47.26	66.91	83.90
15G	25.98	46.35	65.82	84.74
20A	26.80	47.92	67.56	85.01
20B	26.27	46.97	66.61	84.25
21A	26.38	47.04	66.49	84.73
21B	26.45	48.22	68.37	85.73
22A	27.05	47.49	66.84	83.99
22B	26.59	47.62	66.86	84.62

MARINE CORPS MM STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score			
	115.00	105.00	95.00	85.00
15G	-1.14	-0.91	-1.09	0.84
20A	-0.32	0.66	0.65	1.11
20B	-0.85	-0.29	-0.29	0.35
21A	-0.74	-0.22	-0.42	0.83
21B	-0.67	0.96	1.47	1.83
22A	-0.07	0.23	-0.07	0.09
22B	-0.53	0.37	-0.05	0.72

MARINE CORPS CL STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score				
	120.00	110.00	101.00	90.00	80.00
REF	17.25	42.00	66.82	86.43	95.78
15G	18.44	43.10	67.94	87.16	96.06
20A	17.42	41.84	66.27	86.44	95.61
20B	18.02	42.15	66.80	86.67	95.92

MARINE CORPS CL STANDARD SCORE COMPOSITE, Con't.

21A	17.23	41.84	66.62	87.09	95.96
21B	17.19	41.57	66.96	87.26	96.00
22A	17.83	42.23	66.46	86.21	95.62
22B	17.02	41.75	66.90	86.76	95.81

MARINE CORPS CL STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	------------ Cut Score -----------				
	120.00	110.00	101.00	90.00	80.00
15G	1.19	1.10	1.11	0.73	0.28
20A	0.16	-0.16	-0.55	0.01	-0.17
20B	0.77	0.15	-0.02	0.24	0.15
21A	-0.03	-0.16	-0.20	0.66	0.18
21B	-0.06	-0.43	0.13	0.83	0.23
22A	0.58	0.23	-0.36	-0.22	-0.16
22B	-0.23	-0.25	0.08	0.33	0.04

MARINE CORPS GT STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	---------- Cut Score ------			
	110.00	100.00	90.00	80.00
REF	39.56	61.40	79.45	92.48
15G	39.87	61.34	79.95	92.98
20A	40.12	61.07	79.66	92.59
20B	39.47	60.83	79.53	92.66
21A	39.45	61.23	79.51	93.06
21B	40.22	62.31	80.59	93.06
22A	40.21	62.07	79.70	92.60
22B	39.59	61.44	80.17	93.00

MARINE CORPS GT STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	---------- Cut Score ------			
	110.00	100.00	90.00	80.00
15G	0.31	-0.06	0.50	0.50
20A	0.56	-0.33	0.21	0.12
20B	-0.08	-0.56	0.07	0.18
21A	-0.11	-0.17	0.06	0.58
21B	0.67	0.92	1.14	0.58
22A	0.66	0.67	0.25	0.13
22B	0.03	0.05	0.71	0.52

MARINE CORPS EL STANDARD SCORE COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 115.00	110.00	100.00	90.00
REF	25.72	36.22	57.75	77.95
15G	25.31	35.17	57.42	77.48
20A	26.46	36.44	57.94	78.22
20B	26.66	36.12	58.11	77.69
21A	25.61	35.17	58.04	77.69
21B	25.18	35.60	58.62	79.04
22A	25.49	36.41	58.45	77.76
22B	25.91	35.75	58.25	78.11

MARINE CORPS EL STANDARD SCORE COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 115.00	110.00	100.00	90.00
15G	-0.41	-1.05	-0.33	-0.47
20A	0.74	0.21	0.19	0.27
20B	0.93	-0.11	0.35	-0.26
21A	-0.11	-1.06	0.29	-0.26
21B	-0.54	-0.63	0.87	1.09
22A	-0.23	0.18	0.70	-0.19
22B	0.18	-0.47	0.49	0.16

NAVY EL SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 218.00	204.00	200.00	190.00
REF	34.94	51.68	56.54	69.22
15G	34.13	51.17	56.21	68.66
20A	35.44	52.31	57.00	69.12
20B	35.11	51.50	57.14	68.63
21A	34.01	51.44	56.69	68.82
21B	34.34	52.27	57.62	70.08
22A	35.08	52.24	57.30	68.71
22B	34.70	52.13	57.04	69.28

NAVY EL SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 218.00	204.00	200.00	190.00
15G	-0.80	-0.51	-0.33	-0.56
20A	0.50	0.63	0.46	-0.11
20B	0.17	-0.18	0.60	-0.59
21A	-0.93	-0.24	0.15	-0.41

NAVY EL SUM OF SUBTEST STANDARD SCORES COMPOSITE, Con't.

21B	-0.60	0.59	1.08	0.86
22A	0.14	0.56	0.76	-0.52
22B	-0.24	0.45	0.50	0.06

NAVY E SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 214.00	210.00	204.00	200.00	196.00
REF	41.85	46.02	53.24	57.81	62.17
15G	42.50	46.62	52.93	57.81	62.67
20A	42.56	47.01	53.68	58.10	62.65
20B	41.99	46.57	53.33	57.68	62.22
21A	42.12	46.53	53.22	57.55	61.79
21B	42.38	46.76	53.61	58.33	62.67
22A	42.74	47.30	53.88	58.38	62.98
22B	42.24	46.65	53.36	58.48	62.87

NAVY E SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 214.00	210.00	204.00	200.00	196.00
15G	0.65	0.60	-0.31	-0.00	0.50
20A	0.71	0.99	0.45	0.28	0.48
20B	0.14	0.55	0.09	-0.14	0.06
21A	0.26	0.51	-0.02	-0.27	-0.37
21B	0.53	0.74	0.37	0.51	0.50
22A	0.89	1.28	0.64	0.57	0.81
22B	0.38	0.63	0.12	0.67	0.70

NAVY CL SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 160.00
REF	50.10
15G	49.68
20A	50.17
20B	50.41
21A	50.03
21B	49.61
22A	50.34
22B	49.80

NAVY CL SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 160.00
15G	-0.42
20A	0.07
20B	0.31
21A	-0.07
21B	-0.49
22A	0.23
22B	-0.30

NAVY GT SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score						
	115.00	113.00	108.00	103.00	97.00	96.00	89.00
REF	23.67	28.46	41.72	55.11	69.89	72.09	84.21
15G	24.22	29.18	42.04	54.70	68.95	71.15	83.91
20A	24.04	28.95	41.75	54.30	69.58	72.14	84.77
20B	24.06	29.04	41.47	54.34	68.67	70.91	84.49
21A	23.54	28.33	41.18	54.40	69.24	71.46	84.62
21B	23.31	28.30	41.56	55.12	69.56	72.00	85.20
22A	24.55	29.56	41.94	55.04	69.04	71.16	84.37
22B	23.61	28.90	40.93	54.21	69.47	71.34	84.49

NAVY GT SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score						
	115.00	113.00	108.00	103.00	97.00	96.00	89.00
15G	0.55	0.73	0.32	-0.41	-0.94	-0.94	-0.30
20A	0.37	0.49	0.03	-0.81	-0.31	0.05	0.56
20B	0.39	0.58	-0.25	-0.76	-1.21	-1.18	0.28
21A	-0.13	-0.13	-0.54	-0.70	-0.65	-0.63	0.41
21B	-0.36	-0.16	-0.16	0.02	-0.33	-0.09	0.99
22A	0.88	1.10	0.21	-0.07	-0.84	-0.93	0.17
22B	-0.06	0.44	-0.79	-0.90	-0.42	-0.75	0.28

NAVY ME SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score		
	167.00	158.00	150.00
REF	32.46	46.95	60.30
15G	31.69	47.38	60.72
20A	32.78	48.23	61.27
20B	32.10	47.54	60.18

NAVY ME SUM OF SUBTEST STANDARD SCORES COMPOSITE, Con't.

21A	31.63	46.84	60.29
21B	32.05	47.60	61.14
22A	33.00	47.51	60.30
22B	32.43	47.27	59.89

NAVY ME SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	---- Cut Score -----		
	167.00	158.00	150.00
15G	-0.78	0.43	0.41
20A	0.31	1.28	0.96
20B	-0.36	0.59	-0.12
21A	-0.83	-0.11	-0.02
21B	-0.42	0.65	0.83
22A	0.53	0.56	-0.00
22B	-0.03	0.32	-0.41

NAVY EG SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score
	96.00
REF	69.87
15G	70.46
20A	70.12
20B	69.47
21A	70.81
21B	70.90
22A	69.70
22B	69.53

NAVY EG SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score
	96.00
15G	0.59
20A	0.24
20B	-0.40
21A	0.94
21B	1.03
22A	-0.17
22B	-0.34

NAVY CT SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 202.00
REF	65.51
15G	64.80
20A	65.54
20B	65.21
21A	65.17
21B	64.80
22A	65.13
22B	65.25

NAVY CT SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 202.00
15G	-0.71
20A	0.03
20B	-0.30
21A	-0.34
21B	-0.71
22A	-0.38
22B	-0.26

NAVY HM SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	- Cut Score -	
	165.00	149.00
REF	34.67	63.77
15G	35.91	64.04
20A	35.75	63.23
20B	35.44	62.96
21A	35.31	62.54
21B	35.17	63.14
22A	35.86	63.64
22B	35.23	63.57

NAVY HM SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	- Cut Score -	
	165.00	149.00
15G	1.24	0.27
20A	1.08	-0.54
20B	0.77	-0.81

NAVY HM SUM OF SUBTEST STANDARD SCORES COMPOSITE, Con't.

21A	0.64	-1.23
21B	0.51	-0.63
22A	1.19	-0.13
22B	0.56	-0.20

NAVY ST SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	Cut Score 147.00
REF	98.74
15G	98.86
20A	98.54
20B	98.78
21A	98.62
21B	98.61
22A	98.79
22B	98.65

NAVY ST SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	Cut Score 147.00
15G	0.12
20A	-0.20
20B	0.04
21A	-0.12
21B	-0.13
22A	0.05
22B	-0.09

NAVY MR SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	----- Cut Score ----		
	164.00	158.00	130.00
REF	36.79	45.51	83.68
15G	36.30	45.41	84.43
20A	37.05	46.17	84.71
20B	36.41	45.53	83.97
21A	36.34	45.31	84.85
21B	36.53	46.33	85.58
22A	37.22	46.23	84.49
22B	36.48	46.03	84.08

NAVY MR SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	----- Cut Score ----		
	164.00	158.00	130.00
15G	-0.49	-0.10	0.74
20A	0.27	0.66	1.02
20B	-0.38	0.02	0.29
21A	-0.45	-0.20	1.16
21B	-0.26	0.82	1.90
22A	0.43	0.72	0.80
22B	-0.30	0.52	0.40

NAVY BC SUM OF SUBTEST STANDARD SCORES COMPOSITE

Percentages At or Above Cut Scores (Ordered High to Low)

Test	- Cut Score -	
	153.00	147.00
REF	61.24	72.25
15G	61.96	73.14
20A	60.55	71.93
20B	60.55	71.92
21A	60.66	72.53
21B	60.87	72.42
22A	60.70	72.13
22B	61.07	72.75

NAVY BC SUM OF SUBTEST STANDARD SCORES COMPOSITE

Differences in Percentages At or Above Cut Scores (Test-REF)

Test	- Cut Score -	
	53.00	147.00
15G	0.72	0.88
20A	-0.69	-0.32
20B	-0.69	-0.33
21A	-0.58	0.28
21B	-0.37	0.17
22A	-0.54	-0.12
22B	-0.17	0.49

ASVAB 20, 21, AND 22 IOT&E SUPPLEMENT

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Gary L. Thomasson, Bruce Bloxom, and Lauress Wise

Defense Manpower Data Center

JANUARY 1994

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ASVAB 20, 21, AND 22 IOT&E SUPPLEMENT TABLES 1-26

Table 1

ASVAB Subtests, Numbers of Items, Time Limits, and Normative Means and Standard Deviations

Subtest	Items	Time (min.)	Mean	S.D.
General Science (GS)	25	11	15.950	5.010
Arithmetic Reasoning (AR)	30	36	18.009	7.373
Word Knowledge (WK)	35	11	26.270	7.710
Paragraph Comprehension (PC)	15	13	11.011	3.355
Numerical Operations (NO)	50	3	37.236	10.800
Coding Speed (CS)	84	7	47.606	16.763
Auto and Shop Information (AS)	25	11	14.317	5.550
Math Knowledge (MK)	25	24	13.578	6.393
Mechanical Comprehension (MC)	25	19	14.165	5.349
Electronics Information (EI)	20	9	11.569	4.236
Verbal (VE = WK + PC)	50	-	37.281	10.595

Table 2

Number of Subjects, by Test Form

ASVAB Form	All Tested from 10/1/92 to 1/15/93	Initial Testing Only	After Editing for Extreme Unbalancing
15g (Operational)	18852 13.5%	15959 13.5%	13312 13.4%
15h (Reference)	18027 12.9%	15342 13.0%	12931 13.0%
20a	18613 13.3%	15647 13.2%	13097 13.2%
20b	17973 12.8%	15237 12.9%	12778 12.9%
21a	17688 12.6%	14951 12.6%	12532 12.6%
21b	16926 12.1%	14369 12.1%	12060 12.2%
22a	16350 11.7%	13753 11.6%	11558 11.6%
22b	15633 11.2%	13007 11.0%	10986 11.1%
Total	140062	118265	99254
Cumulative Percent Deleted		15.6%	29.1%

Table 3

Number of Subjects, Percentage of Subjects, and Contribution to Chi-Square, by Gender, Race, and Education

	ASVAB Form								
	15G	15H	20A	20B	21A	21B	22A	22B	Total
Female									
Number	2600	2518	2532	2631	2402	2280	2282	2110	19355
Chi-Sq	0.0065	0.0052	0.1891	7.7795	0.7149	2.1895	0.3512	0.4877	
Percent	19.53	19.47	19.33	20.59	19.17	18.91	19.74	19.21	19.50
Male									
Number	10712	10413	10565	10147	10130	9780	9276	8876	79899
Chi-Sq	0.0016	0.0012	0.0458	1.8845	0.1732	0.5304	0.0851	0.1181	
Percent	80.47	80.53	80.67	79.41	80.83	81.09	80.26	80.79	80.50
Gender x ASVAB Form Pearson Chi-Square = 14.564 (d.f.=7, pr.=.042)									
Non-High School Graduates (including Current Students)									
Number	4647	4513	4664	4437	4430	4242	3980	3869	34782
Chi-Sq	0.0693	0.0752	1.2048	0.3726	0.3350	0.0588	1.2208	0.0951	
Percent	34.91	34.90	35.61	34.72	35.35	35.17	34.44	35.22	35.04
High School Graduates									
Number	8047	7803	7829	7758	7517	7290	7071	6629	59944
Chi-Sq	0.0066	0.0056	0.8269	0.2155	0.3524	0.0057	1.1759	0.0053	
Percent	60.45	60.34	59.78	60.71	59.98	60.45	61.18	60.34	60.39
Post-Secondary Education									
Number	618	615	604	583	585	528	507	488	4528
Chi-Sq	0.1886	1.0666	0.0709	0.0000	0.3088	0.8943	0.7800	0.3469	
Percent	4.64	4.76	4.61	4.56	4.67	4.38	4.39	4.44	4.56
Education x ASVAB Form Pearson Chi-Square = 9.862 (d.f.=14, pr.=.785)									
Caucasian									
Number	10029	9733	9866	9621	9369	9117	8682	8241	74658
Chi-Sq	0.0250	0.0042	0.0215	0.0094	0.3503	0.2289	0.0161	0.0617	
Percent	75.34	75.27	75.33	75.29	74.76	75.60	75.12	75.01	75.22
Non-Caucasian									
Number	3283	3198	3231	3157	3163	2943	2876	2745	24596
Chi-Sq	0.0760	0.0128	0.0652	0.0285	1.0632	0.6949	0.0488	0.1872	
Percent	24.66	24.73	24.67	24.71	25.24	24.40	24.88	24.99	24.78

Race x ASVAB Form Pearson Chi-Square = 2.894 (d.f.=7, pr.=.895)

Table 4

Subtest Raw Score Mean, Standard Deviation, Skewness, and Kurtosis, by ASVAB Form

	Form	15G	15H	20A	20B	21A	21B	22A	22B
GS	Mean	16.849	16.406	17.311	17.297	17.484	17.528	17.147	17.144
	SD	4.362	4.275	4.448	4.407	4.297	4.211	4.410	4.389
	Skew	-0.256	-0.253	-0.320	-0.282	-0.511	-0.549	-0.516	-0.508
	Kurt	2.434	2.565	2.463	2.408	2.927	3.063	2.738	2.759
AR	Mean	19.33[illegible]	19.016	20.001	18.596	19.611	19.338	19.468	19.354
	SD	6.188	6.282	5.812	6.440	6.359	5.705	6.055	6.227
	Skew	-0.154	-0.113	-0.244	-0.136	-0.184	-0.087	-0.145	-0.091
	Kurt	2.099	2.102	2.319	2.174	2.097	2.384	2.230	2.120
WK	Mean	27.333	27.610	27.404	27.090	27.271	27.073	27.175	27.240
	SD	5.552	5.361	5.594	6.150	5.787	5.604	5.733	5.691
	Skew	-0.924	-0.961	-1.029	-0.877	-0.938	-0.837	-0.893	-0.889
	Kurt	3.644	3.904	4.025	3.251	3.523	3.321	3.477	3.440
PC	Mean	12.353	11.599	11.732	11.668	11.999	11.641	12.070	11.423
	SD	2.492	2.551	2.727	2.484	2.320	2.667	2.588	2.849
	Skew	-1.381	-1.074	-1.093	-0.873	-1.143	-1.007	-1.101	-0.926
	Kurt	5.032	4.069	3.924	3.707	4.613	3.788	4.019	3.398
NO	Mean	36.781	37.161	36.452	36.678	36.271	36.171	36.818	37.026
	SD	8.639	8.613	8.440	8.316	8.619	8.580	8.610	8.649
	Skew	-0.430	-0.477	-0.354	-0.379	-0.353	-0.314	-0.402	-0.426
	Kurt	2.947	2.990	2.814	2.897	2.793	2.694	2.828	2.823
CS	Mean	51.296	50.966	48.735	48.983	49.843	49.174	50.382	50.358
	SD	12.555	12.530	12.052	12.161	12.252	12.003	12.669	12.378
	Skew	-0.140	-0.252	-0.194	-0.159	-0.170	-0.130	-0.187	-0.233
	Kurt	3.388	3.567	3.451	3.447	3.348	3.444	3.318	3.378
AS	Mean	14.537	14.840	14.981	14.813	15.249	15.355	15.157	15.073
	SD	5.060	4.930	4.693	4.714	4.865	4.810	5.117	5.138
	Skew	0.040	-0.012	-0.047	-0.022	0.070	0.018	-0.022	0.011
	Kurt	2.138	2.226	2.370	2.369	2.161	2.197	2.097	2.082
MK	Mean	15.345	15.066	15.034	14.698	15.019	15.027	15.270	14.705
	SD	5.439	5.532	5.719	5.603	5.728	5.429	6.002	5.854
	Skew	-0.064	-0.022	0.049	0.092	0.065	-0.011	-0.068	0.059
	Kurt	2.101	2.019	1.982	2.057	1.924	2.093	1.931	1.964
MC	Mean	15.860	15.170	15.463	15.427	16.002	16.085	15.588	15.537
	SD	4.647	4.952	4.871	4.864	4.751	4.727	4.769	4.762
	Skew	-0.274	-0.095	-0.167	-0.167	-0.169	-0.187	-0.149	-0.130
	Kurt	2.396	2.176	2.271	2.294	2.305	2.289	2.257	2.267
EI	Mean	11.778	11.771	12.120	12.088	11.927	12.043	11.904	12.032
	SD	3.536	3.600	3.640	3.712	3.725	3.686	3.701	3.636
	Skew	0.075	-0.169	-0.077	-0.108	-0.060	-0.027	-0.079	-0.105
	Kurt	2.519	2.513	2.487	2.462	2.443	2.425	2.500	2.569
VE	Mean	39.686	39.209	39.136	38.758	39.269	38.714	39.245	38.663
	SD	7.556	7.301	7.790	8.029	7.591	7.719	7.750	7.996
	Skew	-1.070	-1.027	-1.084	-0.862	-1.013	-0.894	-0.946	-0.931
	Kurt	4.101	4.080	4.127	3.361	3.837	3.504	3.632	3.525

Table 5

Degrees of Polynomials and Tests of Significance of Item-Order Effects

Subtests	Forms	Degree of Polynomial	Chi-Square	D.F.	Prob.
GS	20a&b	9 (6&9)	13.688	9	0.139
	21a&b	7 (7&6)	14.154	7	0.049
	22a&b	6 (6&6)	1.393	6	0.966
CS	20a&b	8 (8&8)	13.147	8	0.107
	21a&b	8 (8&8)	34.263	8	*0.000
	22a&b	9 (9&8)	22.293	9	0.008
AS	20a&b	7 (7&7)	10.767	7	0.149
	21a&b	7 (7&7)	16.088	7	0.024
	22a&b	9 (7&9)	7.284	9	0.608
MC	20a&b	7 (7&7)	7.614	7	0.368
	21a&b	9 (9&7)	15.729	9	0.083
	22a&b	9 (7&9)	3.548	9	0.939
EI	20a&b	9 (9&5)	12.983	9	0.163
	21a&b	7 (7&4)	13.586	7	0.059
	22a&b	9 (9&9)	20.675	9	0.014

* Chi-square significant at alpha = .05/15 = .0033

Table 6

Means, Standard Deviations, and Number of Terms in Polynomial Smoothings for Equating

	Form	15G	15H	20A	20B	21A	21B	22A	22B
GS	Mean	16.849	16.406	17.304*		17.506*		17.146*	
	SD	4.362	4.275	4.428		4.255		4.400	
	Terms	6	4	6		7		6	
AR	Mean	19.332	19.016	20.001	18.596	19.611	19.338	19.468	19.354
	SD	6.188	6.282	5.812	6.440	6.359	5.705	6.055	6.227
	Terms	7	7	6	5	10	7	9	4
WK	Mean	27.333	27.610	27.404	27.090	27.271	27.073	27.175	27.240
	SD	5.552	5.361	5.594	6.150	5.787	5.604	5.733	5.691
	Terms	7	7	7	9	7	9	7	7
PC	Mean	12.353	11.599	11.732	11.668	11.999	11.641	12.070	11.423
	SD	2.492	2.551	2.727	2.484	2.320	2.667	2.588	2.849
	Terms	8	7	7	7	5	6	4	7
NO	Mean	36.781	37.161	36.564*		36.222*		36.919*	
	SD	8.639	8.613	8.380		8.600		8.630	
	Terms	9	9	9		10		7	
CS	Mean	51.296	50.966	48.857*		49.843	49.174	50.370*	
	SD	12.555	12.530	12.106		12.252	12.003	12.528	
	Terms	8	8	8		8	8	10	
AS	Mean	14.537	14.840	14.893*		15.301*		15.116*	
	SD	5.060	4.930	4.704		4.838		5.128	
	Terms	9	9	9		7		9	
MK	Mean	15.345	15.066	15.034	14.698	15.019	15.027	15.270	14.705
	SD	5.439	5.532	5.719	5.603	5.728	5.429	6.002	5.854
	Terms	7	7	9	7	4	9	6	7
MC	Mean	15.860	15.170	15.445*		16.043*		15.563*	
	SD	4.647	4.952	4.868		4.739		4.766	
	Terms	7	8	7		9		9	
EI	Mean	11.778	11.771	12.104*		11.984*		11.966*	
	SD	3.536	3.600	3.676		3.706		3.670	
	Terms	9	7	9		9		9	
VE	Mean	39.686	39.209	39.136	38.758	39.269	38.714	39.245	38.663
	SD	7.556	7.301	7.790	8.029	7.591	7.719	7.750	7.996
	Terms	9	9	9	9	9	10	9	7

* Data pooled for subtests with same items in different order.

Table 7

Root Mean Square Difference Between Equatings, by Subtest and Form

AFQT Subtest andForm	Raw vs. Linear	Raw vs. Polymomial
AR 15g	0.140	0.044
AR 20a	0.415	0.037
AR 20b	0.153	0.055
AR 21a	0.226	0.041
AR 21b	0.527	0.044
AR 22a	0.246	0.028
AR 22b	0.152	0.047
WK 15g	0.214	0.038
WK 20a	0.147	0.033
WK 20b	0.433	0.039
WK 21a	0.298	0.054
WK 21b	0.311	0.046
WK 22a	0.244	0.039
WK 22b	0.268	0.040
PC 15g	0.443	0.018
PC 20a	0.232	0.050
PC 20b	0.506	0.026
PC 21a	0.324	0.041
PC 21b	0.167	0.069
PC 22a	0.183	0.046
PC 22b	0.362	0.036
MK 15g	0.189	0.039
MK 20a	0.237	0.031
MK 20b	0.351	0.033
MK 21a	0.318	0.051
MK 21b	0.199	0.038
MK 22a	0.246	0.040
MK 22b	0.245	0.045
VE 15g	0.150	0.041
VE 20a	0.166	[illegible]
VE 20b	0.370	[illegible]
VE 21a	0.163	[illegible]
VE 21b	0.248	0.039
VE 22a	0.219	0.037
VE 22b	0.284	0.053

NON-AFQT Subtest and Form	Raw vs. Linear	Raw vs. Polymomial
GS 15g	0.278	0.058
GS 20a/b	0.337	0.052
GS 21a/b	0.613	0.074
GS 22a/b	0.619	0.065
NO 15g	0.138	0.063
NO 20a/b	0.294	0.058
NO 21a/b	0.307	0.055
NO 22a/b	0.130	0.052
CS 15g	0.248	0.061
CS 20a/b	0.224	0.083
CS 21a	0.244	0.075
CS 21b	0.238	0.064
CS 22a/b	0.188	0.065
AS 15g	0.207	0.042
AS 20a/b	0.291	0.037
AS 21a/b	0.221	0.041
AS 22a/b	0.253	0.037
MC 15g	0.549	0.050
MC 20a/b	0.244	0.038
MC 21a/b	0.292	0.041
MC 22a/b	0.203	0.048
EI 15g	0.614	0.041
EI 20a/b	0.238	0.041
EI 21a/b	0.327	0.036
EI 22a/b	0.249	0.046

Table 8

Percentage of Subjects for Which Equatings Differ by More Than .5 Standard Score Points, by Subtest and Form

AFQT Subtest and Form	Raw vs. Linear	Raw vs. Polynomial
AR 15g	0.06	0.00
AR 20a	5.98	0.00
AR 20b	1.24	0.00
AR 21a	3.75	0.00
AR 21b	48.59	0.00
AR 22a	3.61	0.00
AR 22b	0.00	0.00
WK 15g	1.95	0.00
WK 20a	0.74	0.00
WK 20b	19.23	0.00
WK 21a	3.99	0.00
WK 21b	8.54	0.00
WK 22a	1.88	0.00
WK 22b	1.65	0.00
PC 15g	3.56	0.00
PC 20a	0.40	0.00
PC 20b	39.36	0.00
PC 21a	4.76	0.00
PC 21b	0.85	0.55
PC 22a	0.07	0.00
PC 22b	15.85	0.00
MK 15g	2.49	0.00
MK 20a	1.53	0.00
MK 20b	12.72	0.00
MK 21a	2.98	0.00
MK 21b	0.00	0.00
MK 22a	5.10	0.00
MK 22b	2.02	0.00
VE 15g	0.04	0.00
VE 20a	1.70	0.00
VE 20b	4.66	0.00
VE 21a	0.73	0.00
VE 21b	2.62	0.00
VE 22a	1.64	0.00
VE 22b	2.09	0.00

NON-AFQT Subtest and Form	Raw vs. Linear	Raw vs. Polynomial
GS 15g	5.06	0.00
GS 20a/b	7.49	0.00
GS 21a/b	18.27	0.00
GS 22a/b	32.72	0.00
NO 15g	0.00	0.00
NO 20a/b	10.14	0.00
NO 21a/b	12.26	0.00
NO 22a/b	0.80	0.00
CS 15g	5.73	0.00
CS 20a/b	3.28	0.00
CS 21a	5.87	0.00
CS 21b	4.31	0.00
CS 22a/b	3.43	0.00
AS 15g	2.21	0.00
AS 20a/b	1.55	0.00
AS 21a/b	0.06	0.00
AS 22a/b	3.15	0.00
MC 15g	36.56	0.00
MC 20a/b	3.16	0.00
MC 21a/b	3.66	0.00
MC 22a/b	2.42	0.00
EI 15g	51.55	0.00
EI 20a/b	0.00	0.00
EI 21a/b	13.17	0.00
EI 22a/b	5.79	0.00

Table 9

Root Mean Square Difference Between Distributions of Reference Form and Equated New Forms, by Subtest and Form

AFQT Subtest and Form	Reference vs. Polynomial Equated Scores	NON-AFQT Subtest and Form	Reference vs. Polynomial Equated Scores
AR 15g	0.0013	GS 15g	0.0017
AR 20a	0.0010	GS 20a/b	0.0014
AR 20b	0.0014	GS 21a/b	0.0017
AR 21a	0.0009	GS 22a/b	0.0017
AR 21b	0.0010		
AR 22a	0.0006	NO 15g	0.0019
AR 22b	0.0012	NO 20a/b	0.0014
		NO 21a/b	0.0020
WK 15g	0.0007	NO 22a/b	0.0015
WK 20a	0.0009		
WK 20b	0.0009	CS 15g	0.0023
WK 21a	0.0011	CS 20a/b	0.0028
WK 21b	0.0008	CS 21a	0.0020
WK 22a	0.0008	CS 21b	0.0019
WK 22b	0.0013	CS 22a/b	0.0021
PC 15g	0.0003	AS 15g	0.0009
PC 20a	0.0006	AS 20a/b	0.0010
PC 20b	0.0003	AS 21a/b	0.0009
PC 21a	0.0007	AS 22a/b	0.0009
PC 21b	0.0007		
PC 22a	0.0013	MC 15g	0.0014
PC 22b	0.0002	MC 20a/b	0.0009
		MC 21a/b	0.0009
MK 15g	0.0010	MC 22a/b	0.0012
MK 20a	0.0008		
MK 20b	0.0006	EI 15g	0.0009
MK 21a	0.0013	EI 20a/b	0.0010
MK 21b	0.0010	EI 21a/b	0.0009
MK 22a	0.0010	EI 22a/b	0.0014
MK 22b	0.0010		
VE 15g	0.0014		
VE 20a	0.0013		
VE 20b	0.0015		
VE 21a	0.0013		
VE 21b	0.0013		
VE 22a	0.0013		
VE 22b	0.0020		

Table 10

Percentage of Subjects at Scores Where Cumulative Distributions of Reference Form and Equated New Forms Differ by More than .01, by Subtest and Form

AFQT Subtest and Form	Reference vs. Polynomial Equated Scores	NON-AFQT Subtest and Form	Reference vs. Polynomial Equated Scores
AR 15g	0.00	GS 15g	0.00
AR 20a	0.00	GS 20a/b	0.00
AR 20b	0.00	GS 21a/b	0.00
AR 21a	0.00	GS 22a/b	0.00
AR 21b	0.00		
AR 22a	0.00	NO 15g	0.00
AR 22b	0.00	NO 20a/b	0.00
		NO 21a/b	0.00
WK 15g	0.00	NO 22a/b	0.00
WK 20a	0.00		
WK 20b	0.00	CS 15g	0.00
WK 21a	0.00	CS 20a/b	0.00
WK 21b	0.00	CS 21a	0.00
WK 22a	0.00	CS 21b	0.00
WK 22b	0.00	CS 22a/b	0.00
PC 15g	0.00	AS 15g	0.00
PC 20a	0.00	AS 20a/b	0.00
PC 20b	0.00	AS 21a/b	0.00
PC 21a	0.00	AS 22a/b	0.00
PC 21b	0.00		
PC 22a	0.00	MC 15g	0.00
PC 22b	0.00	MC 20a/b	0.00
		MC 21a/b	0.00
MK 15g	0.00	MC 22a/b	0.00
MK 20a	0.00		
MK 20b	0.00	EI 15g	0.00
MK 21a	0.00	EI 20a/b	0.00
MK 21b	0.00	EI 21a/b	0.00
MK 22a	0.00	EI 22a/b	0.00
MK 22b	0.00		
VE 15g	0.00		
VE 20a	0.00		
VE 20b	0.00		
VE 21a	0.00		
VE 21b	0.00		
VE 22a	0.00		
VE 22b	0.00		

Table 11

Subtest Means, Standard Deviations, and Correlations of Subtests, after Application of Current Conversion Tables

FORM 15h Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	50.81	51.34	51.73	51.80	53.12	52.58	50.91	52.33	51.89	50.46	51.80
S.D.	8.55	8.53	6.94	7.65	7.78	7.65	8.88	8.64	9.31	8.48	6.82
N	12931	12931	12931	12931	12931	12931	12931	12931	12931	12931	12931

FORM 15h Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.60	0.72	0.56	0.23	0.22	0.58	0.53	0.65	0.69	0.72
STD-AR	0.60	1.00	0.59	0.58	0.44	0.37	0.44	0.73	0.61	0.53	0.63
STD-WK	0.72	0.59	1.00	0.66	0.28	0.28	0.48	0.50	0.55	0.60	0.96
STD-PC	0.56	0.58	0.66	1.00	0.38	0.37	0.36	0.51	0.46	0.48	0.83
STD-NO	0.23	0.44	0.28	0.38	1.00	0.63	0.09	0.47	0.20	0.16	0.34
STD-CS	0.22	0.37	0.28	0.37	0.63	1.00	0.10	0.40	0.20	0.17	0.34
STD-AS	0.58	0.44	0.48	0.36	0.09	0.10	1.00	0.24	0.67	0.68	0.48
STD-MK	0.53	0.73	0.50	0.51	0.47	0.40	0.24	1.00	0.48	0.40	0.54
STD-MC	0.65	0.61	0.55	0.46	0.20	0.20	0.67	0.48	1.00	0.67	0.56
STD-EI	0.69	0.53	0.60	0.48	0.16	0.17	0.68	0.40	0.67	1.00	0.60
STD-VE	0.72	0.63	0.96	0.83	0.34	0.34	0.48	0.54	0.56	0.60	1.00

FORM 15g (Operational) Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	51.00	51.07	52.00	52.06	52.84	52.83	50.89	52.44	52.07	50.32	52.03
S.D.	8.36	8.56	6.88	7.46	7.72	7.59	8.95	8.63	9.07	8.99	6.87
N	13312	13312	13312	13312	13312	13312	13312	13312	13312	13312	13312

FORM 15g (Operational) Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.62	0.70	0.58	0.22	0.23	0.53	0.54	0.65	0.62	0.70
STD-AR	0.62	1.00	0.59	0.55	0.42	0.39	0.39	0.71	0.62	0.47	0.62
STD-WK	0.70	0.59	1.00	0.72	0.29	0.33	0.40	0.50	0.51	0.47	0.97
STD-PC	0.58	0.55	0.72	1.00	0.32	0.34	0.30	0.48	0.42	0.39	0.86
STD-NO	0.22	0.42	0.29	0.32	1.00	0.65	0.03	0.44	0.18	0.13	0.32
STD-CS	0.23	0.39	0.33	0.34	0.65	1.00	0.05	0.40	0.19	0.15	0.35
STD-AS	0.53	0.39	0.40	0.30	0.03	0.05	1.00	0.19	0.60	0.65	0.39
STD-MK	0.54	0.71	0.50	0.48	0.44	0.40	0.19	1.00	0.50	0.36	0.52
STD-MC	0.65	0.62	0.51	0.42	0.18	0.19	0.60	0.50	1.00	0.60	0.52
STD-EI	0.62	0.47	0.47	0.39	0.13	0.15	0.65	0.36	0.60	1.00	0.48
STD-VE	0.70	0.62	0.97	0.86	0.32	0.35	0.39	0.52	0.52	0.48	1.00

FORM 15g Standard Score Statistic Differences from the Reference FORM (15H)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.19	-0.27	0.28	0.27	-0.27	0.24	-0.02	0.11	0.18	-0.13	0.23
S.D	-0.19	0.02	-0.06	-0.19	-0.06	-0.06	0.07	-0.01	-0.24	0.51	0.05
N	381.00	381.00	381.00	381.00	381.00	381.00	381.00	381.00	381.00	381.00	381.00

FORM 15g Standard Score Correlation Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	0.02	-0.02	0.02	-0.02	0.00	-0.05	0.02	-0.00	-0.07	-0.02
STD-AR	0.02	0.00	0.01	-0.03	-0.03	0.02	-0.05	-0.02	0.01	-0.06	-0.01
STD-WK	-0.02	0.01	0.00	0.07	0.01	0.04	-0.09	-0.00	-0.04	-0.13	0.01
STD-PC	0.02	-0.03	0.07	0.00	-0.06	-0.03	-0.06	-0.04	-0.03	-0.08	0.03
STD-NO	-0.02	-0.03	0.01	-0.06	0.00	0.02	-0.06	-0.03	-0.01	-0.03	-0.02
STD-CS	0.00	0.02	0.04	-0.03	0.02	0.00	-0.05	0.00	-0.01	-0.02	0.01
STD-AS	-0.05	-0.05	-0.09	-0.06	-0.06	-0.05	0.00	-0.06	-0.07	-0.03	-0.09
STD-MK	0.02	-0.02	-0.00	-0.04	-0.03	0.00	-0.06	0.00	0.02	-0.04	-0.02
STD-MC	-0.00	0.01	-0.04	-0.03	-0.01	-0.01	-0.07	0.02	0.00	-0.07	-0.04
STD-EI	-0.07	-0.06	-0.13	-0.08	-0.03	-0.02	-0.03	-0.04	-0.07	0.00	-0.13
STD-VE	-0.02	-0.01	0.01	0.03	-0.02	0.01	-0.09	-0.02	-0.04	-0.13	0.00

continued

Table 11
(continued)

Subtest Means, Standard Deviations, and Correlations of Subtests, after Application of Current Conversion Tables

FORM 20a Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	51.07	51.37	51.77	51.70	53.16	52.49	51.08	52.27	51.97	50.51	51.82
S.D.	8.54	8.48	6.96	7.53	7.78	7.62	8.88	8.62	9.29	8.40	6.90
N	13097	13097	13097	13097	13097	13097	13097	13097	13097	13097	13097

FORM 20a Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.62	0.73	0.63	0.27	0.26	0.48	0.60	0.62	0.64	0.74
STD-AR	0.62	1.00	0.58	0.59	0.43	0.38	0.39	0.74	0.64	0.52	0.63
STD-WK	0.73	0.58	1.00	0.72	0.29	0.32	0.43	0.51	0.55	0.56	0.97
STD-PC	0.63	0.59	0.72	1.00	0.37	0.40	0.39	0.52	0.53	0.51	0.86
STD-NO	0.27	0.43	0.29	0.37	1.00	0.62	0.07	0.44	0.24	0.19	0.33
STD-CS	0.26	0.38	0.32	0.40	0.62	1.00	0.10	0.38	0.25	0.19	0.37
STD-AS	0.48	0.39	0.43	0.39	0.07	0.10	1.00	0.22	0.60	0.59	0.45
STD-MK	0.60	0.74	0.51	0.52	0.44	0.38	0.22	1.00	0.52	0.46	0.55
STD-MC	0.62	0.64	0.55	0.53	0.24	0.25	0.60	0.52	1.00	0.64	0.58
STD-EI	0.64	0.52	0.56	0.51	0.19	0.19	0.59	0.46	0.64	1.00	0.58
STD-VE	0.74	0.63	0.97	0.86	0.33	0.37	0.45	0.55	0.58	0.58	1.00

FORM 20a Standard Score Statistic Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.26	0.03	0.05	-0.10	0.05	-0.10	0.17	-0.06	0.08	0.06	0.02
S.D.	-0.01	-0.05	0.02	-0.12	0.00	-0.03	-0.00	-0.02	-0.02	-0.08	0.08
N	166.00	166.00	166.00	166.00	166.00	166.00	166.00	166.00	166.00	166.00	166.00

FORM 20a Standard Score Correlation Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	0.02	0.01	0.07	0.04	0.04	-0.10	0.07	-0.03	-0.05	0.02
STD-AR	0.02	0.00	-0.00	0.01	-0.01	0.01	-0.05	0.01	0.03	-0.01	-0.00
STD-WK	0.01	-0.00	0.00	0.06	0.00	0.03	-0.06	0.01	0.00	-0.04	0.01
STD-PC	0.07	0.01	0.06	0.00	-0.01	0.02	0.03	0.01	0.07	0.03	0.03
STD-NO	0.04	-0.01	0.00	-0.01	0.00	-0.01	-0.02	-0.03	0.05	0.03	-0.01
STD-CS	0.04	0.01	0.03	0.02	-0.01	0.00	0.00	-0.02	0.04	0.02	0.03
STD-AS	-0.10	-0.05	-0.06	0.03	-0.02	0.00	0.00	-0.03	-0.06	-0.08	-0.04
STD-MK	0.07	0.01	0.01	0.01	-0.03	-0.02	-0.03	0.00	0.04	0.06	0.01
STD-MC	-0.03	0.03	0.00	0.07	0.05	0.04	-0.06	0.04	0.00	-0.03	0.02
STD-EI	-0.05	-0.01	-0.04	0.03	0.03	0.02	-0.08	0.06	-0.03	0.00	-0.02
STD-VE	0.02	-0.00	0.01	0.03	-0.01	0.03	-0.04	0.01	0.02	-0.02	0.00

FORM 20a Standard Score Statistic Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.07	0.30	-0.23	-0.36	0.32	-0.34	0.19	-0.17	-0.10	0.19	-0.21
S.D.	0.18	-0.08	0.08	0.07	0.07	0.03	-0.07	-0.01	0.22	-0.59	0.03
N	-215.0	-215.0	-215.0	-215.0	-215.0	-215.0	-215.0	-215.0	-215.0	-215.0	-215.0

FORM 20a Standard Score Correlation Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.00	0.03	0.05	0.05	0.04	-0.05	0.05	-0.03	0.02	0.04
STD-AR	-0.00	0.00	-0.01	0.04	0.01	-0.01	-0.01	0.03	0.01	0.05	0.01
STD-WK	0.03	-0.01	0.00	-0.01	-0.01	-0.01	0.03	0.01	0.04	0.09	-0.00
STD-PC	0.05	0.04	-0.01	0.00	0.05	0.05	0.09	0.04	0.11	0.12	0.00
STD-NO	0.05	0.01	-0.01	0.05	0.00	-0.03	0.04	0.00	0.06	0.06	0.01
STD-CS	0.04	-0.01	-0.01	0.05	-0.03	0.00	0.05	-0.02	0.06	0.04	0.01
STD-AS	-0.05	-0.01	0.03	0.09	0.04	0.05	0.00	0.03	0.01	-0.06	0.05
STD-MK	0.05	0.03	0.01	0.04	0.00	-0.02	0.03	0.00	0.02	0.10	0.03
STD-MC	-0.03	0.01	0.04	0.11	0.06	0.06	0.01	0.02	0.00	0.04	0.07
STD-EI	0.02	0.05	0.09	0.12	0.06	0.04	-0.06	0.10	0.04	0.00	0.10
STD-VE	0.04	0.01	-0.00	0.00	0.01	0.01	0.05	0.03	0.07	0.10	0.00

continued

Table 11
(continued)

Subtest Means, Standard Deviations, and Intercorrelations, after Application of Current Conversion Tables

FORM 20b Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	51.04	51.36	51.72	51.57	53.18	52.65	50.76	52.37	51.90	50.43	51.88
S.D.	8.46	8.53	7.03	7.51	7.83	7.68	8.91	8.67	9.27	8.57	6.95
N	12778	12778	12778	12778	12778	12778	12778	12778	12778	12778	12778

FORM 20b Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.61	0.73	0.57	0.26	0.25	0.49	0.60	0.62	0.65	0.74
STD-AR	0.61	1.00	0.58	0.54	0.43	0.39	0.39	0.74	0.62	0.51	0.61
STD-WK	0.73	0.58	1.00	0.67	0.27	0.31	0.47	0.51	0.57	0.58	0.97
STD-PC	0.57	0.54	0.67	1.00	0.35	0.38	0.31	0.50	0.47	0.46	0.82
STD-NO	0.26	0.43	0.27	0.35	1.00	0.61	0.07	0.44	0.23	0.19	0.32
STD-CS	0.25	0.39	0.31	0.38	0.61	1.00	0.10	0.38	0.24	0.20	0.36
STD-AS	0.49	0.39	0.47	0.31	0.07	0.10	1.00	0.24	0.61	0.61	0.45
STD-MK	0.60	0.74	0.51	0.50	0.44	0.38	0.24	1.00	0.53	0.47	0.55
STD-MC	0.62	0.62	0.57	0.47	0.23	0.24	0.61	0.53	1.00	0.65	0.58
STD-EI	0.65	0.51	0.58	0.46	0.19	0.20	0.61	0.47	0.65	1.00	0.58
STD-VE	0.74	0.61	0.97	0.82	0.32	0.36	0.45	0.55	0.58	0.58	1.00

FORM 20b Standard Score Statistic Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.23	0.03	-0.00	-0.23	0.06	0.06	-0.15	0.05	0.01	-0.03	0.08
S.D.	-0.09	-0.01	0.09	-0.13	0.05	0.03	0.03	0.03	-0.04	0.08	0.13
N	-153.0	-153.0	-153.0	-153.0	-153.0	-153.0	-153.0	-153.0	-153.0	-153.0	-153.0

FORM 20b Standard Score Correlation Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	0.01	0.02	0.02	0.02	0.03	-0.09	0.07	-0.03	-0.04	0.02
STD-AR	0.01	0.00	-0.00	-0.04	-0.01	0.02	-0.05	0.01	0.01	-0.02	-0.02
STD-WK	0.02	-0.00	0.00	0.01	-0.01	0.02	-0.02	0.02	0.02	-0.02	0.01
STD-PC	0.02	-0.04	0.01	0.00	-0.03	0.01	-0.06	-0.01	0.01	-0.02	-0.01
STD-NO	0.02	-0.01	-0.01	-0.03	0.00	-0.02	-0.02	-0.03	0.03	0.03	-0.02
STD-CS	0.03	0.02	0.02	0.01	-0.02	0.00	-0.00	-0.02	0.04	0.03	0.01
STD-AS	-0.09	-0.05	-0.02	-0.06	-0.02	-0.00	0.00	-0.00	-0.06	-0.06	-0.03
STD-MK	0.07	0.01	0.02	-0.01	-0.03	-0.02	-0.00	0.00	0.04	0.07	0.00
STD-MC	-0.03	0.01	0.02	0.01	0.03	0.04	-0.06	0.04	0.00	-0.02	0.02
STD-EI	-0.04	-0.02	-0.02	-0.02	0.03	0.03	-0.06	0.07	-0.02	0.00	-0.02
STD-VE	0.02	-0.02	0.01	-0.01	-0.02	0.01	-0.03	0.00	0.02	-0.02	0.00

FORM 20b Standard Score Statistic Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.04	0.29	-0.28	-0.49	0.34	-0.18	-0.13	-0.06	-0.17	0.11	-0.15
S.D.	0.09	-0.03	0.15	0.06	0.11	0.09	-0.04	0.04	0.20	-0.42	0.08
N	-534.0	-534.0	-534.0	-534.0	-534.0	-534.0	-534.0	-534.0	-534.0	-534.0	-534.0

FORM 20b Standard Score Correlation Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.00	0.04	-0.01	0.04	0.02	-0.04	0.05	-0.03	0.03	0.04
STD-AR	-0.00	0.00	-0.01	-0.01	0.02	0.00	-0.00	0.03	-0.00	0.04	-0.00
STD-WK	0.04	-0.01	0.00	-0.06	-0.02	-0.02	0.07	0.02	0.06	0.11	-0.00
STD-PC	-0.01	-0.01	-0.06	0.00	0.03	0.04	0.00	0.02	0.04	0.06	-0.04
STD-NO	0.04	0.02	-0.02	0.03	0.00	-0.04	0.04	-0.00	0.04	0.06	-0.00
STD-CS	0.02	0.00	-0.02	0.04	-0.04	0.00	0.04	-0.03	0.05	0.05	0.00
STD-AS	-0.04	-0.00	0.07	0.00	0.04	0.04	0.00	0.05	0.01	-0.04	0.06
STD-MK	0.05	0.03	0.02	0.02	-0.00	-0.03	0.05	0.00	0.03	0.10	0.03
STD-MC	-0.03	-0.00	0.06	0.04	0.04	0.05	0.01	0.03	0.00	0.05	0.06
STD-EI	0.03	0.04	0.11	0.06	0.06	0.05	-0.04	0.10	0.05	0.00	0.11
STD-VE	0.04	-0.00	-0.00	-0.04	-0.00	0.00	0.06	0.03	0.06	0.11	0.00

continued

Table 11
(continued)

Subtest Means, Standard Deviations, and Intercorrelations, after Application of Current Conversion Tables

FORM 21a Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	50.85	51.33	51.74	51.71	53.09	52.58	50.88	52.35	52.00	50.32	51.81
S.D.	8.60	8.49	6.93	7.43	7.78	7.62	8.99	8.66	9.25	8.51	6.92
N	12532	12532	12532	12532	12532	12532	12532	12532	12532	12532	12532

FORM 21a Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.60	0.72	0.61	0.29	0.28	0.36	0.61	0.58	0.54	0.74
STD-AR	0.60	1.00	0.58	0.56	0.44	0.40	0.37	0.72	0.62	0.49	0.61
STD-WK	0.72	0.58	1.00	0.70	0.29	0.31	0.37	0.49	0.54	0.54	0.97
STD-PC	0.61	0.56	0.70	1.00	0.33	0.34	0.36	0.45	0.50	0.48	0.84
STD-NO	0.29	0.44	0.29	0.33	1.00	0.63	0.03	0.43	0.19	0.10	0.32
STD-CS	0.28	0.40	0.31	0.34	0.63	1.00	0.06	0.36	0.23	0.14	0.34
STD-AS	0.36	0.37	0.37	0.36	0.03	0.06	1.00	0.17	0.60	0.67	0.39
STD-MK	0.61	0.72	0.49	0.45	0.43	0.36	0.17	1.00	0.50	0.34	0.51
STD-MC	0.58	0.62	0.54	0.50	0.19	0.23	0.60	0.50	1.00	0.68	0.57
STD-EI	0.54	0.49	0.54	0.48	0.10	0.14	0.67	0.34	0.68	1.00	0.56
STD-VE	0.74	0.61	0.97	0.84	0.32	0.34	0.39	0.51	0.57	0.56	1.00

FORM 21a Standard Score Statistic Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.04	-0.01	0.01	-0.09	-0.02	-0.01	-0.03	0.02	0.12	-0.14	0.01
S.D.	0.05	-0.04	-0.01	-0.22	0.00	-0.04	0.10	0.02	-0.07	0.03	0.10
N	-399.0	-399.0	-399.0	-399.0	-399.0	-399.0	-399.0	-399.0	-399.0	-399.0	-399.0

FORM 21a Standard Score Correlation Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	0.00	0.00	0.05	0.06	0.05	-0.23	0.08	-0.08	-0.15	0.02
STD-AR	0.00	0.00	-0.01	-0.02	-0.00	0.03	-0.07	-0.01	0.01	-0.04	-0.02
STD-WK	0.00	-0.01	0.00	0.04	0.01	0.02	-0.11	-0.01	-0.00	-0.06	0.01
STD-PC	0.05	-0.02	0.04	0.00	-0.05	-0.03	-0.00	-0.06	0.05	0.01	0.00
STD-NO	0.06	-0.00	0.01	-0.05	0.00	-0.00	-0.07	-0.04	-0.00	-0.06	-0.02
STD-CS	0.05	0.03	0.02	-0.03	-0.00	0.00	-0.04	-0.04	0.02	-0.04	-0.00
STD-AS	-0.23	-0.07	-0.11	-0.00	-0.07	-0.04	0.00	-0.08	-0.07	-0.01	-0.09
STD-MK	0.08	-0.01	-0.01	-0.06	-0.04	-0.04	-0.08	0.00	0.02	-0.06	-0.03
STD-MC	-0.08	0.01	-0.00	0.05	-0.00	0.02	-0.07	0.02	0.00	0.01	0.01
STD-EI	-0.15	-0.04	-0.06	0.01	-0.06	-0.04	-0.01	-0.06	0.01	0.00	-0.05
STD-VE	0.02	-0.02	0.01	0.00	-0.02	-0.00	-0.09	-0.03	0.01	-0.05	0.00

FORM 21a Standard Score Statistic Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	-0.15	0.26	-0.26	-0.35	0.25	-0.25	-0.01	-0.09	-0.07	-0.00	-0.22
S.D.	0.24	-0.07	0.05	-0.03	0.06	0.03	0.03	0.03	0.18	-0.48	0.05
N	-780.0	-780.0	-780.0	-780.0	-780.0	-780.0	-780.0	-780.0	-780.0	-780.0	-780.0

FORM 21a Standard Score Correlation Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.01	0.02	0.02	0.07	0.05	-0.18	0.06	-0.08	-0.08	0.03
STD-AR	-0.01	0.00	-0.01	0.01	0.02	0.01	-0.02	0.01	-0.00	0.01	-0.00
STD-WK	0.02	-0.01	0.00	-0.03	0.00	-0.02	-0.03	-0.01	0.03	0.07	0.00
STD-PC	0.02	0.01	-0.03	0.00	0.01	-0.00	0.06	-0.02	0.08	0.09	-0.02
STD-NO	0.07	0.02	0.00	0.01	0.00	-0.02	-0.00	-0.01	0.01	-0.03	0.00
STD-CS	0.05	0.01	-0.02	-0.00	-0.02	0.00	0.00	-0.04	0.04	-0.02	-0.02
STD-AS	-0.18	-0.02	-0.03	0.06	-0.00	0.00	0.00	-0.02	-0.00	0.02	-0.00
STD-MK	0.06	0.01	-0.01	-0.02	-0.01	-0.04	-0.02	0.00	0.00	-0.02	-0.01
STD-MC	-0.08	-0.00	0.03	0.08	0.01	0.04	-0.00	0.00	0.00	0.08	0.05
STD-EI	-0.08	0.01	0.07	0.09	-0.03	-0.02	0.02	-0.02	0.08	0.00	0.08
STD-VE	0.03	-0.00	0.00	-0.02	0.00	-0.02	-0.00	-0.01	0.05	0.08	0.00

continued

Table 11
(continued)

Subtest Means, Standard Deviations, and Intercorrelations, after Application of Current Conversion Tables

FORM 21b Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	50.92	51.46	51.68	51.68	53.02	52.58	50.96	52.36	52.16	50.60	51.82
S.D.	8.44	8.53	6.87	7.62	7.76	7.62	8.84	8.62	9.19	8.39	6.85
N	12060	12060	12060	12060	12060	12060	12060	12060	12060	12060	12060

FORM 21b Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.58	0.72	0.62	0.30	0.30	0.35	0.59	0.57	0.55	0.74
STD-AR	0.58	1.00	0.55	0.55	0.43	0.39	0.31	0.69	0.58	0.44	0.59
STD-WK	0.72	0.55	1.00	0.70	0.28	0.32	0.40	0.46	0.56	0.56	0.97
STD-PC	0.62	0.55	0.70	1.00	0.34	0.36	0.29	0.46	0.49	0.45	0.86
STD-NO	0.30	0.43	0.28	0.34	1.00	0.63	0.02	0.42	0.19	0.11	0.32
STD-CS	0.30	0.39	0.32	0.36	0.63	1.00	0.06	0.38	0.23	0.15	0.36
STD-AS	0.35	0.31	0.40	0.29	0.02	0.06	1.00	0.15	0.59	0.67	0.39
STD-MK	0.59	0.69	0.46	0.46	0.42	0.38	0.15	1.00	0.49	0.34	0.50
STD-MC	0.57	0.58	0.56	0.49	0.19	0.23	0.59	0.49	1.00	0.68	0.58
STD-EI	0.55	0.44	0.56	0.45	0.11	0.15	0.67	0.34	0.68	1.00	0.56
STD-VE	0.74	0.59	0.97	0.86	0.32	0.36	0.39	0.50	0.58	0.56	1.00

FORM 21b Standard Score Statistic Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.11	0.13	-0.05	-0.12	-0.10	-0.01	0.05	0.04	0.28	0.14	0.02
S.D.	-0.12	-0.00	-0.07	-0.03	-0.02	-0.03	-0.04	-0.02	-0.12	-0.09	0.03
N	-871.0	-871.0	-871.0	-871.0	-871.0	-871.0	-871.0	-871.0	-871.0	-871.0	-871.0

FORM 21b Standard Score Correlation Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.02	0.00	0.07	0.07	0.08	-0.23	0.06	-0.08	-0.14	0.02
STD-AR	-0.02	0.00	-0.04	-0.03	-0.02	0.02	-0.13	-0.04	-0.03	-0.09	-0.04
STD-WK	0.00	-0.04	0.00	0.05	-0.01	0.03	-0.08	-0.04	0.01	-0.04	0.00
STD-PC	0.07	-0.03	0.05	0.00	-0.04	-0.02	-0.07	-0.05	0.03	-0.03	0.02
STD-NO	0.07	-0.02	-0.01	-0.04	0.00	-0.01	-0.07	-0.05	-0.01	-0.05	-0.02
STD-CS	0.08	0.02	0.03	-0.02	-0.01	0.00	-0.05	-0.02	0.03	-0.02	0.02
STD-AS	-0.23	-0.13	-0.08	-0.07	-0.07	-0.05	0.00	-0.09	-0.07	-0.01	-0.09
STD-MK	0.06	-0.04	-0.04	-0.05	-0.05	-0.02	-0.09	0.00	0.01	-0.06	-0.05
STD-MC	-0.08	-0.03	0.01	0.03	-0.01	0.03	-0.07	0.01	0.00	0.01	0.02
STD-EI	-0.14	-0.09	-0.04	-0.03	-0.05	-0.02	-0.01	-0.06	0.01	0.00	-0.04
STD-VE	0.02	-0.04	0.00	0.02	-0.02	0.02	-0.09	-0.05	0.02	-0.04	0.00

FORM 21b Standard Score Statistic Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	-0.08	0.39	-0.32	-0.39	0.18	-0.25	0.07	-0.07	0.09	0.27	-0.21
S.D.	0.07	-0.03	-0.01	0.17	0.04	0.04	-0.11	-0.01	0.12	-0.60	-0.02
N	-1252	-1252	-1252	-1252	-1252	-1252	-1252	-1252	-1252	-1252	-1252

FORM 21b Standard Score Correlation Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.04	0.02	0.04	0.08	0.07	-0.18	0.05	-0.08	-0.07	0.03
STD-AR	-0.04	0.00	-0.04	-0.00	0.01	0.01	-0.08	-0.02	-0.04	-0.03	-0.03
STD-WK	0.02	-0.04	0.00	-0.02	-0.02	-0.01	0.00	-0.03	0.05	0.09	-0.01
STD-PC	0.04	-0.00	-0.02	0.00	0.01	0.02	-0.01	-0.01	0.07	0.06	-0.00
STD-NO	0.08	0.01	-0.02	0.01	0.00	-0.03	-0.01	-0.02	0.01	-0.02	-0.00
STD-CS	0.07	0.01	-0.01	0.02	-0.03	0.00	0.00	-0.02	0.04	-0.00	0.00
STD-AS	-0.18	-0.08	0.00	-0.01	-0.01	0.00	0.00	-0.04	-0.01	0.02	0.00
STD-MK	0.05	-0.02	-0.03	-0.01	-0.02	-0.02	-0.04	0.00	-0.01	-0.02	-0.03
STD-MC	-0.08	-0.04	0.05	0.07	0.01	[illegible]	-0.01	-0.01	0.00	0.08	0.06
STD-EI	-0.07	-0.03	0.09	0.06	-0.02	[illegible]	0.02	-0.02	0.08	0.00	0.09
STD-VE	0.03	-0.03	-0.01	-0.00	-0.00	[illegible]	0.00	-0.03	0.06	0.09	0.00

continued

Table 11
(continued)

**Subtest Means, Standard Deviations,
and Intercorrelations, after Application of Current Conversion Tables**

FORM 22a Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	50.89	51.40	51.76	51.68	53.15	52.58	50.99	52.33	52.13	50.30	51.86
S.D.	8.56	8.56	6.93	7.36	7.80	7.70	8.91	8.57	9.22	8.62	7.05
N	11558	11558	11558	11558	11558	11558	11558	11558	11558	11558	11558

FORM 22a Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.59	0.76	0.63	0.26	0.27	0.49	0.56	0.60	0.61	0.77
STD-AR	0.59	1.00	0.59	0.57	0.41	0.39	0.39	0.72	0.60	0.49	0.63
STD-WK	0.76	0.59	1.00	0.69	0.28	0.32	0.42	0.51	0.54	0.55	0.97
STD-PC	0.63	0.57	0.69	1.00	0.36	0.37	0.33	0.50	0.48	0.46	0.84
STD-NO	0.26	0.41	0.28	0.36	1.00	0.63	0.04	0.45	0.17	0.15	0.33
STD-CS	0.27	0.39	0.32	0.37	0.63	1.00	0.06	0.40	0.20	0.18	0.36
STD-AS	0.49	0.39	0.42	0.33	0.04	0.06	1.00	0.21	0.65	0.67	0.42
STD-MK	0.56	0.72	0.51	0.50	0.45	0.40	0.21	1.00	0.49	0.39	0.55
STD-MC	0.60	0.60	0.54	0.48	0.17	0.20	0.65	0.49	1.00	0.66	0.56
STD-EI	0.61	0.49	0.55	0.46	0.15	0.18	0.67	0.39	0.66	1.00	0.56
STD-VE	0.77	0.63	0.97	0.84	0.33	0.36	0.42	0.55	0.56	0.56	1.00

FORM 22a Standard Score Statistic Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.07	0.06	0.03	-0.11	0.04	-0.01	0.08	0.00	0.25	-0.16	0.06
S.D.	0.01	0.02	-0.01	-0.29	0.02	0.05	0.03	-0.08	-0.10	0.13	0.23
N	-1373	-1373	-1373	-1373	-1373	-1373	-1373	-1373	-1373	-1373	-1373

FORM 22a Standard Score Correlation Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.01	0.04	0.07	0.02	0.05	-0.09	0.03	-0.05	-0.07	0.05
STD-AR	-0.01	0.00	0.01	-0.01	-0.04	0.02	-0.05	-0.01	-0.01	-0.04	-0.00
STD-WK	0.04	0.01	0.00	0.03	-0.00	0.03	-0.07	0.01	-0.01	-0.04	0.01
STD-PC	0.07	-0.01	0.03	0.00	-0.02	-0.01	-0.03	-0.01	0.02	-0.02	0.01
STD-NO	0.02	-0.04	-0.00	-0.02	0.00	-0.01	-0.05	-0.02	-0.02	-0.01	-0.02
STD-CS	0.05	0.02	0.03	-0.01	-0.01	0.00	-0.04	0.00	-0.00	0.01	0.02
STD-AS	-0.09	-0.05	-0.07	-0.03	-0.05	-0.04	0.00	-0.04	-0.01	-0.01	-0.06
STD-MK	0.03	-0.01	0.01	-0.01	-0.02	0.00	-0.04	0.00	0.00	-0.01	0.00
STD-MC	-0.05	-0.01	-0.01	0.02	-0.02	-0.00	-0.01	0.00	0.00	-0.01	0.00
STD-EI	-0.07	-0.04	-0.04	-0.02	-0.01	0.01	-0.01	-0.01	-0.01	0.00	-0.04
STD-VE	0.05	-0.00	0.01	0.01	-0.02	0.02	-0.06	0.00	0.00	-0.04	0.00

FORM 22a Standard Score Statistic Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	-0.12	0.33	-0.24	-0.38	0.31	-0.25	0.10	-0.11	0.06	-0.02	-0.17
S.D.	0.20	0.00	0.05	-0.09	0.08	0.11	-0.05	-0.07	0.14	-0.38	0.18
N	-1754	-1754	-17[illegible]	-1754	-1754	-1754	-1754	-1754	-1754	-1754	-1754

FORM 22a Standard Score Correlation Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.03	0.06	0.05	0.04	0.05	-0.04	0.02	-0.05	-0.01	0.07
STD-AR	-0.03	0.00	-0.00	0.02	-0.01	0.00	-0.00	0.01	-0.02	0.02	0.01
STD-WK	0.06	-0.00	[illegible]	-0.04	-0.01	-0.01	0.02	0.02	0.03	0.08	-0.00
STD-PC	0.05	0.02	[illegible]	0.00	0.03	0.03	0.03	0.03	0.06	0.07	-0.02
STD-NO	0.04	-0.01	-0.01	0.03	0.00	-0.03	0.01	0.01	-0.01	0.02	0.01
STD-CS	0.05	0.00	-0.01	0.03	-0.03	0.00	0.01	-0.00	0.01	0.03	0.00
STD-AS	-0.04	-0.00	0.02	0.03	0.01	0.01	0.00	0.02	0.06	0.02	0.03
STD-MK	0.02	0.01	0.02	0.03	0.01	-0.00	0.02	0.00	-0.01	0.03	0.03
STD-MC	-0.05	-0.02	0.03	0.06	-0.01	0.01	0.06	-0.01	0.00	0.06	0.04
STD-EI	-0.01	0.02	0.08	0.07	0.02	0.03	0.02	0.03	0.06	0.00	0.09
STD-VE	0.07	0.01	-0.00	-0.02	0.01	0.00	0.03	0.03	0.04	0.09	0.00

continued

Table 11
(continued)

Subtest Means, Standard Deviations, and Intercorrelations, after Application of Current Conversion Tables

FORM 22b Standard Score Statistics

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	50.88	51.34	51.71	51.64	53.02	52.57	50.85	52.39	52.03	50.60	51.84
S.D.	8.52	8.49	6.92	7.54	7.77	7.53	8.94	8.60	9.20	8.46	6.86
N	10986	10986	10986	10986	10986	10986	10986	10986	10986	10986	10986

FORM 22b Standard Score Correlations

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	1.00	0.60	0.75	0.66	0.26	0.28	0.50	0.55	0.61	0.62	0.77
STD-AR	0.60	1.00	0.58	0.60	0.42	0.40	0.41	0.72	0.59	0.50	0.63
STD-WK	0.75	0.58	1.00	0.72	0.27	0.32	0.44	0.48	0.55	0.56	0.97
STD-PC	0.66	0.60	0.72	1.00	0.38	0.40	0.36	0.52	0.49	0.49	0.87
STD-NO	0.26	0.42	0.27	0.38	1.00	0.62	0.06	0.42	0.18	0.16	0.33
STD-CS	0.28	0.40	0.32	0.40	0.62	1.00	0.08	0.38	0.21	0.18	0.37
STD-AS	0.50	0.41	0.44	0.36	0.06	0.08	1.00	0.24	0.67	0.67	0.45
STD-MK	0.55	0.72	0.48	0.52	0.42	0.38	0.24	1.00	0.51	0.40	0.53
STD-MC	0.61	0.59	0.55	0.49	0.18	0.21	0.67	0.51	1.00	0.66	0.57
STD-EI	0.62	0.50	0.56	0.49	0.16	0.18	0.67	0.40	0.66	1.00	0.57
STD-VE	0.77	0.63	0.97	0.87	0.33	0.37	0.45	0.53	0.57	0.57	1.00

FORM 22b Standard Score Statistic Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	0.07	-0.00	-0.02	-0.16	-0.09	-0.02	-0.07	0.06	0.15	0.15	0.04
S.D.	-0.03	-0.05	-0.02	-0.11	-0.01	-0.12	0.06	-0.04	-0.12	-0.02	0.04
N	-1945	-1945	-1945	-1945	-1945	-1945	-1945	-1945	-1945	-1945	-1945

FORM 22b Standard Score Correlation Differences from the Reference FORM (15h)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	0.00	0.03	0.10	0.02	0.06	-0.08	0.02	-0.05	-0.07	0.05
STD-AR	0.00	0.00	-0.01	0.03	-0.03	0.03	-0.03	-0.01	-0.01	-0.03	-0.00
STD-WK	0.03	-0.01	0.00	0.06	-0.01	0.03	-0.04	-0.02	0.00	-0.04	0.00
STD-PC	0.10	0.03	0.06	0.00	-0.00	0.03	-0.00	0.01	0.03	0.01	0.04
STD-NO	0.02	-0.03	-0.01	-0.00	0.00	-0.01	-0.03	-0.05	-0.01	0.00	-0.01
STD-CS	0.06	0.03	0.03	0.03	-0.01	0.00	-0.02	-0.02	0.00	0.01	0.03
STD-AS	-0.08	-0.03	-0.04	-0.00	-0.03	-0.02	0.00	-0.00	0.00	-0.01	-0.04
STD-MK	0.02	-0.01	-0.02	0.01	-0.05	-0.02	-0.00	0.00	0.02	-0.00	-0.02
STD-MC	-0.05	-0.01	0.00	0.03	-0.01	0.00	0.00	0.02	0.00	-0.00	0.01
STD-EI	0.07	-0.03	-0.04	0.01	0.00	0.01	-0.01	-0.00	-0.00	0.00	-0.03
STD-VE	0.05	-0.00	0.00	0.04	-0.01	0.03	-0.04	-0.02	0.01	-0.03	0.00

FORM 22b Standard Score Statistic Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
MEAN	-0.13	0.26	-0.29	-0.42	0.18	-0.26	-0.04	-0.05	-0.04	0.28	-0.19
S.D.	0.16	-0.07	0.04	0.08	0.06	-0.06	-0.01	-0.03	0.13	-0.53	-0.01
N	-2326	-2326	-2326	-2326	-2326	-2326	-2326	-2326	-2326	-2326	-2326

FORM 22b Standard Score Correlation Differences from the Operational FORM (15g)

Subtest	STD-GS	STD-AR	STD-WK	STD-PC	STD-NO	STD-CS	STD-AS	STD-MK	STD-MC	STD-EI	STD-VE
STD-GS	0.00	-0.02	0.05	0.08	0.04	0.06	-0.03	0.01	-0.04	-0.00	0.07
STD-AR	-0.02	0.00	-0.01	0.06	0.00	0.01	0.01	0.01	-0.03	0.02	0.01
STD-WK	0.05	-0.01	0.00	-0.00	-0.02	-0.01	0.05	-0.02	0.04	0.09	-0.01
STD-PC	0.08	0.06	-0.00	0.00	0.05	0.06	0.06	0.05	0.07	0.10	0.01
STD-NO	0.04	0.00	-0.02	0.05	0.00	-0.03	0.03	-0.02	-0.00	0.04	0.01
STD-CS	0.06	0.01	-0.01	0.06	-0.03	0.00	0.02	-0.02	0.02	0.03	0.02
STD-AS	-0.03	0.01	0.05	0.06	0.03	0.02	0.00	0.05	0.07	0.02	0.05
STD-MK	0.01	0.01	-0.02	0.05	-0.02	-0.02	0.05	0.00	0.00	0.03	0.01
STD-MC	-0.04	-0.03	0.04	0.07	-0.00	0.02	0.07	0.00	0.00	0.06	0.05
STD-EI	-0.00	0.02	0.09	0.10	0.04	0.03	0.02	0.03	0.06	0.00	0.10
STD-VE	0.07	0.01	-0.01	0.01	0.01	0.02	0.05	0.01	0.05	0.10	0.00

Table 12

Subtests and Upper Bounds of Categories for Composites

Composite		Category Upper Bounds
AFQT*	2VE + AR + MK	09/15/20/30/49/64/92/99
	ARMY**	
GT	VE + AR	109\160
GM	MK + EI + AS + GS	84/89/94/99/104/160
EL	AR + MK + EI + GS	84/89/94/99/104/109/114/119/160
CL	AR + MK + VE	84/89/94/99/104/109/160
MM	NO + AS + MC + EI	84/94/99/104/160
SC	AR + AS + MC + VE	89/94/99/104/160
CO	CS + AR + MC + AS	84/89/94/99/160
FA	AR + CS + MC + MK	84/89/94/99/160
OF	NO + AS + MC + VE	89/94/99/104/160
ST	VE + MK + MC + GS	84/89/94/99/104/109/114/160
	NAVY***	
EL	AR + MK + EI + GS	189/199/203/217/320
E	AR + GS + 2MK	195/199/203/209/213/320
CL	NO + CS + VE	159/240
GT	VE + AR	88/95/96/102/107/112/114/160
ME	VE + MC + AS	149/157/166/240
EG	MK + AS	95/160
CT	VE + AR + NO + CS	201/320
HM	VE + MK + GS	148/164/240
ST	VE + AR + MC	146/240
MR	AR + MC + AS	129/157/163/240
BC	VE + MK + CS	146/152/240
	AIR FORCE*	
M	MC + GS + 2AS	43/44/50/56/60/88/99
A	NO + CS + VE	26/31/39/44/50/60/66/99
G	VE + AR	29/34/38/41/42/47/49/ 52/55/57/63/68/69/99
E	AR + MK + EI + GS	32/38/42/44/45/49/57/ 66/71/76/80/99
	MARINE CORPS**	
MM	AR + EI + MC + AS	84/94/104/114/160
CL	VE + MK + CS	79/89/99/109/119/160
GT	VE + AR + MC	79/89/99/109/160
EL	AR + MK + EI + GS	89/99/109/114/160

* Percentile Scores; AFQT upper bounds are for categories V, IVc, IVb, IVa, IIIb, IIIa, II and I, respectively.

** Standard Scores (Mean=100, S.D.=20).

*** Sum of Subtest Standard Scores.

Table 13

Composite-Category-by-Test-Form Chi-Squares (Reference, Operational, & New [20-22] Forms)

Composite		D.F.	Chi-Square	Prob.
AFQT	2VE + AR + MK	49	148.836*	.000
		ARMY		
GT	VE + AR	7	6.824	.447
GM	MK + EI + AS + GS	35	88.814*	.000
EL	AR + MK + EI + GS	56	108.241	.000
CL	AR + MK + VE	42	46.701	.285
MM	NO + AS + MC + EI	28	81.825*	.000
SC	AR + AS + MC + VE	28	41.266	.051
CO	CS + AR + MC + AS	28	39.739	.070
FA	AR + CS + MC + MK	28	27.037	.516
OF	NO + AS + MC + VE	28	75.452*	.000
ST	VE + MK + MC + GS	49	67.870	.038
		AIR FORCE		
M	MC + GS + 2AS	42	246.198*	.000
A	NO + CS + VE	49	47.891	.516
G	VE + AR	84	186.039*	.000
E	AR + MK + EI + GS	77	99.539	.043
		NAVY		
EL	AR + MK + EI + GS	28	55.575	.001
E	AR + GS + 2MK	35	41.523	.208
CL	NO + CS + VE	7	3.043	.881
GT	VE + AR	49	81.834	.002
ME	VE + MC + AS	21	33.496	.041
EG	MK + AS	7	12.859	.076
CT	VE + AR + NO + CS	7	3.029	.882
HM	VE + MK + GS	14	21.252	.095
ST	VE + AR + MC	7	8.277	.309
MR	AR + MC + AS	21	39.759	.008
BC	VE + MK + CS	14	14.767	.394
		MARINE CORPS		
MM	AR + EI + MC + AS	28	59.689*	.000
CL	VE + MK + CS	35	37.329	.362
GT	VE + AR + MC	28	27.560	.488
EL	AR + MK + EI + GS	28	59.054*	.001

* Chi-Square > 2 x D.F.

continued

Table 13
(continued)

Composite-Category-by-Test-Form Chi-Squares
(Reference Form vs. Operational 15G and Each New Form [20-22])

Comp.	DF	15G	20A	20B	21A	21B	22A	22B
AFQT	7	30.392*	14.317*	26.029*	12.950	12.192	20.080*	5.981
ARMY								
GT	1	1.674	0.359	0.389	0.552	0.048	1.046	0.081
GM	5	13.844*	4.455	2.538	13.408*	22.825*	6.901	5.831
EL	8	6.414	5.586	12.441	20.021*	18.656*	13.078	10.193
CL	6	5.547	11.266	7.564	8.003	15.443*	3.604	9.240
MM	4	19.411*	11.960*	5.609	12.627*	6.387	0.999	2.958
SC	4	4.093	3.505	0.326	7.379	13.473*	1.549	1.878
CO	4	3.747	4.527	1.299	5.427	16.025*	2.801	3.954
FA	4	3.083	2.953	2.830	1.759	5.309	0.877	2.948
OF	4	22.092*	5.520	4.567	6.357	14.736*	5.048	1.593
ST	7	12.709	9.239	13.169	11.821	9.143	7.200	9.658
AIR FORCE								
M	6	47.080*	45.779*	35.388*	30.692*	81.012*	72.520*	78.533*
A	7	3.256	5.204	3.065	7.111	5.108	5.662	1.532
G	12	26.608*	[illegible]1.061*	39.105*	18.188	15.273	24.736*	20.801
E	11	4.071	4.638	13.596	18.648	16.120	13.705	6.903
NAVY								
EL	4	2.970	2.611	16.136*	7.174	10.507*	9.986*	2.707
E	5	13.914*	6.089	5.744	4.815	2.925	8.822	7.704
CL	1	0.463	0.012	0.248	0.013	0.609	0.133	0.221
GT	7	8.537	12.277	17.604*	7.132	12.790	15.217*	19.714*
ME	3	7.868*	6.325*	6.752*	3.670	6.349*	1.992	3.190
EG	1	1.098	0.185	0.486	2.694*	3.193*	0.084	0.319
CT	1	1.459	0.003	0.248	0.325	1.379	0.383	0.181
HM	2	5.134*	8.722*	7.872*	11.208*	3.928	6.277*	1.772
ST	1	0.779	1.898	0.083	0.703	0.838	0.121	0.347
MR	3	5.041	5.794	1.874	9.325*	24.528*	3.353	5.199
BC	2	2.591	1.555	1.498	4.662*	1.808	1.268	2.885
MARINE CORPS								
MM	4	20.082*	9.286*	4.745	10.726*	23.985*	0.685	7.453
CL	5	8.445	2.459	3.872	4.535	5.932	2.762	1.195
GT	4	3.947	4.085	2.480	4.514	5.471	1.484	3.847
EL	4	5.349	3.404	11.176	12.050*	10.601	4.397	5.470

Table 14

Standard Deviations of Composites

Comp.	15H	15G	20A	20B	21A	21B	22A	22B
AFQT PERCENTILE								
AFQT	23.932	23.961	23.925	24.179	23.935	23.777	24.334	23.975
ARMY STANDARD SCORE								
GT	15.003	15.012	15.004	15.040	14.974	14.838	15.232	14.991
GM	16.171	16.004	15.900	16.077	15.546	15.277	15.914	15.934
EL	16.010	15.918	16.068	16.156	15.773	15.483	15.892	15.807
CL	15.375	15.284	15.394	15.466	15.284	15.088	15.462	15.291
MM	15.870	15.551	15.604	15.745	15.574	15.409	15.727	15.744
SC	16.221	15.791	16.048	16.077	15.911	15.611	16.098	16.072
CO	16.183	15.808	16.059	16.090	15.922	15.649	15.998	16.011
FA	16.025	15.928	16.159	16.197	16.032	15.884	15.970	15.911
OF	15.043	14.434	14.959	14.977	14.685	14.544	14.857	14.878
ST	15.836	15.597	16.039	16.026	15.906	15.684	15.911	15.822
AIR FORCE PERCENTILE								
M	25.967	25.474	25.327	25.400	24.853	24.500	25.554	25.640
A	23.821	24.014	23.882	24.001	23.764	23.820	24.157	23.799
G	23.878	23.912	23.870	24.129	23.886	23.729	24.281	23.924
E	23.904	23.760	23.981	24.133	23.639	23.202	23.783	23.644
NAVY SSSS								
EL	28.318	28.157	28.423	28.577	27.900	27.393	28.103	27.963
E	30.071	29.951	30.378	30.446	30.463	29.999	30.065	30.011
CL	17.686	17.653	17.726	17.738	17.658	17.611	17.875	17.618
GT	13.882	13.886	13.886	13.920	13.859	13.729	14.097	13.874
ME	21.254	20.478	21.010	21.097	20.854	20.644	21.137	21.163
EG	13.825	13.550	13.669	13.851	13.474	13.250	13.582	13.821
CT	23.794	23.716	23.773	23.846	23.783	23.650	23.964	23.700
HM	20.508	20.326	20.876	20.868	20.889	20.544	20.932	20.673
ST	23.794	23.716	23.773	23.846	23.783	23.650	23.964	23.700
MR	22.632	22.134	22.262	22.282	22.172	21.667	22.340	22.387
BC	18.220	18.188	18.264	18.344	18.031	18.021	18.435	18.107
MARINE CORPS STANDARD SCORE								
MM	16.841	16.623	16.459	16.589	16.591	16.232	16.688	16.653
CL	14.245	14.219	14.282	14.338	14.093	14.090	14.405	14.151
GT	15.990	15.787	16.113	16.083	15.998	15.795	16.049	15.887
EL	16.019	15.926	16.077	16.164	15.780	15.492	15.900	15.814

Table 15

Composite-Category-by-Test-Form Chi-Square for ASVAB 15/16/17, After Equatings Based on IOT&E of ASVAB 15/16/17

Composite		D.F.	Chi-Square	Prob.
AFQT	2VE + AR + MK	42	161.889*	.000
	ARMY			
GT	VE + AR	6	16.118*	.013
GM	MK + EI + AS + GS	30	61.126*	.001
EL	AR + MK + EI + GS	48	85.668	.001
CL	AR + MK + VE	36	77.358*	.000
MM	NO + AS + MC + EI	24	105.695*	.000
SC	AR + AS + MC + VE	24	46.598	.004
CO	CS + AR + MC + AS	24	67.394*	.000
FA	AR + CS + MC + MK	24	47.832	.003
OF	NO + AS + MC + VE	24	54.103*	.000
ST	VE + MK + MC + GS	42	68.413	.006
	NAVY			
EL	AR + MK + EI + GS	24	48.487*	.002
E	AR + GS + 2MK	30	36.016	.208
CL	NO + CS + VE	6	3.010	.808
GT	VE + AR	30	102.940*	.000
ME	VE + MC + AS	18	51.008*	.000
EG	MK + AS	6	13.519*	.036
CT	VE + AR + NO + CS	6	3.815	.702
HM	VE + MK + GS	12	20.890	.052
ST	VE + AR + MC	6	18.101*	.006
MR	AR + MC + AS	18	47.849*	.000
BC	VE + MK + CS	12	38.865*	.000
	AIR FORCE			
M	MC + GS + 2AS	30	75.807*	.000
A	NO + CS + VE	42	40.596	.533
G	VE + AR	60	138.701*	.000
E	AR + MK + EI + GS	60	88.960	.009
	MARINE CORPS			
MM	AR + EI + MC + AS	24	90.074*	.000
CL	VE + MK + CS	30	94.259*	.000
GT	VE + AR + MC	24	55.064*	.000
EL	AR + MK + EI + GS	24	38.179	.033

* Chi-Square > 2 x D.F.

Table 16

Standard Deviations of Composites from ASVAB 15/16/17 IOT&E

Composite		15C	15A	15B	16A	16B	17A	17B
AFQT	2VE + AR + MK	24.05	23.85	24.15	23.79	24.31	24.06	23.85
	ARMY							
GT	VE + AR	15.92	15.82	15.96	15.88	16.03	15.91	15.88
GM	MK + EI + AS + GS	17.07	16.44	16.67	16.40	16.55	16.78	16.66
EL	AR + MK + EI + GS	16.80	16.23	16.53	16.30	16.53	16.49	16.44
CL	AR + MK + VE	16.10	15.90	16.04	15.86	16.01	15.97	15.84
MM	NO + AS + MC + EI	16.49	15.94	16.02	15.92	16.16	16.02	15.90
SC	AR + AS + MC + VE	17.10	16.60	16.70	16.68	16.72	16.59	16.49
CO	CS + AR + MC + AS	16.63	16.17	16.31	16.28	16.33	16.09	16.01
FA	AR + CS + MC + MK	16.28	16.18	16.30	16.15	16.22	15.97	15.86
OF	NO + AS + MC + VE	15.78	15.21	15.23	15.29	15.38	15.29	15.08
ST	VE + MK + MC + GS	16.63	16.32	16.50	16.53	16.57	16.43	16.26
	NAVY							
EL	AR + MK + EI + GS	29.72	28.71	29.23	28.82	29.24	29.17	29.08
E	AR + GS + 2MK	30.99	30.54	30.88	30.70	30.98	30.74	30.56
CL	NO + CS + VE	18.36	18.25	18.37	18.36	18.48	18.24	18.26
GT	VE + AR	14.73	14.64	14.76	14.69	14.83	14.72	14.70
ME	VE + MC + AS	22.51	21.72	21.76	21.96	21.83	21.80	21.54
EG	MK + AS	14.44	14.08	14.17	13.86	13.91	14.08	13.94
CT	VE + AR + NO + CS	24.59	24.52	24.60	24.56	24.77	24.55	24.52
HM	VE + MK + GS	21.72	21.38	21.66	21.83	21.93	21.70	21.60
ST	VE + AR + MC	22.19	21.88	22.04	21.98	22.10	21.74	21.64
MR	AR + MC + AS	23.50	22.87	23.00	22.82	22.99	22.64	22.59
BC	VE + MK + CS	18.90	18.83	18.99	19.00	19.02	18.84	18.75
	AIR FORCE							
M	MC + GS + 2AS	27.12	26.36	26.49	26.45	26.48	26.62	26.52
A	NO + CS + VE	24.16	24.25	24.34	24.57	24.10	24.28	24.32
G	VE + AR	24.59	24.47	24.77	24.34	24.98	24.63	24.55
E	AR + MK + EI + GS	25.07	24.31	24.70	24.40	24.76	24.67	24.60
	MARINE CORPS							
MM	AR + EI + MC + AS	17.63	17.08	17.27	17.11	17.29	17.11	17.09
CL	VE + MK + CS	14.78	14.73	14.85	14.86	14.88	14.73	14.67
GT	VE + AR + MC	16.78	16.54	16.66	16.62	16.71	16.44	16.36
EL	AR + MK + EI + GS	16.81	16.24	16.53	16.30	16.53	16.49	16.45

Table 17

Standard Deviations of Composites from ASVAB 18/19 IOT&E

Composite		15C	18A	18B	19A	19B
AFQT	2VE + AR + MK	23.94	24.32	24.03	24.35	23.95
	ARMY					
GT	VE + AR	15.77	15.79	15.72	15.85	15.70
GM	MK + EI + AS + GS	16.67	16.30	16.13	16.15	16.15
EL	AR + MK + EI + GS	16.53	16.58	16.46	16.32	16.28
CL	AR + MK + VE	15.97	16.15	16.03	16.13	15.93
MM	NO + AS + MC + EI	16.67	16.13	16.06	16.05	16.16
SC	AR + AS + MC + VE	16.81	16.28	16.26	16.42	16.46
CO	CS + AR + MC + AS	16.87	16.48	16.50	16.66	16.64
FA	AR + CS + MC + MK	16.73	17.07	17.06	17.23	17.01
OF	NO + AS + MC + VE	16.05	15.61	15.59	15.65	15.69
ST	VE + MK + MC + GS	16.37	16.70	16.57	16.73	16.59
	NAVY					
EL	AR + MK + EI + GS	29.24	29.34	29.12	28.87	28.79
E	AR + GS + 2MK	30.84	31.54	31.34	31.31	31.02
CL	NO + CS + VE	19.30	19.32	19.54	19.41	19.17
GT	VE + AR	14.59	14.62	14.54	14.67	14.52
ME	VE + MC + AS	22.08	21.31	21.29	21.40	21.48
EG	MK + AS	14.09	13.84	13.74	13.83	13.85
CT	VE + AR + NO + CS	25.91	26.14	26.25	26.20	25.81
HM	VE + MK + GS	21.34	21.95	21.73	21.77	21.58
ST	VE + AR + MC	21.96	22.04	21.98	22.27	22.12
MR	AR + MC + AS	23.14	22.22	22.30	22.43	22.58
BC	VE + MK + CS	19.40	19.61	19.66	19.58	19.33
	AIR FORCE					
M	MC + GS + 2AS	26.16	24.86	24.83	24.80	24.89
A	NO + CS + VE	24.99	25.09	25.25	25.14	25.07
G	VE + AR	24.82	24.93	24.78	25.00	24.79
E	AR + MK + EI + GS	24.56	24.65	24.42	24.29	24.22
	MARINE CORPS					
MM	AR + EI + MC + AS	17.30	16.64	16.59	16.68	16.80
CL	VE + MK + CS	15.17	15.33	15.38	15.31	15.11
GT	VE + AR + MC	16.60	16.67	16.61	16.84	16.72
EL	AR + MK + EI + GS	16.54	16.60	16.47	16.33	16.29

Table 18

AFQT Category Distributions for Three Subsets of the Data

All Initial Tests, N = 118,265

Form	Cut Score on Composite 92.00	64.00	49.00	30.00	20.00	15.00	9.00
	Percentage at or Above Cut Score						
15H	5.14	35.99	57.87	80.97	91.42	94.60	97.83
	Contrast with Reference Form Percentage (Form - 15H)						
15G	-0.95	1.11	-0.33	0.01	0.01	0.12	0.11
20A	-0.23	0.62	-0.21	1.11	0.67	0.24	-0.09
20B	0.81	0.69	-0.93	0.16	0.49	0.41	-0.01
21A	-0.03	-0.19	-0.89	0.87	0.82	0.63	0.03
21B	0.37	0.27	-0.15	1.15	0.96	0.78	0.21
22A	0.91	0.91	-0.62	0.61	0.42	0.21	-0.17
22B	0.05	0.57	-0.09	0.47	0.84	0.69	0.21

After Editing for Extreme Unbalancing, N = 99,254

Form	Cut Score on Composite 92.00	64.00	49.00	30.00	20.00	15.00	9.00
	Percentage at or Above Cut Score						
15H	5.07	35.95	57.62	80.91	91.39	94.53	97.76
	Contrast with Reference Form Percentage (Form - 15H)						
15G	-0.96	1.09	-0.36	-0.10	-0.08	0.16	0.15
20A	-0.16	0.58	-0.20	0.95	0.54	0.14	-0.16
20B	0.92	0.84	-0.86	0.10	0.58	0.49	0.13
21A	0.13	-0.22	-0.90	0.61	0.48	0.48	0.00
21B	0.41	-0.08	-0.06	0.95	0.81	0.71	0.19
22A	0.99	0.92	-0.47	0.29	0.15	0.05	-0.17
22B	0.17	0.11	-0.35	0.22	0.46	0.54	0.13

Strongly Balanced Samples, N = 59,976

Form	Cut Score on Composite 92.00	64.00	49.00	30.00	20.00	15.00	9.00
	Percentage at or Above Cut Score						
15H	5.30	37.34	59.55	82.22	92.05	95.14	98.05
	Contrast with Reference Form Percentage (Form - 15H)						
15G	-0.79	1.17	-0.56	-0.25	0.01	-0.14	-0.00
20A	-0.46	0.38	-0.36	1.42	0.93	0.31	0.05
20B	0.90	0.96	-0.73	0.20	0.52	0.38	-0.05
21A	-0.01	-0.29	-1.11	0.78	0.70	0.54	0.04
21B	0.36	0.55	0.02	1.26	0.91	0.58	0.24
22A	1.03	0.78	-0.82	0.60	0.53	0.11	-0.17
22B	0.06	0.18	-0.51	0.19	0.94	0.53	0.27

Table 19

Air Force M Composite Distributions for Three Subsets of the Data

All Initial Tests, N = 118,265

Form	Cut Score on Composite					
	89.00	61.00	57.00	51.00	45.00	44.00
	Percentage at or Above Cut Score					
15H	9.83	43.91	49.52	56.17	62.51	62.98
	Contrast with Reference Form Percentage (Form - 15H)					
15G	-0.16	0.31	-0.52	-0.65	-0.40	0.41
20A	-0.95	1.46	1.23	1.12	1.45	2.04
20B	-1.00	0.60	-0.01	0.07	0.23	0.76
21A	-1.58	-0.80	-0.23	-0.13	0.18	0.68
21B	-2.06	-0.33	0.50	0.95	1.48	2.09
22A	-0.40	0.87	-0.04	-0.19	-0.17	0.91
22B	-0.07	0.54	-0.44	-0.47	-0.13	0.90

After Editing for Extreme Unbalancing, N = 99,254

Form	Cut Score on Composite					
	89.00	61.00	57.00	51.00	45.00	44.00
	Percentage at or Above Cut Score					
15H	9.83	43.98	49.55	56.17	62.58	63.10
	Contrast with Reference Form Percentage (Form - 15H)					
15G	-0.12	0.31	-0.44	-0.54	-0.33	0.40
20A	-0.80	1.40	1.27	1.07	1.47	1.99
20B	-0.99	0.57	-0.03	0.01	0.17	0.64
21A	-1.42	-0.44	-0.03	-0.03	0.13	0.50
21B	-2.10	-0.13	0.74	1.10	1.63	2.16
22A	-0.36	0.72	-0.06	-0.15	-0.14	0.86
22B	-0.20	0.10	-0.85	-0.86	-0.52	0.54

Strongly Balanced Samples, N = 59,976

Form	Cut Score on Composite					
	89.00	61.00	57.00	51.00	45.00	44.00
	Percentage at or Above Cut Score					
15H	10.29	45.57	51.35	58.05	64.52	65.01
	Contrast with Reference Form Percentage (Form - 15H)					
15G	-0.08	0.64	-0.34	-0.63	-0.51	0.22
20A	-0.92	1.49	1.19	1.24	1.63	2.13
20B	-0.92	1.02	0.31	0.31	0.38	0.92
21A	-1.56	-1.05	-0.48	-0.31	-0.10	0.42
21B	-2.28	-0.38	0.27	0.87	1.28	1.76
22A	-0.86	0.90	-0.01	0.02	-0.10	0.84
22B	-0.04	0.31	-0.82	-0.77	-0.54	0.39

Table 20

Army GM Composite Distributions for Three Subsets of the Data

All Initial Tests, N = 118,265

Form	Cut Score on Composite				
	105.00	100.00	95.00	90.00	85.00
	Percentage at or Above Cut Score				
15H	46.79	58.70	68.32	78.28	85.86
	Contrast with Reference Form Percentage (Form - 15H)				
15G	-1.14	-1.45	-1.05	0.26	0.81
20A	0.52	0.75	1.17	0.88	0.81
20B	0.29	-0.07	-0.12	0.19	-0.08
21A	-0.86	-0.55	0.59	1.18	1.07
21B	-0.12	0.30	1.42	1.82	1.83
22A	-0.05	-0.68	0.12	-0.00	0.33
22B	0.00	-0.16	0.62	0.79	0.64

After Editing for Extreme Unbalancing, N = 99,254

Form	Cut Score on Composite				
	105.00	100.00	95.00	90.00	85.00
	Percentage at or Above Cut Score				
15H	46.48	58.49	68.11	78.28	85.96
	Contrast with Reference Form Percentage (Form - 15H)				
15G	-0.92	-1.28	-0.86	0.18	0.67
20A	0.70	0.92	1.14	0.61	0.53
20B	0.38	0.04	-0.11	0.17	-0.16
21A	-0.63	-0.40	0.72	1.08	0.89
21B	0.11	0.49	1.60	1.78	1.74
22A	0.24	-0.41	0.30	-0.15	0.04
22B	-0.06	-0.41	0.48	0.40	0.29

Strongly Balanced Samples, N = 59,976

Form	Cut Score on Composite				
	105.00	100.00	95.00	90.00	85.00
	Percentage at or Above Cut Score				
15H	48.80	60.74	70.47	79.89	86.86
	Contrast with Reference Form Percentage (Form - 15H)				
15G	-1.31	-1.90	-1.63	-0.05	0.88
20A	0.33	0.67	1.01	1.08	1.36
20B	0.63	0.29	-0.09	0.24	0.01
21A	-1.29	-0.79	-0.06	0.74	0.84
21B	-0.56	0.16	1.19	1.40	1.82
22A	-0.32	-1.00	-0.24	-0.05	0.43
22B	-0.55	-0.85	-0.38	0.45	0.71

Table 21

ASVAB Form 20A
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	GS	AR	WK	PC	NO	CS	Raw	Raw	GS	AR	WK	PC	NO	CS	Raw
0	20	25	20	20	20	22	0	45					61	50	45
1	20	27	20	21	20	22	1	46					61	51	46
2	22	28	20	24	20	23	2	47					61	51	47
3	24	29	21	27	20	23	3	48					62	52	48
4	25	31	22	30	20	24	4	49					62	53	49
5	27	32	24	33	20	24	5	50					62	53	50
6	29	33	25	36	21	25	6	51						54	51
7	31	34	26	39	22	25	7	52						55	52
8	33	35	28	42	22	26	8	53						55	53
9	35	36	29	44	23	26	9	54						56	54
10	37	37	31	47	24	27	10	55						56	55
11	39	38	32	50	25	27	11	56						57	56
12	41	40	33	52	26	28	12	57						58	57
13	43	41	34	55	27	28	13	58						58	58
14	45	42	35	58	28	29	14	59						59	59
15	47	44	37	61	29	30	15	60						60	60
16	49	45	38		30	30	16	61						60	61
17	50	47	39		32	31	17	62						61	62
18	52	48	40		33	32	18	63						62	63
19	54	50	41		34	32	19	64						62	64
20	56	51	43		36	33	20	65						63	65
21	58	53	44		37	34	21	66						63	66
22	60	54	45		38	35	22	67						64	67
23	62	56	46		39	35	23	68						65	68
24	64	57	47		40	36	24	69						65	69
25	67	59	49		42	37	25	70						66	70
26		60	50		43	38	26	71						66	71
27		62	51		44	39	27	72						67	72
28		63	52		45	39	28	73						67	73
29		65	54		46	40	29	74						68	74
30		66	55		47	41	30	75						69	75
31			56		48	41	31	76						69	76
32			58		50	42	32	77						70	77
33			59		51	43	33	78						70	78
34			60		52	43	34	79						71	79
35			61		53	44	35	80						71	80
36					54	45	36	81						71	81
37					55	45	37	82						72	82
38					56	46	38	83						72	83
39					57	47	39	84						72	84
40					58	47	40	85							85
41					59	48	41	86							86
42					59	48	42	87							87
43					60	49	43	88							88
44					60	50	44	89							89

continued

Table 21
(continued)

ASVAB Form 20A
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	AS	MK	MC	EI	VE	Raw
0	24	29	24	22	20	0
1	26	30	25	25	20	1
2	27	32	27	27	20	2
3	29	33	29	29	20	3
4	31	35	31	31	20	4
5	33	37	33	34	20	5
6	35	38	35	36	21	6
7	36	40	36	38	23	7
8	38	41	38	41	24	8
9	40	43	40	43	25	9
10	42	45	41	46	26	10
11	43	46	43	48	27	11
12	45	48	45	51	28	12
13	47	50	47	53	29	13
14	49	51	49	55	30	14
15	51	53	51	57	31	15
16	53	54	53	59	32	16
17	55	55	55	61	33	17
18	57	57	57	64	33	18
19	59	58	59	66	34	19
20	61	60	61	69	35	20
21	63	61	63		36	21
22	64	63	64		37	22
23	66	64	66		38	23
24	68	65	68		39	24
25	69	67	70		39	25
26					40	26
27					41	27
28					42	28
29					43	29
30					44	30
31					45	31
32					46	32
33					46	33
34					47	34
35					48	35
36					49	36
37					50	37
38					51	38
39					52	39
40					52	40
41					53	41
42					54	42
43					55	43
44					56	44
45					57	45
46					58	46
47					59	47
48					60	48
49					61	49
50					62	50

Table 22

ASVAB Form 20B
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	GS	AR	WK	PC	NO	CS	Raw
0	20	26	20	20	20	22	0
1	20	28	20	20	20	22	1
2	22	29	20	22	20	23	2
3	24	31	21	25	20	23	3
4	25	32	22	28	20	24	4
5	27	34	24	30	20	24	5
6	29	35	25	33	21	25	6
7	31	36	27	36	22	25	7
8	33	38	28	40	22	26	8
9	35	39	30	44	23	26	9
10	37	40	31	47	24	27	10
11	39	41	32	50	25	27	11
12	41	43	34	53	26	28	12
13	43	44	35	56	27	28	13
14	45	45	37	58	28	29	14
15	47	46	38	61	29	30	15
16	49	48	40		30	30	16
17	50	49	41		32	31	17
18	52	50	42		33	32	18
19	54	52	43		34	32	19
20	56	53	44		36	33	20
21	58	55	45		37	34	21
22	60	56	46		38	35	22
23	62	57	47		39	35	23
24	64	59	48		40	36	24
25	67	60	49		42	37	25
26		61	50		43	38	26
27		63	52		44	39	27
28		64	53		45	39	28
29		65	54		46	40	29
30		66	55		47	41	30
31			56		48	41	31
32			57		50	42	32
33			58		51	43	33
34			60		52	43	34
35			61		53	44	35
36					54	45	36
37					55	45	37
38					56	46	38
39					57	47	39
40					58	47	40
41					59	48	41
42					59	48	42
43					60	49	43
44					60	50	44

Raw	GS	AR	WK	PC	NO	CS	Raw
45					61	50	45
46					61	51	46
47					61	51	47
48					62	52	48
49					62	53	49
50					62	53	50
51						54	51
52						55	52
53						55	53
54						56	54
55						56	55
56						57	56
57						58	57
58						58	58
59						59	59
60						60	60
61						60	61
62						61	62
63						62	63
64						62	64
65						63	65
66						63	66
67						64	67
68						65	68
69						65	69
70						66	70
71						66	71
72						67	72
73						67	73
74						68	74
75						69	75
76						69	76
77						70	77
78						70	78
79						71	79
80						71	80
81						71	81
82						72	82
83						72	83
84						72	84
85							85
86							86
87							87
88							88
89							89

continued

Table 22
(continued)

ASVAB Form 20B
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	AS	MK	MC	EI	VE	Raw	Raw	AS	MK	MC	EI	VE	Raw
0	24	29	24	22	20	0	25	69	68	70		40	25
1	26	31	25	25	20	1	26					41	26
2	27	32	27	27	20	2	27					42	27
3	29	34	29	29	20	3	28					43	28
4	31	35	31	31	20	4	29					44	29
5	33	37	33	34	20	5	30					45	30
6	35	39	35	36	21	6	31					46	31
7	36	40	36	38	22	7	32					46	32
8	38	42	38	41	23	8	33					47	33
9	40	43	40	43	24	9	34					48	34
10	42	45	41	46	25	10	35					49	35
11	43	47	43	48	26	11	36					50	36
12	45	48	45	51	27	12	37					51	37
13	47	50	47	53	28	13	38					51	38
14	49	52	49	55	29	14	39					52	39
15	51	53	51	57	30	15	40					53	40
16	53	55	53	59	31	16	41					54	41
17	55	56	55	61	32	17	42					54	42
18	57	58	57	64	33	18	43					55	43
19	59	59	59	66	34	19	44					56	44
20	61	61	61	69	35	20	45					57	45
21	63	62	63		36	21	46					58	46
22	64	63	64		37	22	47					59	47
23	66	65	66		38	23	48					60	48
24	68	66	68		39	24	49					61	49
							50					62	50

Table 23

ASVAB Form 21A
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	GS	AR	WK	PC	NO	CS	Raw	Raw	GS	AR	WK	PC	NO	CS	Raw
0	20	25	20	20	20	21	0	45					61	50	45
1	20	27	20	20	20	22	1	46					61	50	46
2	22	28	20	22	20	22	2	47					61	51	47
3	25	30	20	25	20	23	3	48					62	51	48
4	27	31	22	27	20	23	4	49					62	52	49
5	29	32	23	29	20	24	5	50					62	53	50
6	30	34	24	32	21	24	6	51						53	51
7	32	35	26	35	22	25	7	52						54	52
8	34	36	27	38	23	25	8	53						55	53
9	35	37	29	42	24	26	9	54						55	54
10	37	39	30	45	25	26	10	55						56	55
11	38	40	31	49	26	27	11	56						56	56
12	40	41	33	52	27	27	12	57						57	57
13	42	43	34	55	28	28	13	58						58	58
14	43	44	36	58	29	28	14	59						58	59
15	45	45	37	61	30	29	15	60						59	60
16	47	46	39		31	30	16	61						60	61
17	49	48	40		32	30	17	62						60	62
18	52	49	41		34	31	18	63						61	63
19	54	50	42		35	32	19	64						61	64
20	56	52	43		36	33	20	65						62	65
21	58	53	45		38	33	21	66						63	66
22	60	54	46		39	34	22	67						63	67
23	62	56	47		40	35	23	68						64	68
24	65	57	48		41	36	24	69						64	69
25	67	58	49		42	37	25	70						65	70
26		60	50		43	37	26	71						66	71
27		61	51		45	38	27	72						66	72
28		63	52		46	39	28	73						67	73
29		64	54		47	40	29	74						67	74
30		66	55		48	40	30	75						68	75
31			56		49	41	31	76						68	76
32			57		50	42	32	77						69	77
33			59		51	42	33	78						69	78
34			60		52	43	34	79						70	79
35			61		53	44	35	80						70	80
36					54	44	36	81						71	81
37					55	45	37	82						71	82
38					56	46	38	83						72	83
39					57	46	39	84						72	84
40					58	47	40	85							85
41					59	47	41	86							86
42					59	48	42	87							87
43					60	48	43	88							88
44					60	49	44	89							89

continued

Table 23
(continued)

ASVAB Form 21A
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	AS	MK	MC	EI	VE	Raw	Raw	AS	MK	MC	EI	VE	Raw
0	24	29	23	22	20	0	25	69	67	70		39	25
1	25	30	25	25	20	1	26					40	26
2	27	32	27	27	20	2	27					41	27
3	29	33	28	29	20	3	28					42	28
4	30	35	30	31	20	4	29					43	29
5	32	37	32	34	20	5	30					44	30
6	33	38	33	36	20	6	31					45	31
7	35	40	35	39	21	7	32					45	32
8	37	41	37	41	22	8	33					46	33
9	39	43	38	44	23	9	34					47	34
10	41	45	40	46	24	10	35					48	35
11	43	47	42	49	25	11	36					49	36
12	45	48	44	51	26	12	37					50	37
13	47	50	46	53	27	13	38					51	38
14	49	51	48	55	28	14	39					51	39
15	51	53	50	57	29	15	40					52	40
16	52	54	52	59	30	16	41					53	41
17	54	55	54	62	31	17	42					54	42
18	56	57	56	64	32	18	43					55	43
19	58	58	58	66	33	19	44					56	44
20	59	60	60	68	34	20	45					57	45
21	61	61	62		35	21	46					58	46
22	63	63	64		36	22	47					59	47
23	65	64	65		37	23	48					60	48
24	67	66	67		38	24	49					61	49
							50					62	50

Table 24

ASVAB Form 21B
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	GS	AR	WK	PC	NO	CS	Raw	Raw	GS	AR	WK	PC	NO	CS	Raw
0	20	25	20	20	20	22	0	45					61	50	45
1	20	27	20	21	20	22	1	46					61	51	46
2	22	28	20	24	20	23	2	47					61	51	47
3	25	29	20	27	20	23	3	48					62	52	48
4	27	30	21	30	20	24	4	49					62	53	49
5	29	32	23	33	20	24	5	50					62	53	50
6	30	33	24	35	21	25	6	51						54	51
7	32	34	25	38	22	25	7	52						54	52
8	34	35	27	41	23	25	8	53						55	53
9	35	36	28	44	24	26	9	54						56	54
10	37	38	29	47	25	26	10	55						56	55
11	38	39	30	50	26	27	11	56						57	56
12	40	40	32	53	27	27	12	57						58	57
13	42	42	33	56	28	28	13	58						58	58
14	43	43	35	58	29	29	14	59						59	59
15	45	44	36	61	30	29	15	60						60	60
16	47	46	38		31	30	16	61						60	61
17	49	48	39		32	31	17	62						61	62
18	52	49	41		34	31	18	63						61	63
19	54	51	42		35	32	19	64						62	64
20	56	53	44		36	33	20	65						63	65
21	58	54	45		38	33	21	66						63	66
22	60	56	46		39	34	22	67						64	67
23	62	58	47		40	35	23	68						64	68
24	65	59	48		41	36	24	69						65	69
25	67	60	49		42	36	25	70						65	70
26		62	50		43	37	26	71						66	71
27		63	52		45	38	27	72						67	72
28		64	53		46	39	28	73						67	73
29		65	54		47	40	29	74						68	74
30		66	55		48	40	30	75						68	75
31			56		49	41	31	76						69	76
32			58		50	42	32	77						69	77
33			59		51	42	33	78						70	78
34			60		52	43	34	79						70	79
35			61		53	44	35	80						71	80
36					54	44	36	81						71	81
37					55	45	37	82						71	82
38					56	46	38	83						72	83
39					57	46	39	84						72	84
40					58	47	40	85							85
41					59	48	41	86							86
42					59	48	42	87							87
43					60	49	43	88							88
44					60	49	44	89							89

continued

Table 24
(continued)

ASVAB Form 21B
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	AS	MK	MC	EI	VE	Raw	Raw	AS	MK	MC	EI	VE	Raw
0	24	29	23	22	20	0	25	69	68	70		40	25
1	25	30	25	25	20	1	26					41	26
2	27	32	27	27	20	2	27					42	27
3	29	33	28	29	20	3	28					43	28
4	30	35	30	31	20	4	29					43	29
5	32	37	32	34	20	5	30					44	30
6	33	38	33	36	21	6	31					45	31
7	35	40	35	39	22	7	32					46	32
8	37	41	37	41	22	8	33					47	33
9	39	43	38	44	23	9	34					48	34
10	41	44	40	46	24	10	35					49	35
11	43	46	42	49	25	11	36					50	36
12	45	47	44	51	26	12	37					50	37
13	47	49	46	53	27	13	38					51	38
14	49	51	48	55	28	14	39					52	39
15	51	52	50	57	29	15	40					53	40
16	52	54	52	59	30	16	41					54	41
17	54	56	54	62	31	17	42					55	42
18	56	57	56	64	32	18	43					56	43
19	58	59	58	66	34	19	44					56	44
20	59	61	60	68	35	20	45					57	45
21	61	62	62		36	21	46					58	46
22	63	63	64		37	22	47					59	47
23	65	65	65		38	23	48					60	48
24	67	66	67		39	24	49					61	49
							50					62	50

Table 25

ASVAB Form 22A
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	GS	AR	WK	PC	NO	CS	Raw	Raw	GS	AR	WK	PC	NO	CS	Raw
0	20	25	20	20	20	22	0	45					60	49	45
1	21	27	20	20	20	22	1	46					61	50	46
2	23	28	20	23	20	23	2	47					61	51	47
3	25	29	20	25	20	23	3	48					61	51	48
4	27	30	21	28	20	24	4	49					62	52	49
5	29	32	23	31	20	24	5	50					62	52	50
6	31	33	24	34	21	25	6	51						53	51
7	33	35	25	37	22	25	7	52						54	52
8	34	36	27	40	23	26	8	53						54	53
9	36	37	28	43	24	26	9	54						55	54
10	38	38	30	46	25	27	10	55						55	55
11	39	39	31	49	26	27	11	56						56	56
12	41	41	33	52	26	28	12	57						57	57
13	43	42	34	54	27	28	13	58						57	58
14	45	43	36	57	28	29	14	59						58	59
15	46	45	37	60	30	29	15	60						58	60
16	48	46	39		31	30	16	61						59	61
17	50	48	40		32	31	17	62						60	62
18	52	49	41		33	32	18	63						60	63
19	54	51	42		35	32	19	64						61	64
20	56	52	43		36	33	20	65						61	65
21	58	54	45		37	34	21	66						62	66
22	61	55	46		38	34	22	67						63	67
23	63	57	47		39	35	23	68						63	68
24	66	58	48		41	36	24	69						64	69
25	68	59	49		42	37	25	70						64	70
26		61	50		43	37	26	71						65	71
27		62	51		44	38	27	72						66	72
28		63	53		45	39	28	73						66	73
29		65	54		46	40	29	74						67	74
30		66	55		47	40	30	75						67	75
31			56		48	41	31	76						68	76
32			58		49	42	32	77						69	77
33			59		50	42	33	78						69	78
34			60		51	43	34	79						70	79
35			61		52	44	35	80						70	80
36					54	44	36	81						71	81
37					55	45	37	82						71	82
38					56	45	38	83						71	83
39					57	46	39	84						72	84
40					57	46	40	85							85
41					58	47	41	86							86
42					59	48	42	87							87
43					59	48	43	88							88
44					60	49	44	89							89

continued

Table 25
(continued)

ASVAB Form 22A
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	AS	MK	MC	EI	VE	Raw	Raw	AS	MK	MC	EI	VE	Raw
0	24	29	23	22	20	0	25	69	67	70		39	25
1	26	31	25	25	20	1	26					40	26
2	28	33	27	27	20	2	27					41	27
3	29	35	28	29	20	3	28					42	28
4	31	36	30	32	20	4	29					43	29
5	33	38	32	34	20	5	30					44	30
6	35	39	34	37	20	6	31					45	31
7	37	41	36	39	21	7	32					46	32
8	39	42	38	41	22	8	33					46	33
9	40	43	39	43	23	9	34					47	34
10	42	45	41	46	24	10	35					48	35
11	44	46	43	48	25	11	36					49	36
12	46	48	45	51	26	12	37					50	37
13	47	49	47	53	27	13	38					51	38
14	49	51	49	55	28	14	39					52	39
15	51	52	51	58	29	15	40					52	40
16	52	53	53	60	30	16	41					53	41
17	54	55	55	62	31	17	42					54	42
18	56	56	57	64	32	18	43					55	43
19	57	57	59	66	33	19	44					56	44
20	59	59	61	69	34	20	45					57	45
21	61	60	63		35	21	46					58	46
22	63	62	64		36	22	47					59	47
23	65	63	66		37	23	48					60	48
24	67	65	68		38	24	49					61	49
							50					62	50

Table 26

ASVAB Form 22B
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	GS	AR	WK	PC	NO	CS	Raw	Raw	GS	AR	WK	PC	NO	CS	Raw
0	20	26	20	20	20	22	0	45					60	49	45
1	21	27	20	21	20	22	1	46					61	50	46
2	23	28	20	24	20	23	2	47					61	51	47
3	25	30	20	28	20	23	3	48					61	51	48
4	27	31	21	31	20	24	4	49					62	52	49
5	29	32	22	34	20	24	5	50					62	52	50
6	31	33	23	37	21	25	6	51						53	51
7	33	35	25	40	22	25	7	52						54	52
8	34	36	26	43	23	26	8	53						54	53
9	36	37	27	46	24	26	9	54						55	54
10	38	38	29	48	25	27	10	55						55	55
11	39	40	31	51	26	27	11	56						56	56
12	41	41	32	53	26	28	12	57						57	57
13	43	43	34	56	27	28	13	58						57	58
14	45	44	35	58	28	29	14	59						58	59
15	46	45	37	61	30	29	15	60						58	60
16	48	47	38		31	30	16	61						59	61
17	50	48	40		32	31	17	62						60	62
18	52	50	41		33	32	18	63						60	63
19	54	51	42		35	32	19	64						61	64
20	56	52	43		36	33	20	65						61	65
21	58	54	44		37	34	21	66						62	66
22	61	55	46		38	34	22	67						63	67
23	63	56	47		39	35	23	68						63	68
24	66	58	48		41	36	24	69						64	69
25	68	59	49		42	37	25	70						64	70
26		60	50		43	37	26	71						65	71
27		62	51		44	38	27	72						66	72
28		63	53		45	39	28	73						66	73
29		64	54		46	40	29	74						67	74
30		66	55		47	40	30	75						67	75
31			56		48	41	31	76						68	76
32			57		49	42	32	77						69	77
33			59		50	42	33	78						69	78
34			60		51	43	34	79						70	79
35			61		52	44	35	80						70	80
36					54	44	36	81						71	81
37					55	45	37	82						71	82
38					56	45	38	83						71	83
39					57	46	39	84						72	84
40					57	46	40	85							85
41					58	47	41	86							86
42					59	48	42	87							87
43					59	48	43	88							88
44					60	49	44	89							89

continued

Table 26
(continued)

ASVAB Form 22B
Conversion of Raw Test Scores to 1980 Standard Score Equivalents

Raw	AS	MK	MC	EI	VE	Raw	Raw	AS	MK	MC	EI	VE	Raw
0	24	29	23	22	20	0	25	69	67	70		40	25
1	26	31	25	25	20	1	26					41	26
2	28	33	27	27	20	2	27					42	27
3	29	34	28	29	20	3	28					43	28
4	31	36	30	32	20	4	29					44	29
5	33	38	32	34	20	5	30					45	30
6	35	39	34	37	21	6	31					46	31
7	37	41	36	39	21	7	32					46	32
8	39	42	38	41	22	8	33					47	33
9	40	44	39	43	23	9	34					48	34
10	42	46	41	46	24	10	35					49	35
11	44	47	43	48	25	11	36					50	36
12	46	49	45	51	26	12	37					50	37
13	47	50	47	53	27	13	38					51	38
14	49	52	49	55	29	14	39					52	39
15	51	53	51	58	30	15	40					53	40
16	52	54	53	60	31	16	41					54	41
17	54	56	55	62	32	17	42					55	42
18	56	57	57	64	34	18	43					55	43
19	57	59	59	66	35	19	44					56	44
20	59	60	61	69	36	20	45					57	45
21	61	62	63		37	21	46					58	46
22	63	63	64		38	22	47					59	47
23	65	64	66		39	23	48					60	48
24	67	66	68		40	24	49					61	49
							50					62	50

ASVAB 20, 21, AND 22 IOT&E SUPPLEMENT FIGURES 1-35

Figure 1a
Unsmoothed and Smoothed GS 15h

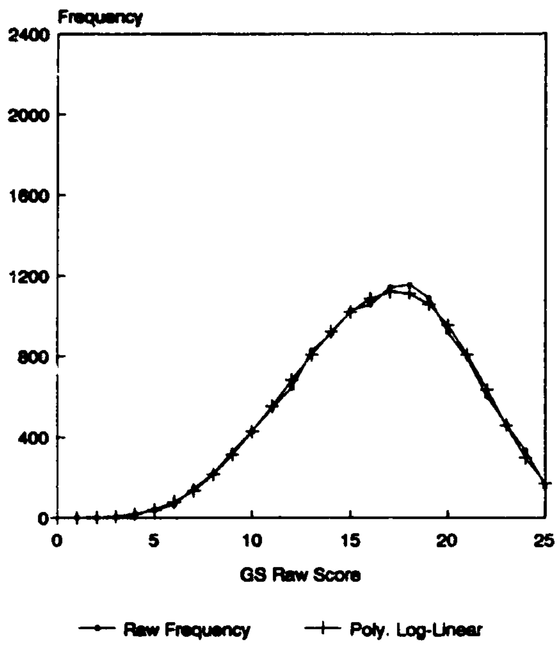


Figure 1b
Unsmoothed and Smoothed GS 20a/b

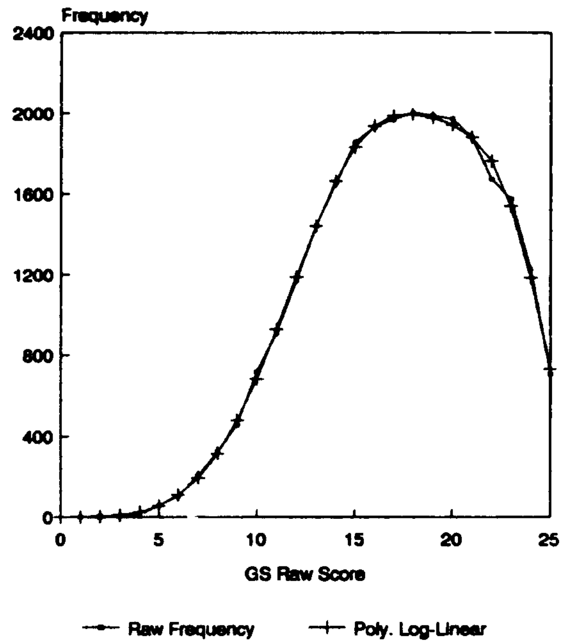


Figure 1c
Unsmoothed and Smoothed GS 21a/b

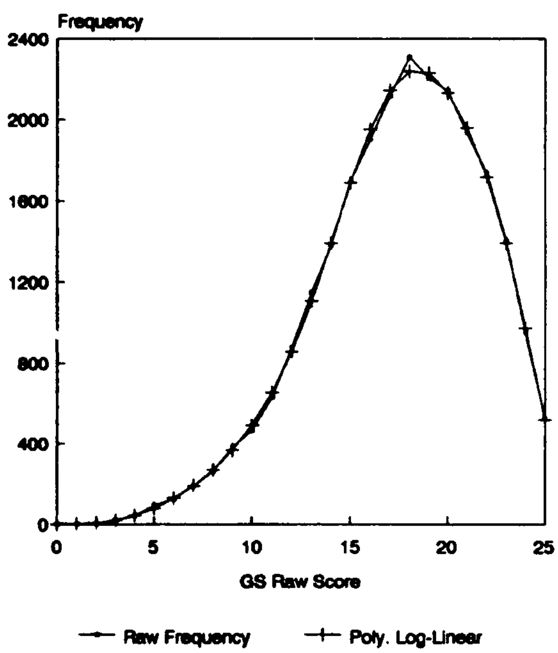


Figure 1d
Unsmoothed and Smoothed GS 22a/b

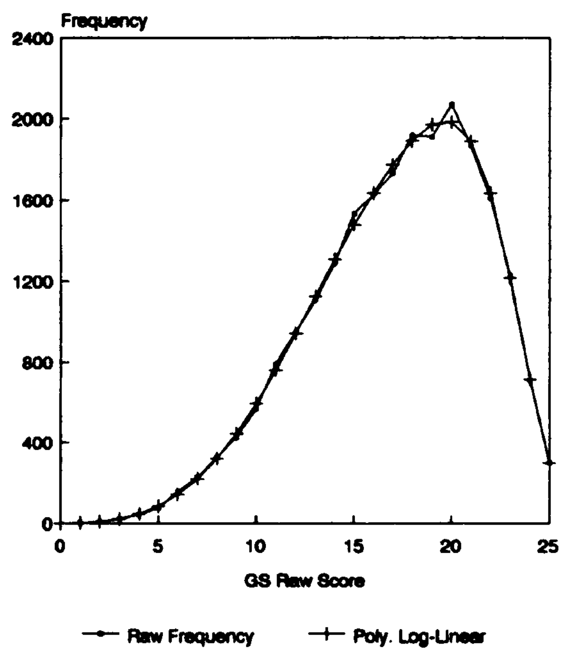


Figure 1. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating GS

Figure 2a
Unsmoothed and Smoothed AR 15h

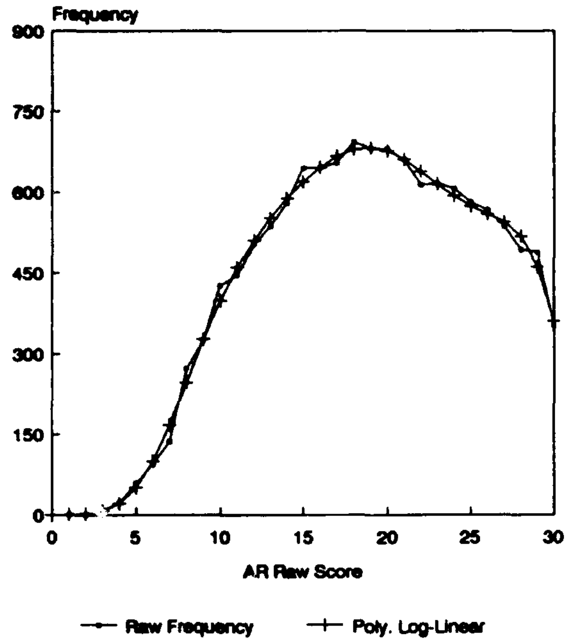


Figure 2b
Unsmoothed and Smoothed AR 20a

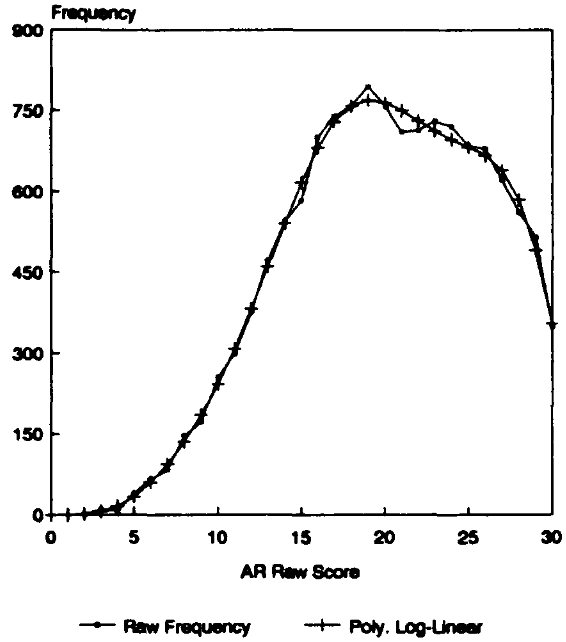


Figure 2c
Unsmoothed and Smoothed AR 20b

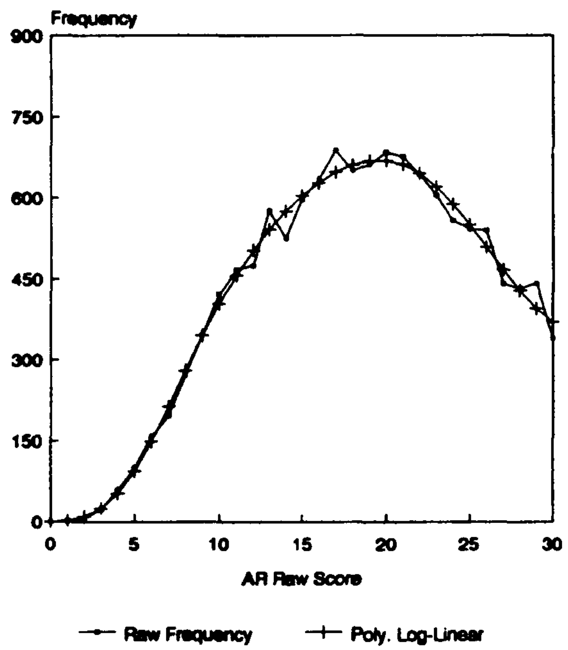


Figure 2d
Unsmoothed and Smoothed AR 21a

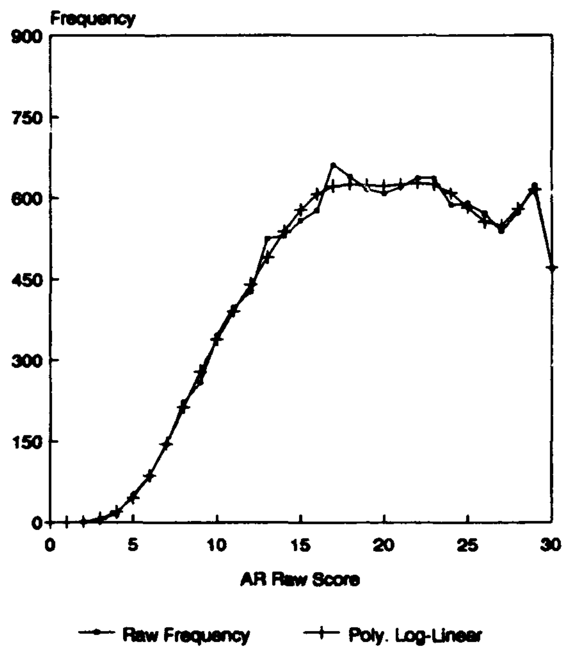


Figure 2. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating AR

Figure 2a
Unsmoothed and Smoothed AR 15h

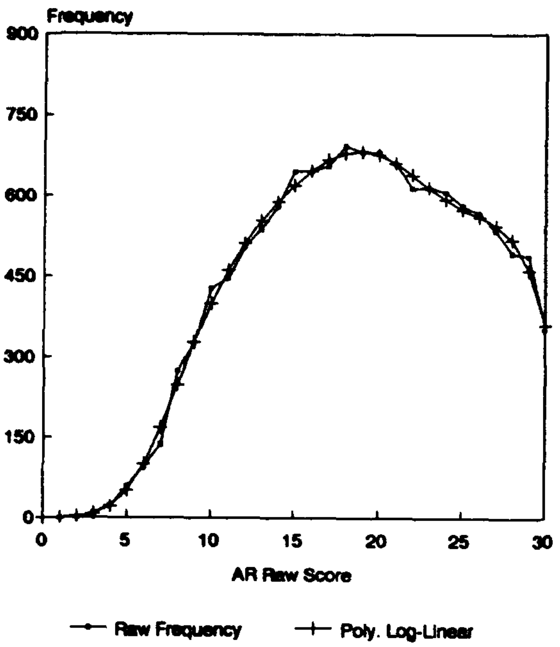


Figure 2e
Unsmoothed and Smoothed AR 21b

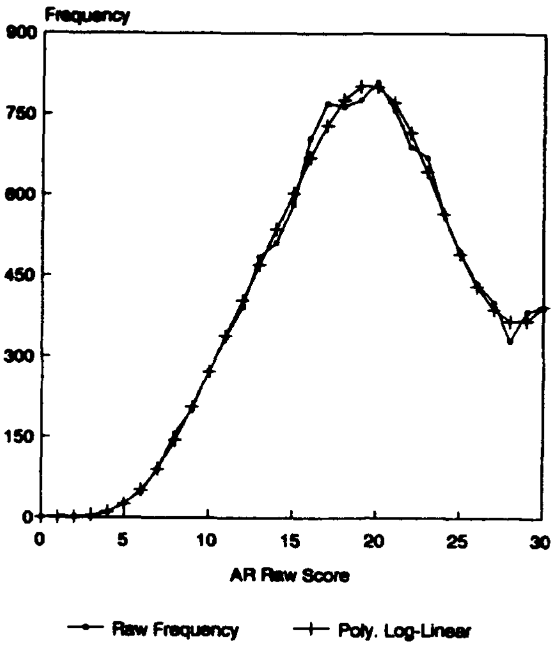


Figure 2f
Unsmoothed and Smoothed AR 22a

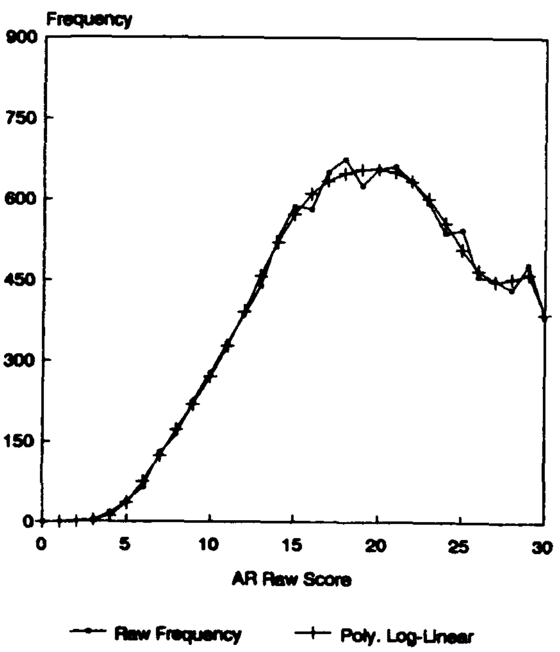


Figure 2g
Unsmoothed and Smoothed AR 22b

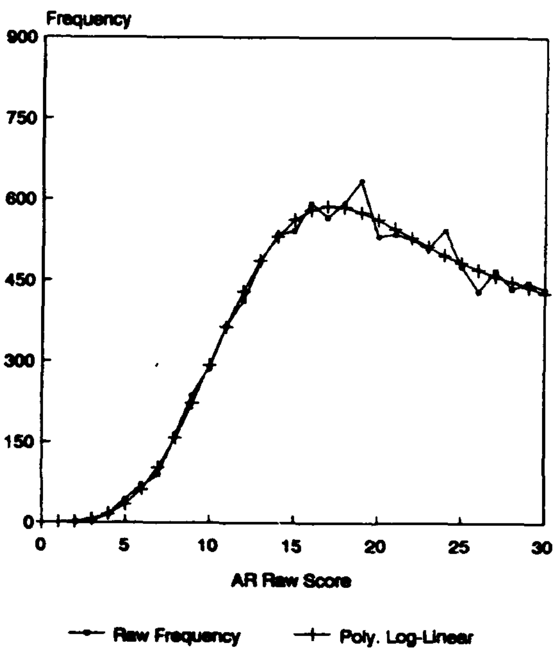


Figure 2, Con't. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating AR

Figure 3a
Unsmoothed and Smoothed WK 15h

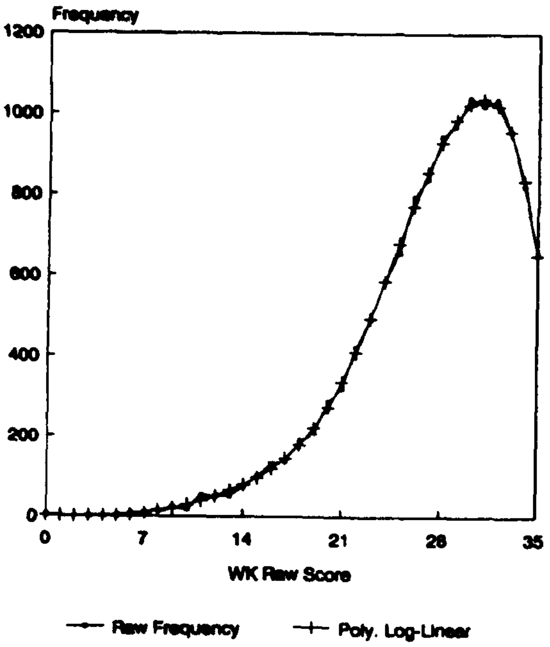


Figure 3b
Unsmoothed and Smoothed WK 20a

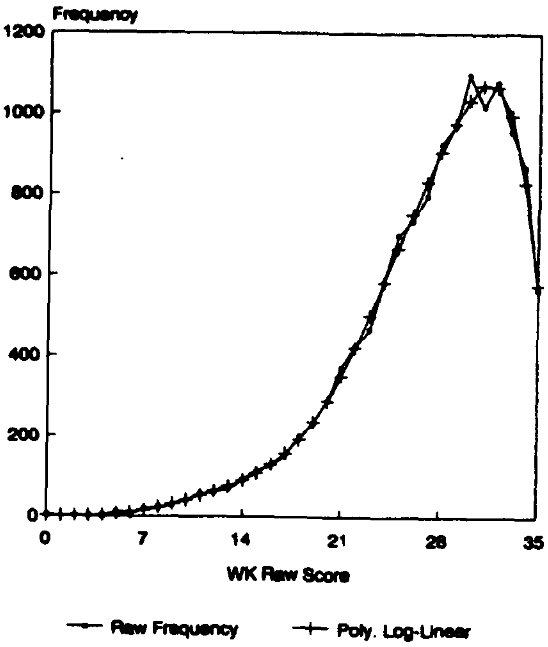


Figure 3c
Unsmoothed and Smoothed WK 20b

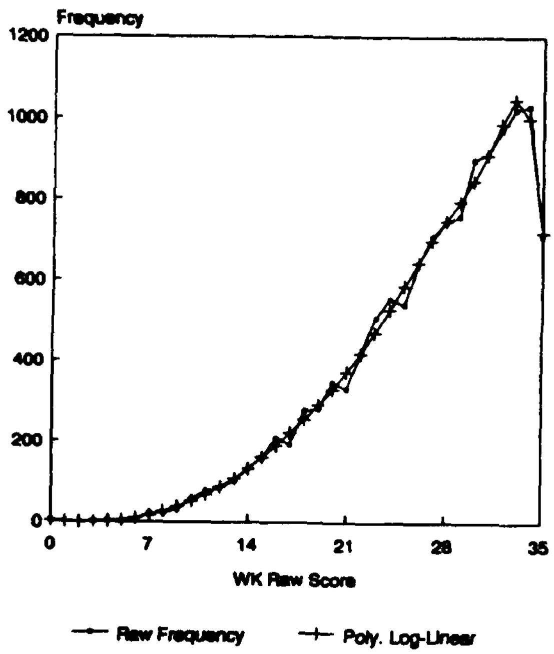


Figure 3d
Unsmoothed and Smoothed WK 21a

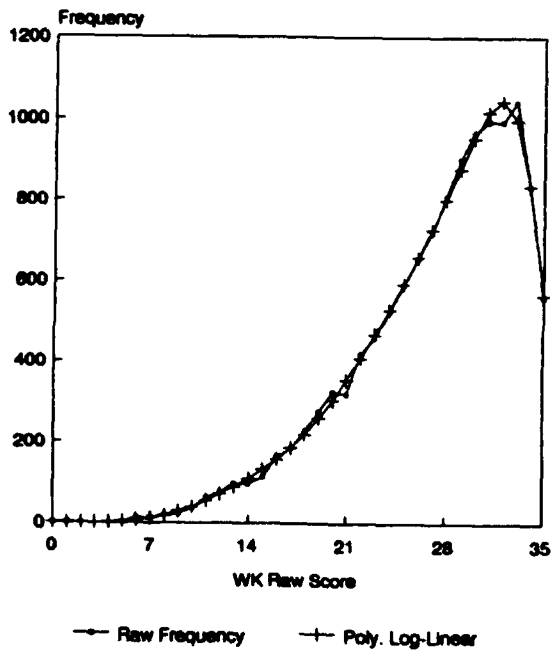


Figure 3. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating WK

Figure 3a
Unsmoothed and Smoothed WK 15h

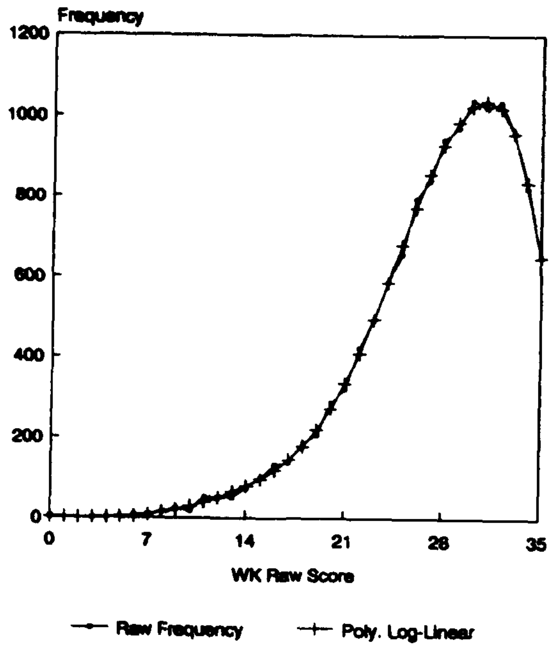


Figure 3e
Unsmoothed and Smoothed WK 21b

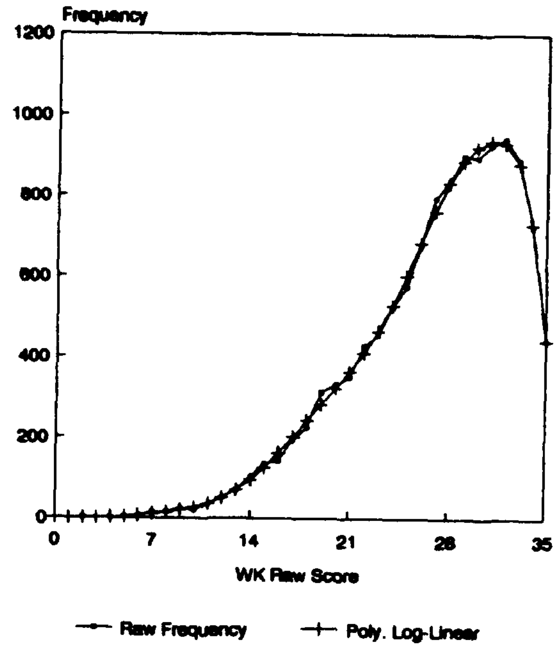


Figure 3f
Unsmoothed and Smoothed WK 22a

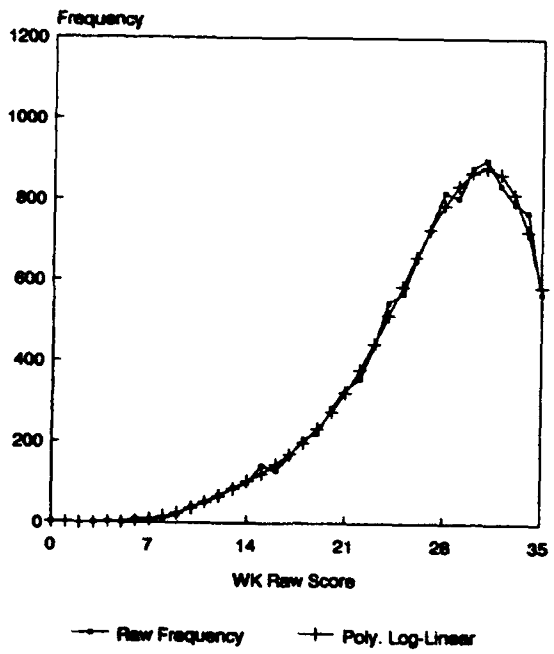


Figure 3g
Unsmoothed and Smoothed WK 22b

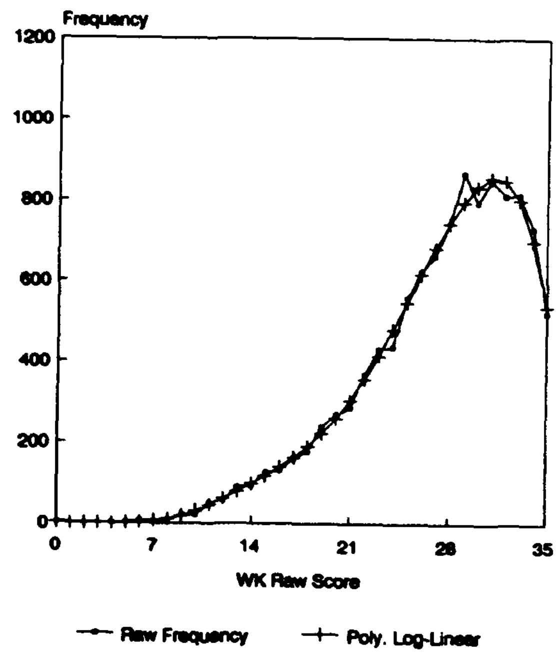


Figure 3, Con't. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating WK

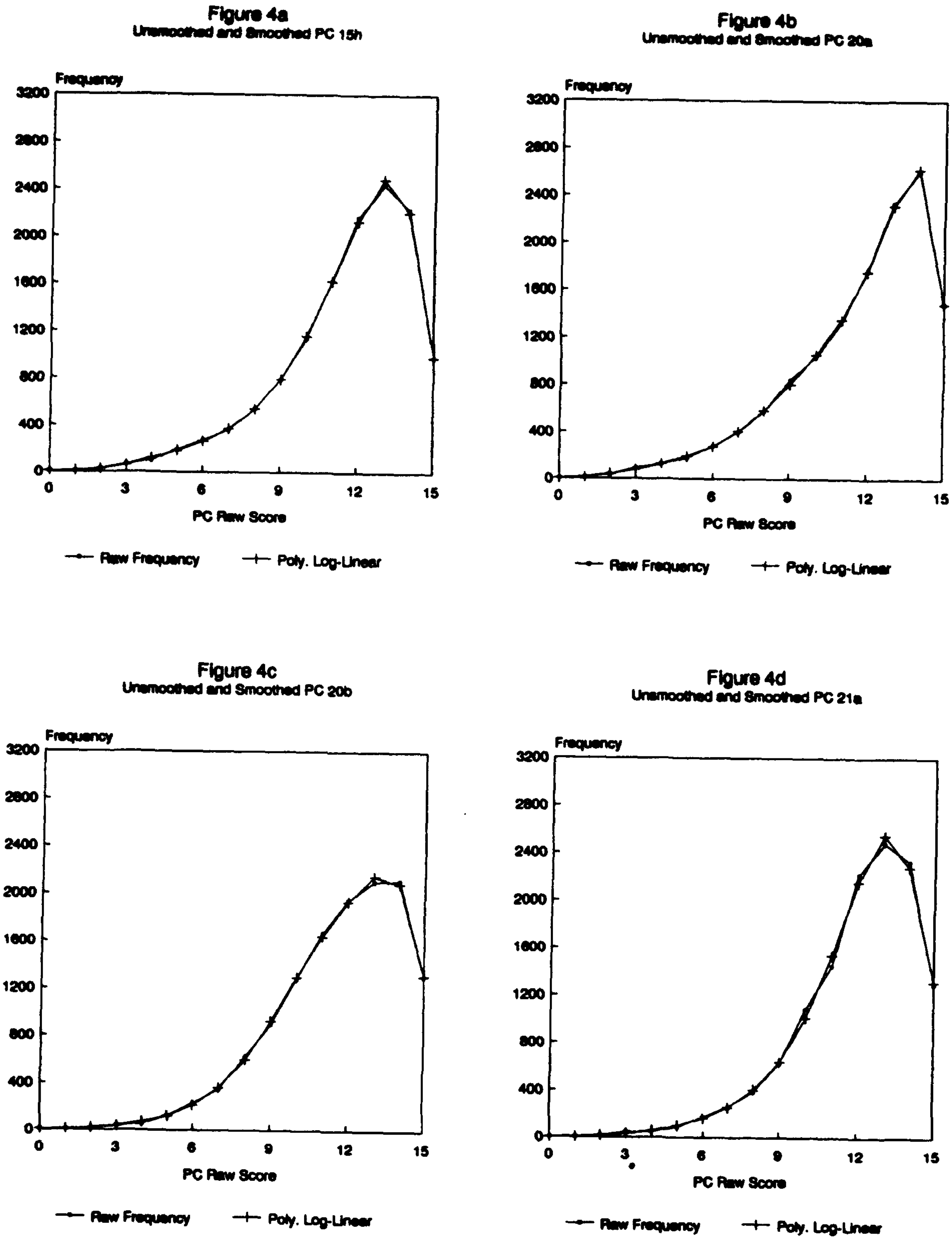


Figure 4. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating PC

Figure 4a
Unsmoothed and Smoothed PC 15h

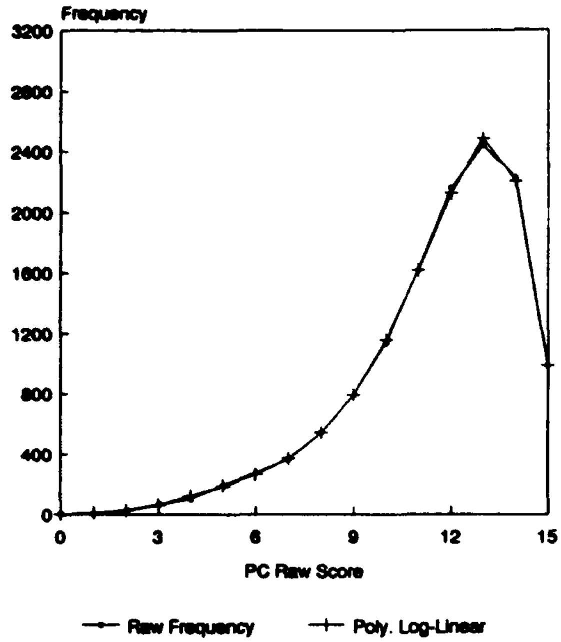


Figure 4e
Unsmoothed and Smoothed PC 21b

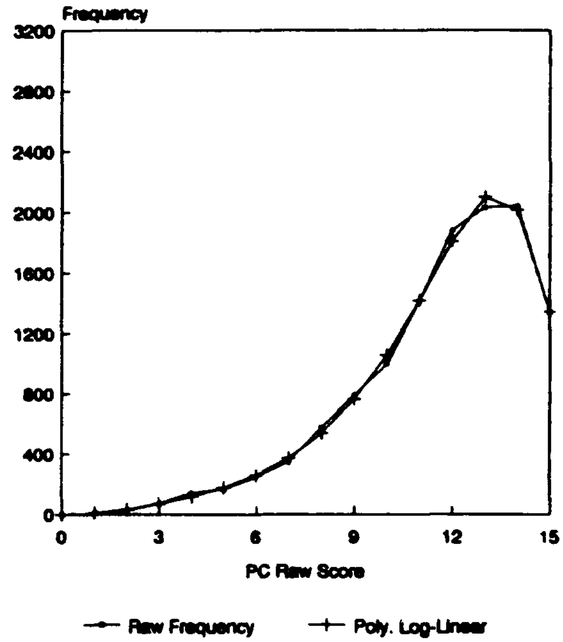


Figure 4f
Unsmoothed and Smoothed PC 22a

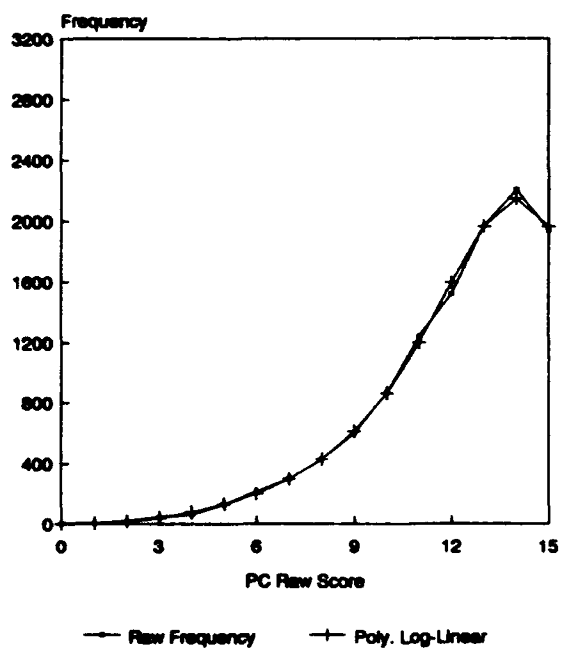


Figure 4g
Unsmoothed and Smoothed PC 22b

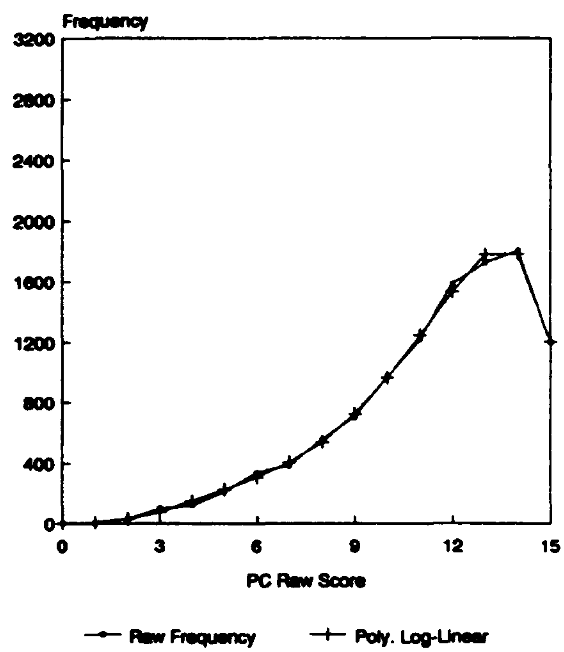


Figure 4, Con't. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating PC

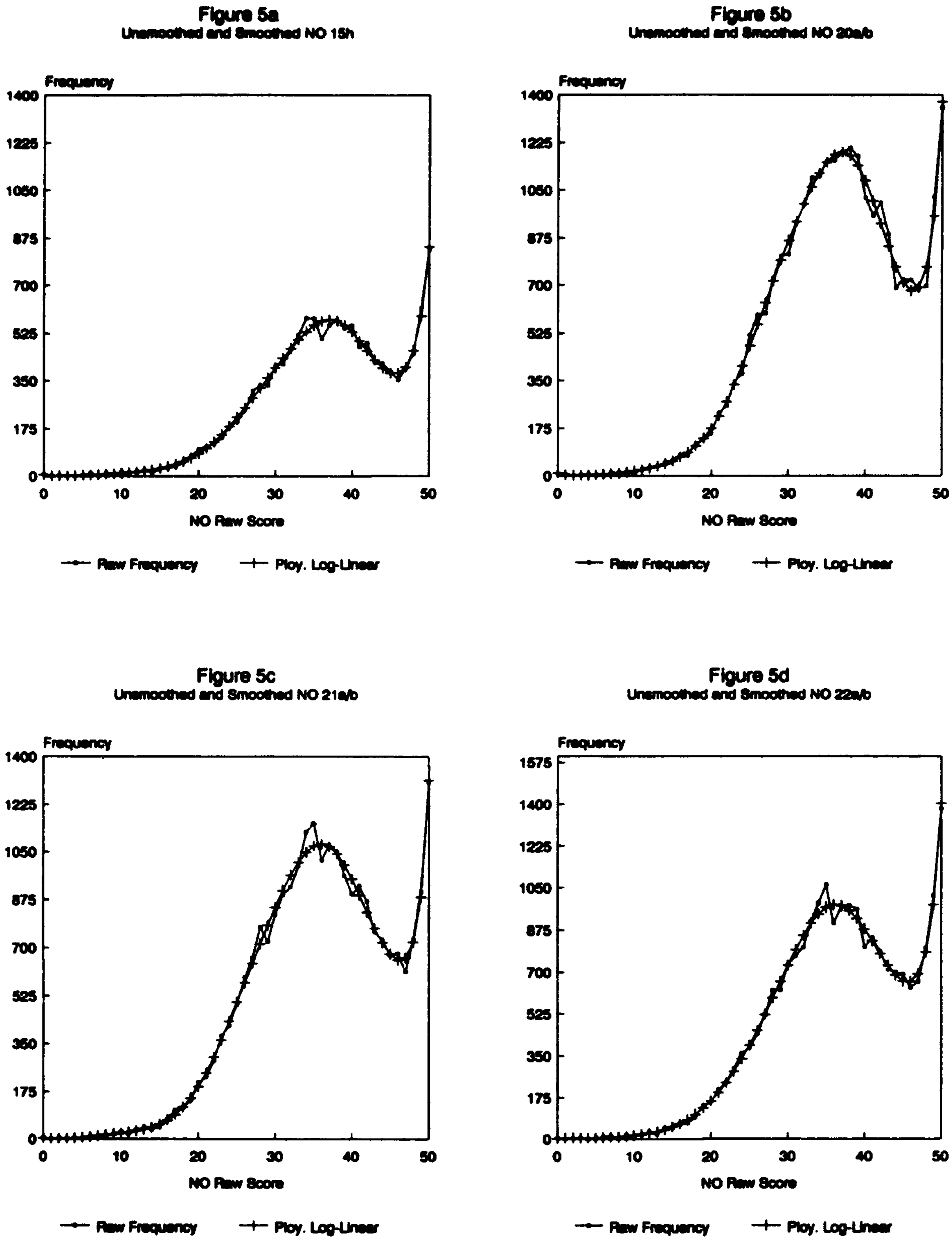


Figure 5. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating NO

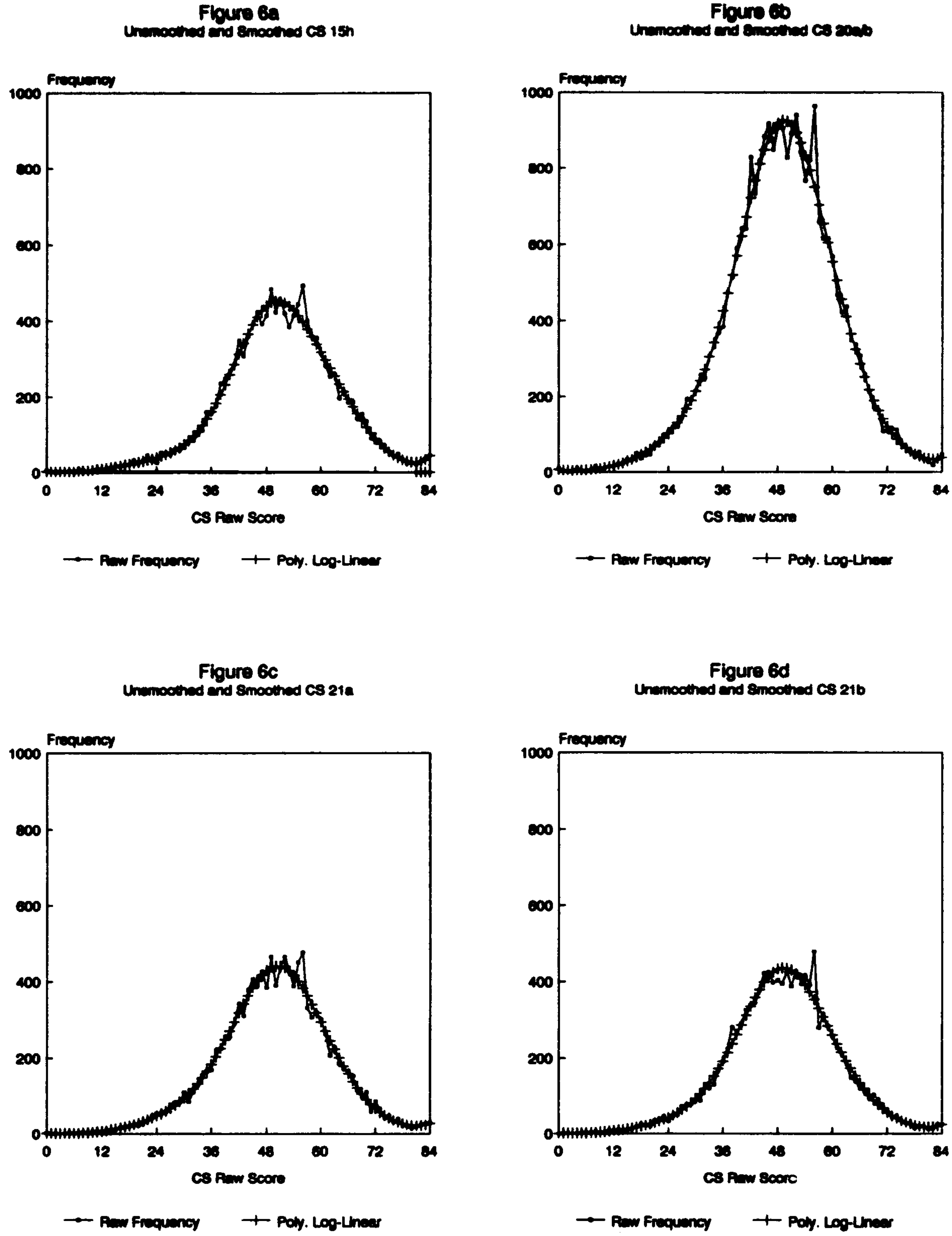


Figure 6. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating CS

Figure 6a
Unsmoothed and Smoothed CS 15h

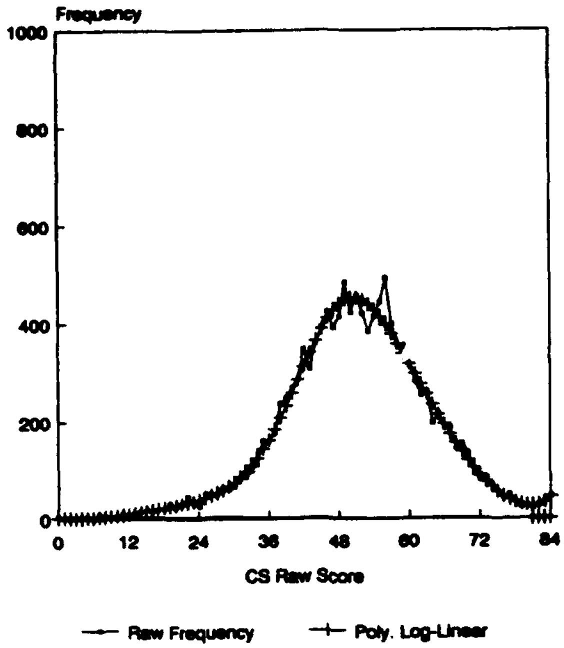


Figure 6e
Unsmoothed and Smoothed CS 22a/b

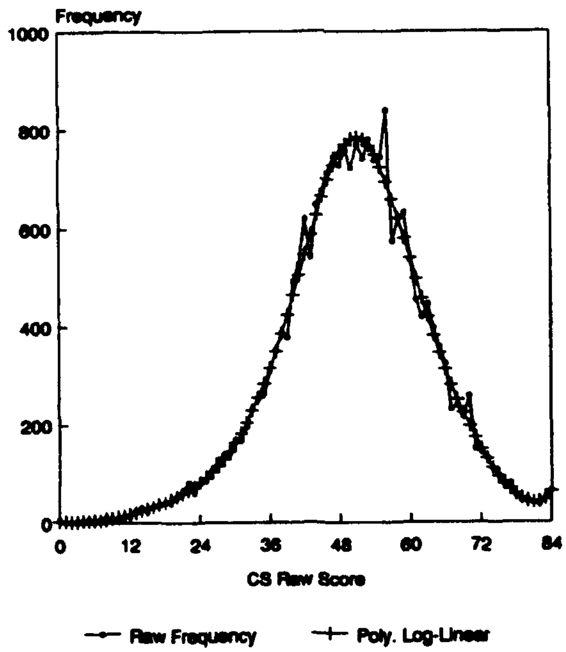


Figure 6, Con't. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating CS

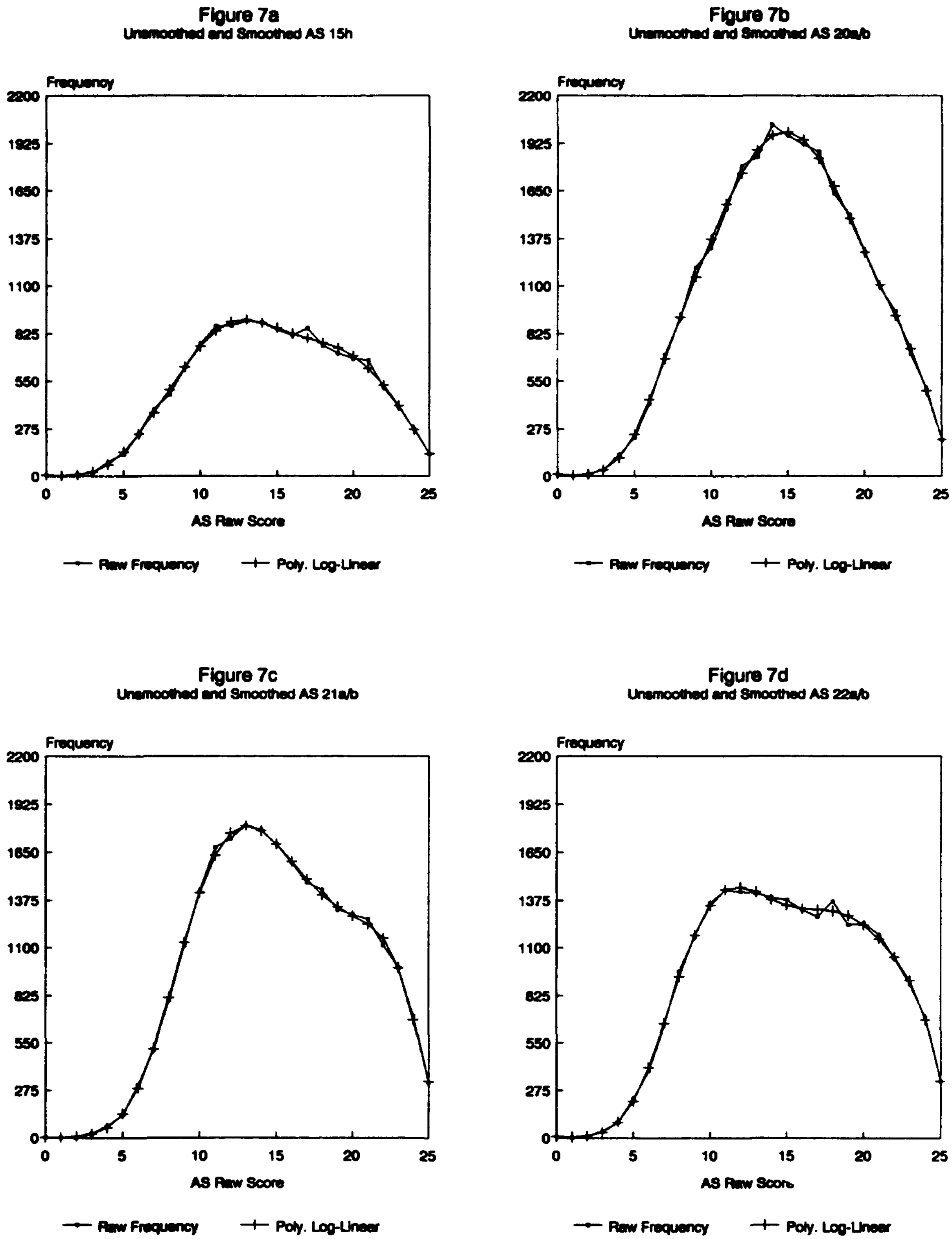


Figure 7. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating AS

Figure 8a
Unsmoothed and Smoothed MK 15h

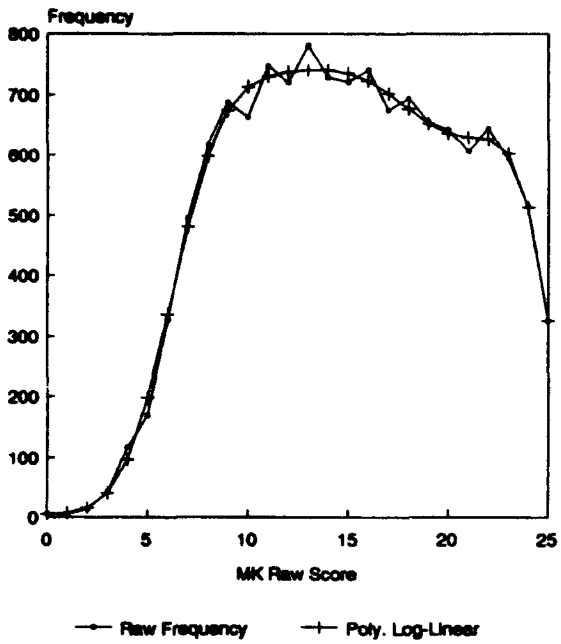


Figure 8b
Unsmoothed and Smoothed MK 20a

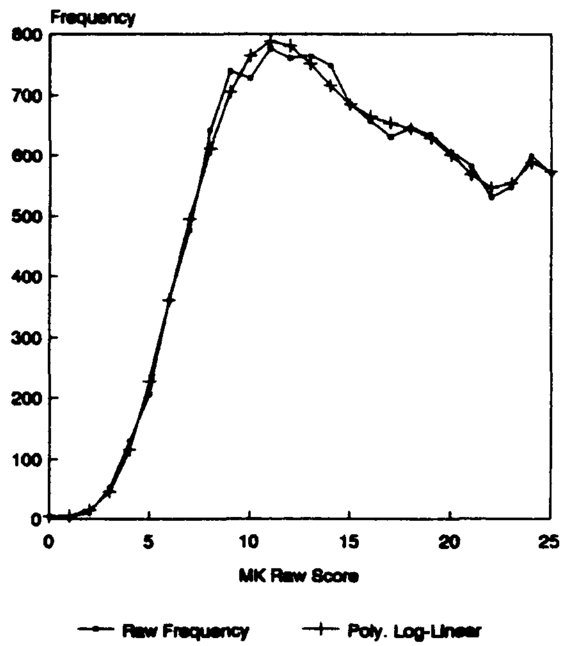


Figure 8c
Unsmoothed and Smoothed MK 20b

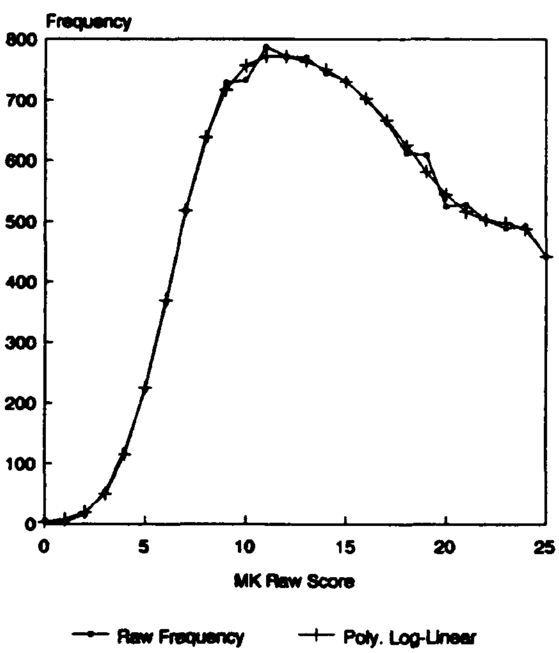


Figure 8d
Unsmoothed and Smoothed MK 21a

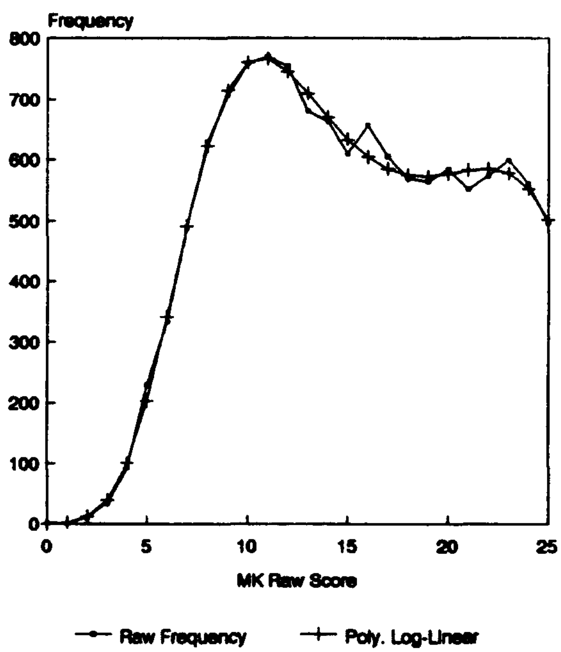


Figure 8. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating MK

Figure 8a
Unsmoothed and Smoothed MK 15h

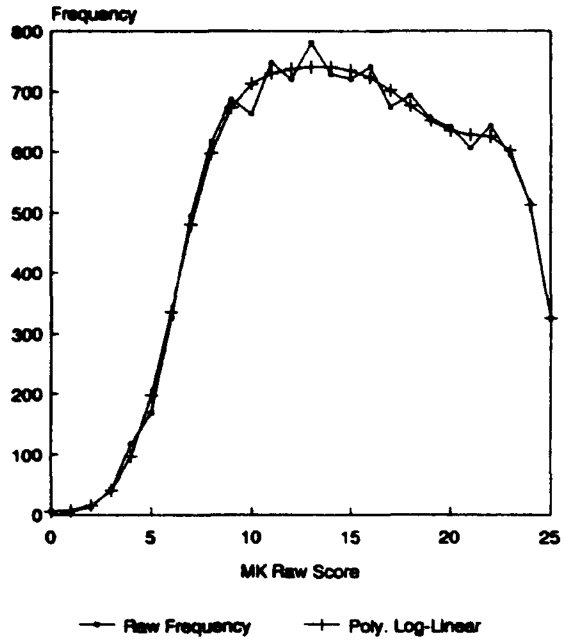


Figure 8e
Unsmoothed and Smoothed MK 21b

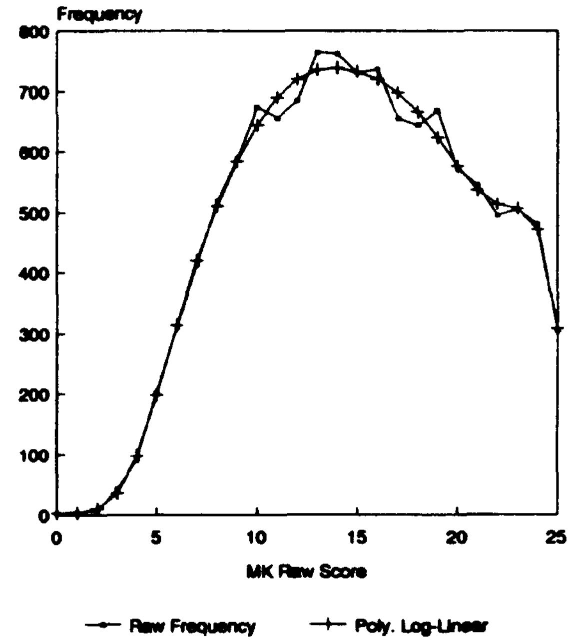


Figure 8f
Unsmoothed and Smoothed MK 22a

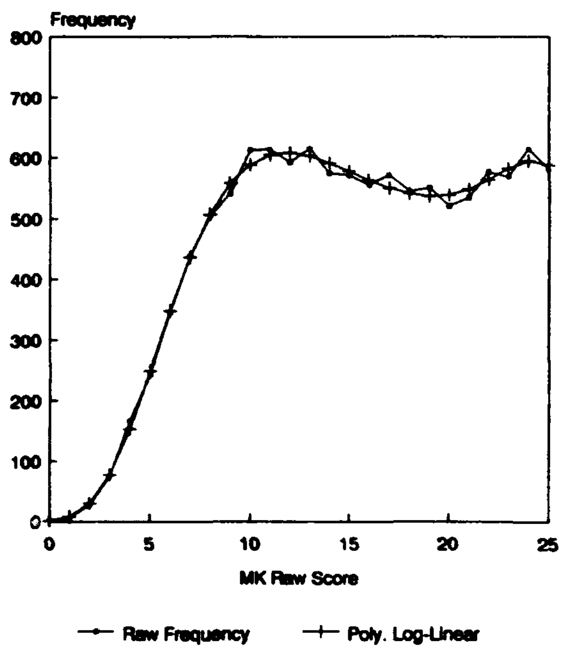


Figure 8g
Unsmoothed and Smoothed MK 22b

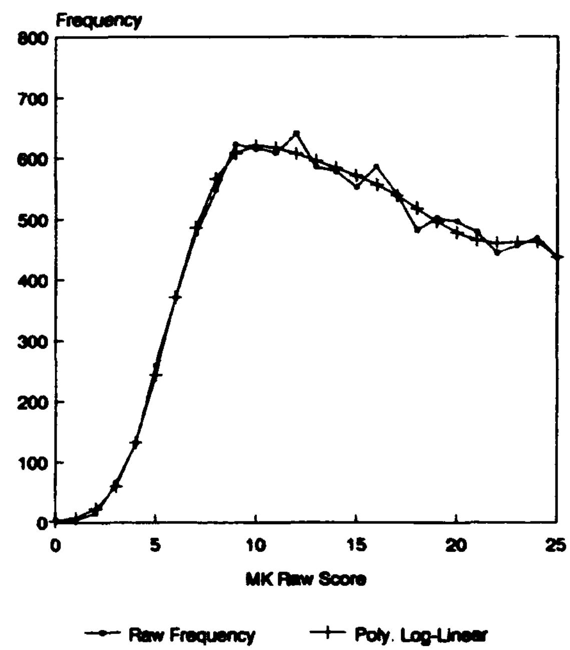


Figure 8, Con't. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating MK

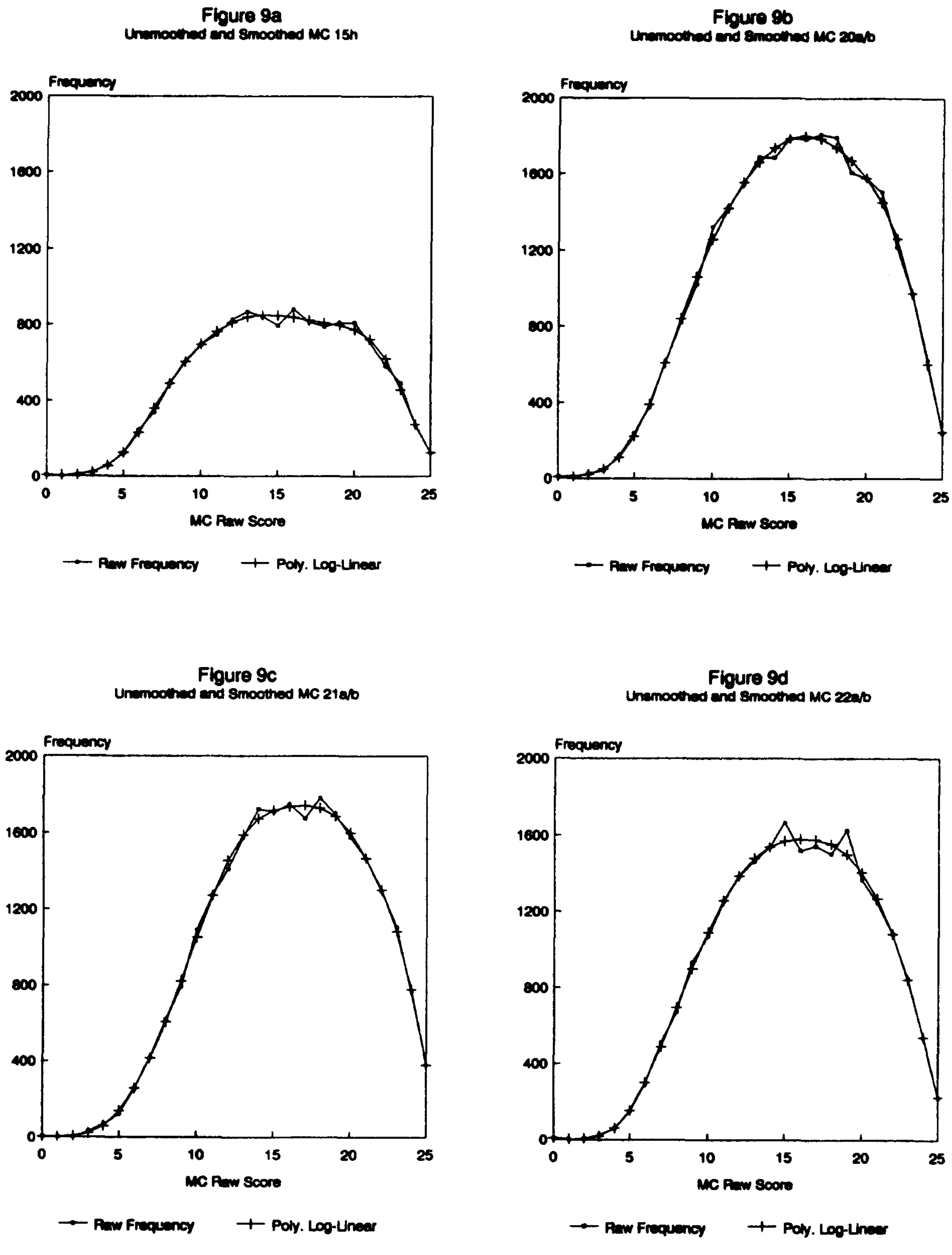


Figure 9. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating MC

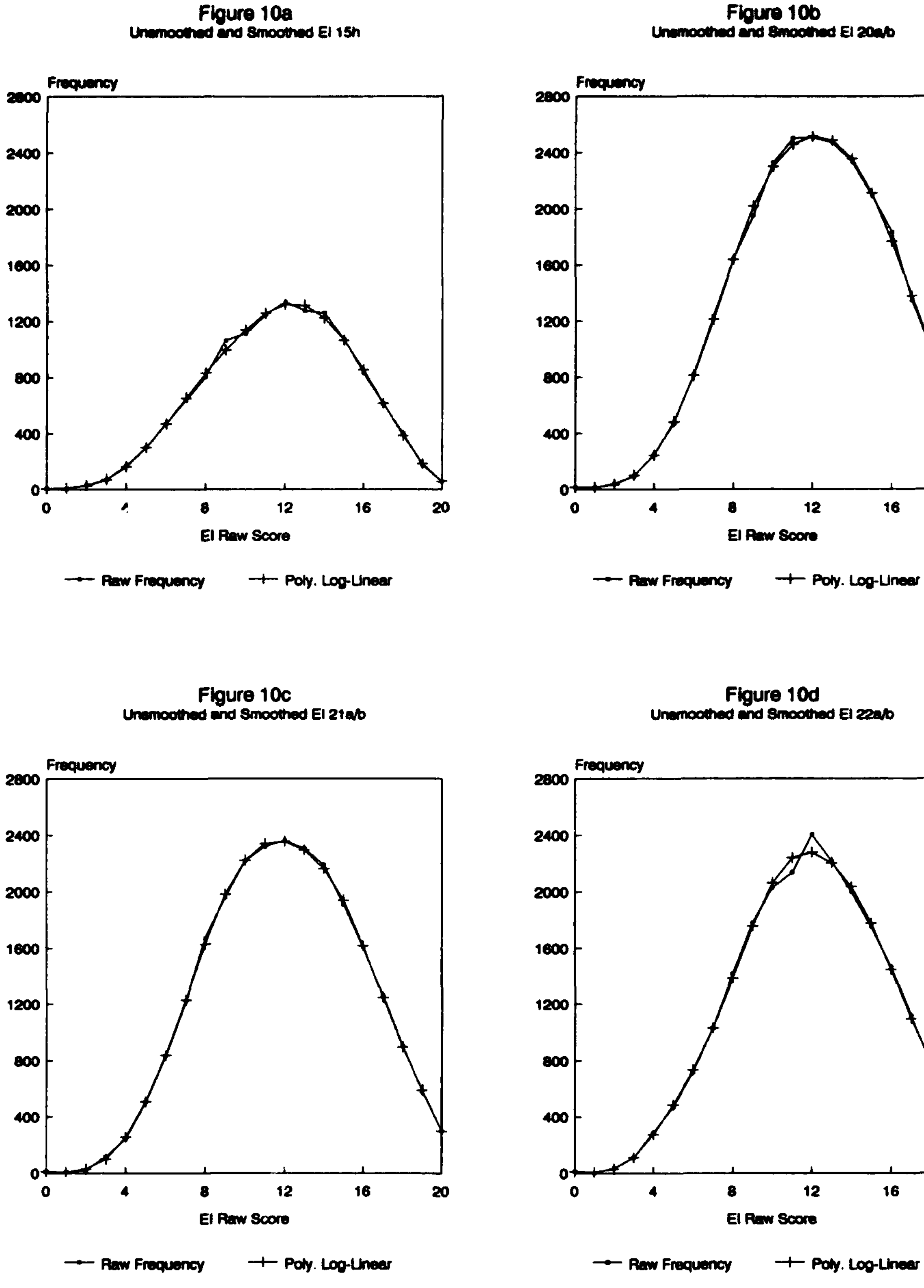


Figure 10. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating EI

Figure 11a
Unsmoothed and Smoothed VE 15h

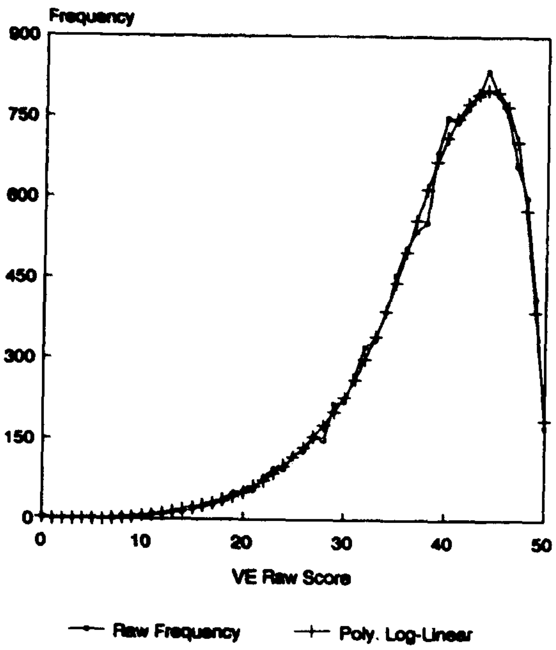


Figure 11b
Unsmoothed and Smoothed VE 20a

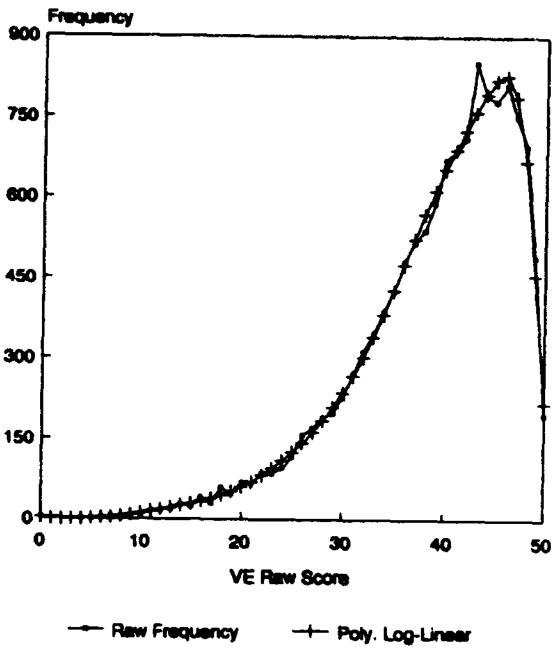


Figure 11c
Unsmoothed and Smoothed VE 20b

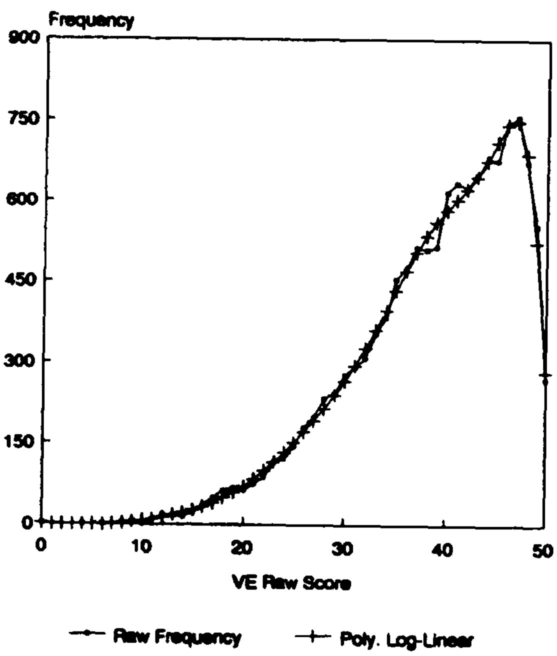


Figure 11d
Unsmoothed and Smoothed VE 21a

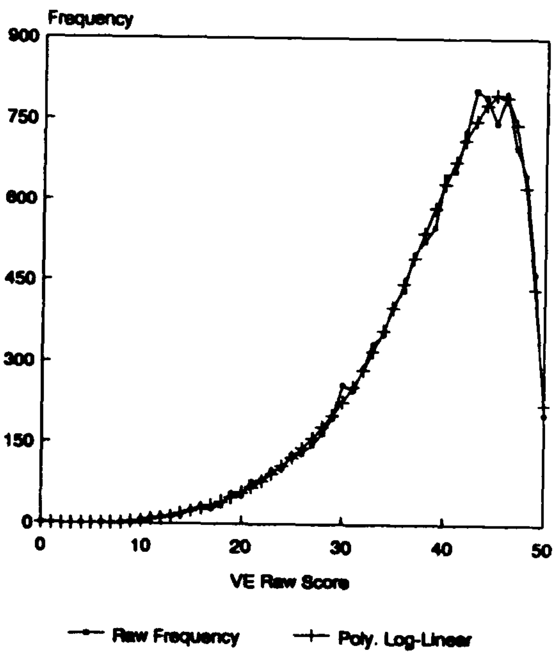


Figure 11. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating VE

Figure 11a
Unsmoothed and Smoothed VE 15h

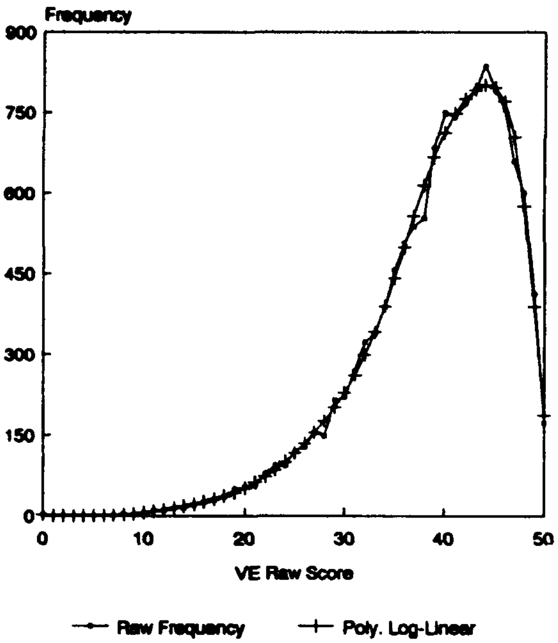


Figure 11e
Unsmoothed and Smoothed VE 21b

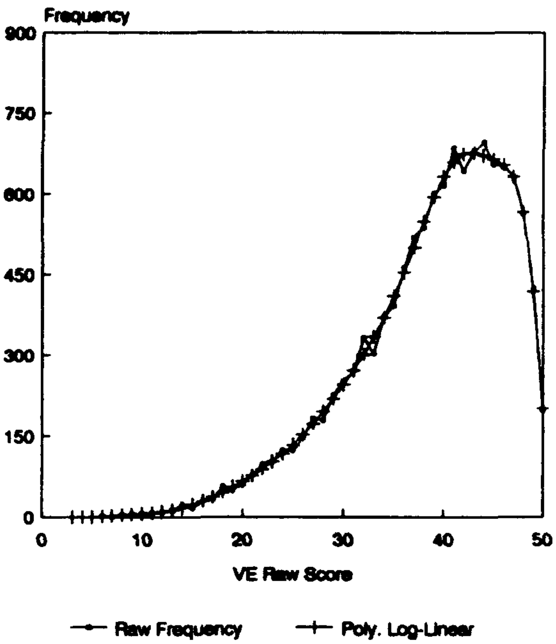


Figure 11f
Unsmoothed and Smoothed VE 22a

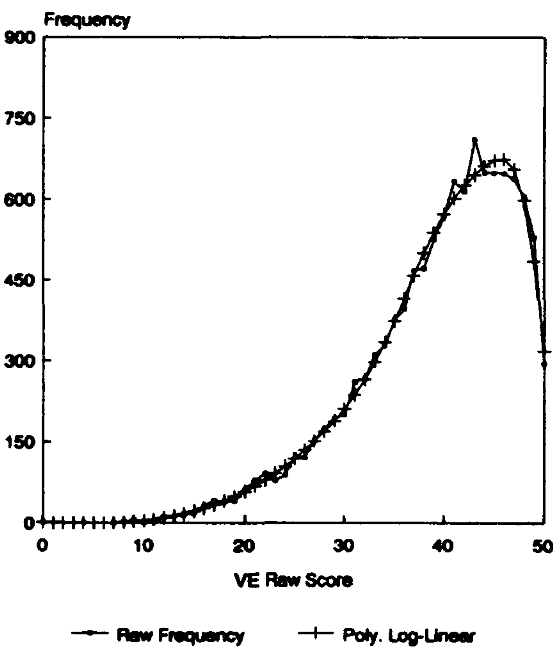


Figure 11g
Unsmoothed and Smoothed VE 22b

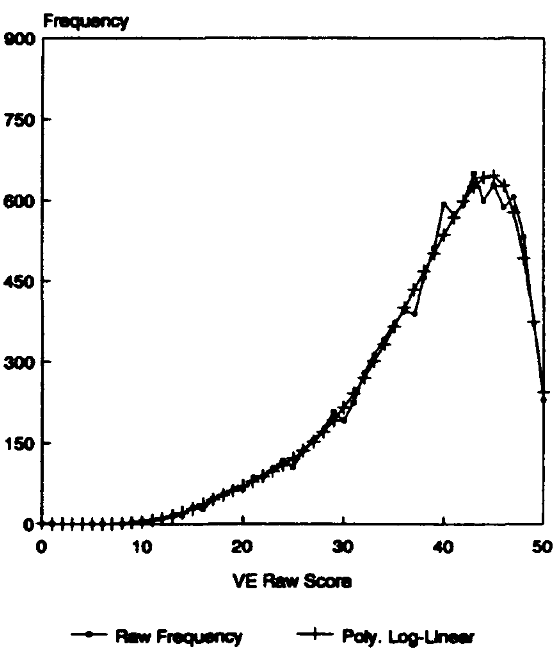


Figure 11, Con't. Unsmoothed and Polynomial Log-Linear Smoothed Distributions for Equating VE

Figure 12a
Contrast With Identity: GS 20a/b

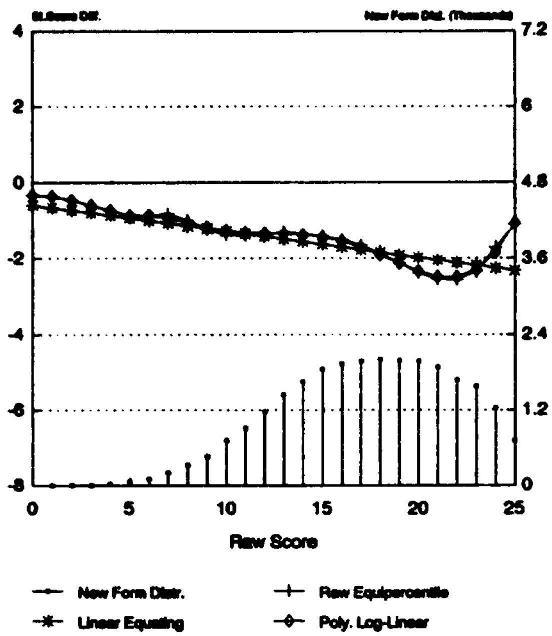


Figure 12b
Contrast With Identity: GS 21a/b

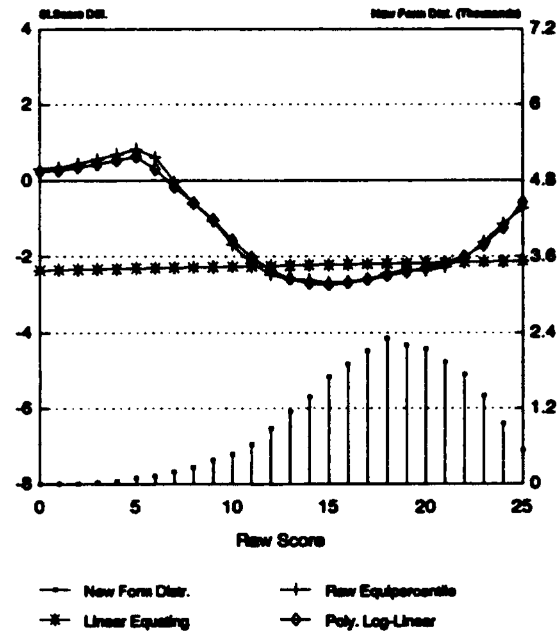


Figure 12c
Contrast With Identity: GS 22a/b

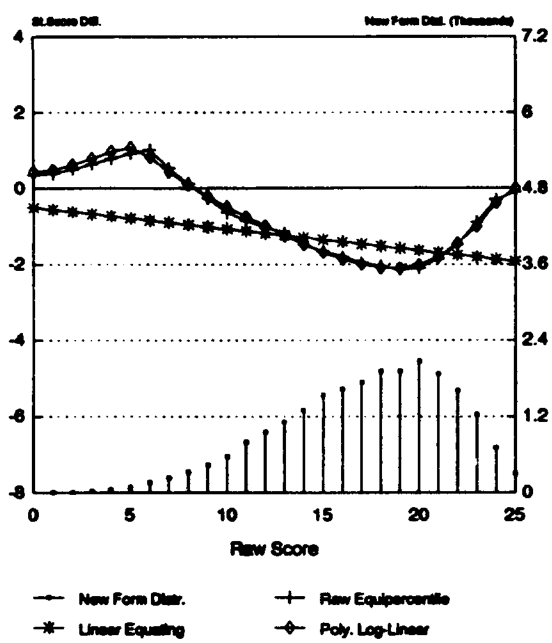


Figure 12 Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for GS

Figure 13a
Contrast With Refer. Dist.: GS 20a/b

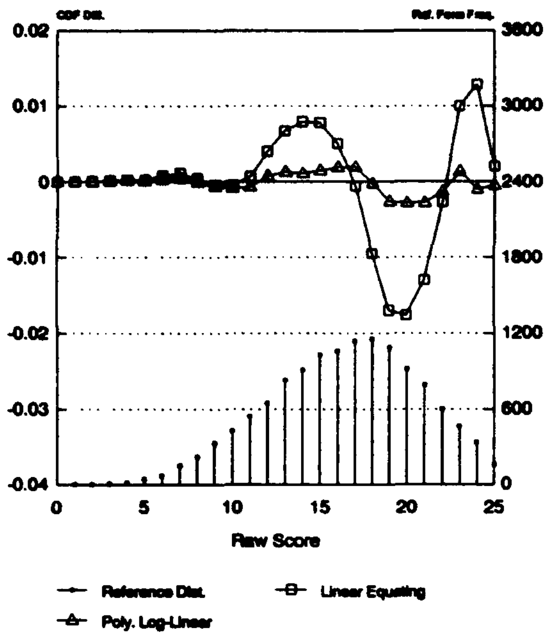


Figure 13b
Contrast With Refer. Dist.: GS 21a/b

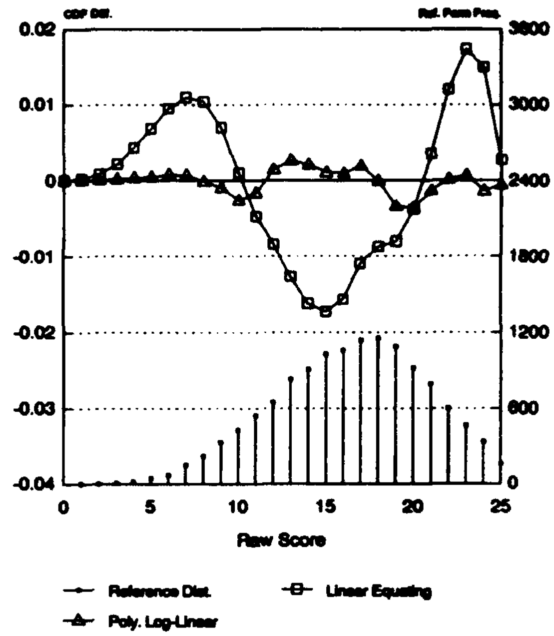


Figure 13c
Contrast With Refer. Dist.: GS 22a/b

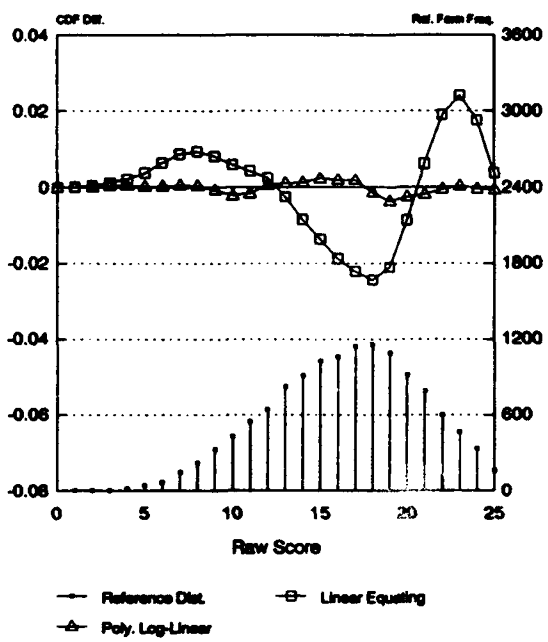


Figure 13. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for GS

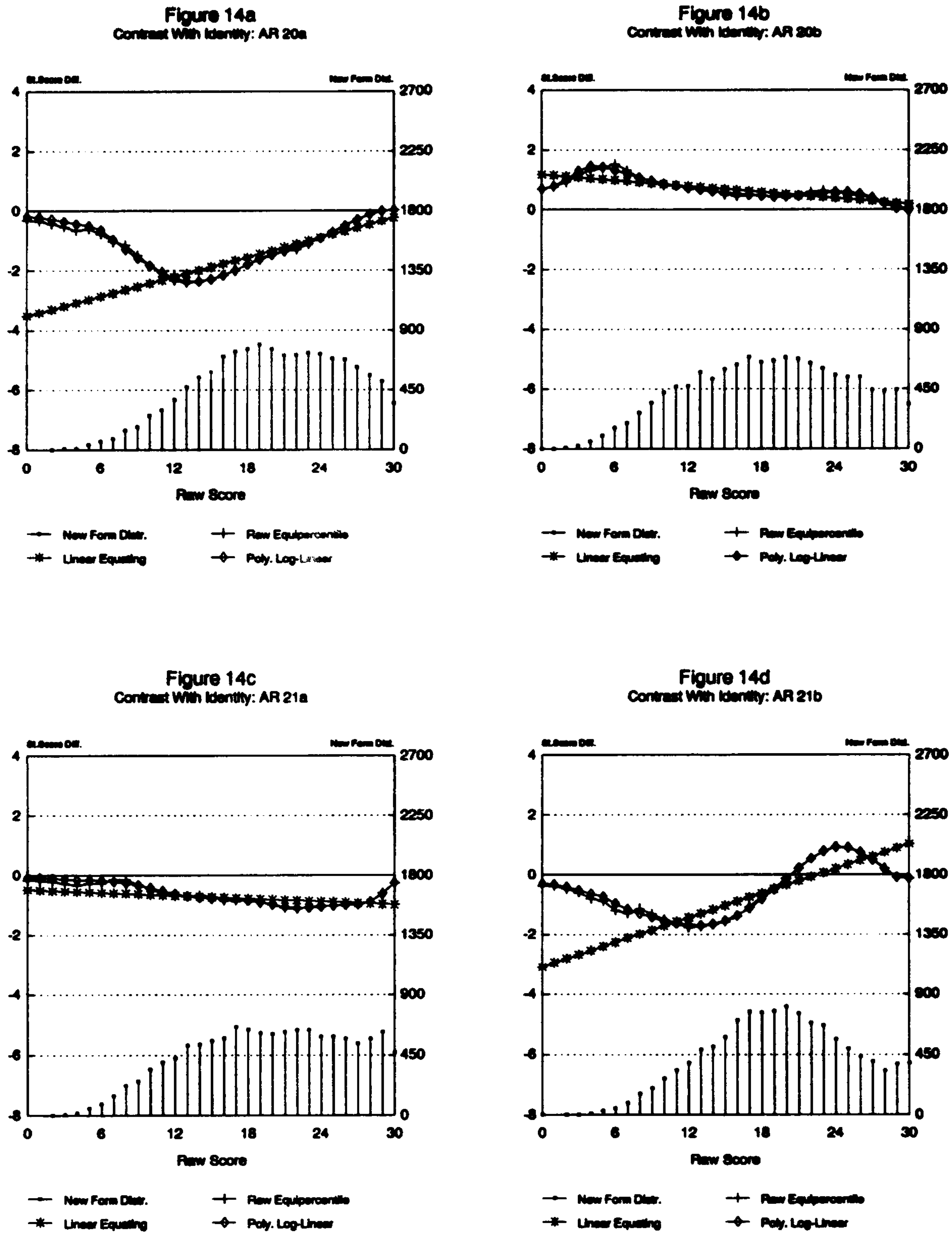
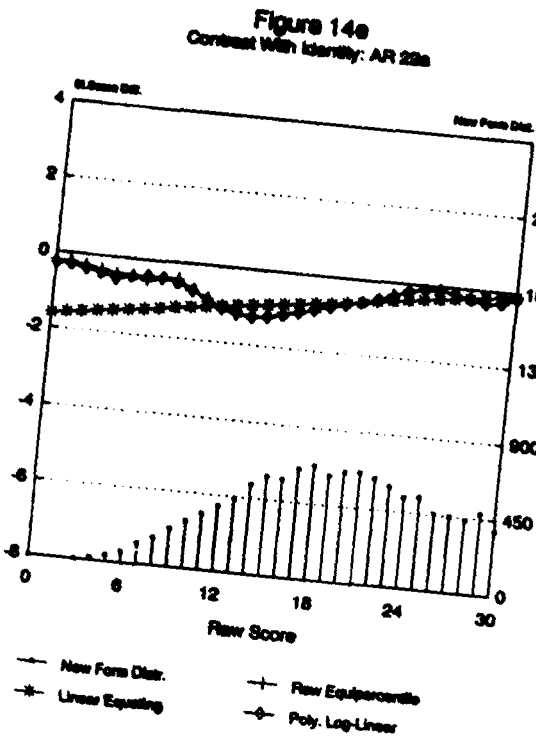


Figure 14. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for AR



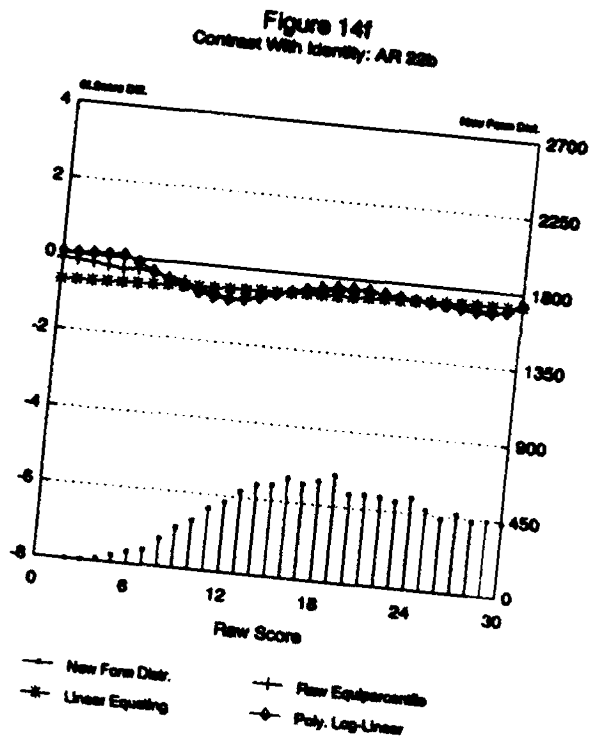


Figure 14, Con't. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for AR

Figure 15a
Contrast With Refer. Dist.: AR 20a

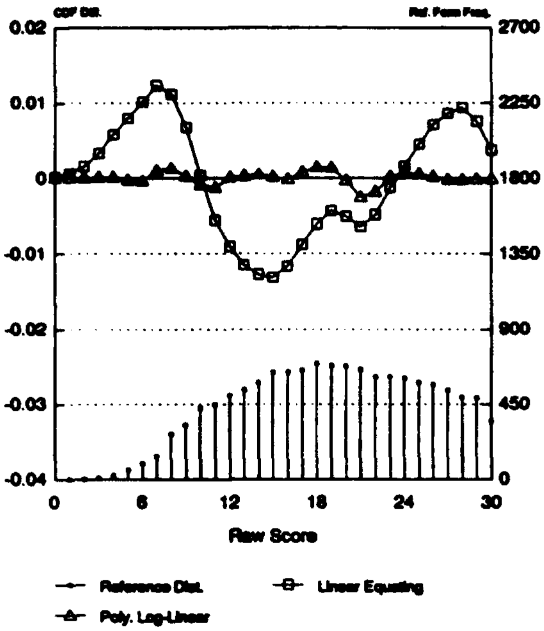


Figure 15b
Contrast With Refer. Dist.: AR 20b

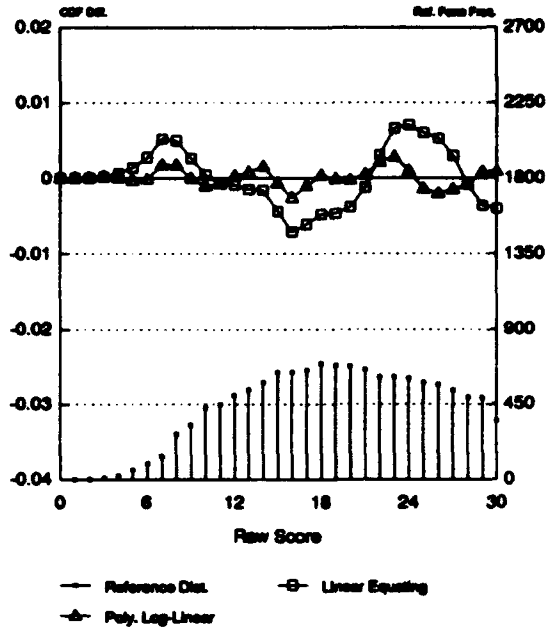


Figure 15c
Contrast With Refer. Dist.: AR 21a

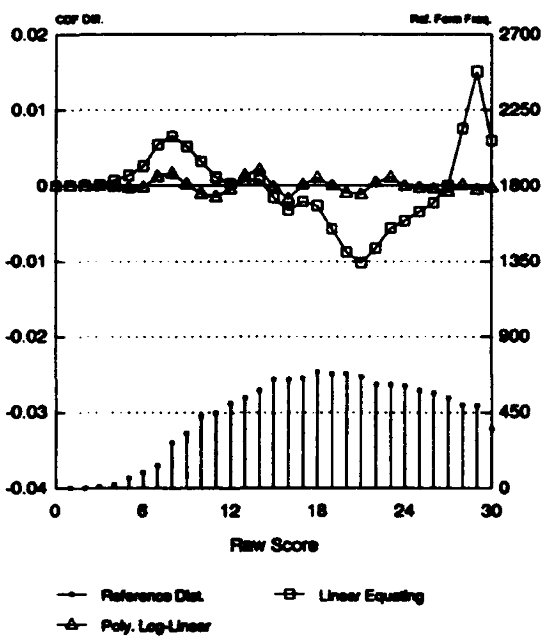


Figure 15d
Contrast With Refer. Dist.: AR 21b

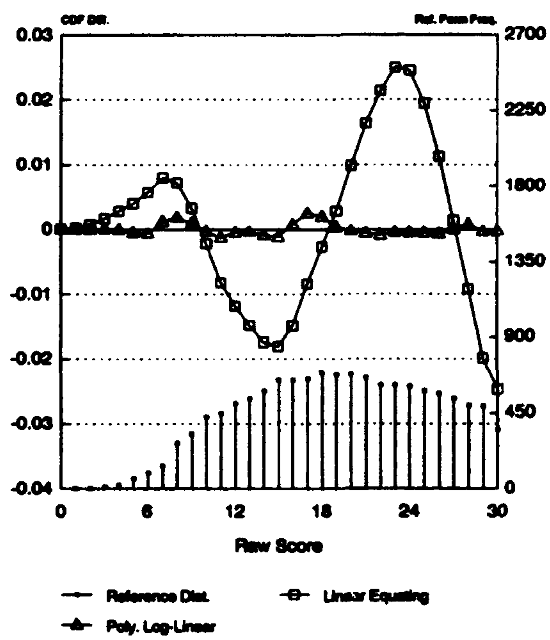
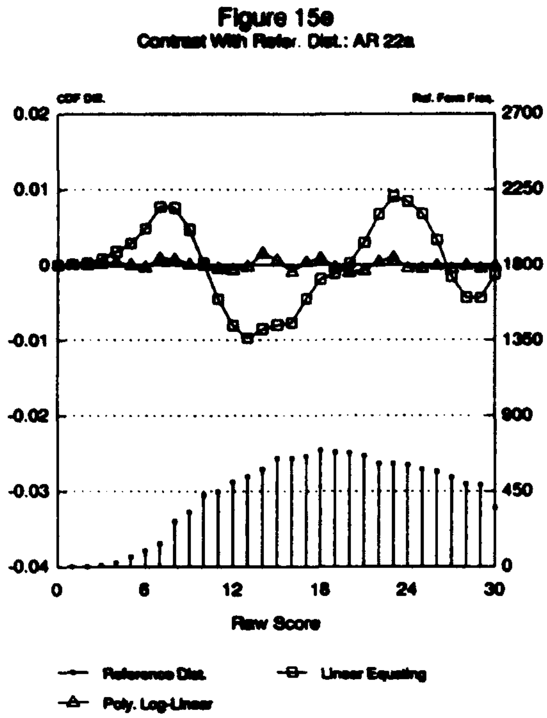


Figure 15. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for AR



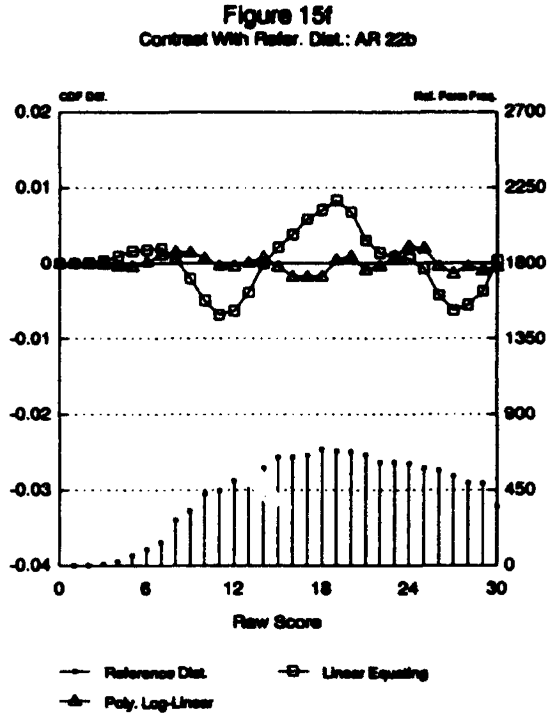


Figure 15, Con't. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for AR

Figure 16a
Contrast With Identity: WK 20a

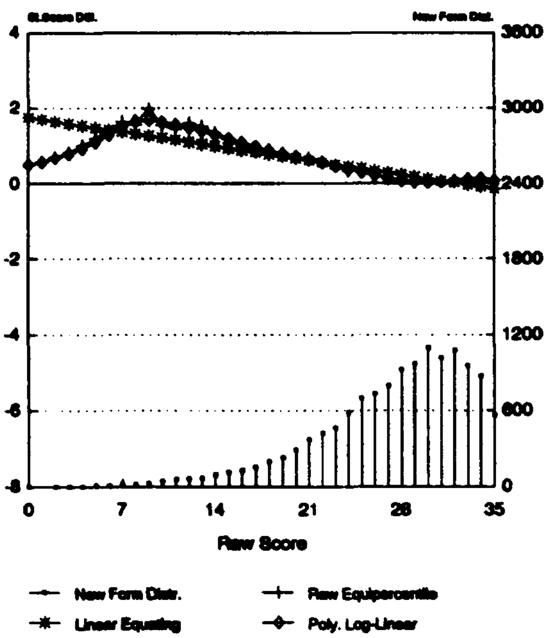


Figure 16b
Contrast With Identity: WK 20b

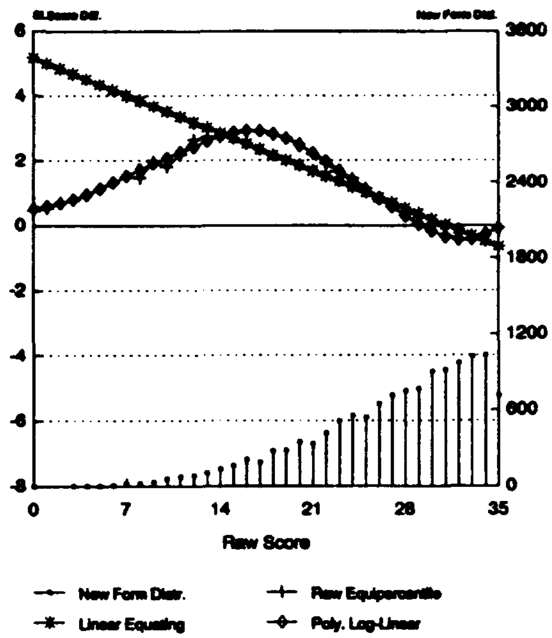


Figure 16c
Contrast With Identity: WK 21a

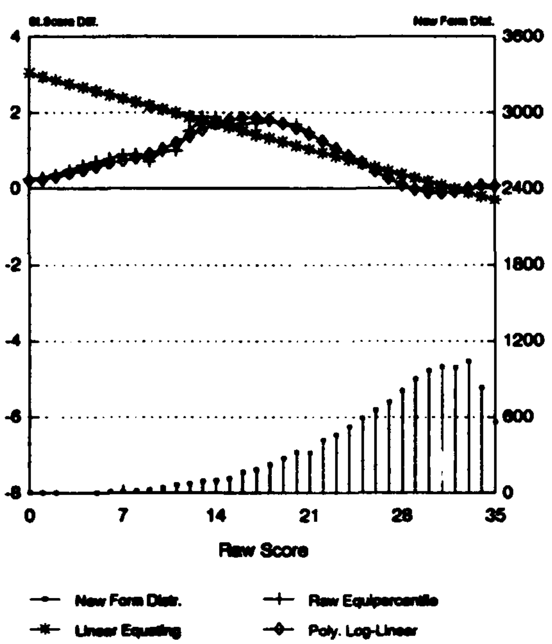


Figure 16d
Contrast With Identity: WK 21b

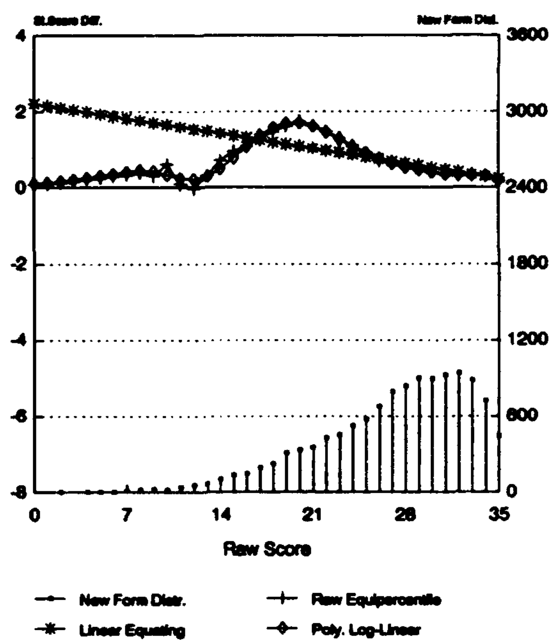


Figure 16. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for WK

Figure 16e
Contrast With Identity: WK 22a

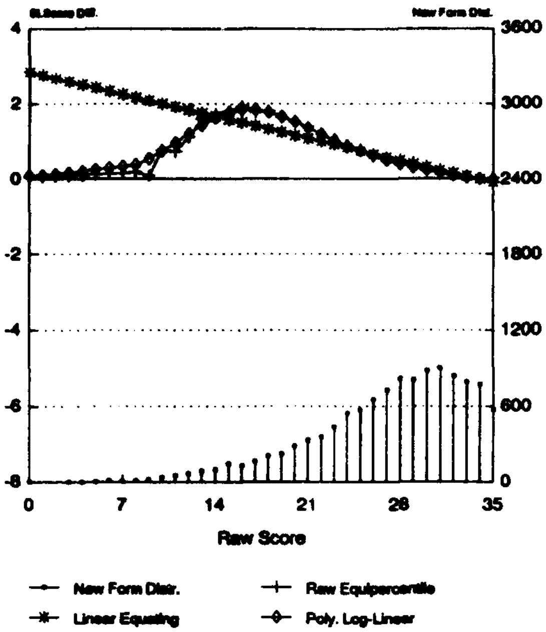


Figure 16f
Contrast With Identity: WK 22b

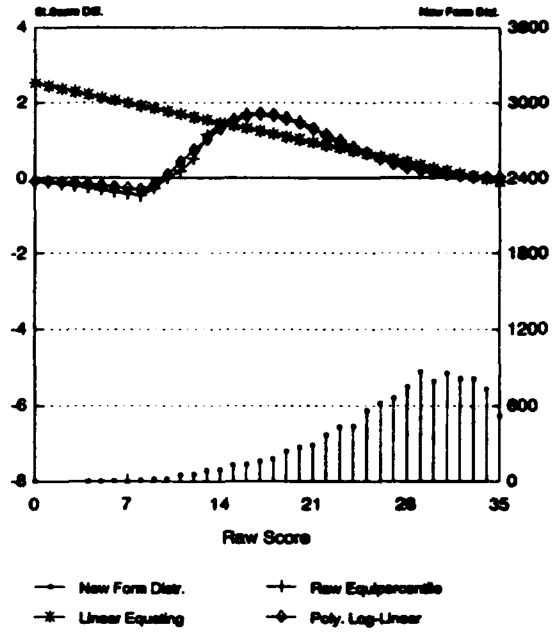


Figure 16, Con't. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for WK

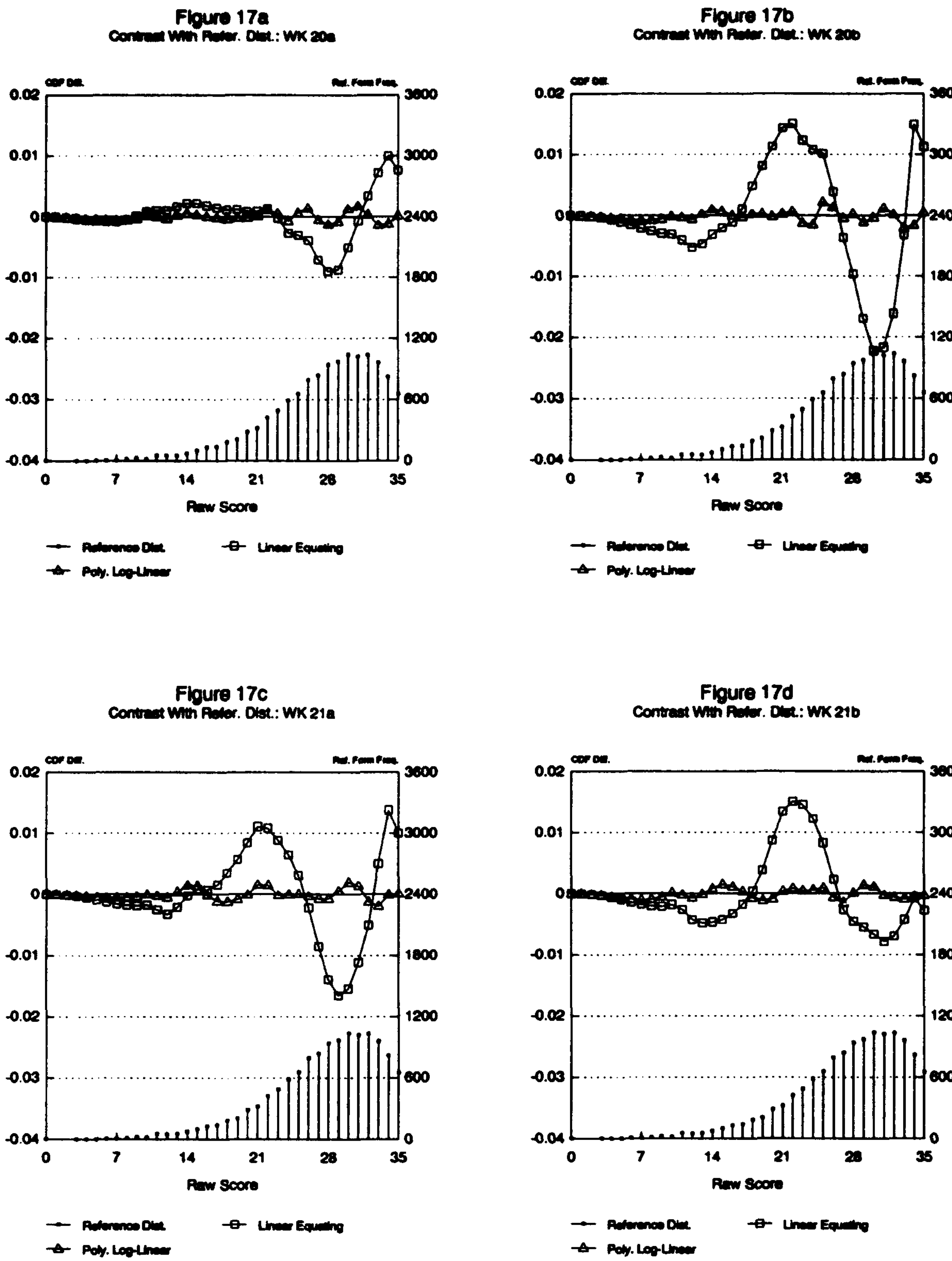


Figure 17. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for WK

Figure 17e
Contrast With Refer. Dist.: WK 22a

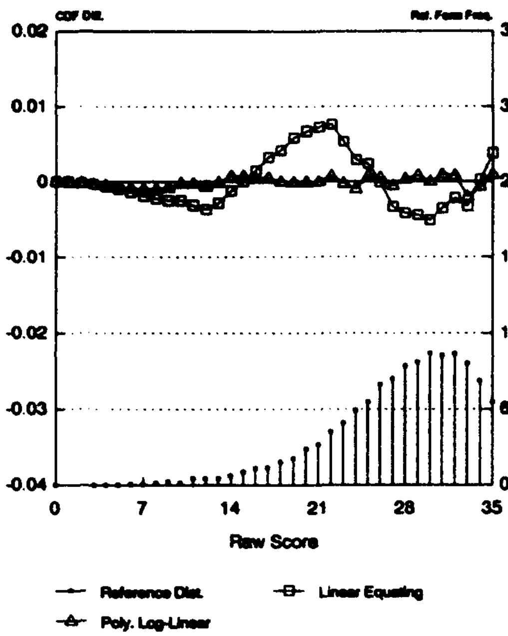


Figure 17f
Contrast With Refer. Dist.: WK 22b

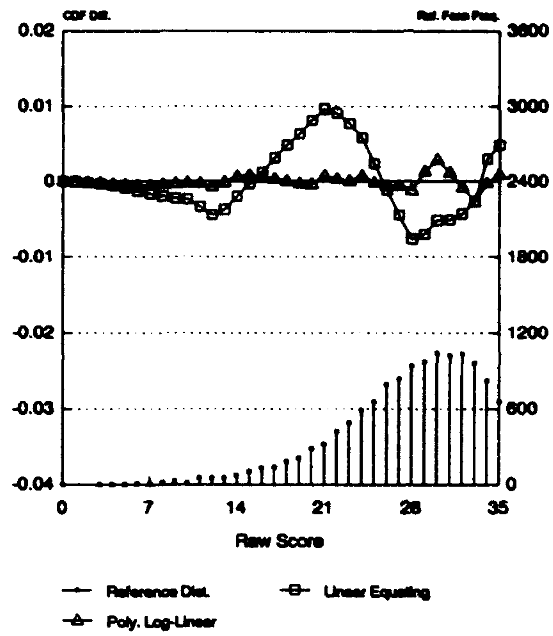


Figure 17, Con't. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for WK

Figure 18a
Contrast With Identity: PC 20a

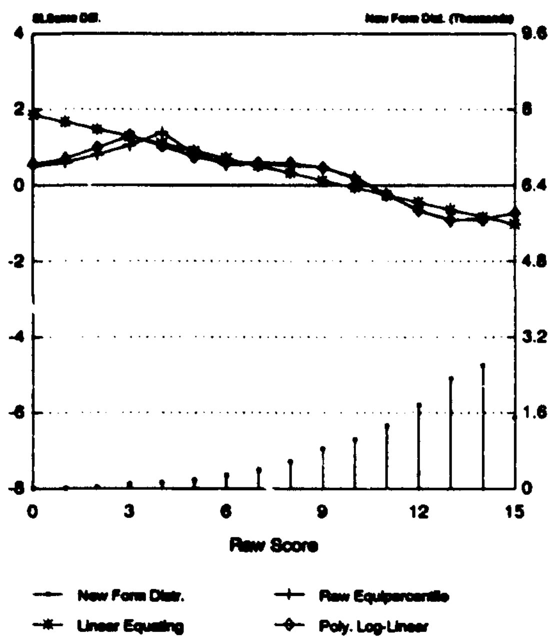


Figure 18b
Contrast With Identity: PC 20b

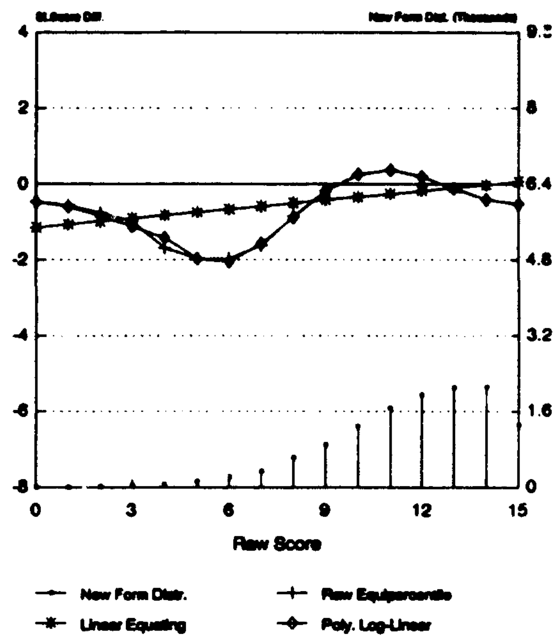


Figure 18c
Contrast With Identity: PC 21a

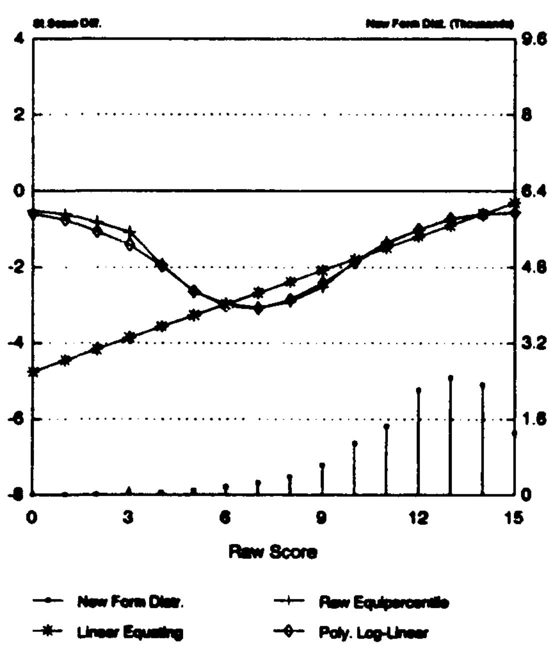


Figure 18d
Contrast With Identity: PC 21b

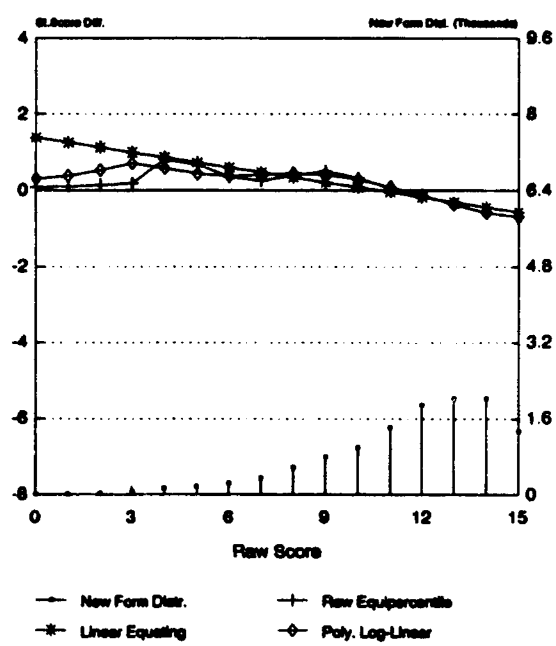
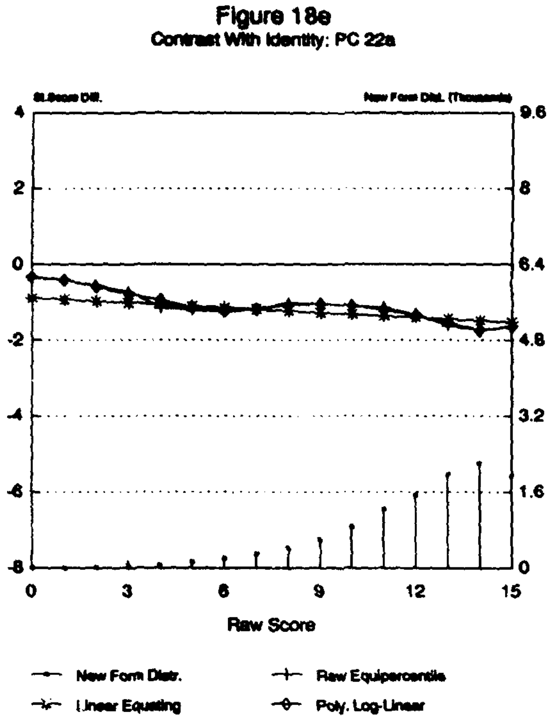


Figure 18. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for PC



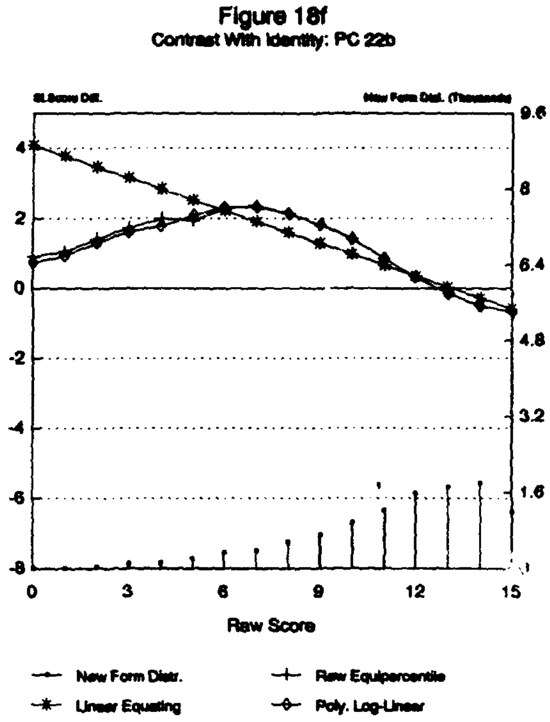


Figure 18, Con't. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for PC

Figure 19a
Contrast With Refer. Dist.: PC 20a

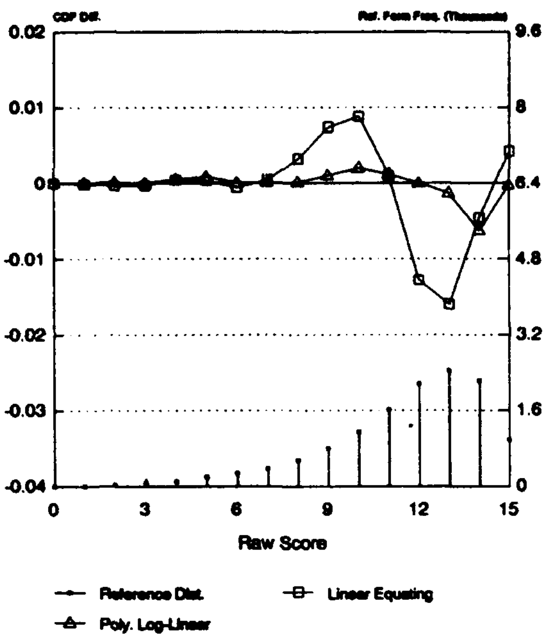


Figure 19b
Contrast With Refer. Dist.: PC 20b

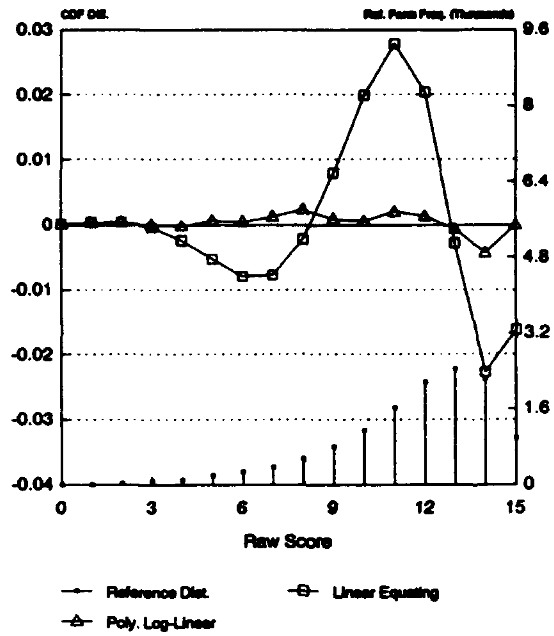


Figure 19c
Contrast With Refer. Dist.: PC 21a

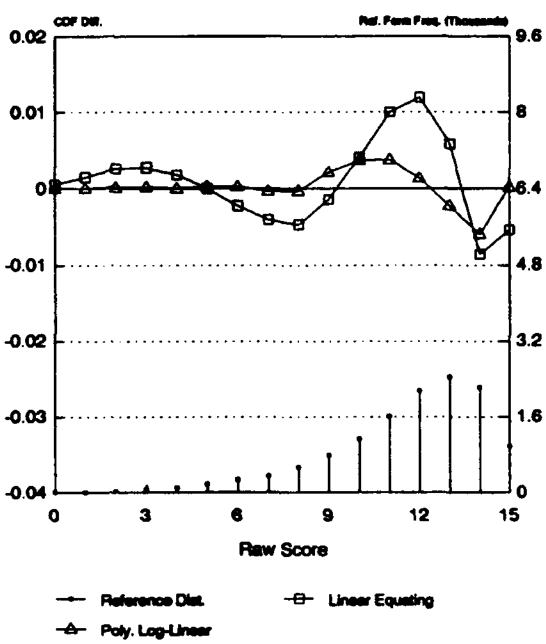


Figure 19d
Contrast With Refer. Dist.: PC 21b

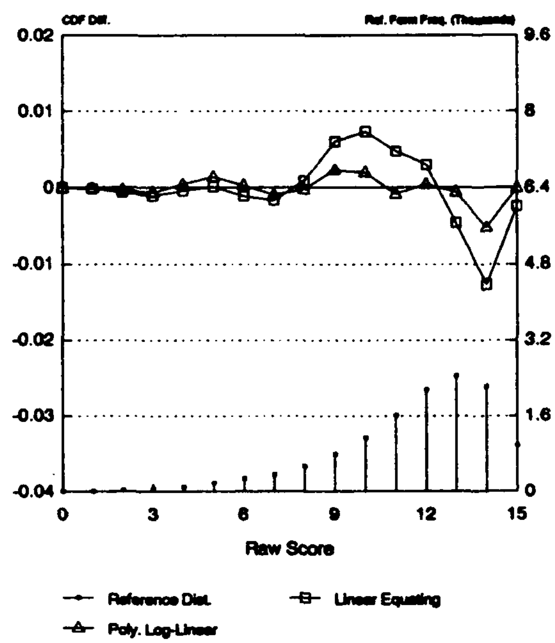


Figure 19. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for PC

Figure 19e
Contrast With Refer. Dist.: PC 22a

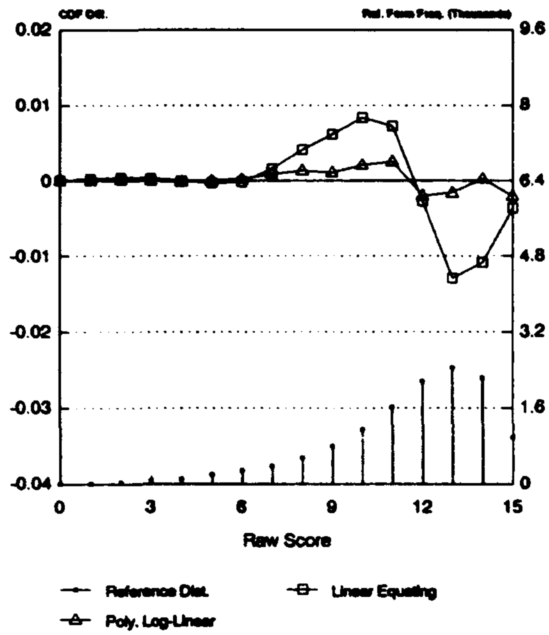


Figure 19f
Contrast With Refer. Dist.: PC 22b

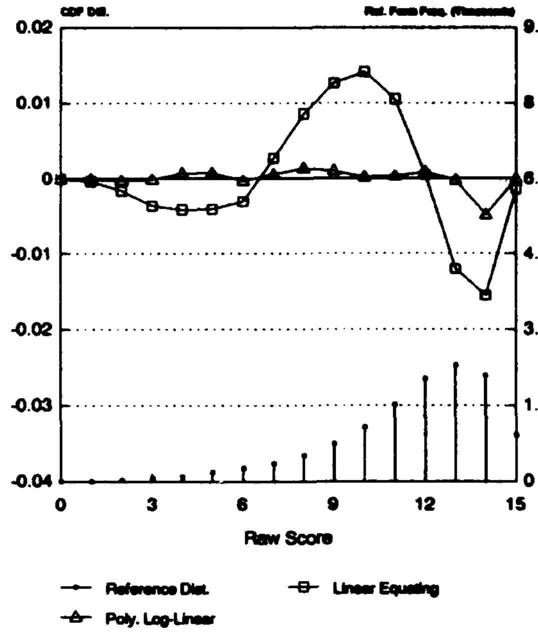


Figure 19, Con't. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for PC

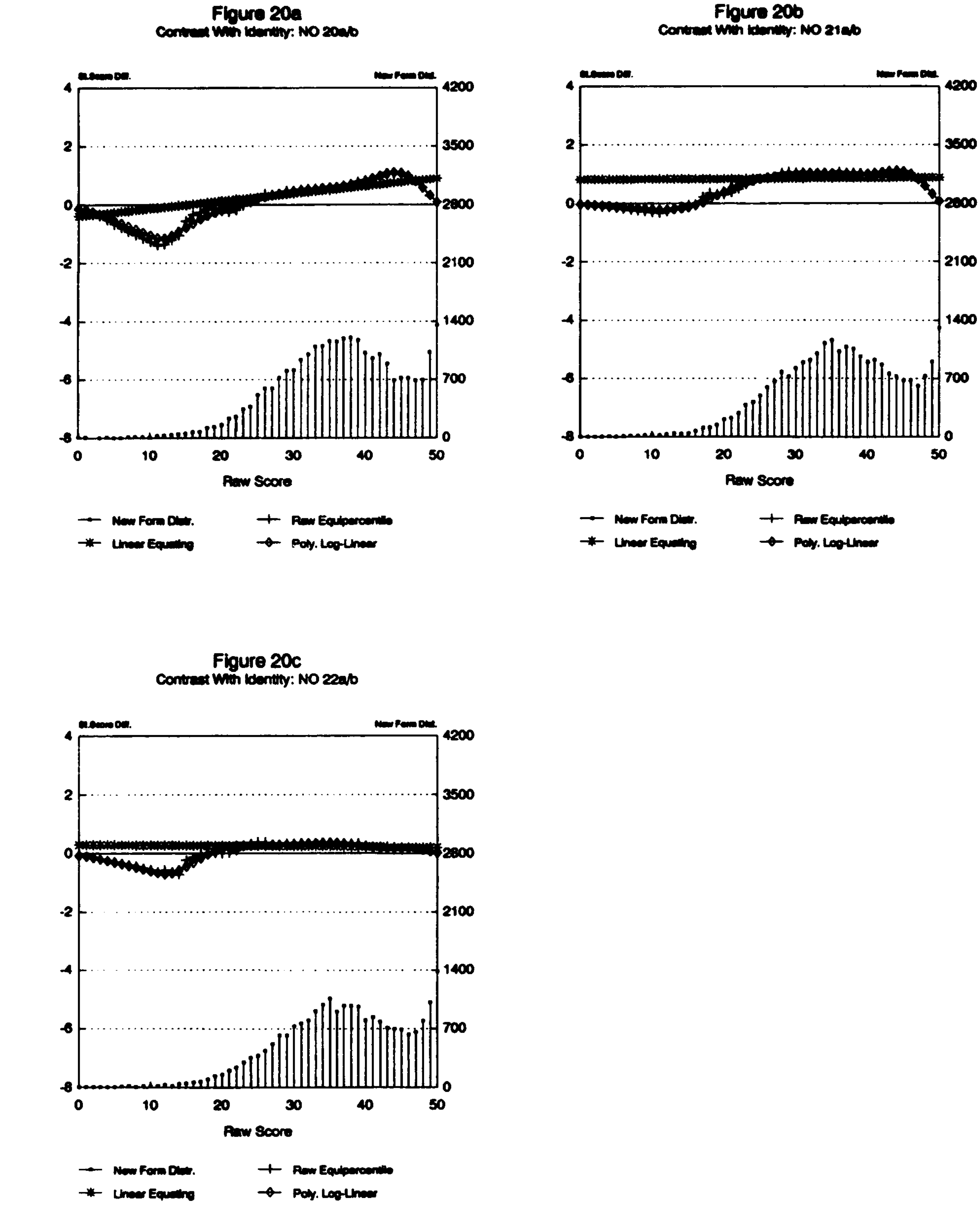


Figure 20. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for NO

Figure 21a
Contrast With Refer. Dist.: NO 20a/b

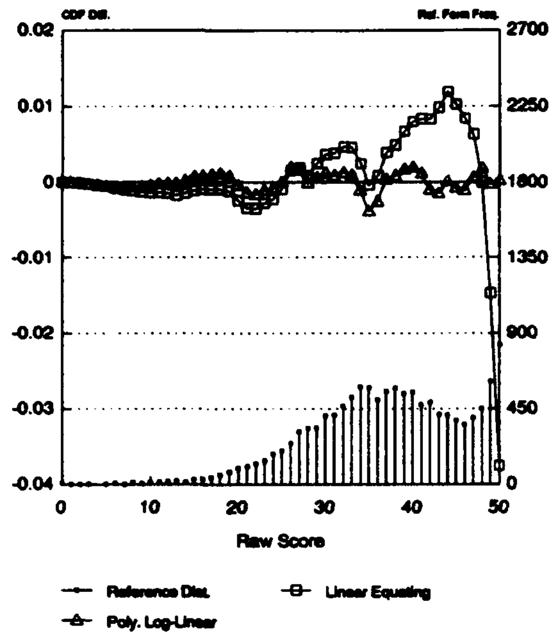


Figure 21b
Contrast With Refer. Dist.: NO 21a/b

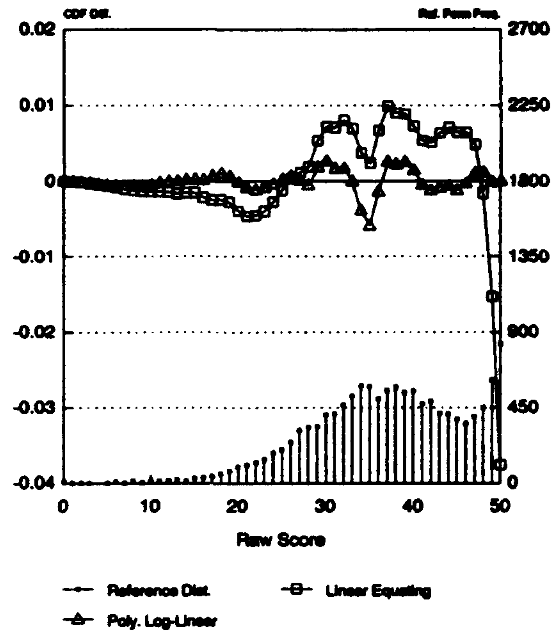


Figure 21c
Contrast With Refer. Dist.: NO 22a/b

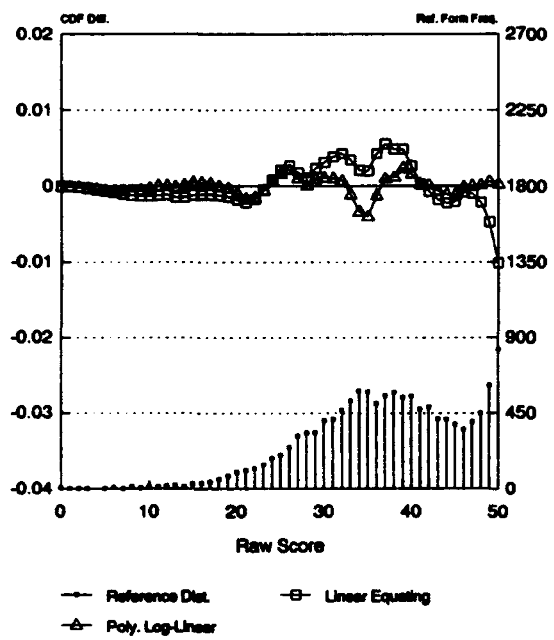


Figure 21. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for NO

Figure 22a

Contrast With Identity: CS 20a/b

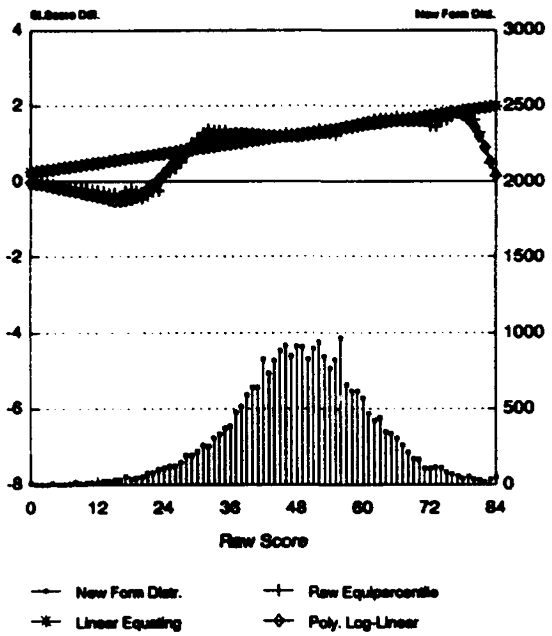


Figure 22b

Contrast With Identity: CS 21a

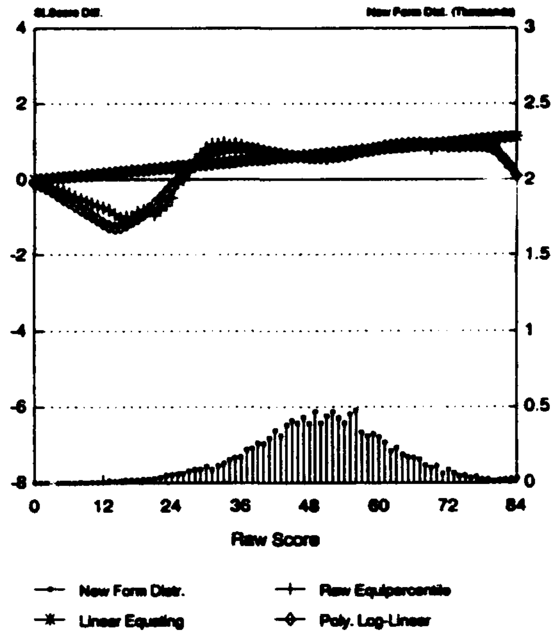


Figure 22c

Contrast With Identity: CS 21b

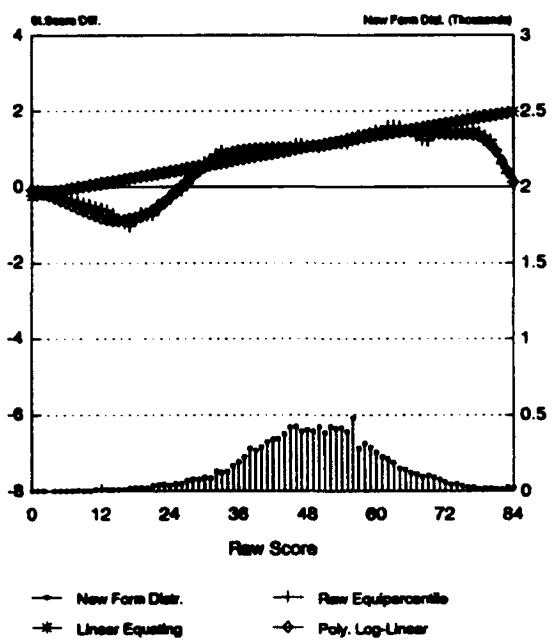


Figure 22d

Contrast With Identity: CS 22a/b

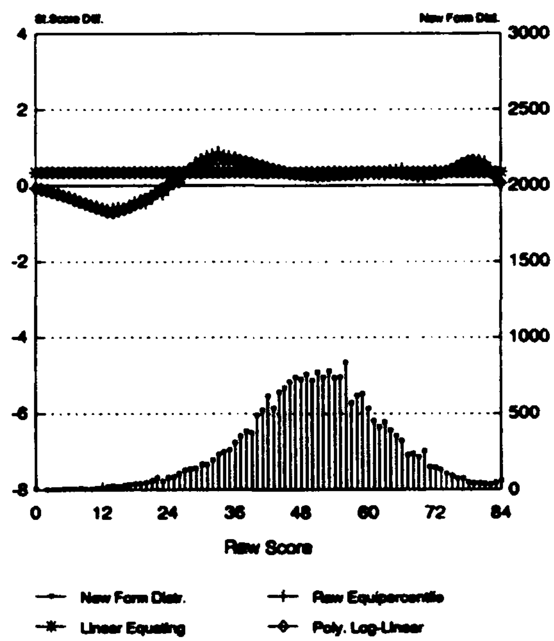


Figure 22. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for CS

Figure 23a
Contrast With Refer. Dist.: CS 20a/b

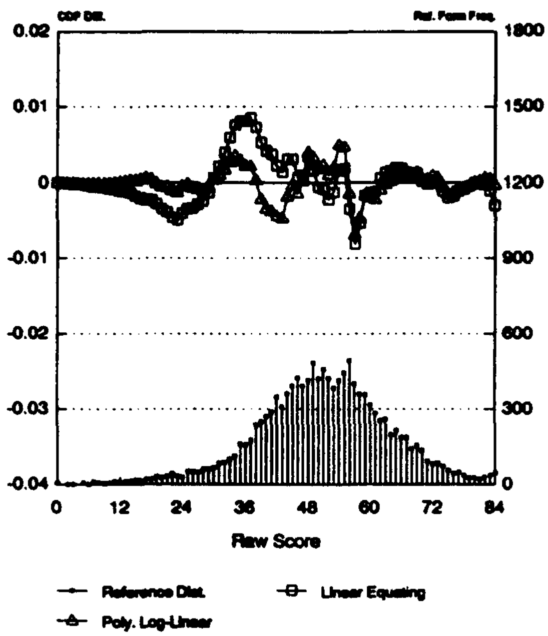


Figure 23b
Contrast With Refer. Dist.: CS 21a

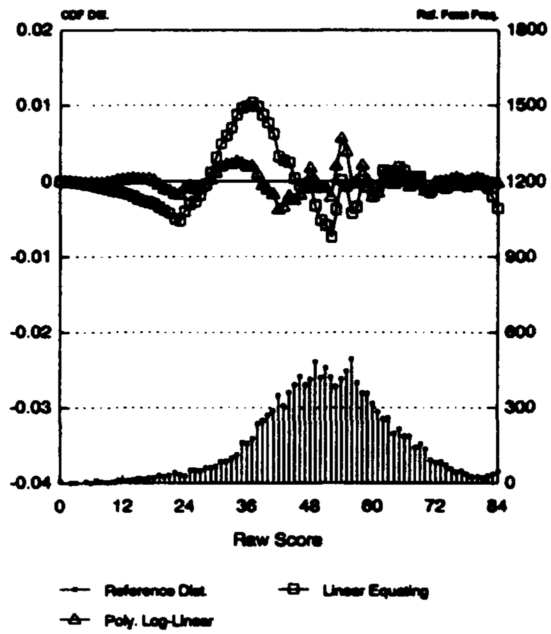


Figure 23c
Contrast With Refer. Dist.: CS 21b

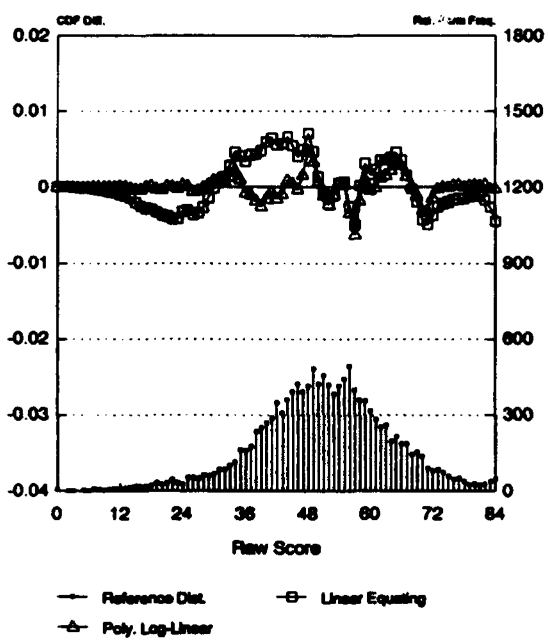


Figure 23d
Contrast With Refer. Dist.: CS 22a/b

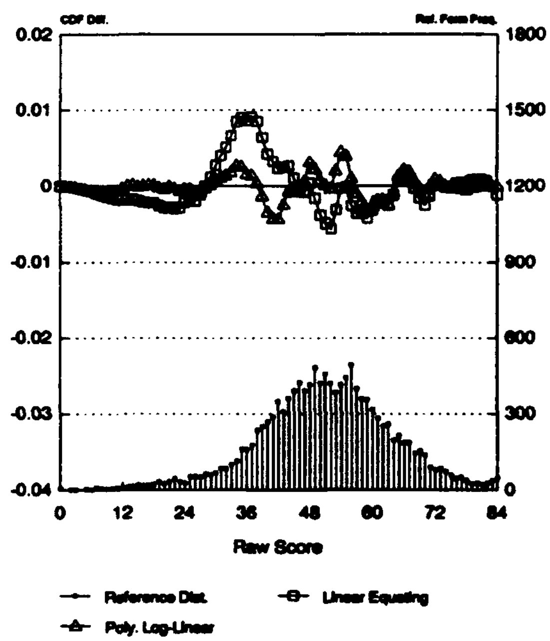


Figure 23. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for CS

Figure 24a
Contrast With Identity: AS 20a/b

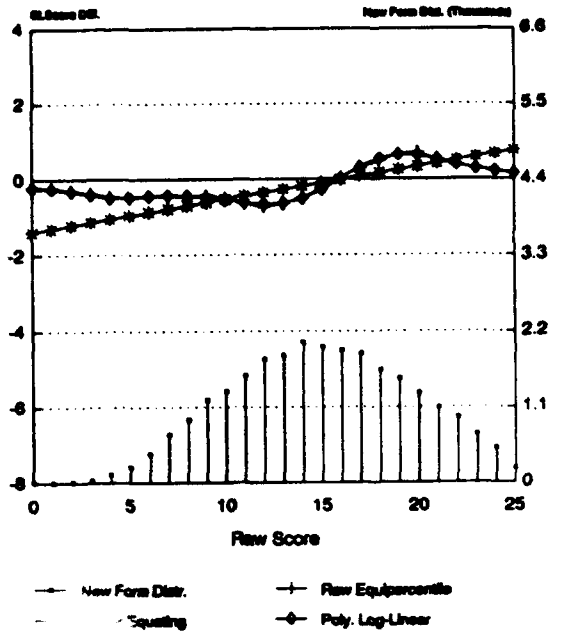


Figure 24b
Contrast With Identity: AS 21a/b

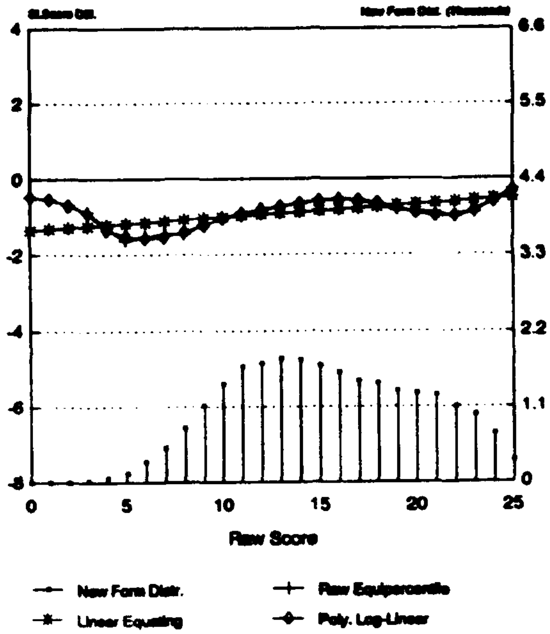


Figure 24c
Contrast With Identity: AS 22a/b

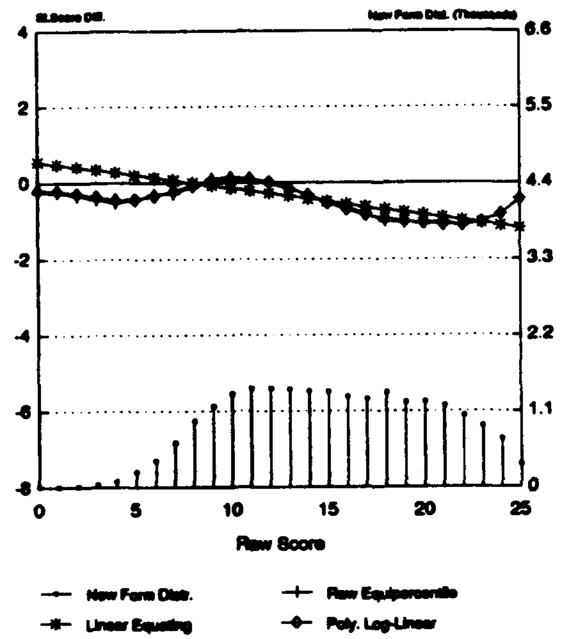


Figure 24. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for AS

Figure 25a
Contrast With Refer. Dist.: AS 20a/b

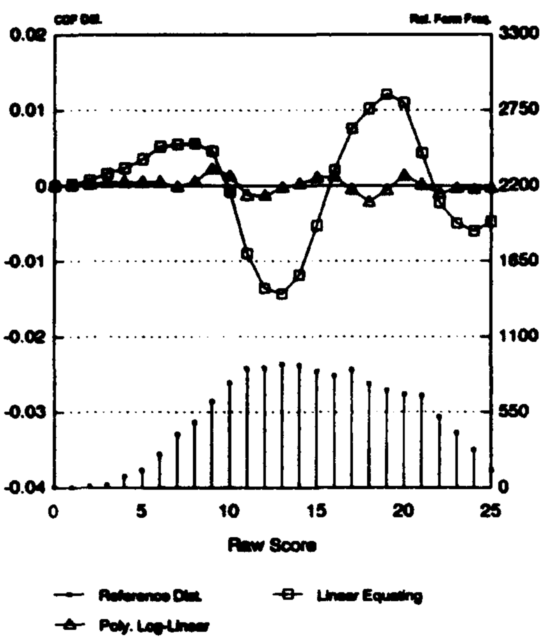


Figure 25b
Contrast With Refer. Dist.: AS 21a/b

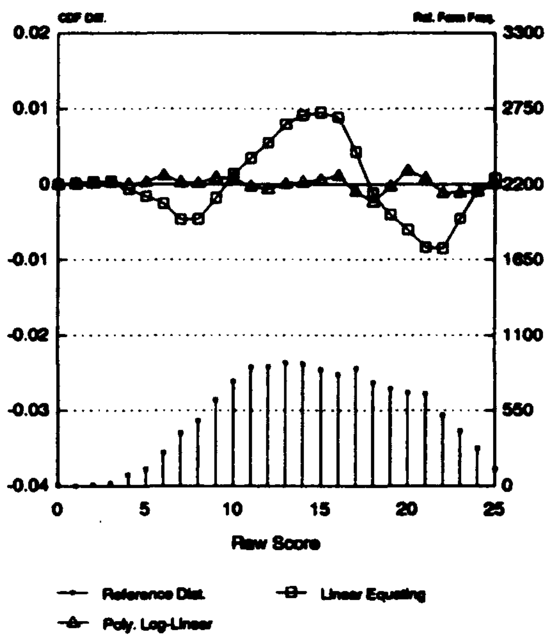


Figure 25c
Contrast With Refer. Dist.: AS 22a/b

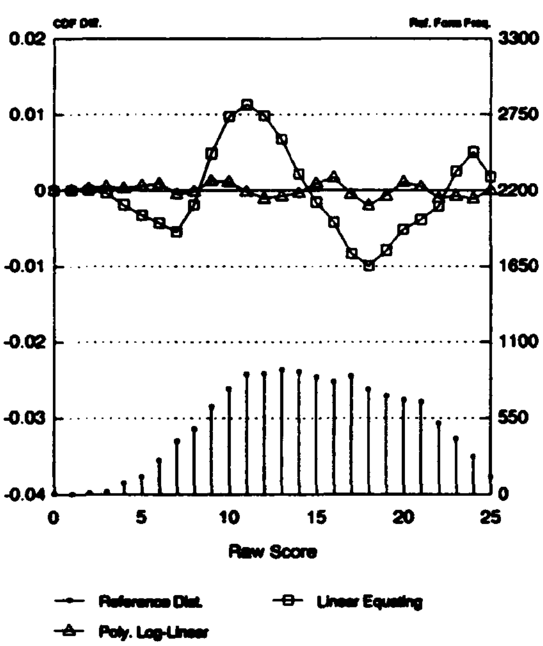


Figure 25. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for AS

Figure 26a

Contrast With Identity: MK 20a

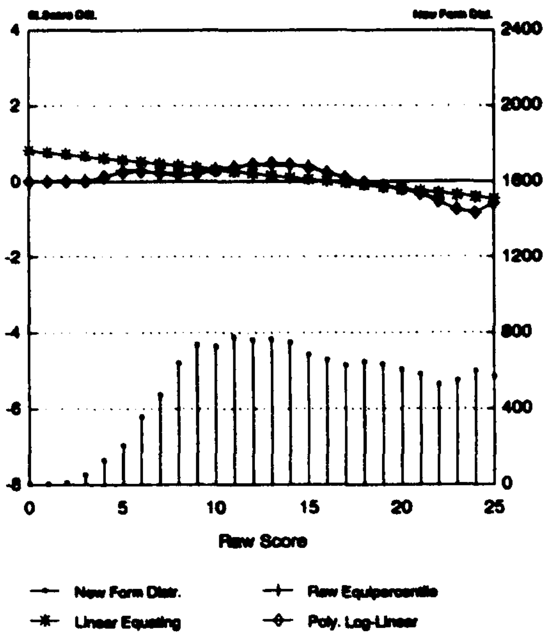


Figure 26b

Contrast With Identity: MK 20b

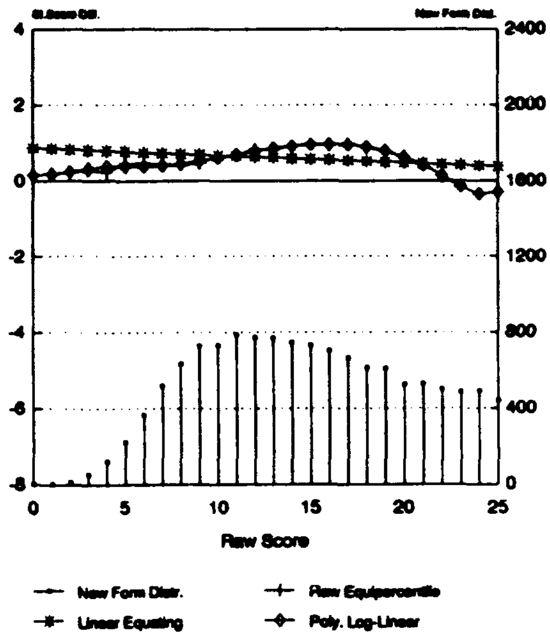


Figure 26c

Contrast With Identity: MK 21a

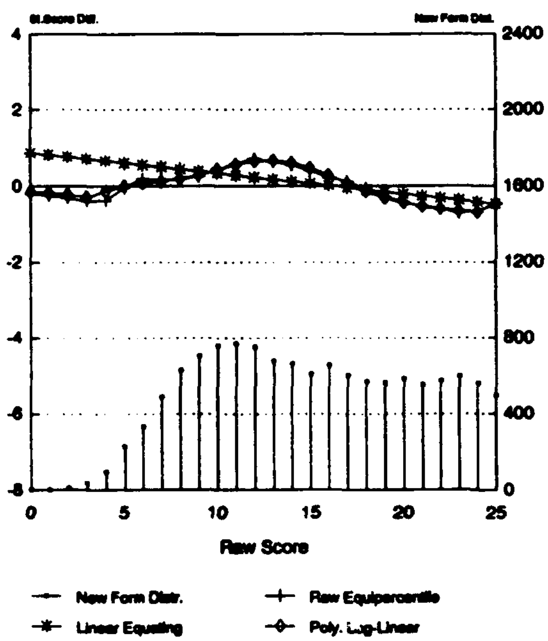


Figure 26. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for MK

Figure 26d
Contrast With Identity: MK 21b

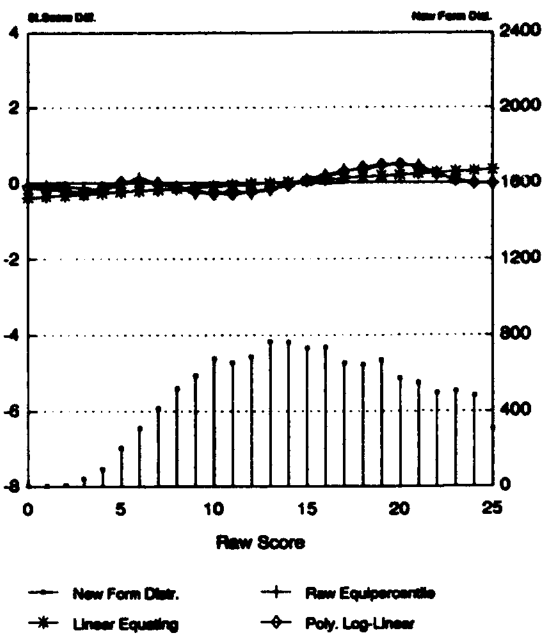


Figure 26e
Contrast With Identity: MK 22a

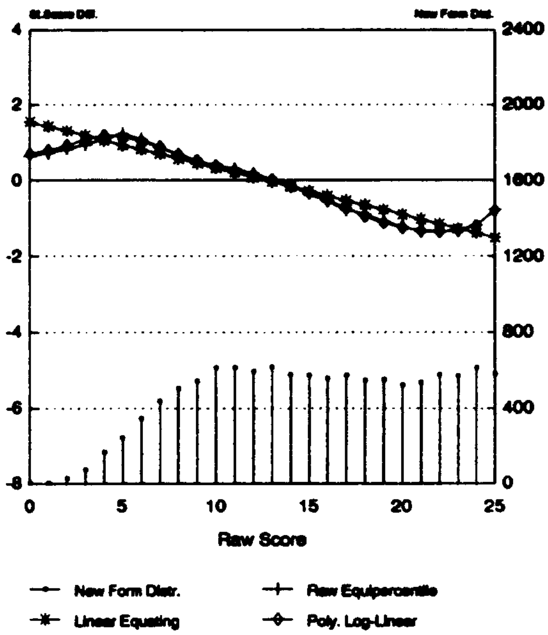


Figure 26f
Contrast With Identity: MK 22b

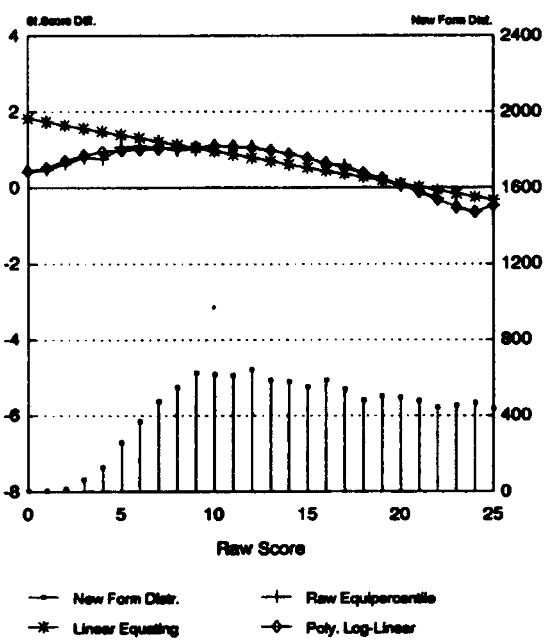


Figure 26, Con't. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for MK

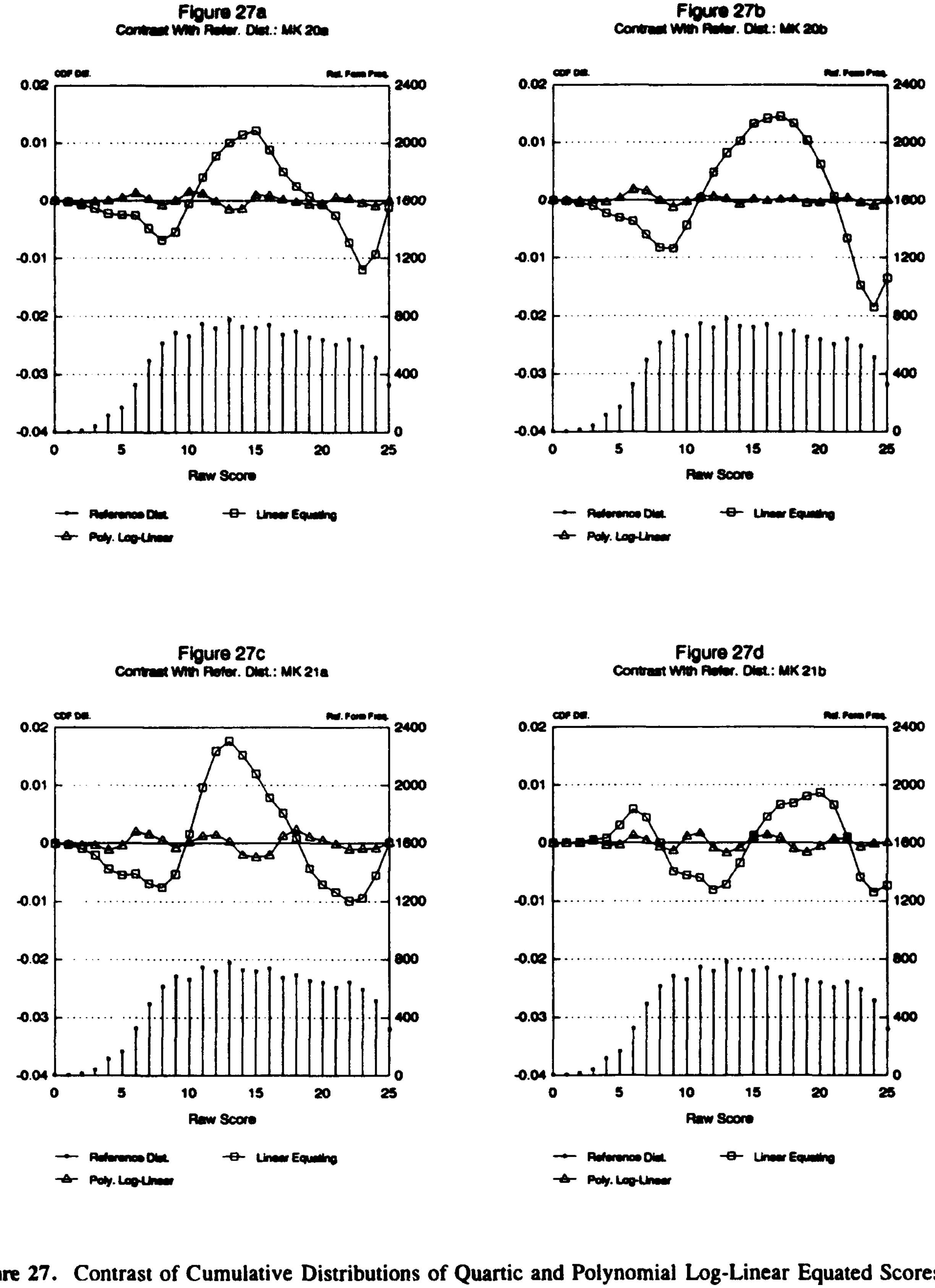


Figure 27. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for MK

Figure 27e
Contrast With Refer. Dist.: MK 22a

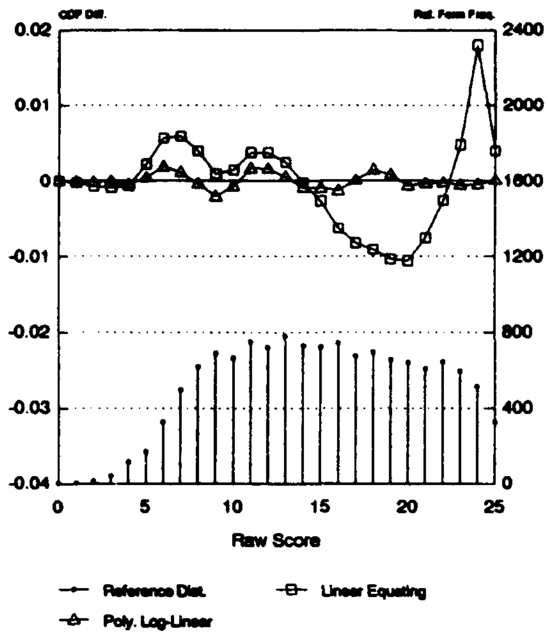


Figure 27f
Contrast With Refer. Dist.: MK 22b

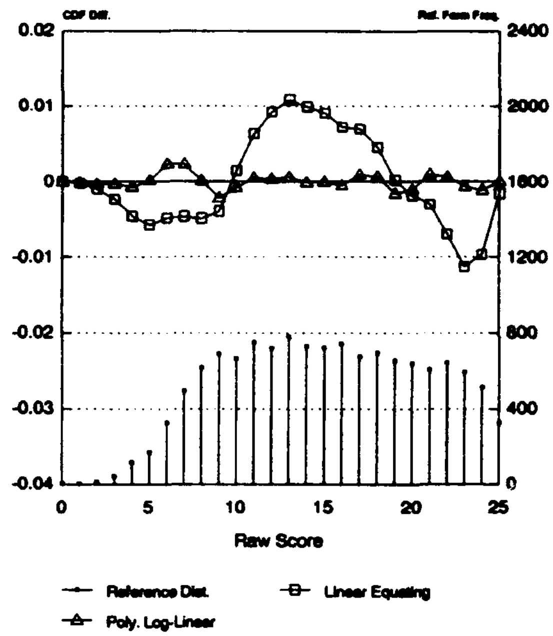


Figure 27, Con't. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for MK

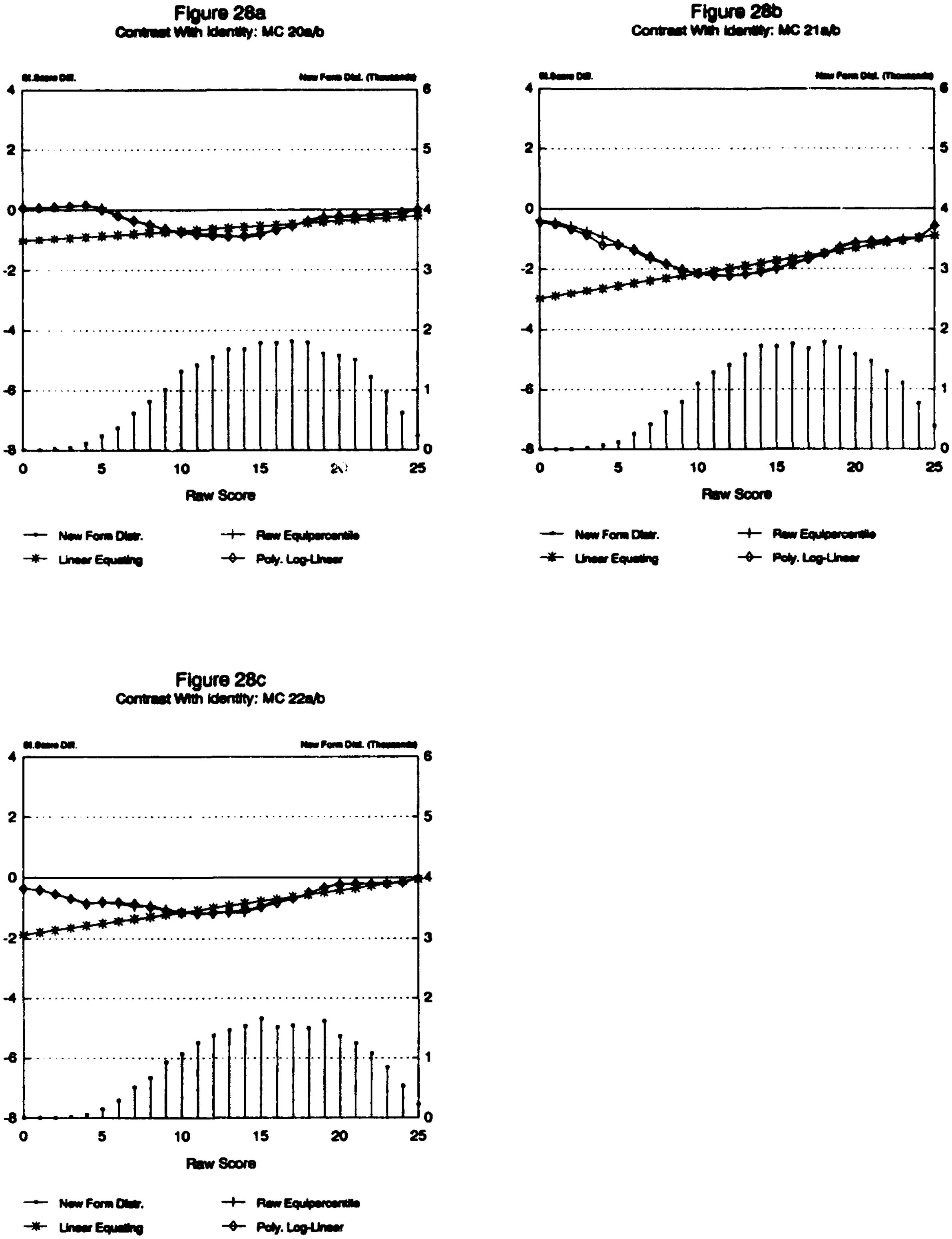


Figure 28. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for MC

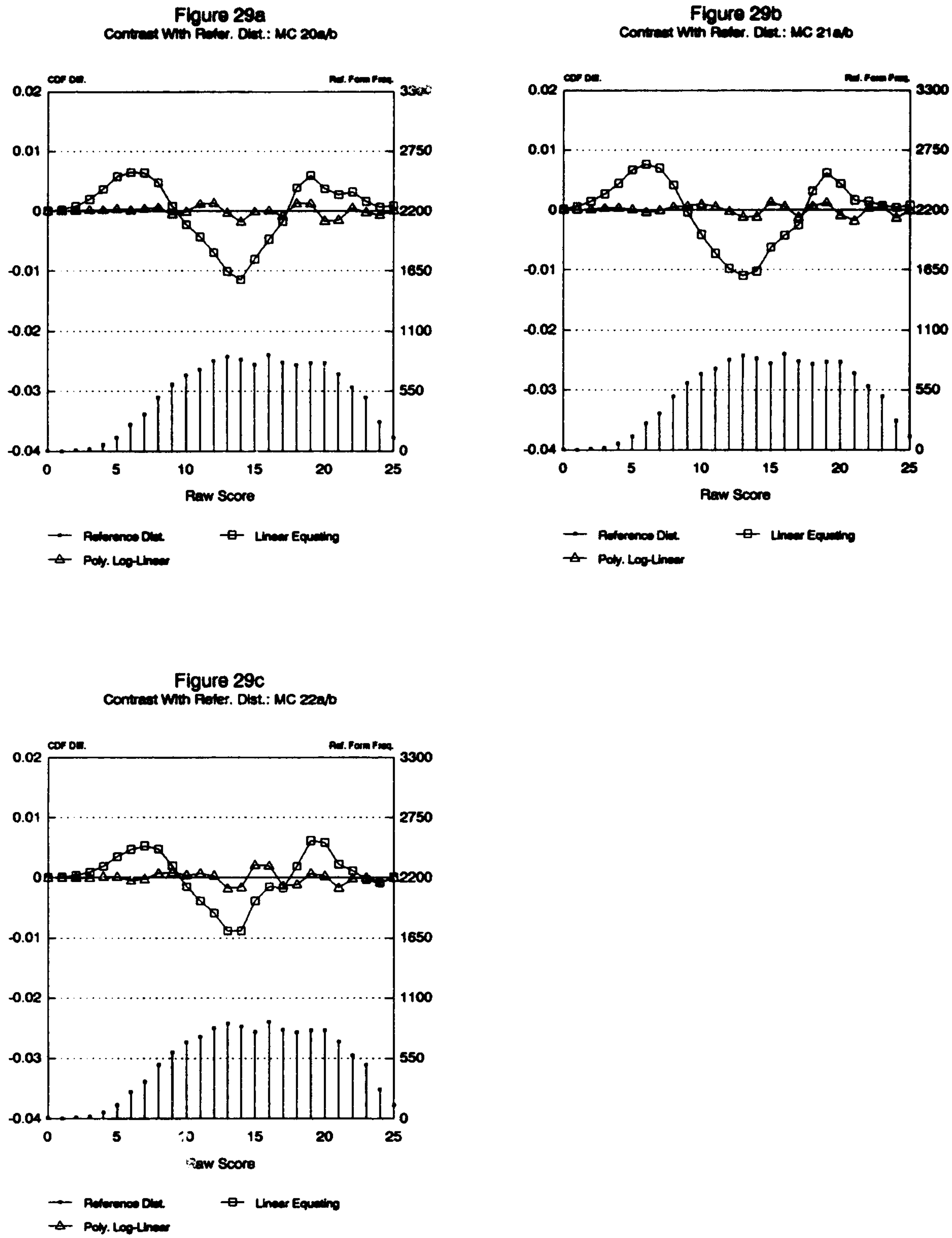


Figure 29. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for MC

Figure 30a

Contrast With Identity: EI 20a/b

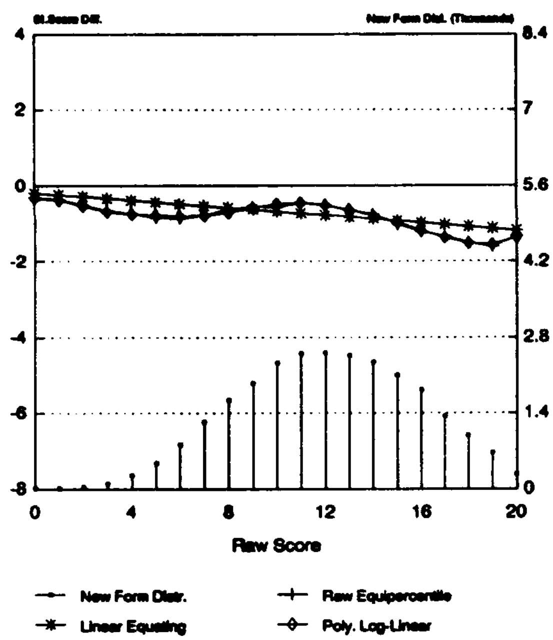


Figure 30b

Contrast With Identity: EI 21a/b

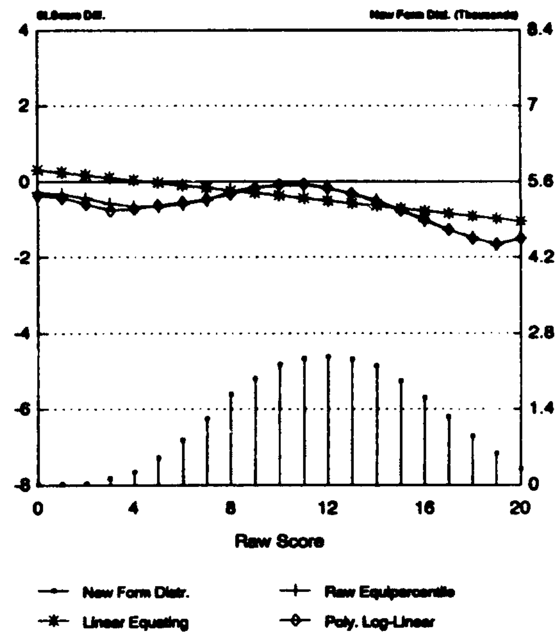


Figure 30c

Contrast With Identity: EI 22a/b

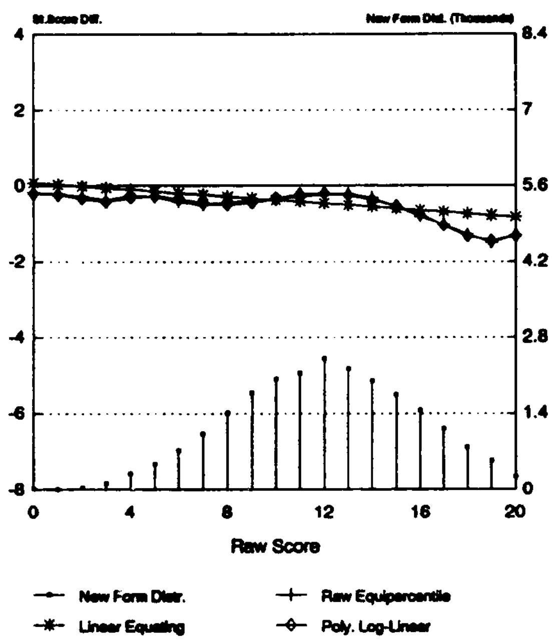


Figure 30. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for EI

Figure 31a
Contrast With Refer. Dist.: EI 20a/b

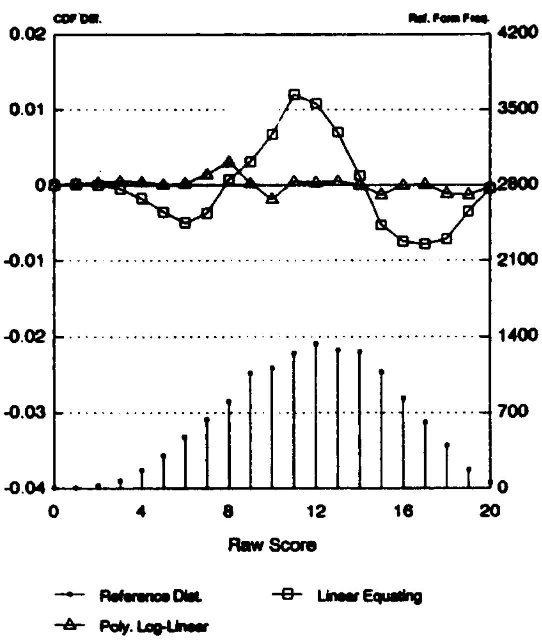


Figure 31b
Contrast With Refer. Dist.: EI 21a/b

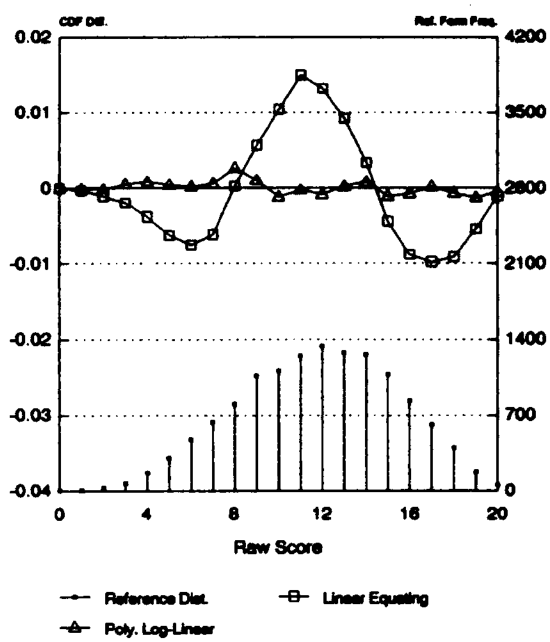


Figure 31c
Contrast With Refer. Dist.: EI 22a/b

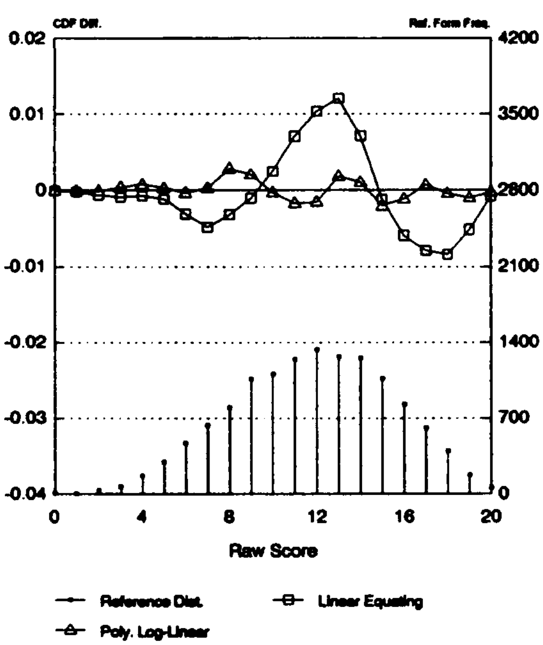


Figure 31. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for EI

Figure 32a
Contrast With Identity: VE 20a

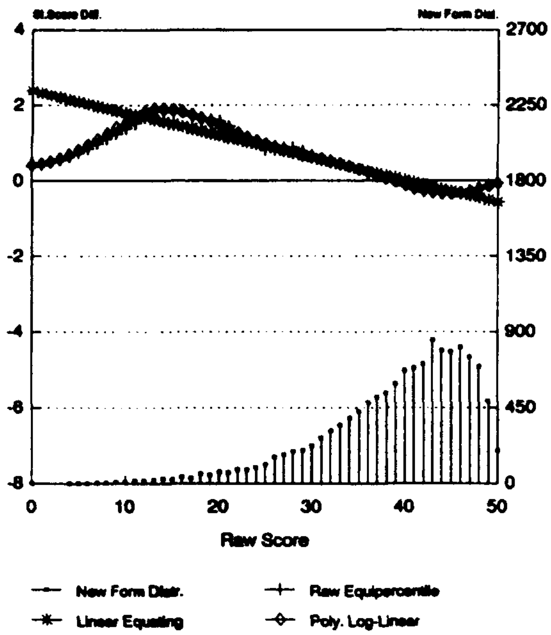


Figure 32b
Contrast With Identity: VE 20b

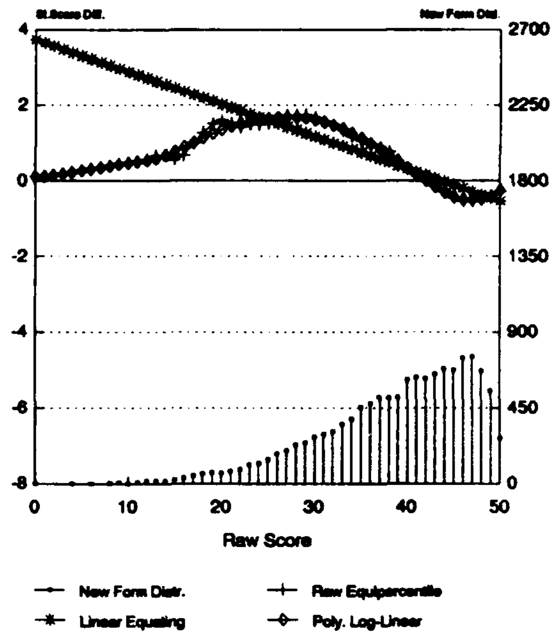


Figure 32c
Contrast With Identity: VE 21a

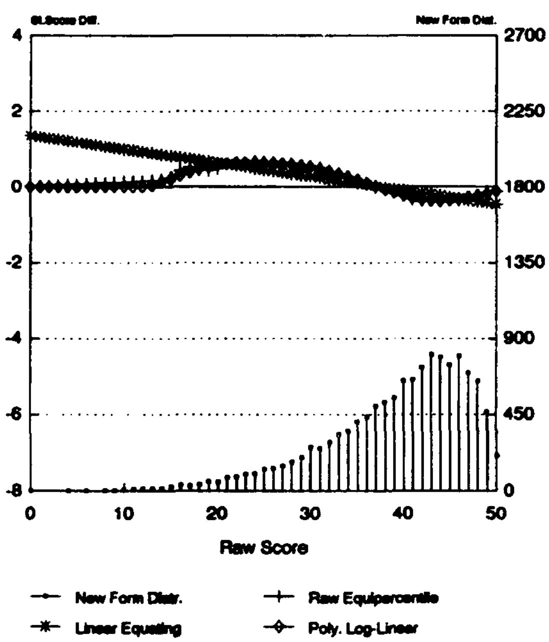


Figure 32d
Contrast With Identity: VE 21b

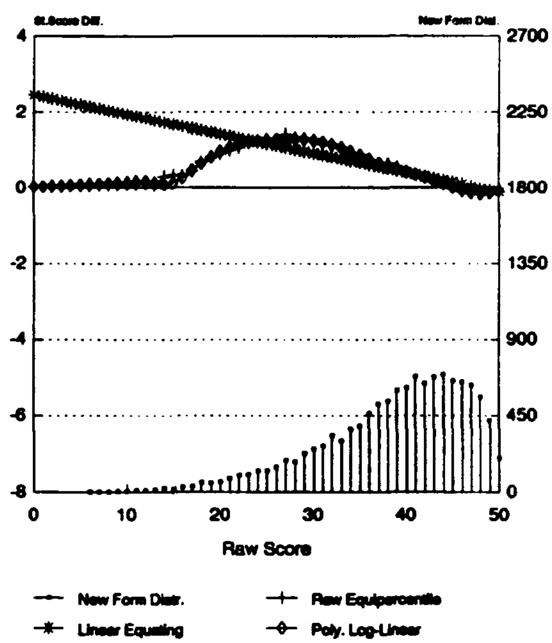


Figure 32. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for VE

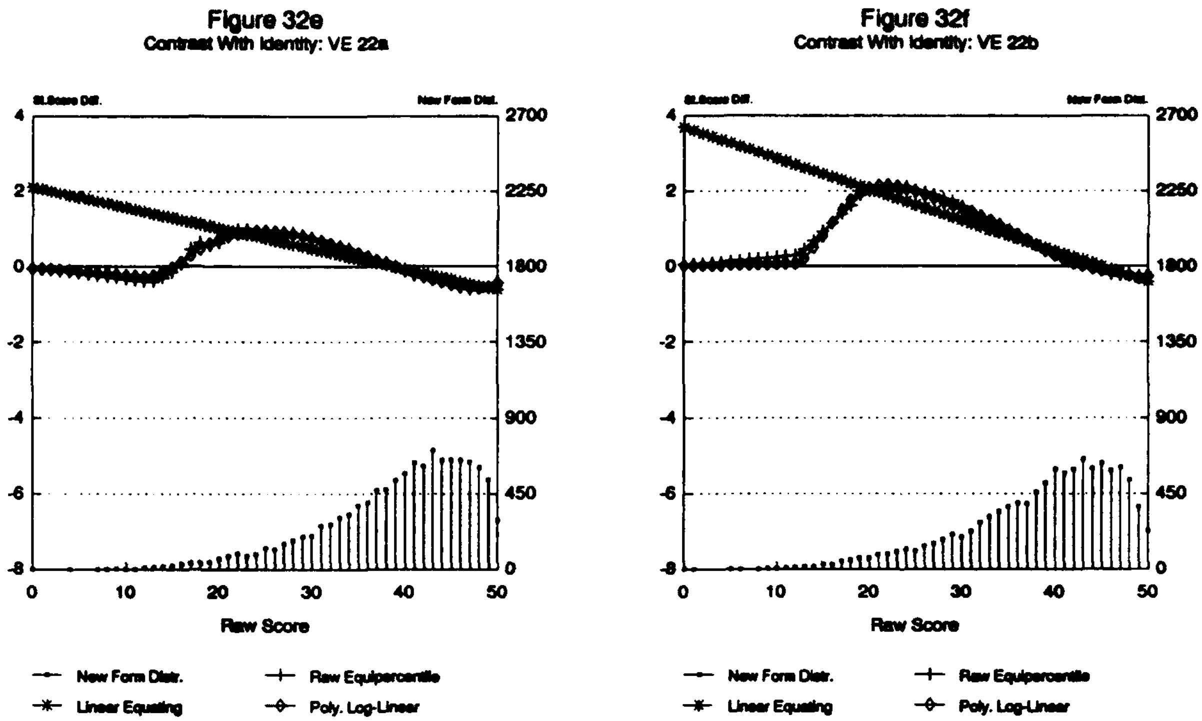


Figure 32, Con't. Standard-Score Contrast of Linear-Rescaling, Quartic Log-Linear and Polynomial Log-Linear Equatings With Linear-Identity Equating for VE

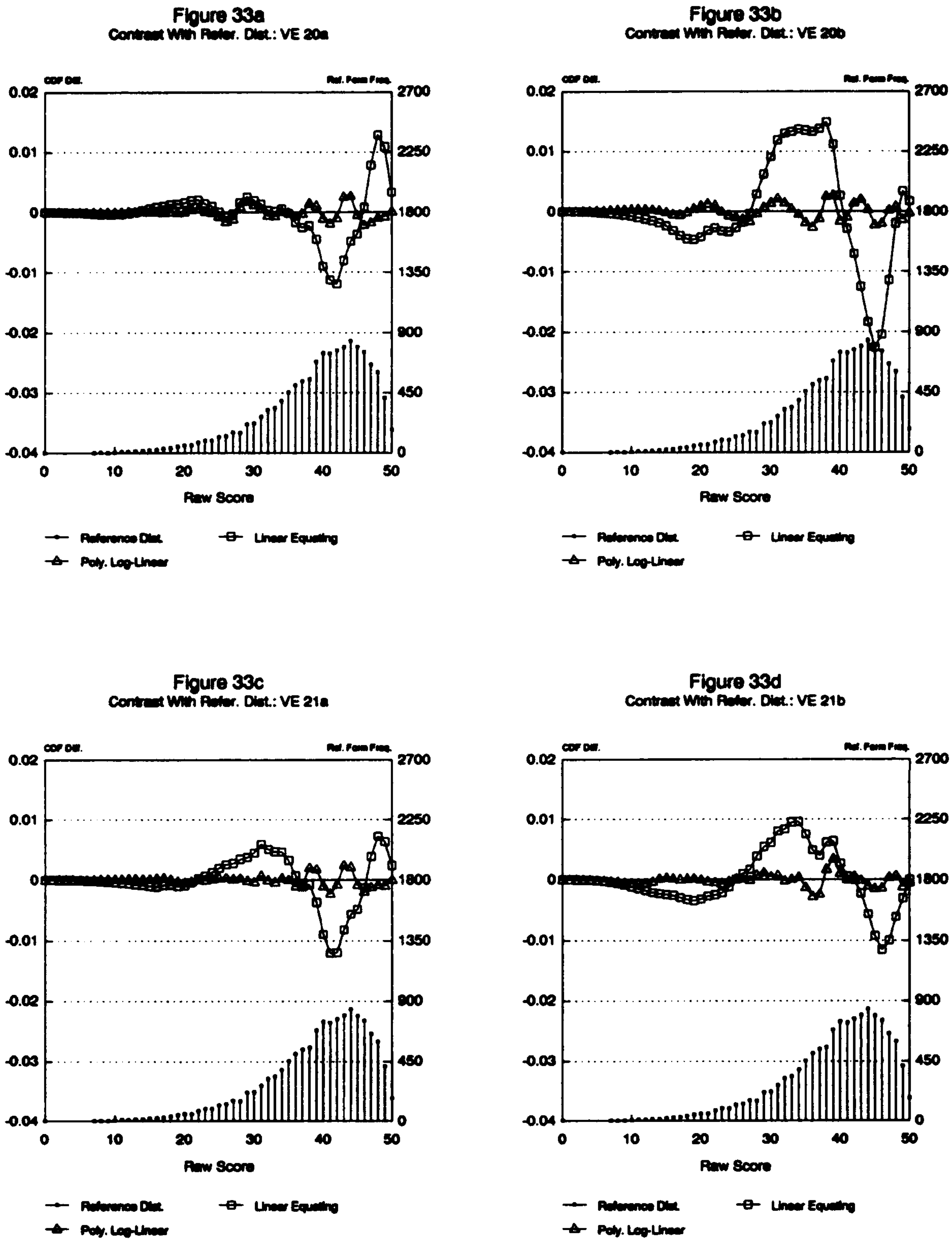
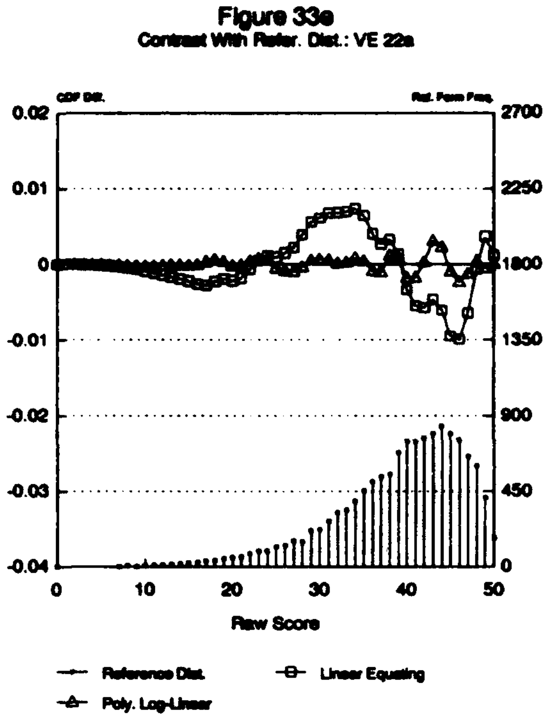


Figure 33. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for VE



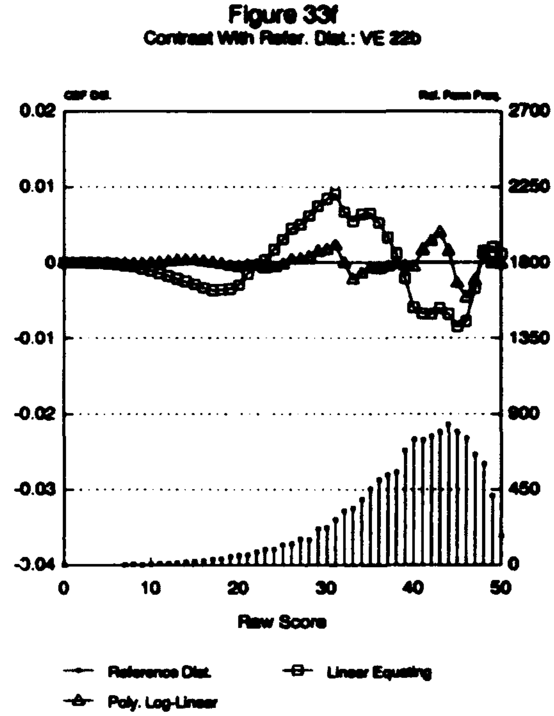


Figure 33, Con't. Contrast of Cumulative Distributions of Quartic and Polynomial Log-Linear Equated Scores With Cumulative Distributions of Reference Form for VE

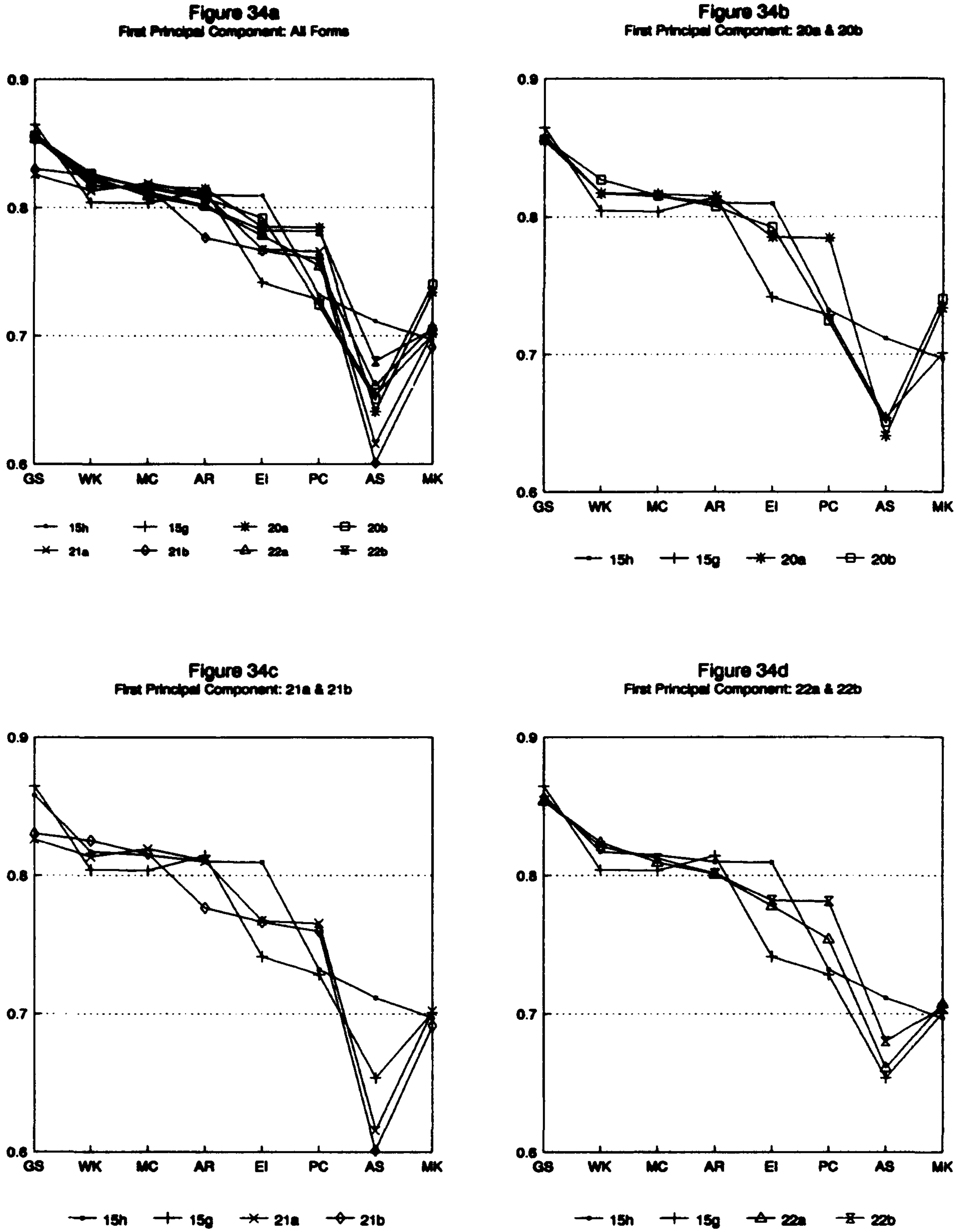


Figure 34. First Principal Component of Power Subtest Standard Scores, by Test Form

Figure 35a
Second and Third Components: 15h

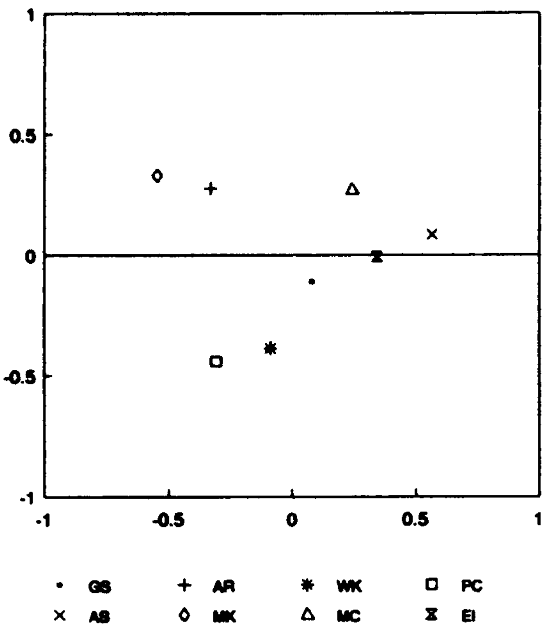


Figure 35b
Second and Third Components: 15g

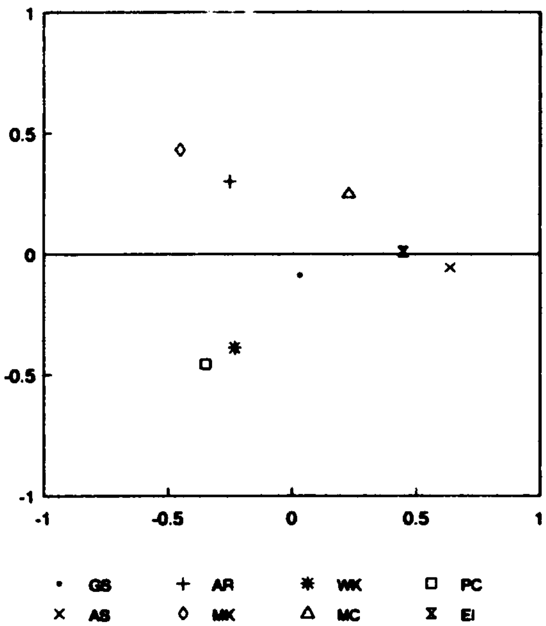


Figure 35c
Second and Third Components: 20a

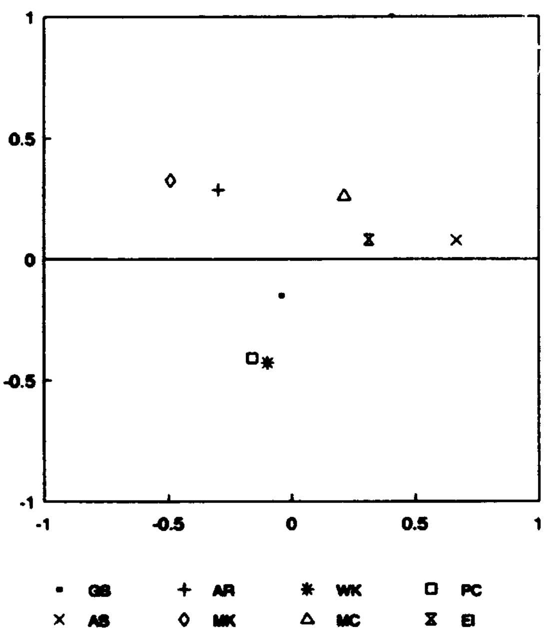


Figure 35d
Second and Third Components: 20b

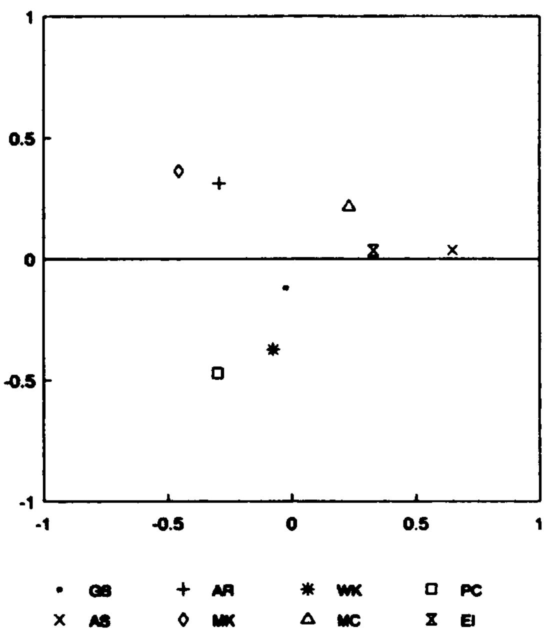


Figure 35. Second and Third Principal Components of Power Subtest Standard Scores, by Test Form

Figure 35e
Second and Third Components: 21a

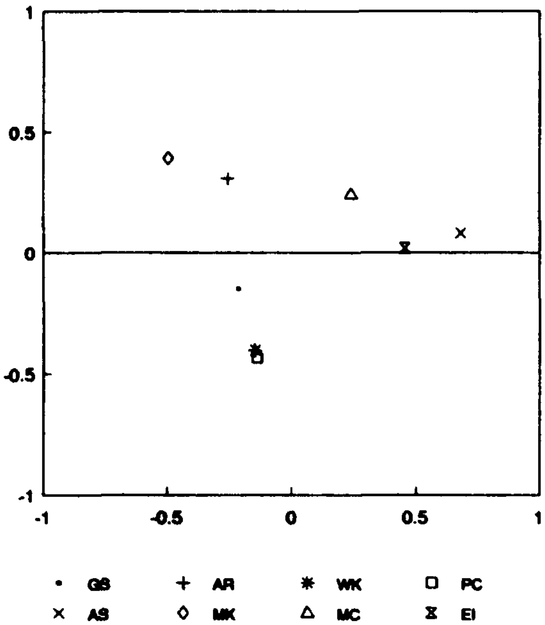


Figure 35f
Second and Third Components: 21b

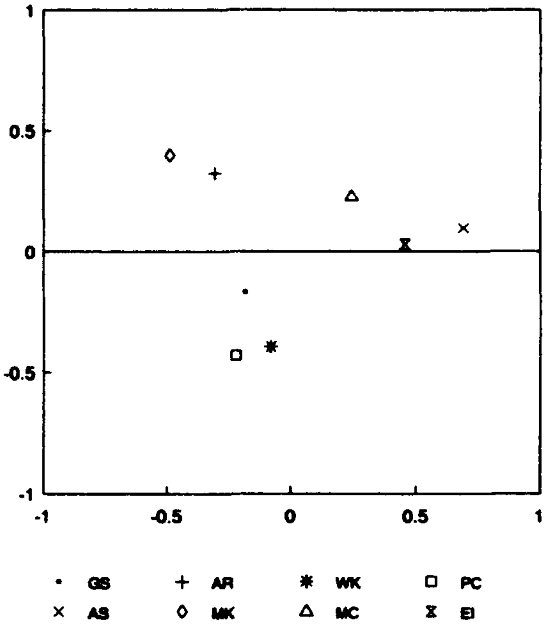


Figure 35g
Second and Third Components: 22a

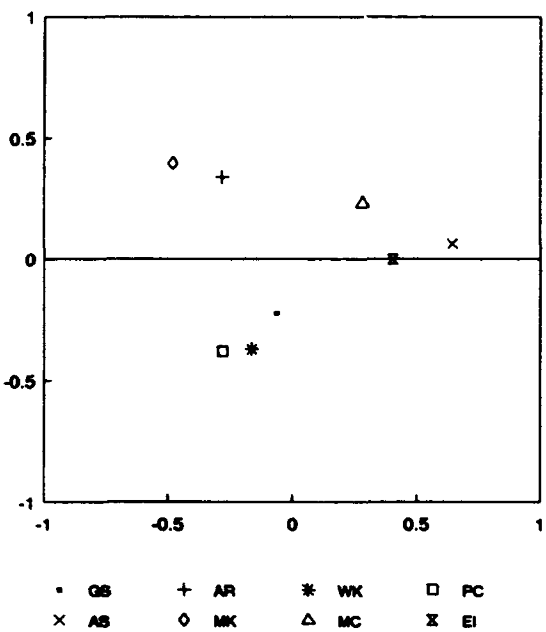


Figure 35h
Second and Third Components: 22b

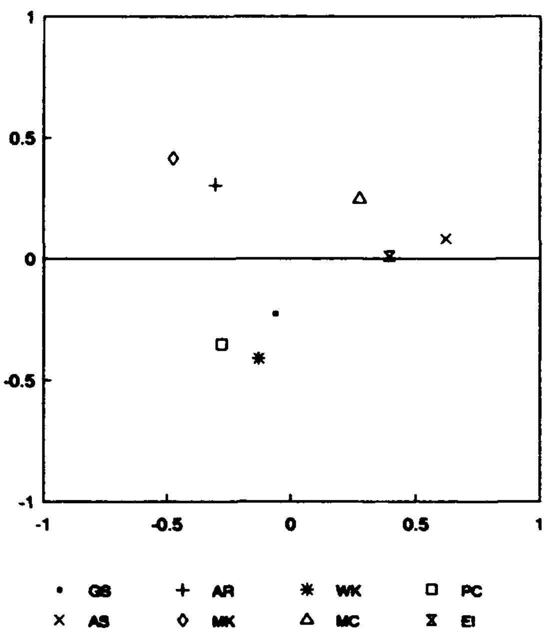


Figure 35, Con't. Second and Third Principal Components of Power Subtest Standard Scores, by Test Form