Comparability of Performance on the SAT® Suite of Assessments Across Pencil-and-Paper and Computer-Based Modes of Administration

SAT, PSAT™ 10, and PSAT™ 8/9

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Executive Summary

This report summarizes the results of three studies investigating the comparability of paper-and-pencil and computer-based versions of the SAT® Suite of Assessments. Studies were carried out for the SAT and PSAT™ 8/9 assessments in October 2016, and for the PSAT™ 10 assessment in April 2018. For each study, participating test takers were randomly assigned to test in either paper-and-pencil (PNP) or computer-based testing (CBT) modes. Mode comparability was assessed for the complete set of scores reported as part of the SAT Suite. These included Math (MSS) and Evidence-Based Reading and Writing (ERW) total scores, Reading test scores and Writing and Language test scores, Analysis in Science cross-test scores, and Analysis in History/Social Studies cross-test scores. In addition, mode comparability was assessed for the following subscores: Words in Context, Command of Evidence, Expression of Ideas, Standard English Conventions, Heart of Algebra, Problem Solving and Data Analysis, and Passport to Advanced Math. Finally, mode comparability was assessed for the three score dimensions of the optional SAT Essay.

Overall, the results of the three studies supported the comparability of scores between PNP and CBT versions of the Writing and Language Test and Math Test across the SAT Suite. However, for the Reading Test there was consistent evidence across the three studies of slightly higher performance on the CBT versions compared with the PNP versions. The differences were between one-half and one point on the Reading Test vertical score scale (which ranges from six to 40 across the three tests).

A significant portion of the mode differences found for Reading appears to be due to items measuring Command of Evidence, which require students to identify the portion of the text that serves as the best evidence for an answer given to a previous question. Analyses of item p-plus values indicated consistently higher CBT performance on this item type on the Reading Test. Consistent with this finding was evidence of higher CBT scores compared with PNP scores for the Command of Evidence subscore and Analysis in Science and Analysis in History/Social Studies cross-test score, each of which includes Command of Evidence items from the Reading Test. For other subscores, there was no consistent evidence of mode differences across studies.

Patterns of raw score correlations among the various test components were similar across modes in each of the three studies, suggesting that the test structures were similar for the PNP and CBT modes. In addition, DIF analyses found very few items that functioned either moderately or significantly different across modes. Some differences in omit and not-reached rates were found between the PNP and CBT modes, with slightly higher percentages of CBT test takers answering questions at the end of the tests than PNP testers, particularly in the Math Test (for which the last several items require students to produce an original response). However, the differences in omit and not-

reached rates did not seem to result in noticeable differences in performance across modes.

Based on the results of the three studies, equating methodology was applied to Reading Test scores, Command of Evidence scores, Analysis in Science cross-test scores, and Analysis in History/Social Studies cross-test scores to determine appropriate adjustments for mode differences seen for these measures. Using the results of the comparability studies as a baseline, College Board will adjust the Reading, Command of Evidence, Analysis in Science, and Analysis in History/Social Studies scores on future computer-based testing forms of the SAT, PSAT 10, and PSAT 8/9.

Analyses of mode differences by subgroup across the three studies largely followed the overall mode difference trends. For most of the subgroups analyzed, CBT scores were consistently higher than PNP scores for the Reading Test. In contrast, there was no consistent evidence of higher or lower performance on the CBT versions of either the Writing and Language Test or Math Test compared with the PNP performance.

Two findings regarding the performance of subgroups across PNP and CBT modes are worth noting. First, for the Hispanic group, the trends in relative performance across mode were slightly different compared to other subgroups, in that there was weaker evidence over the three studies of higher Reading scores for the CBT group compared to the PNP group, and some evidence in the PSAT 10 study of higher PNP scores compared to CBT scores in Writing and Language and Math. Second, although based on very small samples, for the Other Language Best groups there were differences in performance favoring the PNP testers over the CBT testers in all three studies and on each test section, with effect sizes as large as 0.50 for some of the comparisons. It should be noted that the schools recruited for the comparability studies were not otherwise administering the SAT Suite online and may not have exposed their students to the preparation and practice for computer-based testing that might otherwise have been provided. In addition, no accommodations were requested (e.g., extended time, glossaries) for any of the students participating in the study.

The results of the mode comparability analyses for the SAT Essay indicated small but meaningful differences on each score dimension, with higher scores resulting for the PNP group compared to the CBT group. Because Essay scores are not transformed to a scale and average differences on each score dimension were less than half a point, no statistical adjustments for mode will be made. The cause of the differences in Essay scores across modes is not clear. Likely, some of this difference is due to raters and some of the difference is due to student ability. Previous literature suggests that raters can show some bias in favor of handwritten essays (Way, Lin, & Kong, 2008; Puhan, Boughton, & Kim, 2007; Arnold, et al., 1990). Other literature suggests that PNP versus CBT Essay performance may depend on whether or not students are testing with their preferred mode of composition (Horkay, Bennett, Allen, Kaplan, & Yan, 2006). The results of this study were based on randomly assigning students to mode and might not reflect

performance differences that would occur in a school where students are used to composing using keyboards.

As we continue to administer the SAT Suite digitally, College Board will monitor the comparability of CBT and PNP performance on the various tests in the Suite to confirm the appropriateness of the mode adjustments to achieve comparable scores. We will also monitor the performance for various subgroups across testing modes as well as CBT versus PNP performance on the SAT Essay.

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Introduction

Despite the increasing ubiquity of technology in schools, the comparability between paper-and-pencil and computer-based modes of test administration continues to be an issue for many testing programs. Some schools still lack the infrastructure to implement computer-based testing at scale and therefore continue to prefer administering paper-and-pencil tests. At the same time, computer-based testing formats have become less standardized due to the need to administer tests not only on computers but also laptops and tablets, and some computer-based versions of tests employ technology-enhanced items that differ from item types used in paper-and-pencil testing. This issue recently came to the forefront when *Education Week* (Herold, 2016) published a report stating that students taking the Partnership for Assessment of Readiness for College and Careers (PARCC) consortium tests on computer scored lower than students taking the paper-and-pencil version of these assessments. When tests are administered in both paper-and-pencil and computer-based format, a need to demonstrate that scores are comparable across modes of administration is necessary, not only due to the recent spotlight but also as documented in the *Standards for Educational and Psychological Testing* (AERA, APA, NCME, 2014). Specifically, Standard 7.8 notes that when different modes of responding to the same test are offered, test developers should document the extent to which scores from those modes are interchangeable.

Studies dating back to the 1980s are not conclusive about the comparability of scores from paper-and-pencil versus computer-based assessments (Green, Bock, Humphreys, Linn, & Reckase, 1984; Mazzeo & Harvey, 1988; Spray, Ackerman, Reckase, & Carlson, 1989). Several recent meta-analyses on administration mode have found that the effect size, when present, is small overall (Kingston, 2009; Wang, Jiao, Young, Brooks, & Olson, 2007 & 2008). In a study of mode effect on the NAEP assessment, no measurable differences between delivery mode were found (Horkay, et. al., 2006).

Although these studies provide some evidence that computer-based test administrations are comparable to paper-and-pencil administration, comparability cannot be assumed. Some studies have found differences. Kingston (2009) found that scores for students who took a math assessment on paper had statistically significant higher scores than students taking the same assessment on the computer. This pattern was not found in English language arts or social studies. MacCann (2006) found that the mean score was higher for lower Social Economic Status (SES) students taking the paper-and-pencil administered version compared to the computer-based delivery mode.

When differences are found, statistical equating methodologies are sometimes used to ensure that students are not advantaged or disadvantaged by the mode of administration. Way, Lin, and Kong (2008) presented the results for maintaining score equivalence as tests transitioned from paper-and-pencil to computer-based delivery, presenting evidence from several state testing programs. As found in other studies, differences were not consistent. For some states, studies indicated differences, prompting adjustments to convert online scores onto the

established paper-and-pencil scales. However, for other states, studies indicated no mode differences and therefore no adjustments were needed to achieve comparable scores.

The College Board's SAT Suite of Assessments, which includes the SAT, PSAT 10 (PSAT/NMSQT®), and PSAT 8/9, has historically utilized a paper-and-pencil delivery method. As the College Board prepares to offer these assessments digitally, evidence addressing the comparability of scores across administration modes must be established.

Winter (2010) outlined three criteria for evaluating score comparability to ensure that test scores can be used interchangeably. First, tests must measure the same set of knowledge at the same level of content-related complexity across modes. This requirement has been met for the SAT Suite, since the assessments in each administration mode utilize the same item formats and item types. Second, two comparable assessments must produce scores across modes that reflect the same degree of achievement. Third, the assessments must have similar technical properties across modes, such as reliability, decision consistency, and intercorrelations across test components.

The purpose of this research report is to document the results of comparability studies conducted for each of these three assessments in the SAT Suite. The focus of these studies was on the last two of the criteria mentioned above, with the goal of establishing evidence of comparability between scores resulting from computer-based and paper-and-pencil administration.

Test Format

The SAT Suite of Assessments comprises three multiple-choice tests: Reading, Writing and Language, and Math (see Table 1). The SAT has an optional Essay Test, which is a direct-writing task. The College Board designed each test to collect evidence from student performance in support of broad claims about what students know and can do, and each claim is aligned to the SAT Suite's primary usage, assessing college and career readiness. Interested readers are referred to the SAT Suite of Assessments Technical Manual (College Board, 2017) for a more detailed description of the tests.

Test Scoring

The SAT, PSAT 10, and PSAT 8/9 have similar test structures, as indicated in Table 1. Every test in the SAT Suite of Assessments is reported on a common vertical scale, with the SAT as the capstone test of the SAT Suite. Characteristics of the scores are highlighted below:

- A Total Score is the sum of the two section scores (1) Evidence-Based Reading and Writing and (2) Math, on a scale ranging from 400 to 1600 for SAT, 320 to 1520 for PSAT 10, and 240 to 1440 for PSAT 8/9.
- The SAT Suite reports two section (domain) scores: (1) Evidence-Based Reading and Writing, which is the sum of the Reading Test score and the Writing and Language Test score multiplied by 10, and (2) Math, which is the Math Test score multiplied by 20. Each of

the two section scores are reported on a scale ranging from 200 to 800 for SAT, 160 to 760 for PSAT 10, and 120 to 720 for PSAT 8/9.

- The SAT Suite reports two cross-test scores: (1) Analysis in History/Social Studies and (2) Analysis in Science, which are based on select questions in the SAT Suite of Assessments Reading, Writing and Language, and Math Tests. Scores are reported on a scale ranging from 10 to 40 for SAT, 8 to 38 for PSAT 10, and 6 to 36 for PSAT 8/9
- The SAT and PSAT 10 report seven subscores for Reading, Writing and Language, and Math, and six subscores for PSAT 8/9. For all assessments in the SAT Suite, these scores are reported on a scale ranging from 1 to 15.
- The SAT Essay is a 50-minute direct writing task and is scored on three dimensions; Reading, Writing, and Analysis. Two independent raters score every Essay on each dimension on a scale of 0 to 4. A score of zero is given when the rater believes the Essay is off-topic, which includes blank and unreadable responses. The final reported score for the Essay is the sum of the two human raters, with adjudication done if scores are more than one point apart. The scores for the SAT Essay are reported separately and are not factored into the section scores.

Table 1

SAT Suite of Assessments Test Formats

	SAT Test Format		PSAT 10 Test Format		PSAT 8/9 Test Format	
Test	**Min. Allotted**	**Number of Items**	**Min. Allotted**	**Number of Items**	**Min. Allotted**	**Number of Items**
Reading	65	52	60	47	55	42
Writing and Language	35	44	35	44	30	40
Math	80	58	70	48	60	38
Essay (optional)	50	1	N/A		N/A	
Total	180 (230 with Essay) *	154 (155 with Essay)			145	120

* These total times do not include breaks.

For brevity, in places this report will refer to the various scores and subscores using initials: Evidence-Based Reading and Writing: – ERW, Reading – R, Writing and Language – WL, Math Section Score – MSS, Math No Calculator – MNC, Math With Calculator – MWC, Words in Context – WIC, Command of Evidence – COE, Expression of Ideas – EOI, Standard English Conventions – SEC, Heart of Algebra – HOA, Problem Solving and Data Analysis – PSD, and Passport to Advanced Math - PAM.

Comparability Study Research Methods

To support demands of states, districts, and schools, the College Board provides computer-based (CBT) versions of the SAT Suite of Assessments. The CBT versions of the SAT Suite test forms are intended to be a near exact replica of the paper-and-pencil (PNP) versions of the assessments. Some changes were made to the CBT versions to accommodate the online delivery system that were thoroughly reviewed by the College Board's Assessment Design and Development (AD&D) group. Changes included the way questions reference text within reading passages and the ability for students to directly enter open-ended math responses in the CBT version, rather than gridding in responses on an answer sheet, as is done with the PNP version. Previous research (Montgomery & Proctor, 2015) did not find evidence of differential timing effects across modes for the SAT and PSAT 10. From that study, a decision was made to keep the timing of sections the same across modes.

To obtain evidence of comparability of scores across modes, College Board conducted a total of three separate studies for the SAT, PSAT 10, and PSAT 8/9. The SAT and PSAT 8/9 studies took place on October 19, 2016, as part of the operational school day administration of the SAT and the PSAT 8/9 national school day administration. The PSAT 10 study took place during the operational school day administration of the PSAT 10 on April 11 and 12, 2018. A mode comparability study was also done for the SAT Essay as part of the SAT School Day administration.

Test Design and Target Populations

For each study, a random equivalent groups data collection design was used. Recruited schools were required to meet the College Board's requirements for CBT testing and participate in technology readiness testing, as well as meet all other requirements to be a College Board test center. CBT testing occurred on school-provided desktop or laptop computers (Windows, Mac OS, or Chromebooks). Tablets and other mobile devices were not included in this study.

Schools participating in the studies provided the College Board with a list of students taking the assessments and the College Board randomly selected students to take the CBT mode of the assessments. The number of students selected for CBT testing was based on the capacity in the school for CBT testing in a single administration of the assessment; all other students in the school taking the assessment were assigned to the PNP mode. For each study, a single test form that had been equated prior to the study was administered in both modes.

For each study, it was decided the target population would reflect the demographics of the intended national populations taking each assessment. The SAT target sample was intended to be representative of a typical college-bound SAT population taking the SAT in the fall. The sample included both 11th and 12th graders, with specific targets for each grade. The PSAT 10 target sample was intended to be representative of 10th graders taking the PSAT 10 in the spring semester. The PSAT 8/9 target sample was intended to reflect a national representative population of PSAT 8/9 test takers in the fall. The sample included both 8th and 9th graders, however, no specific targets by grade were required.

For each study, a detailed sampling plan was generated, and a targeted recruiting effort at the school level was undertaken to fill the sampling plan. Sampling variables included region of the country, percent minority representation, urbanicity (rural, suburban, urban), public or private schools, and grade level.

The desired participation targets were 6,000 for the SAT and PSAT 8/9 studies and 10,000 for the PSAT 10 study. However, higher numbers of test takers were recruited where possible because it was assumed that a significant number of the recruited participants would drop out prior to testing. For the SAT and PSAT 8/9 studies, the number of test takers recruited exceeded the targets (16,120 test takers for SAT and 10,889 for PSAT 8/9). For PSAT 10, the number of test takers recruited (8,734) was below the number targeted.

Data

At the end of recruiting, 71 schools signed up for the SAT comparability study, 80 schools signed up for the PSAT 10 comparability study, and 68 schools signed up for the PSAT 8/9 comparability study. However, due to school attritions, administration issues, and limitations on CBT testing capacities, the numbers of test takers included in the study were well below the recruited numbers. There was a particularly high level of attrition for the PSAT 10 study: 45% of the schools recruited dropped out by the start of testing.

The equivalency of groups was ensured through random assignment of students to test mode and subsampling within schools such that the number of students across modes was equal. Schools with large discrepancies between assignment and actual form taken were removed from the study to better maintain equivalency across groups. Additional data cleaning was applied, removing test takers who did not answer at least one question that contributed to section scores, test scores, cross-test scores, and subscores. Further, test takers that were form-repeaters were also removed from the analyses. For the SAT and PSAT 8/9 studies, we further cleaned the data such that within a school there were equal numbers of test takers assigned to each mode. This was achieved by simple random selection of students within the school from the mode with the larger number of students. For each of the three studies, we further verified that within schools and key demographics, the expected number of students was within sampling error, thus supporting the assumption of random assignment. For PSAT 10, paper-and-pencil mode test takers in two schools did not respond to the ethnicity and best language background questions; however, both schools are classified by NCES as greater than 50% underrepresented minority schools. This level of missingness suggested that those schools did not meet the random assignment assumption. The analysis was rerun without the “No response” options, and both schools appeared to reasonably meet the random assignment assumptions for all categories.

The final cleaned data set used for the SAT study contained 55 schools and 5,221 students, with 2,614 students testing in the CBT condition. For the PSAT 10 study, the final cleaned data sets contained 42 schools and 2,312 students, with 1,135 students testing in the CBT condition. For the PSAT 8/9 study, there were 47 schools and 3,574 students in the final cleaned data set, with 1,787 students testing in the CBT condition.

Comparability Study Results

The results across the three comparability studies for the multiple-choice portions of the SAT Suite of Assessments are summarized below in five sections. The first section focuses on comparisons of test-level scores across modes. These results include sample characteristics, summaries of the raw and scale score comparisons overall and by subgroup, and raw and scale score intercorrelations by mode. The second section summarizes item-level performance across modes for each study, including p-plus values, item omit and item not-reached rates, and Differential Item Functioning (DIF) analyses. A third section examines results across the three studies for a subset of Command of Evidence (COE) items that contribute to the Reading test. In particular, these items indicate differences in performance across modes that are related to some of the overall score differences seen in the studies. The fourth section presents results of random groups' equatings carried out on a subset of the scores in each test (Reading, Analysis in History/Social Studies, Analysis in Science, and Command of Evidence). These random groups equatings adjusted for the mode differences found for these measures so that comparable scores would result. A final section of the results presents the result of mode comparability analyses for the SAT Essay.

Comparisons of Test-Level Scores Across Modes

Sample Characteristics

Sample sizes by demographic groups are presented in Table 2 for SAT, Table 3 for PSAT 10, and Table 4 for PSAT 8/9. In each table, sample counts and percentages are listed for the PNP and CBT groups. There are some differences in the entries across modes. For the SAT and PSAT 8/9 studies, the difference in the proportion of students between modes appears to be large for the White and English-Only Best Language groups. However, we verified within each school that differences in the numbers of students assigned to each condition in those groups were within sampling error, suggesting that the differences at the aggregate level are an artifact of the recruitment process and random assignment within schools. For the PSAT 10 study, there is a clear difference in percentage of students across modes that did not respond to the ethnicity and best language questions, which is due to the nonresponse for all paper-and-pencil students in the two schools noted earlier. This may be related to some of the differences between modes in the percentages of students in some of these categories (e.g., differences in the percentage of African Americans across modes).

Table 2

Sample Sizes by Background Variable—SAT Comparability Study

	SAT	
Background	**PNP**	**CBT**
Total	2,607	2,614
Females	1,322 (50.7%)	1,344 (51.4%)
Males	1,285 (49.3%)	1,270 (48.6%)
12th Graders	2,460 (94.4%)	2,462 (94.2%)
11th Graders	147 (5.6%)	152 (5.8%)
9th Graders	0 (0%)	0 (0%)
8th Graders	0 (0%)	0 (0%)
Am. Indian/Alaskan Native	22 (0.8%)	16 (0.6%)
Asian	111 (4.3%)	129 (4.9%)
Black/African American	357 (13.7%)	388 (14.8%)
Hispanic/Latino	674 (25.9%)	648 (24.8%)
Mexican	0 (0%)	0 (0%)
Puerto Rican	0 (0%)	0 (0%)
Other Hispanic/Latino	0 (0%)	0 (0%)
Native Hawaiian/Other Pacific Is.	8 (0.3%)	7 (0.3%)
White	1,065 (40.9%)	1,103 (42.2%)
Other Responses	12 (0.5%)	11 (0.4%)
English-Only Best Language	1,839 (70.5%)	1,913 (73.2%)
English & Other Best Language	401 (15.4%)	368 (14.1%)
Other Best Language	40 (1.5%)	41 (1.6%)
Assessment Repeater	221 (8.5%)	177 (6.8%)

Table 3

Sample Sizes by Background Variable—PSAT 10 Comparability Study

	PSAT 10	
Background	**PNP**	**CBT**
Total	1,177	1,135
Females	616 (52.3%)	606 (53.4%)
Males	561 (47.7%)	529 (46.6%)
10th Graders	1,177 (100.0%)	1,135 (100.0%)
Am. Indian/Alaskan Native	12 (1.0%)	13 (1.1%)
Asian	45 (3.8%)	42 (3.7%)
Black/African American	113 (9.6%)	145 (12.8%)
Hispanic/Latino	297 (25.2%)	311 (27.4%)
Native Hawaiian/Other Pacific Is.	3 (0.3%)	1 (0.1%)
White	497 (42.2%)	513 (45.2%)
2 or More Ethnicity	37 (3.1%)	52 (4.6%)
Other Responses	0 (0.0%)	0 (0.0%)
No Response to Ethnicity	173 (14.7%)	58 (5.1%)
English-Only Best Language	871 (74.0%)	879 (77.4%)
English & Other Best Language	146 (12.4%)	205 (18.1%)
Other Best Language	21 (1.8%)	26 (2.3%)
No Response to Best Language	139 (11.8%)	25 (2.2%)
Assessment Repeater	668 (56.8%)	655 (57.7%)

Table 4

Sample Sizes by Background Variable—PSAT 8/9 Comparability Study

	PSAT 8/9	
Background	**PNP**	**CBT**
Total	1,787	1,787
Females	893 (50%)	913 (51.1%)
Males	894 (50%)	874 (48.9%)
12th Graders	0 (0%)	0 (0%)
11th Graders	0 (0%)	0 (0%)
9th Graders	1,282 (71.7%)	1,282 (71.7%)
8th Graders	505 (28.3%)	505 (28.3%)
Am. Indian/Alaskan Native	14 (0.8%)	14 (0.8%)
Asian	199 (11.1%)	221 (12.4%)
Black/African American	225 (12.6%)	263 (14.7%)
Hispanic/Latino	342 (19.1%)	346 (19.4%)
Mexican	0 (0%)	0 (0%)
Puerto Rican	0 (0%)	0 (0%)
Other Hispanic/Latino	0 (0%)	0 (0%)
Native Hawaiian/Other Pacific Is.	26 (1.5%)	19 (1.1%)
White	608 (34%)	763 (42.7%)
Other Responses	0 (0%)	0 (0%)
English-Only Best Language	1,165 (65.2%)	1,426 (79.8%)
English & Other Best Language	291 (16.3%)	281 (15.7%)
Other Best Language	41 (2.3%)	40 (2.2%)
Assessment Repeater	0 (0%)	0 (0%)

Overall Score Differences

Table 5 (SAT), Table 6 (PSAT 10), and Table 7 (PSAT 8/9) present the mean, standard deviation, minimum, and maximum for each of test, cross-test, and subscore in both the raw score and scale score metrics, along with reliability and standard error of measurement (SEM) estimates. In all three tables, the mean raw and scale scores for the CBT test takers in Reading are higher than the corresponding mean raw and scale scores for the PNP test takers. For example, in Table 5, the mean SAT Reading raw score for CBT test takers is 27.11 versus 25.55 for PNP test takers. In Table 6, the mean PSAT 10 Reading raw score for CBT test takers is 23.33 versus 22.26 for PNP test takers. In Table 7, the mean PSAT 8/9 Reading raw score for CBT test takers is 24.82 versus 23.37 for PNP test takers. Similar differences in Reading scale scores across modes are also seen in Tables 5–7.

Table 5

Descriptive Statistics of SAT Raw and Scale Scores by Mode

Form	Score Tier	N	Raw Score						Scale Score				
			Mean	SD	Min	Max	Rel.	SEM	Mean	SD	Min	Max	SEM
PNP	R	2607	25.55	9.99	2	52	0.90	3.13	25.37	5.26	10	40	1.75
	WL	2607	21.42	8.21	2	43	0.88	2.84	24.90	5.42	10	39	1.98
	MSS	2607	26.33	10.05	4	57	0.90	3.20	491.57	100.32	240	790	33.11
	WIC	2607	9.46	3.69	1	18	0.77	1.74	8.05	3.16	1	15	1.52
	COE	2607	8.96	3.82	0	18	0.76	1.83	8.18	2.53	1	15	1.28
	EOI	2607	10.97	5.01	0	24	0.82	2.10	8.28	2.86	1	15	1.30
	SEC	2607	10.44	3.71	1	20	0.74	1.86	7.59	2.95	1	15	1.49
	HOA	2607	9.29	4.04	0	19	0.79	1.80	7.78	2.67	1	15	1.30
	PSD	2607	8.22	3.60	0	17	0.77	1.69	7.73	2.99	1	15	1.46
	PAM	2607	6.86	2.60	0	16	0.55	1.70	7.85	2.59	1	15	1.70
	HSS	2607	16.90	7.12	1	35	0.87	2.54	25.11	5.34	10	40	2.08
	SCI	2607	17.45	6.82	1	35	0.86	2.53	25.20	5.09	10	40	1.96
CBT	R	2614	27.11	10.13	1	52	0.91	3.09	26.18	5.34	10	40	1.69
	WL	2614	21.71	7.92	3	44	0.87	2.82	25.12	5.22	11	40	1.96
	MSS	2614	26.59	9.72	3	56	0.89	3.20	494.58	96.84	220	780	32.96
	WIC	2614	9.69	3.59	0	18	0.76	1.71	8.27	3.06	1	15	1.49
	COE	2614	9.61	3.77	0	18	0.76	1.80	8.60	2.50	1	15	1.25
	EOI	2614	11.06	4.86	0	24	0.81	2.10	8.33	2.76	1	15	1.29
	SEC	2614	10.65	3.62	0	20	0.73	1.84	7.75	2.88	1	15	1.48
	HOA	2614	9.49	3.97	1	19	0.78	1.80	7.93	2.63	1	15	1.28
	PSD	2614	8.24	3.50	0	17	0.75	1.69	7.76	2.90	1	15	1.45
	PAM	2614	6.90	2.52	0	16	0.52	1.70	7.89	2.50	1	15	1.69
	HSS	2614	17.90	7.00	0	35	0.87	2.53	25.86	5.20	10	40	2.00
	SCI	2614	18.10	6.85	0	35	0.86	2.50	25.71	5.13	10	40	1.92

Note: Formulae and procedures for estimating the reliabilities and standard errors of measurement are described in Section 6.4 of the SAT Suite of Assessments Technical Manual (College Board, 2017).

Table 6

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode

Form	Score Tier	N	Raw Score						Scale Score				
			Mean	SD	Min	Max	Rel.	SEM	Mean	SD	Min	Max	SEM
PNP	R	1177	22.26	8.01	1	45	0.86	3.01	23.97	4.68	9	37	1.79
	WL	1177	20.28	7.91	1	43	0.86	2.93	23.79	5.21	9	38	2.06
	MSS	1177	22.78	8.79	5	47	0.89	2.84	461.68	86.01	250	750	29.40
	WIC	1177	8.74	3.76	0	18	0.76	1.80	8.35	2.77	1	15	1.39
	COE	1177	8.23	3.25	0	17	0.66	1.84	8.14	2.40	1	15	1.41
	EOI	1177	10.30	4.33	0	24	0.75	2.12	8.20	2.48	1	15	1.27
	SEC	1177	9.98	4.17	1	20	0.77	1.97	8.30	2.48	2	15	1.23
	HOA	1177	8.80	3.35	1	16	0.77	1.57	7.71	2.73	2	15	1.31
	PSD	1177	5.27	2.88	0	14	0.71	1.52	7.64	2.57	1	15	1.51
	PAM	1177	8.18	3.34	0	16	0.75	1.64	7.90	2.39	1	15	1.25
	HSS	1177	15.39	5.79	1	31	0.81	2.47	23.76	4.79	10	37	2.08
	SCI	1177	16.63	5.99	2	32	0.84	2.39	23.65	4.68	11	38	1.92
CBT	R	1135	23.33	8.14	3	46	0.86	3.02	24.58	4.72	11	38	1.78
	WL	1135	19.92	7.86	5	44	0.86	2.91	23.54	5.21	13	38	2.06
	MSS	1135	22.66	8.70	6	48	0.89	2.85	461.25	85.26	260	760	29.53
	WIC	1135	8.86	3.67	1	18	0.75	1.78	8.44	2.69	1	15	1.41
	COE	1135	8.75	3.33	0	18	0.68	1.85	8.54	2.44	1	15	1.37
	EOI	1135	10.18	4.38	1	24	0.76	2.10	8.13	2.50	2	15	1.26
	SEC	1135	9.75	4.13	0	20	0.76	1.96	8.14	2.47	1	15	1.23
	HOA	1135	8.54	3.30	0	16	0.76	1.57	7.50	2.64	1	15	1.30
	PSD	1135	5.31	2.86	0	14	0.70	1.52	7.71	2.57	1	15	1.26
	PAM	1135	8.27	3.36	0	16	0.75	1.65	7.99	2.43	1	15	1.51
	HSS	1135	15.75	5.75	2	32	0.81	2.47	24.06	4.75	11	38	2.08
	SCI	1135	17.12	6.13	2	32	0.84	2.40	24.06	4.83	11	38	1.93

Note: Formulae and procedures for estimating the reliabilities and standard errors of measurement are described in Section 6.4 of the SAT Suite of Assessments Technical Manual (College Board, 2017).

Table 7

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode

Form	Score Tier	N	Raw Score						Scale Score				
			Mean	SD	Min	Max	Rel.	SEM	Mean	SD	Min	Max	SEM
PNP	R	1787	23.37	8.10	2	41	0.88	2.72	23.01	4.77	9	35	1.66
	WL	1787	20.95	8.23	1	39	0.89	2.68	21.55	5.18	7	35	1.72
	MSS	1787	16.75	7.42	0	38	0.89	2.47	438.23	92.48	120	720	33.12
	WIC	1787	9.97	3.86	0	18	0.78	1.75	8.25	3.48	1	15	1.59
	COE	1787	9.40	3.87	0	18	0.78	1.79	8.19	2.79	1	15	1.34
	EOI	1787	11.26	5.10	0	24	0.83	2.08	7.86	3.06	1	15	1.29
	SEC	1787	9.69	3.65	0	16	0.79	1.63	7.78	3.58	1	15	1.60
	HOA	1787	6.67	3.28	0	16	0.77	1.54	8.06	2.85	1	15	1.38
	PSD	1787	7.93	3.33	0	16	0.76	1.59	7.96	2.97	1	15	1.44
	HSS	1787	15.39	5.64	1	29	0.84	2.21	22.30	5.10	8	36	2.08
	SCI	1787	13.45	5.50	0	28	0.81	2.34	22.56	4.90	6	35	2.13
CBT	R	1787	24.82	8.10	1	42	0.89	2.70	23.85	4.85	7	36	1.70
	WL	1787	21.63	8.31	0	40	0.89	2.67	21.98	5.27	6	36	1.72
	MSS	1787	17.15	7.43	1	38	0.89	2.46	443.73	92.50	150	720	32.64
	WIC	1787	10.30	3.85	0	18	0.79	1.72	8.56	3.48	1	15	1.57
	COE	1787	10.24	4.01	0	18	0.79	1.77	8.79	2.89	1	15	1.33
	EOI	1787	11.75	5.16	0	24	0.83	2.08	8.14	3.07	1	15	1.28
	SEC	1787	9.87	3.60	0	16	0.79	1.61	7.98	3.54	1	15	1.59
	HOA	1787	6.83	3.28	0	16	0.77	1.53	8.18	2.85	1	15	1.37
	PSD	1787	8.13	3.29	0	16	0.75	1.60	8.13	2.95	1	15	1.45
	HSS	1787	15.72	5.63	1	29	0.85	2.18	22.60	5.15	8	36	2.06
	SCI	1787	14.57	5.60	0	28	0.82	2.34	23.53	5.05	6	35	2.16

Note: Formulae and procedures for estimating the reliabilities and standard errors of measurement are described in Section 6.4 of the SAT Suite of Assessments Technical Manual (College Board, 2017).

Table 8 summarizes differences across various tests and subtests for SAT, PSAT 10, and PSAT 8/9 in terms of mean differences between scale scores and effect sizes (defined as the difference in means divided by the pooled standard deviation of the online and paper-and-pencil groups). Effect sizes within ±0.20 are usually interpreted as “small.” However, in the context of score comparability in high-stakes testing, effect sizes beyond ±0.10 are concerning. Of the section and total scores, only Reading had statistically significant mean differences and effect sizes beyond -0.10 in each study. Of the subscores and cross-test scores, Command of Evidence and Analysis in Science also had statistically significant mean differences and effect sizes beyond -0.10 across all three studies (the effect size for COE was -0.211 in the PSAT 8/9 study). The Analysis in Science and Analysis in History/Social Studies cross-test scores also had relatively large effect sizes in at least one of the three studies.

Table 8

Mean Differences and Effect Sizes—SAT, PSAT 10, and PSAT 8/9 Scale Scores

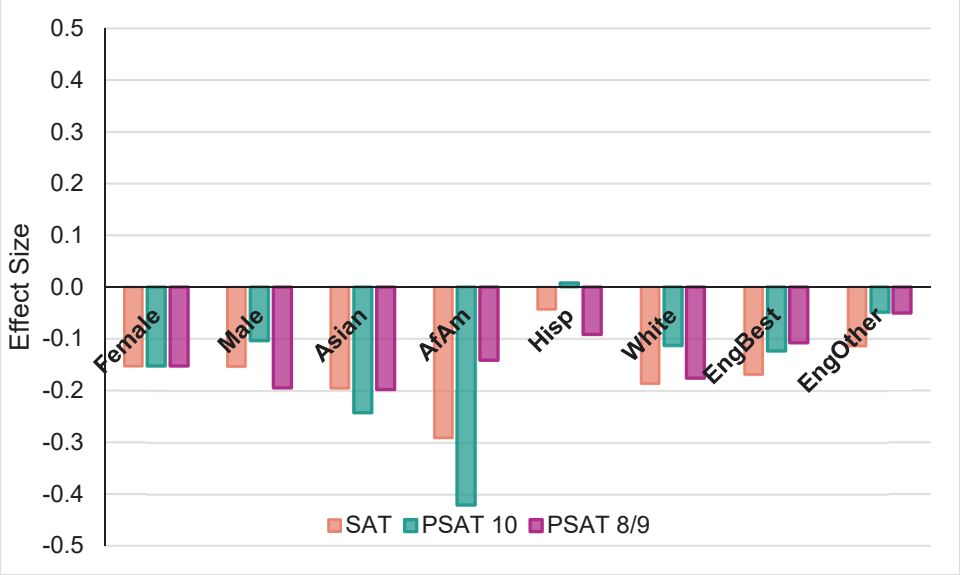
	SAT		PSAT 10		PSAT 8/9	
Section/Total Scores	**Mean Dif.**	**Effect Size**	**Mean Dif.**	**Effect Size**	**Mean Dif.**	**Effect Size**
Math Total	-3.01	-0.03	0.43	0.01	-5.50	-0.06
Reading	-0.81†	-0.15	-0.61†	-0.13	-0.84†	-0.18
Writing and Language	-0.22	-0.04	0.25	0.05	-0.44†	-0.08
ERW Total	-10.32†	-0.10	-3.59	-0.04	-12.79†	-0.13
Total Math + ERW	-13.34†	-0.07	-3.15	-0.02	-18.28†	-0.10
Subscores & Cross-Test Scores	**Mean Dif.**	**Effect Size**	**Mean Dif.**	**Effect Size**	**Mean Dif.**	**Effect Size**
Words in Context	-0.22†	-0.07	-0.08	-0.03	-0.31†	-0.09
Command of Evidence	-0.43†	-0.17	-0.40†	-0.17	-0.60†	-0.21
Expression of Ideas	-0.06	-0.02	0.07	0.03	-0.28†	-0.09
Standard English Conventions	-0.16†	-0.06	0.16	0.06	-0.20	-0.06
Heart of Algebra	-0.15†	-0.06	0.21	0.08	-0.11	-0.04
Problem Solving/Data Analysis	-0.03	-0.01	-0.07	-0.03	-0.17	-0.06
Passport to Advanced Math	-0.04	-0.02	-0.09	-0.04	N/A	N/A
Analysis in History/Social Studies	-0.75†	-0.14	-0.30	-0.06	-0.30	-0.06
Analysis in Science	-0.51	-0.10	-0.41†	-0.09	-0.98†	-0.20

Note: Positive differences indicate PNP higher, negative difference indicate CBT higher. †Indicates significant mean differences at .05 level based on independent sample t-tests.

Score Differences by Subgroups

Appendices A (for SAT), B (for PSAT 10), and C (for PSAT 8/9) present descriptive statistics by mode and subgroup, which include gender (Female, Male), ethnicity (Asian, African American, Hispanic, White), and English language status (English-Only Best, English and Other Best, Other Language Best). The sample sizes by group and mode were relatively high, with some exceptions. In particular, the sample sizes for the Other Language Best groups were less than 50 in each mode, and less than 30 in the PSAT 10 study. For those subgroups where sample sizes were small, caution should be used in interpreting results of mode comparisons.

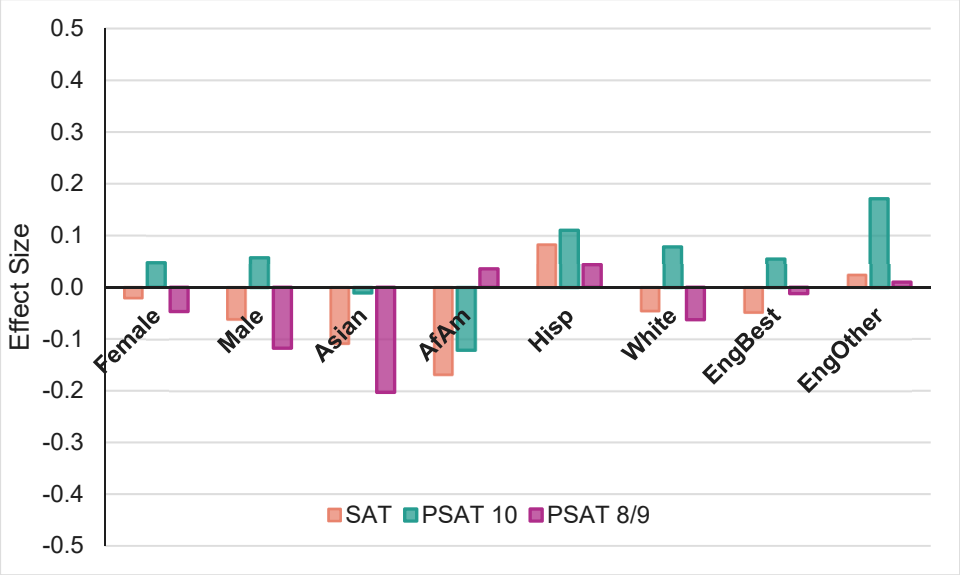
Figures 1–3 present the subgroup effect sizes across the three studies for Reading, Writing and Language, and Math, respectively. The results for the Other Language Best group are not included in these figures due to the small sample sizes. The Reading effect sizes (Figure 1) are consistently negative, indicating higher performance for the CBT testers. Many of the effect sizes are beyond -0.10 and several exceed -0.20. The largest effect sizes occurred for African Americans and the smallest effect sizes occurred for the Hispanic/Latino group.



Note: Positive Differences Indicate PNP Higher, Negative Differences Indicate CBT Higher.

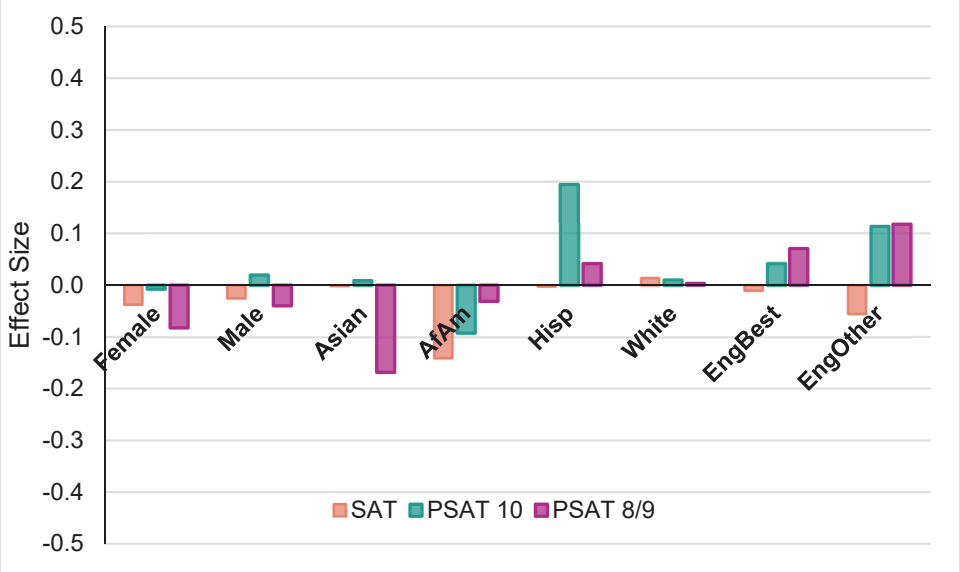
Figure 1. Reading Effect Sizes by Subgroup—SAT, PSAT 10, and PSAT 8/9 Scale Scores.

Effect sizes by subgroup for Writing and Language and Math (Figures 2 and 3, respectively) suggest no consistent pattern of mode differences across studies. The effect sizes across groups and studies are both positive and negative effect sizes, and the magnitudes of the effect sizes are relatively small. For both tests, effect sizes tend to be negative for the Asian and African American groups and positive for the Hispanic group, although these patterns are not completely consistent across studies and may be influenced by sampling fluctuations due to relatively small sample sizes.



Note: Positive Differences Indicate PNP Higher, Negative Differences Indicate CBT Higher.

Figure 2. Writing and Language Effect Sizes by Subgroup—SAT, PSAT 10, and PSAT 8/9 Scale Scores.

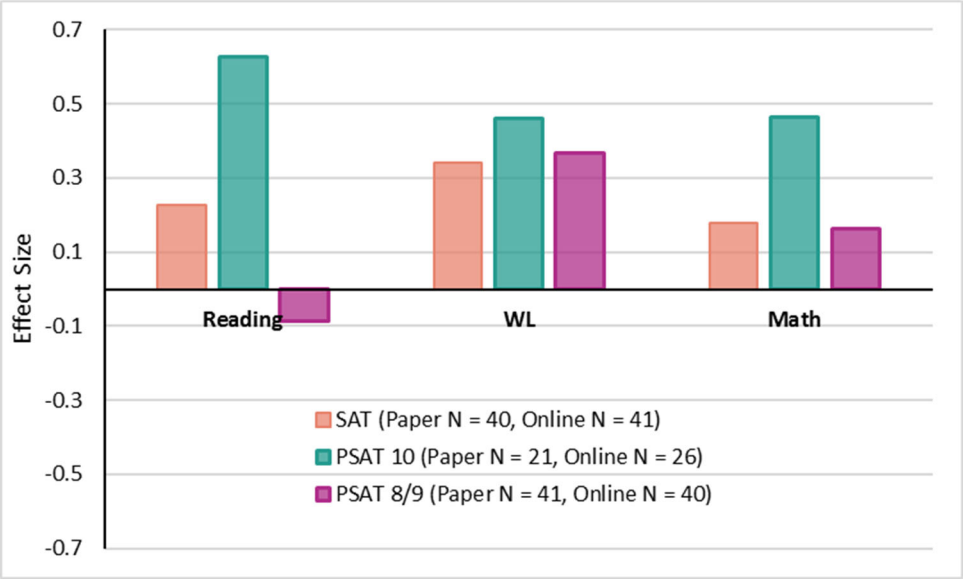


Note: Positive Differences Indicate PNP Higher, Negative Differences Indicate CBT Higher.

Figure 3. Math Effect Sizes by Subgroup—SAT, PSAT 10, and PSAT 8/9 Scale Scores.

Score Differences for the Other Language Best Group

As previously mentioned, the sample sizes for the Other Language Best group were quite small. For this reason, comparisons between PNP and CBT testers were not included in the previous section. However, despite the small sample sizes, comparisons between PNP and CBT revealed notable trends for this group. Figure 4 presents the effect sizes for the Other Language Best group across the three studies. With one exception (the Reading comparison for the PSAT 8/9 study), all effect sizes are positive and relatively large in magnitude.



Note: Positive Differences Indicate PNP Higher, Negative Differences Indicate CBT Higher.

Figure 4. Scale Score Effect Sizes for the Other Language Best Group.

Intercorrelations of Raw Scores by Mode

Correlations are a useful metric to determine if relationships among the scores are comparable across modes. Tables 9–11 report the correlations among the raw scores for both modes of administration for the SAT, PSAT 10, and PSAT 8/9 studies, respectively. For SAT (Table 9), correlations among raw scores for the PNP group show a weak tendency to be larger than the correlations among raw scores for the CBT group. The differences in correlations range from 0.00 to 0.04 across modes, favoring the PNP group. For PSAT 10 (Table 10) and PSAT 8/9 (Table 11), there is no tendency for one mode to show larger correlations than the other mode. Although not shown, intercorrelations of scale scores were also computed and indicated the same trends across the three studies.

Table 9 SAT

Raw Score Correlations Across Modes

Correlations Below Diagonal PNP, Above Diagonal CBT	R	WL	MSS	WIC	COE	EOI	SEC	HOA	PSD	PAM	HSS	SCI
R	-	0.82	0.72	0.85	0.87	0.80	0.72	0.68	0.69	0.52	0.92	0.92
WL	0.83	-	0.75	0.84	0.84	0.95	0.91	0.71	0.71	0.54	0.85	0.83
MSS	0.74	0.76	-	0.67	0.71	0.72	0.67	0.92	0.90	0.80	0.79	0.78
WIC	0.85	0.85	0.69	-	0.75	0.85	0.70	0.63	0.64	0.48	0.83	0.83
COE	0.87	0.86	0.72	0.76	-	0.86	0.69	0.67	0.67	0.52	0.85	0.84
EOI	0.81	0.96	0.72	0.85	0.87	-	0.74	0.68	0.68	0.52	0.84	0.82
SEC	0.74	0.92	0.70	0.72	0.73	0.77	-	0.64	0.63	0.49	0.73	0.71
HOA	0.70	0.71	0.92	0.65	0.68	0.68	0.65	-	0.75	0.64	0.74	0.73
PSD	0.70	0.72	0.91	0.66	0.67	0.69	0.66	0.77	-	0.60	0.76	0.75
PAM	0.55	0.56	0.81	0.52	0.53	0.53	0.52	0.65	0.62	-	0.56	0.56
HSS	0.92	0.85	0.80	0.82	0.85	0.84	0.75	0.76	0.78	0.58	-	0.84
SCI	0.92	0.84	0.80	0.84	0.84	0.83	0.74	0.75	0.77	0.58	0.85	-

Table 10

PSAT 10 Raw Score Correlations Across Modes

Correlations Below Diagonal PNP, Above Diagonal CBT	R	WL	MSS	WIC	COE	EOI	SEC	HOA	PSD	PAM	HSS	SCI
R	-	0.78	0.71	0.84	0.84	0.74	0.70	0.65	0.66	0.58	0.89	0.91
WL	0.78	-	0.72	0.83	0.79	0.93	0.92	0.66	0.66	0.61	0.81	0.81
MSS	0.72	0.72	-	0.69	0.66	0.68	0.65	0.91	0.90	0.86	0.80	0.77
WIC	0.85	0.82	0.68	-	0.71	0.83	0.71	0.62	0.64	0.56	0.82	0.83
COE	0.84	0.80	0.67	0.70	-	0.80	0.66	0.60	0.61	0.56	0.81	0.82
EOI	0.74	0.93	0.68	0.82	0.80	-	0.71	0.61	0.63	0.58	0.79	0.78
SEC	0.71	0.93	0.66	0.71	0.68	0.73	-	0.61	0.58	0.54	0.71	0.71
HOA	0.66	0.66	0.91	0.62	0.62	0.61	0.61	-	0.73	0.68	0.71	0.70
PSD	0.66	0.65	0.89	0.63	0.60	0.62	0.59	0.73	-	0.66	0.79	0.72
PAM	0.61	0.62	0.86	0.57	0.57	0.58	0.57	0.68	0.64	-	0.63	0.63
HSS	0.90	0.79	0.82	0.81	0.79	0.77	0.70	0.73	0.79	0.66	-	0.81
SCI	0.91	0.82	0.76	0.83	0.83	0.80	0.72	0.68	0.71	0.64	0.80	-

Table 11

PSAT 8/9 Raw Score Correlations Across Modes

Correlations Below Diagonal PNP, Above Diagonal CBT	R	WL	MSS	WIC	COE	EOI	SEC	HOA	PSD	HSS	SCI
R	-	0.81	0.72	0.87	0.88	0.79	0.74	0.67	0.68	0.91	0.90
WL	0.82	-	0.78	0.87	0.85	0.96	0.93	0.72	0.72	0.85	0.83
MSS	0.72	0.75	-	0.72	0.72	0.76	0.70	0.93	0.91	0.80	0.79
WIC	0.87	0.86	0.70	-	0.78	0.86	0.76	0.66	0.68	0.86	0.83
COE	0.87	0.85	0.71	0.77	-	0.86	0.74	0.66	0.68	0.85	0.86
EOI	0.80	0.96	0.72	0.86	0.86	-	0.79	0.70	0.71	0.84	0.83
SEC	0.74	0.92	0.67	0.73	0.72	0.76	-	0.65	0.65	0.75	0.73
HOA	0.68	0.71	0.93	0.67	0.67	0.69	0.64	-	0.74	0.73	0.71
PSD	0.67	0.68	0.92	0.64	0.65	0.65	0.61	0.76	-	0.76	0.76
HSS	0.91	0.83	0.78	0.84	0.85	0.82	0.72	0.74	0.73	-	0.80
SCI	0.90	0.84	0.79	0.84	0.84	0.83	0.73	0.72	0.75	0.80	-

Comparison of Test-Level Scores—Summary

In summary, comparisons of test test-level scores across the three mode comparability studies indicated slightly higher scores on the Reading test for the CBT group compared with the PNP group. These differences were less than one point on the reported score scale. However, they were both statistically significant and judged practically significant. Several other scores that include Reading items also indicated differences across studies favoring the CBT group: Command of Evidence subscores, Analysis in Science cross-test scores, and Analysis in History/Social Studies cross-test scores.

Consistent with the overall score differences seen across modes for Reading, for most of the subgroups analyzed, CBT scores were consistently higher than PNP scores for Reading. Also mirroring the overall results, there was no consistent evidence of higher or lower performance for most of the CBT subgroups on either the Writing and Language test or Math test compared to the PNP subgroup performance. Some exceptions to these trends were found for the Hispanic and especially the Other Language Best groups.

Finally, correlations among test scores, cross-test scores, and subscores were highly similar across the CBT and PNP groups in all three of the comparability studies, suggesting that the overall test structures were equivalent across modes of administration.

Comparisons of Item-Level Performance Across Modes

This section of results focuses on the item-level analyses. Specifically, we examined the comparison of p-plus values, item omission rates, and item not-reached rates.

Comparison of P-Plus Values

The difficulty of items, as measured by the proportion correct, where the denominator is the number of students that attempted an item (typically referred to as the p-plus value), was examined across modes. Larger values indicate that an item is easier. Figures 5–16 present plots of the p-plus values for the SAT, PSAT 10, and PSAT 8/9 studies by item position for both modes. The left panels present plots of the overall p-plus values, and the right panels depict the difference in p-plus values (PNP minus CBT) by item position.

The pattern of p-plus values is highly similar across modes, as can be seen in the left panel of each figure for SAT, PSAT 10, and PSAT 8/9. However, in all studies more Reading items were "easier" for the CBT group as can be seen in the right panels of Figures 5–7. In most cases where the CBT p-plus values were higher, the differences were less than 0.05, but in a few cases the differences exceeded 0.10 and for one SAT item the difference in p-plus values exceeded 0.15.

Figures 8–10 present the p-plus values and p-plus differences across the three studies for Writing and Language. In comparison to the Reading results, the p-plus differences for Writing and Language are relatively evenly split between positive and negative values, with more negative values for the SAT and PSAT 8/9 studies and more positive values for the PSAT 10 study. The absolute values of these differences are mostly less than 0.05, and only one difference is greater than 0.10.

Plots for the Math p-plus values and p-plus differences are presented separately for items in the no calculator and calculator sections (Figures 11–16). For all studies, the MNC and MWC sections appear to have an approximately equal number of items favoring each group overall. However, the last items in each section are student-produced response (SPR) items, for which students either grid in (for PNP) or type in (for CBT) their answers. A clear trend for the SPR items across all the figures is that the p-plus values for the PNP students are higher than the p-plus value for the CBT students. As will be discussed in the next section, these p-plus differences appear to reflect mode differences in the percentages of those responding to questions rather than differences in performance.

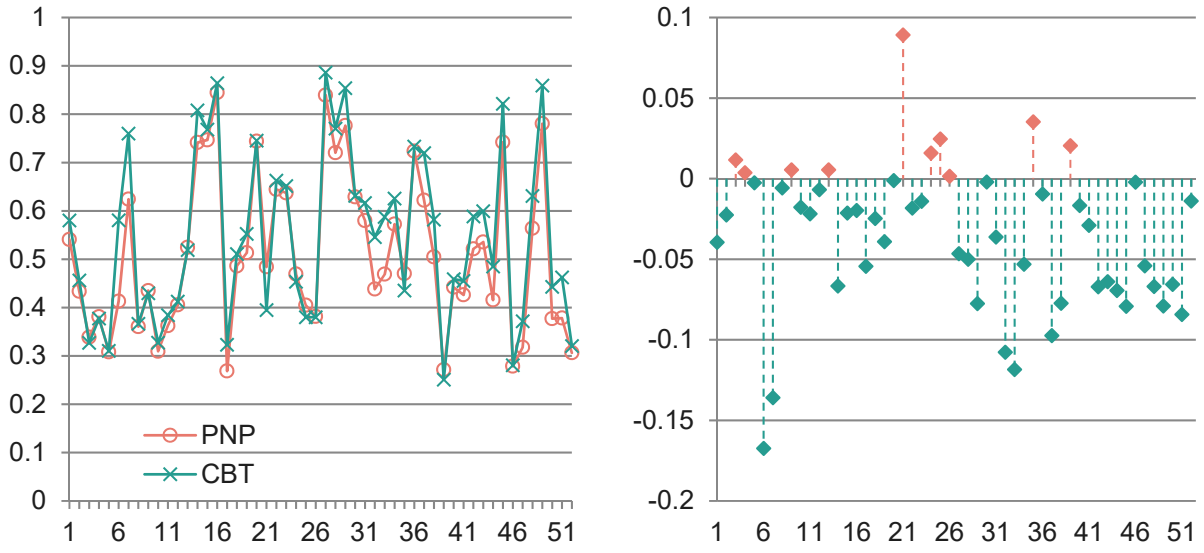


Figure 5. SAT R Items P-Plus Comparisons

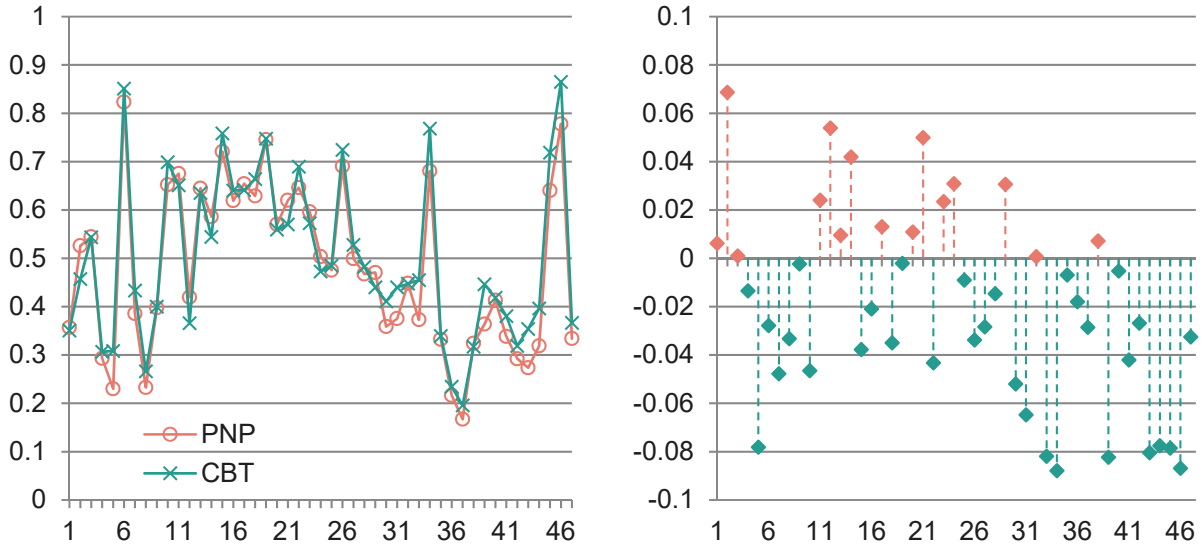


Figure 6. PSAT 10 R Items P-Plus Comparisons

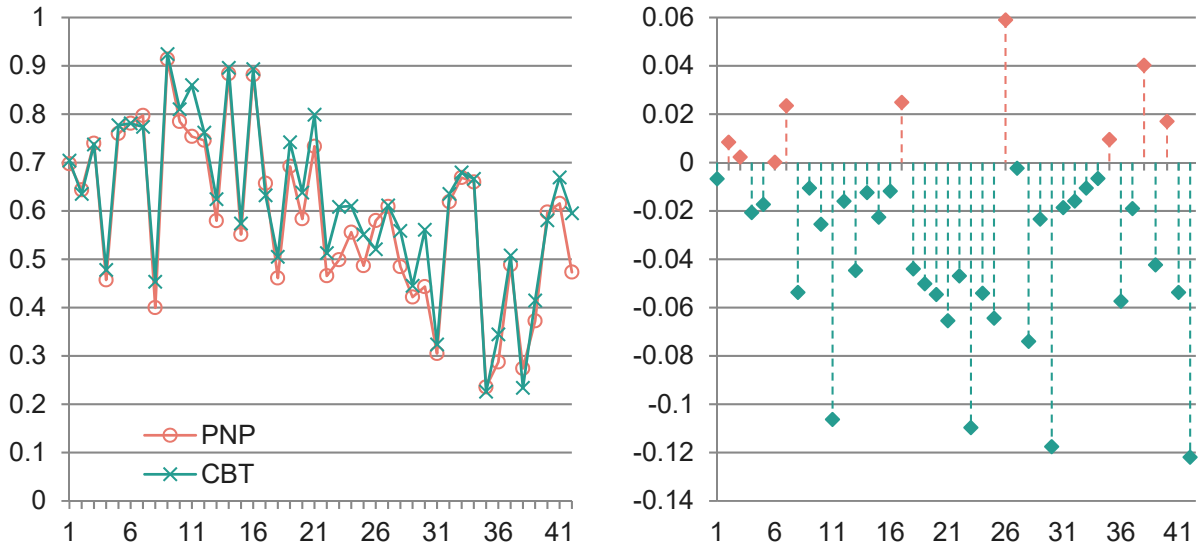


Figure 7. PSAT 8/9 R Items P-Plus Comparisons

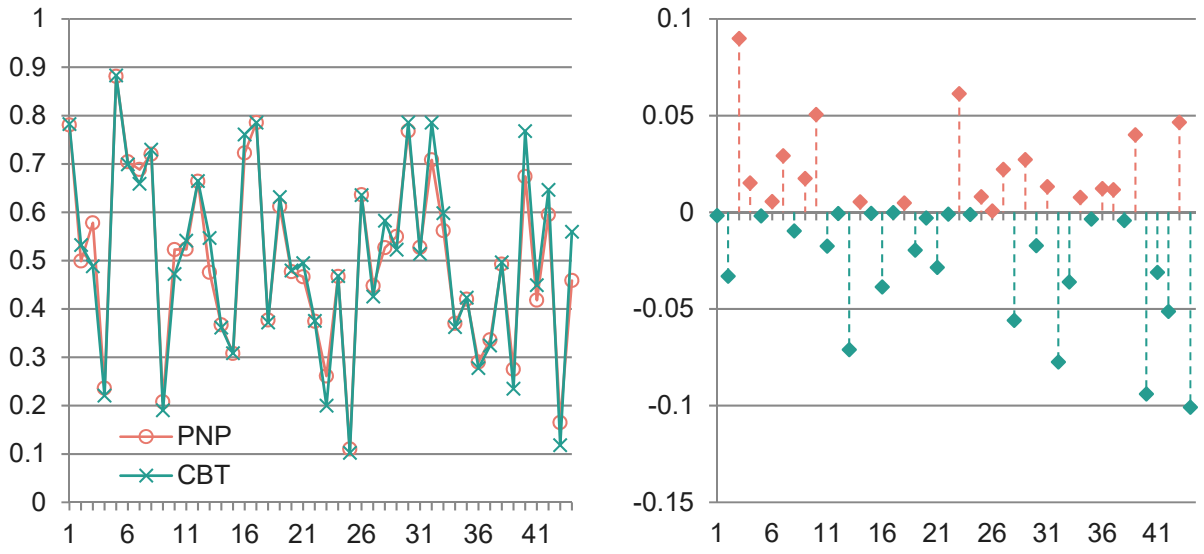


Figure 8. SAT WL Items P-PLUS Comparisons

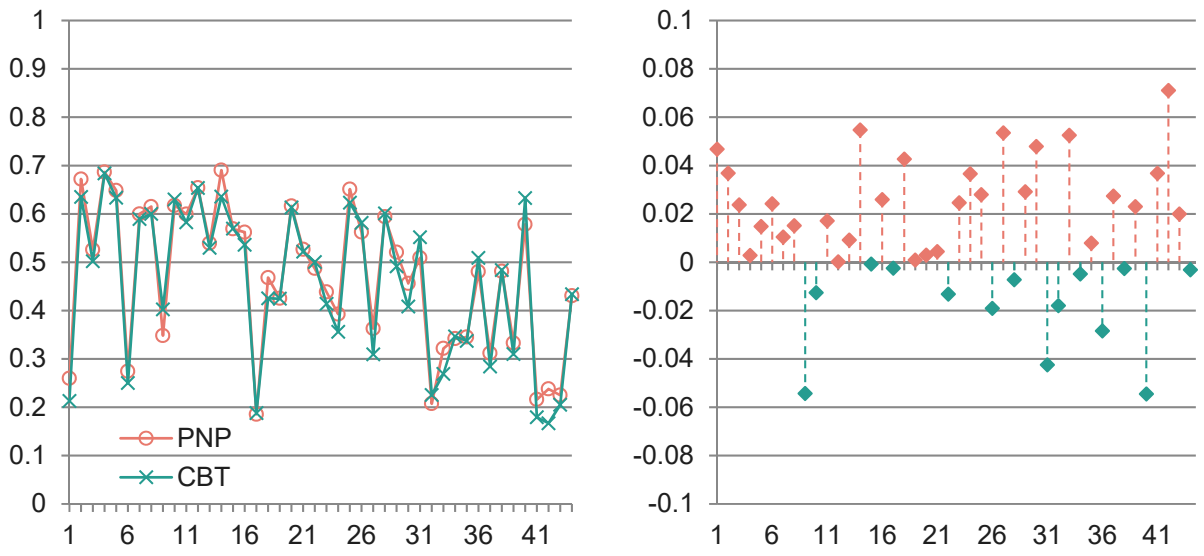


Figure 9. PSAT 10 WL Items P-Plus Comparisons

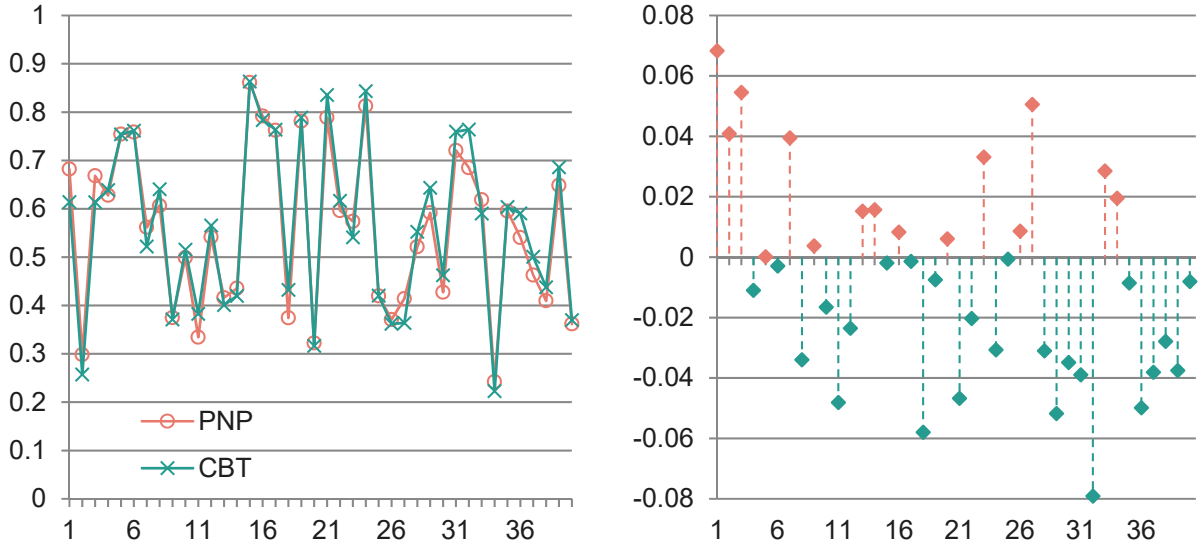


Figure 10. PSAT 8/9 WL Items P-Plus Comparisons

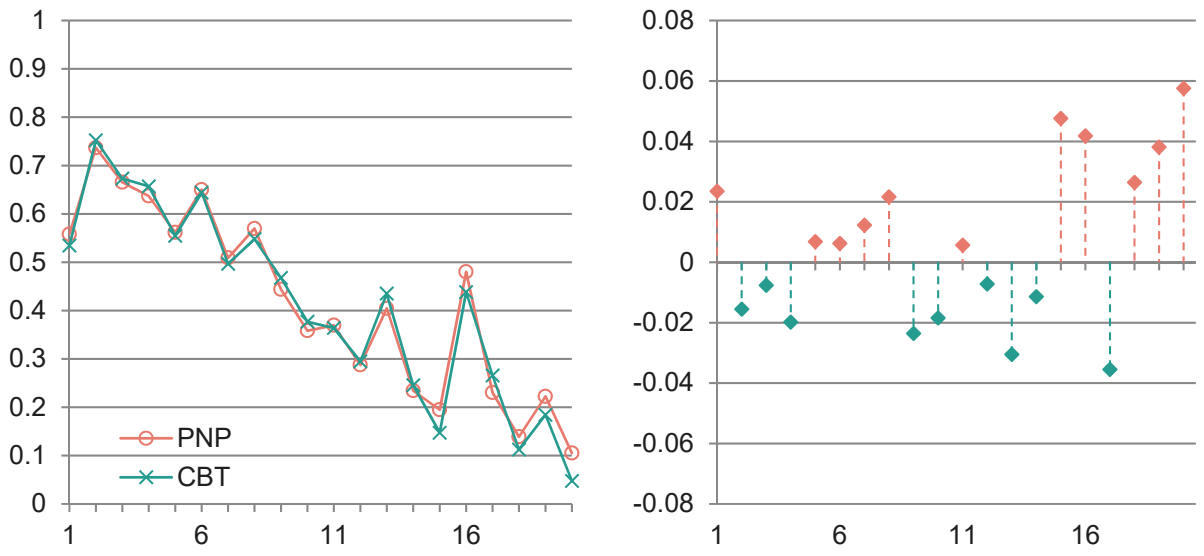


Figure 11. SAT MNC Items P-Plus Comparisons

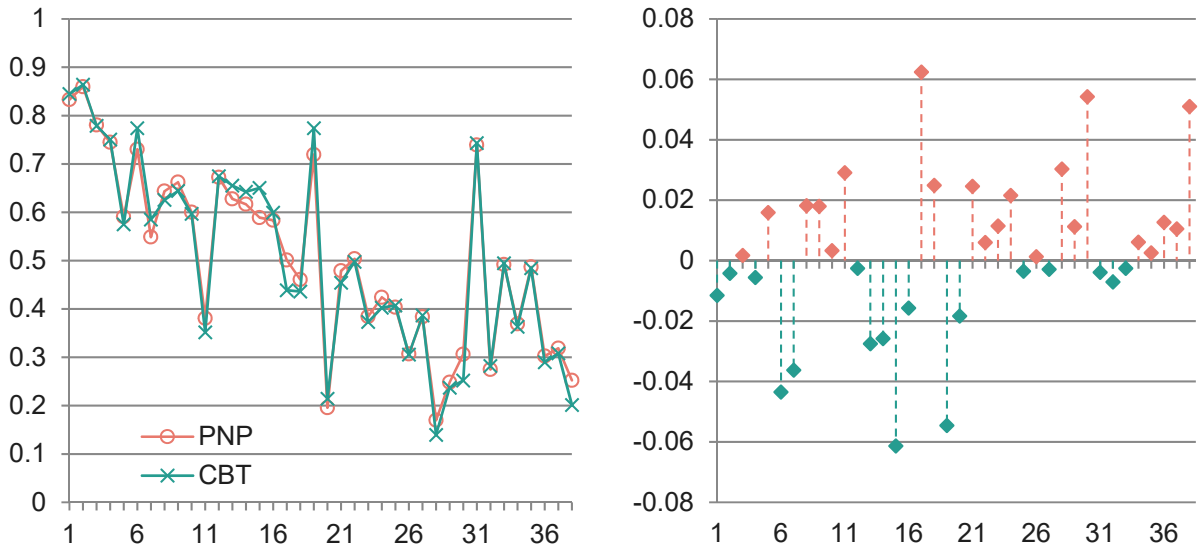


Figure 12. SAT MWC Items P-Plus Comparisons

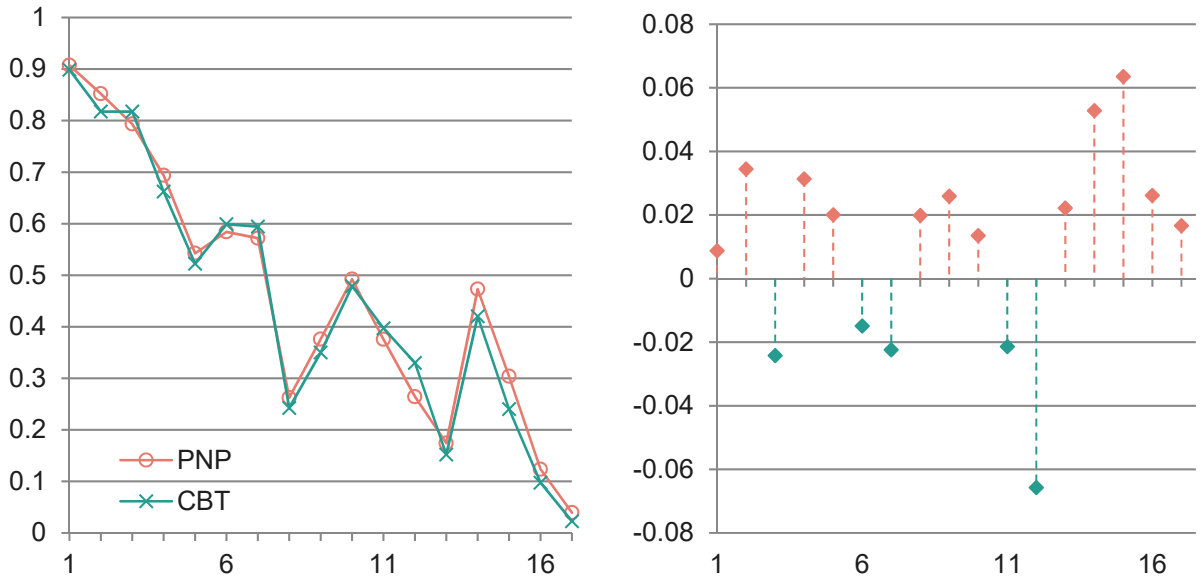


Figure 13. PSAT 10 MNC Items P-Plus Comparisons

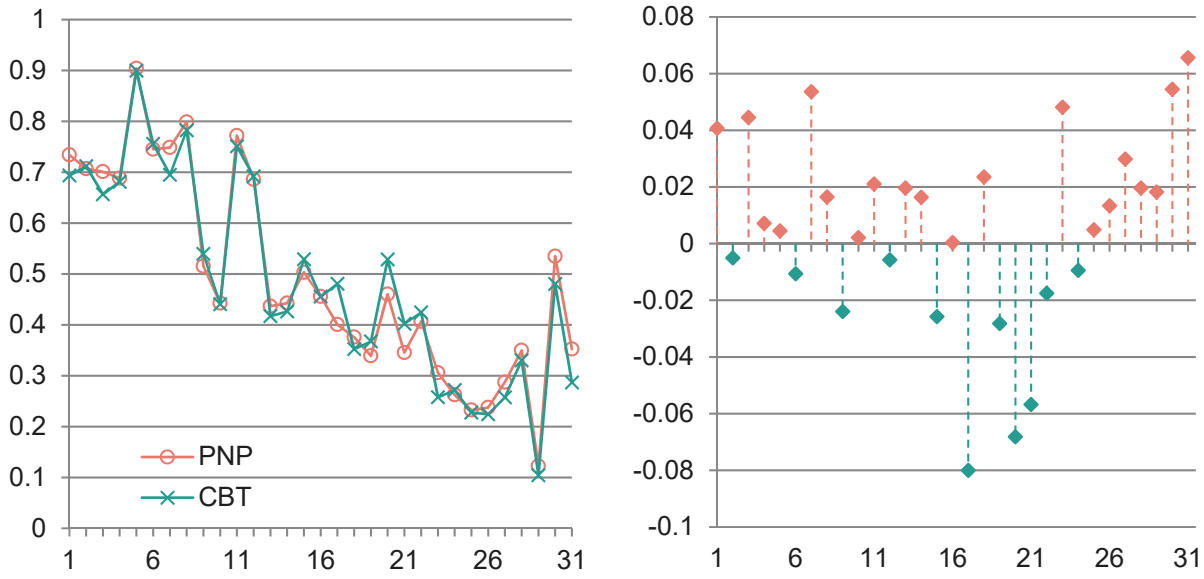


Figure 14. PSAT 10 MWC Items P-Plus Comparisons

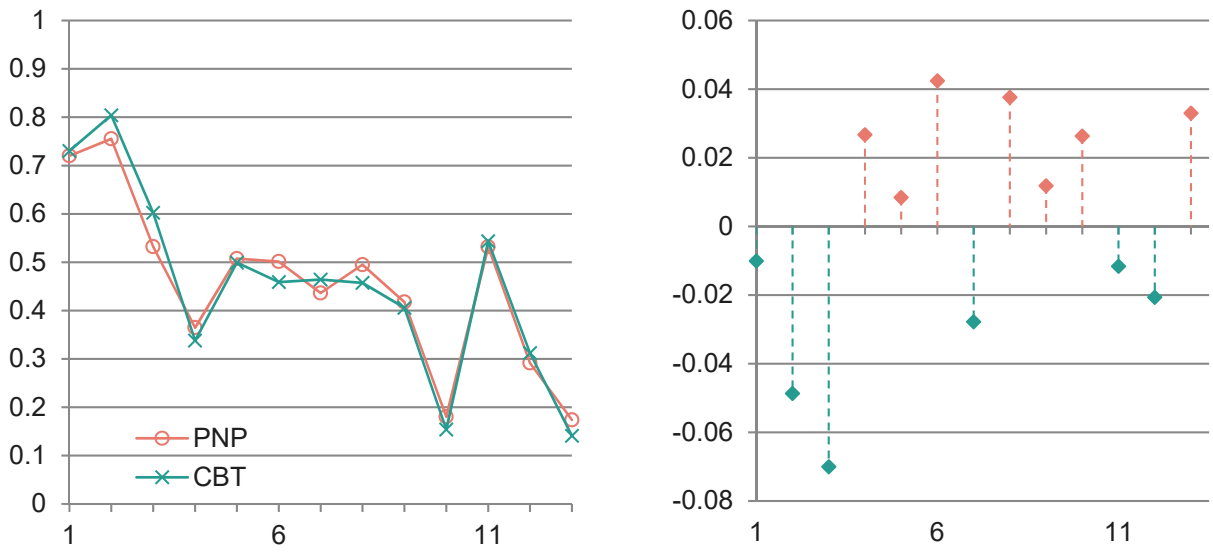


Figure 15. PSAT 8/9 MNC Items P-Plus Comparisons

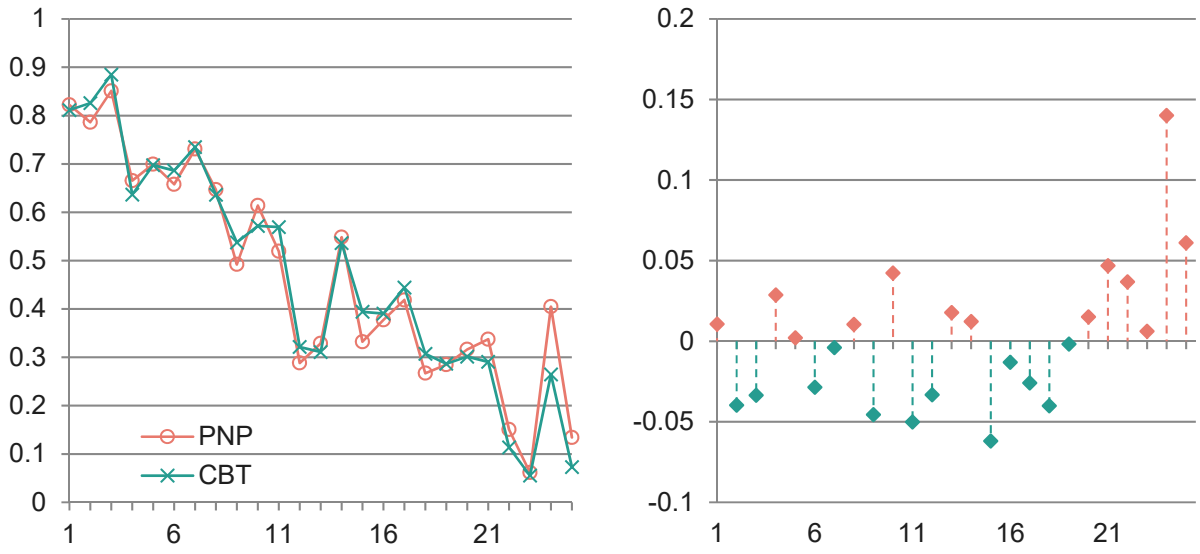


Figure 16. PSAT 8/9 MWC Items P-Plus Comparisons

Comparison of Omission and Not-Reached Rates

The rates of omission and not-reached were also compared. Omission is defined as items not answered up to the last item answered correctly or incorrectly, whereas not-reached is defined as items not answered between the last item answered correctly or incorrectly and the end of the timed test. Figures 17–28 present the PNP and CBT omission rates in the left panel and not-reached rates in the right panel.

Omission and not-reached rates for Reading across the three studies are presented in Figures 17–20. In all three studies, there is a clear pattern that PNP test takers omitted items more frequently than CBT test takers, particularly near the end of the test. However, the omit rates for both groups are low, less than 3%. For the SAT study, both PNP and CBT groups had similar not-reached rates, though for the PSAT 10 and PSAT 8/9 studies the PNP test takers had higher not-reached rates.

For Writing and Language (Figures 20–22), the pattern of omitting was similar across groups in the SAT and PSAT 8/9 studies. Higher omit rates were seen for the PNP group in the PSAT 10 study, but for both groups omit rates were less than 1%. In all three studies, the not-reached rates were higher for the PNP group compared to the CBT group, with particularly large differences in the PSAT 8/9 study (0.05 or more near the end of the test, see Figure 22).

Figures 23–28 present the item omission and not-reached rates for the MNC and MWC sections of the Math tests for the three studies. Across modes, the omit pattern within MNC and MWC is similar until test takers reach the SPR items. Then it is clear that CBT test takers omit the SPR items less often. The not-reached rate is also similar within MNC and MWC tests until the SPR items, at which point CBT test takers complete more items in each timed section. For both the MNC and MWC sections, the differences in not-reached rates seem to be most associated with the SPR items appearing at the end, and it is unclear if that reflects a speededness difference across modes or a tendency for CBT test takers to be more likely to answer the SPR items than PNP test takers. In either case, these differences in omit and not-reached rates explain the differences in the p-plus values seen in Figures 11–16, since p-plus does not count not-reached items in the denominator of the calculation.

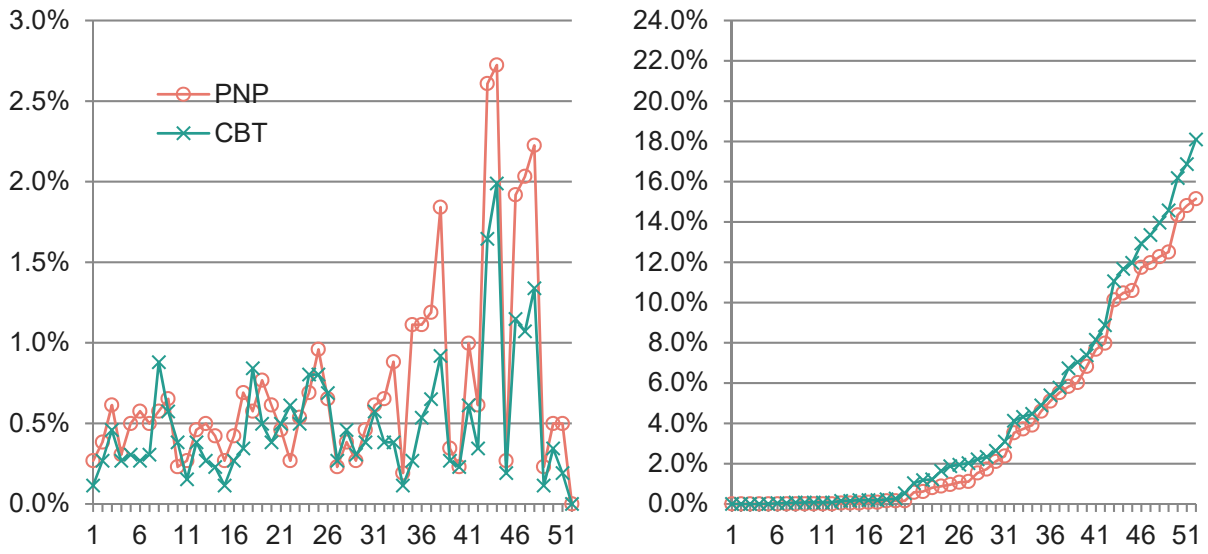


Figure 17. SAT R Item Omission and Not-Reached Rates

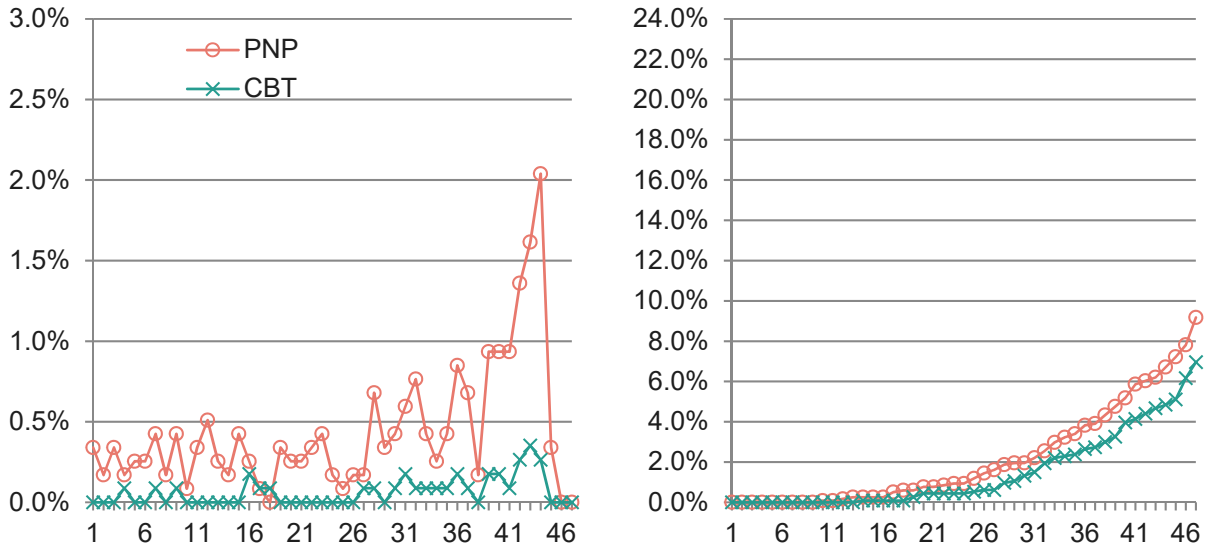


Figure 18. PSAT 10 R Item Omission and Not-Reached Rates

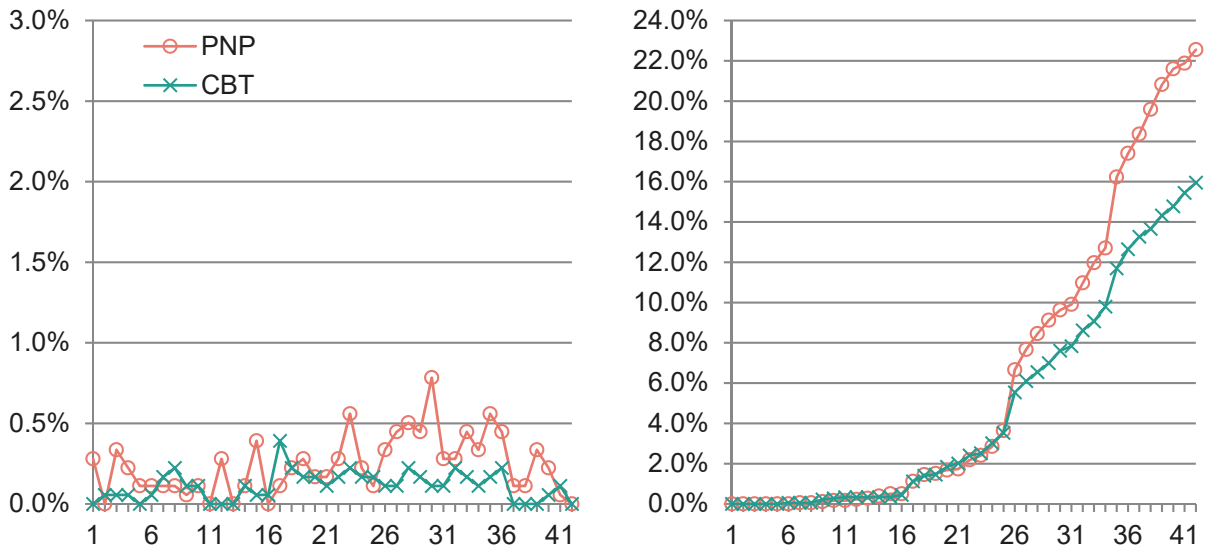


Figure 19. PSAT 8/9 R Item Omission and Not-Reached Rates

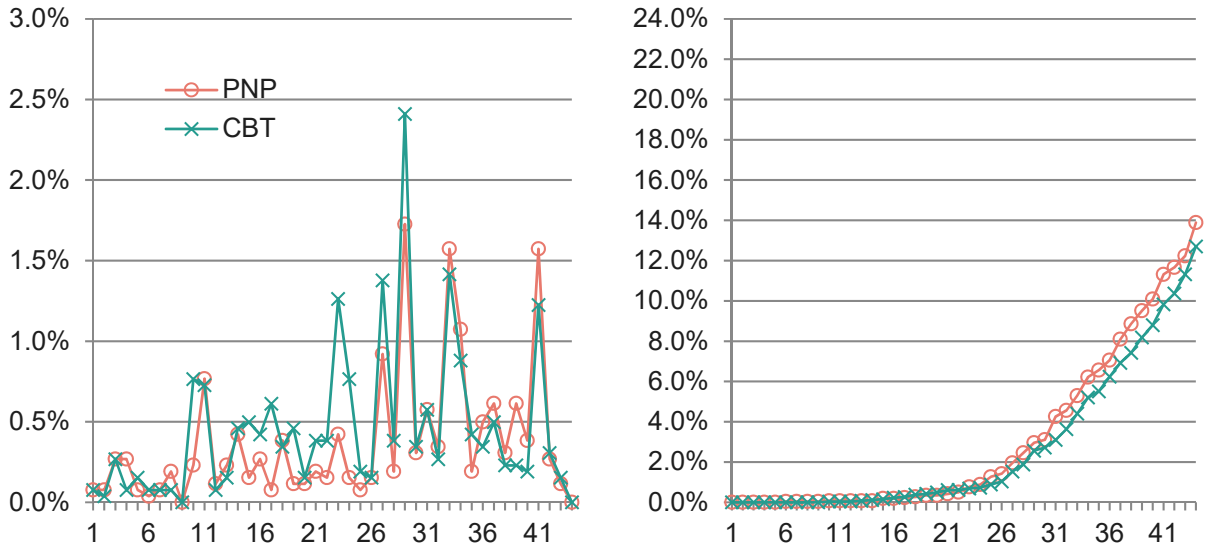


Figure 20. SAT WL Item Omission and Not-Reached Rates

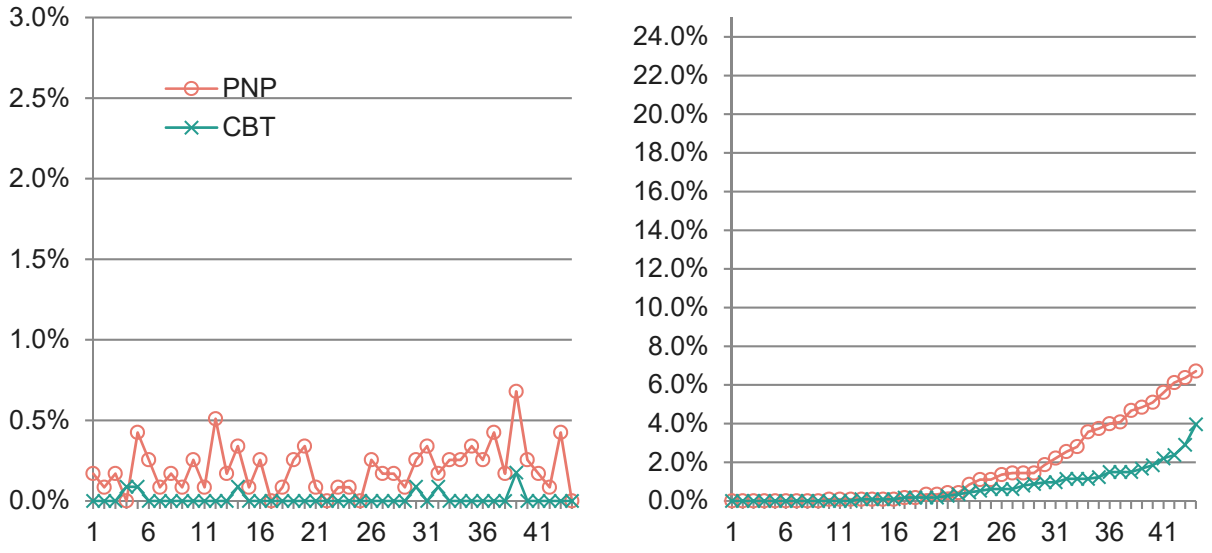


Figure 21. PSAT 10 WL Item Omission and Not-Reached Rates

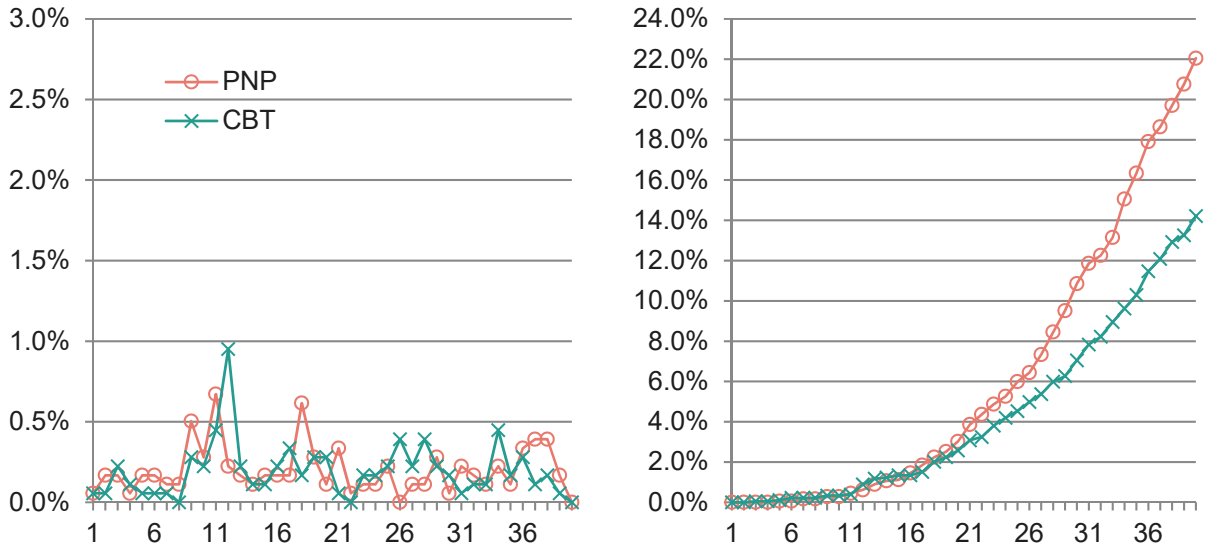


Figure 22. PSAT 8/9 WL Item Omission and Not-Reached Rates

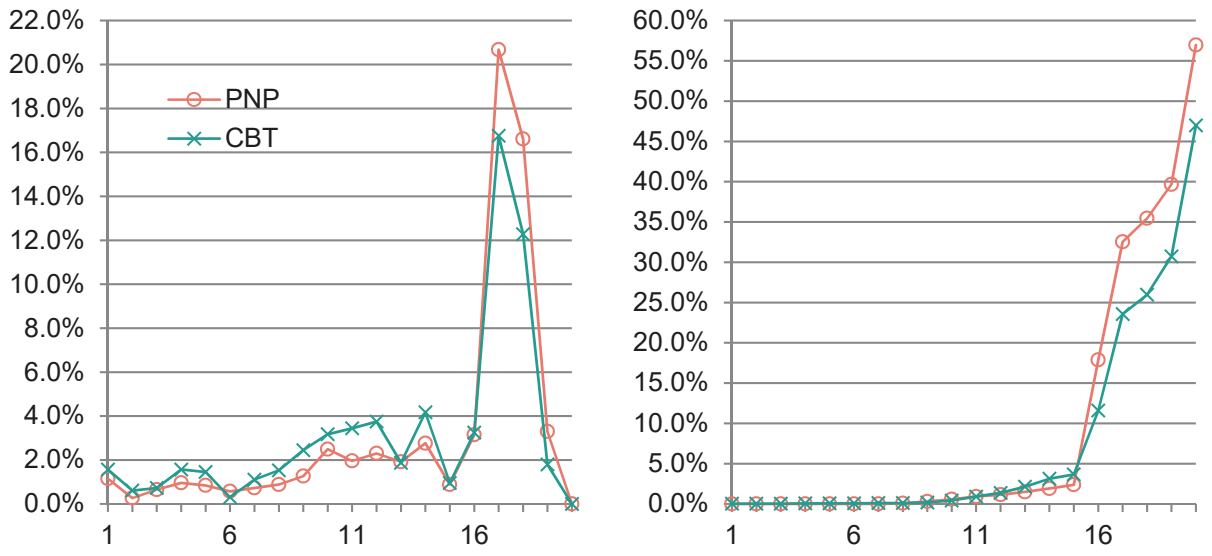


Figure 23. SAT MNC Item Omission and Not-Reached Rates

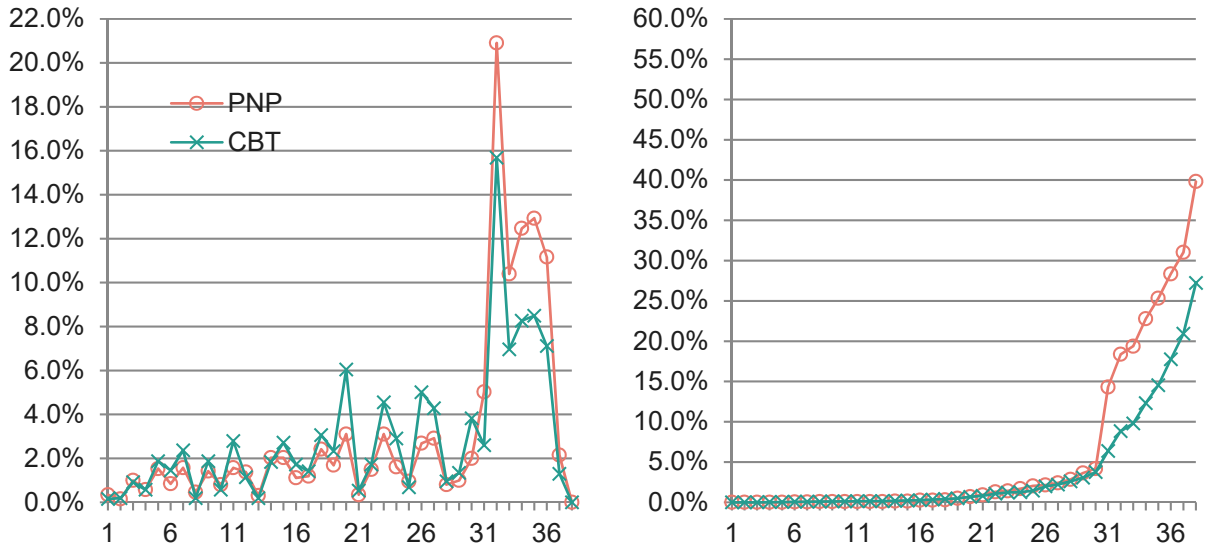


Figure 24. SAT MWC Item Omission and Not-Reached Rates

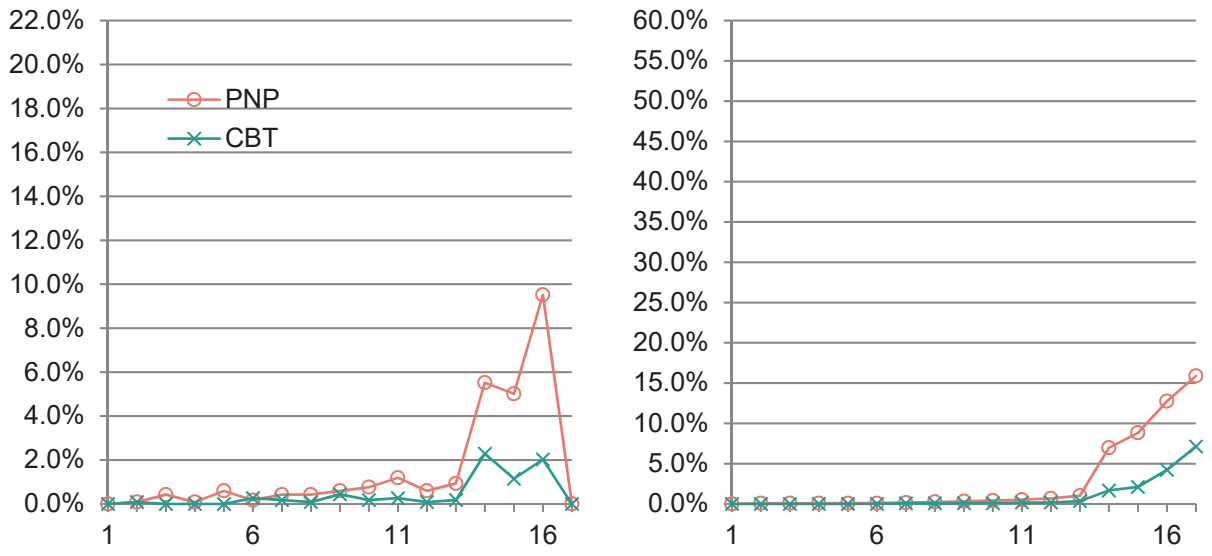


Figure 25. PSAT 10 MNC Item Omission and Not-Reached Rates

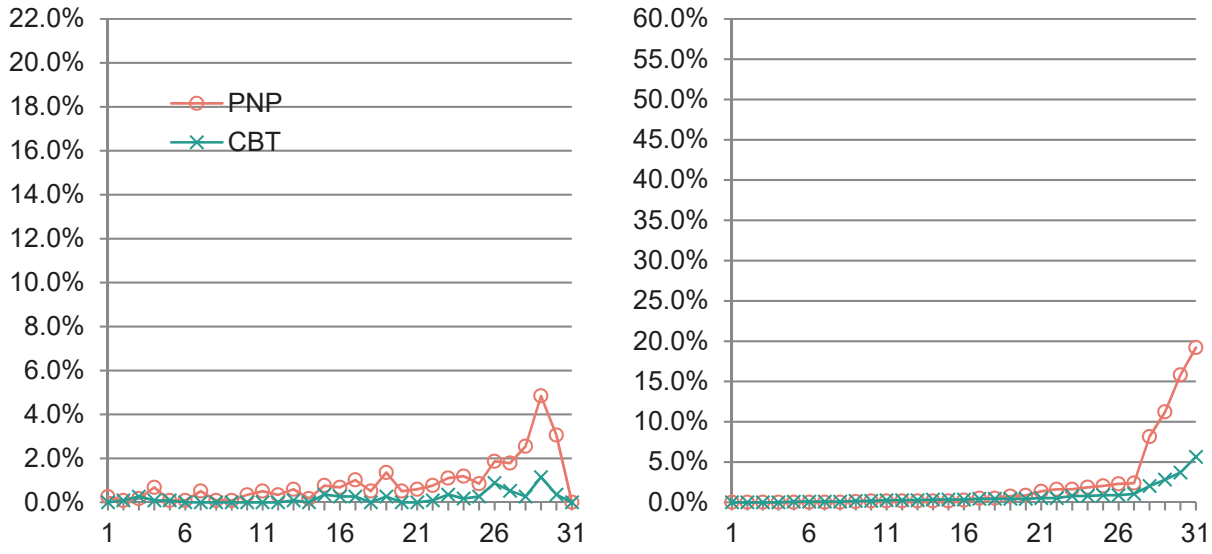


Figure 26. PSAT 10 MWC Item Omission and Not-Reached Rates

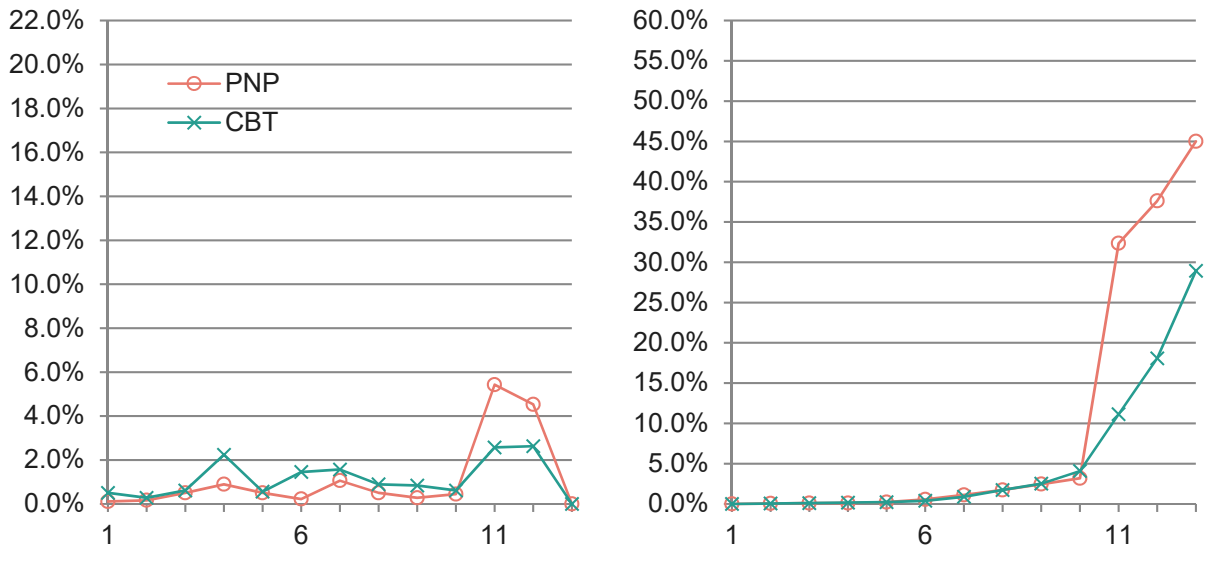


Figure 27. PSAT 8/9 MNC Item Omission and Not-Reached Rates

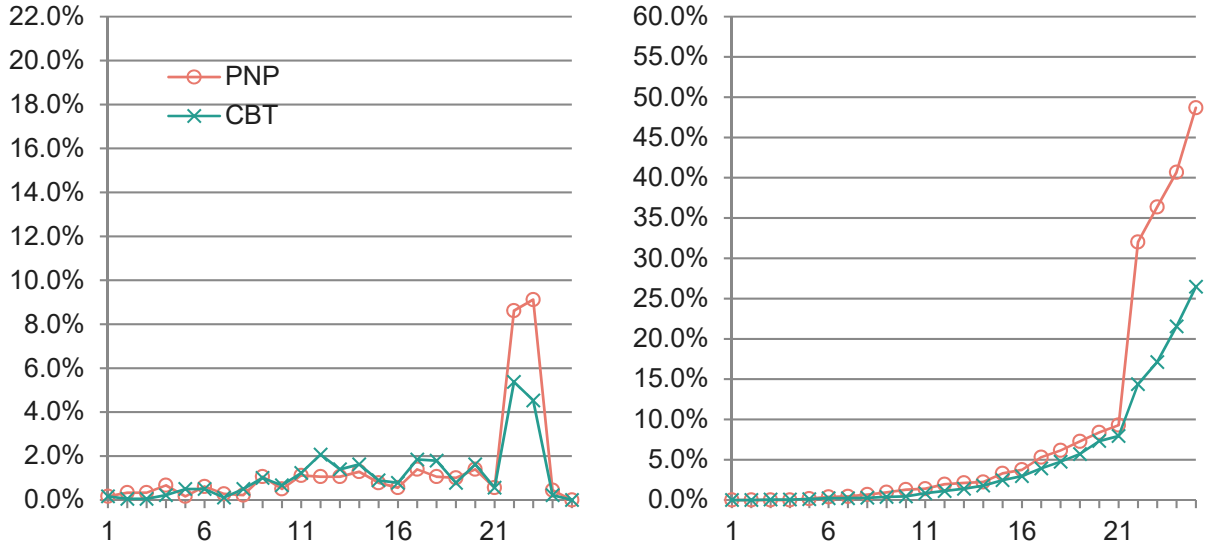


Figure 28. PSAT 8/9 MWC Item Omission and Not-Reached Rates

Analyses of Differential Item Functioning Across Modes

Differential Item Functioning (DIF) across modes is a useful method to examine if items across modes function differently for students who perform at the same overall ability[1]. For this study, we utilized the Mantel-Haenszel method (Dorans & Holland, 1993) for identifying DIF. The specific rules for classification of DIF are:

- ABS (DIF) ≤ 1.0 or ABS (DIF/S.E.) ≤ 1.96 classified as "A" or nonsignificant DIF
- ≤ DIF ≤ 1.5 or DIF > 1.5 and ABS((ABS (DIF) – 1)/SE) ≤ 1.96 classified as "B+" or moderate DIF in favor of CBT test takers
- -1.5 ≤ DIF ≤ -1.0 or DIF < -1.5 and ABS((ABS (DIF) – 1)/SE) ≤ 1.96 classified as "B-" or moderate DIF in favor of PNP test takers
- DIF > 1.5 and ABS(ABS((ABS (DIF) – 1)/SE) > 1.96 classified as "C+" or large DIF in favor of CBT test takers
- DIF < -1.5 and ABS((ABS (DIF) – 1)/SE) > 1.96 classified as "C-" or large DIF in favor of PNP test takers

Tables 12–20 present the classifications for the DIF analyses across modes for the three studies. For Reading (Tables 12–14), there were three items in the SAT study that indicated DIF across modes; one large and one moderate in favor of the CBT group, and one moderate in favor of the PNP group. In the PSAT 10 study, one Reading item was flagged for DIF, moderately favoring the CBT group. Three Reading items indicated moderate DIF in the PSAT 8/9 study, two in favor of the CBT group and one in favor of the PNP group.

For Writing and Language (Tables 15–17), one SAT item was flagged for moderate DIF in favor of the PNP group and one in favor of the CBT group. In the PSAT 10 study, one WL item was flagged for moderate DIF in favor of the PNP group. In the PSAT 8/9 study, three WL items were flagged for moderate DIF, with one in favor of the CBT group and two in favor of the PNP group.

For Math (Tables 18–20), one SAT item was flagged for moderate DIF, favoring the PNP group. In the PSAT 10 study, no items in either of the Math sections were flagged for DIF. In the PSAT 8/9 study (Table 20), three items displayed DIF across modes, one moderate in favor of the PNP group, one moderate in favor of the CBT group, and one large in favor of the CBT group. All three items are SPR, two in MNC and one in MWC.

[1] DIF analyses are typically used in situations where the functioning of items across groups is evaluated when the groups differ systematically, and the measure of ability is unaffected by DIF. In these analyses, groups are considered randomly equivalent and the measure of ability may be affected by testing mode. Thus, the DIF analyses presented here only evaluate the relative higher or lower performance of items across modes and serve mainly to supplement the comparisons of items' p-plus, omission, and not-reached rates across modes presented in the previous sections.

Table 12

Mode DIF Results for SAT Reading

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	0.14	0.14	A	**30**	-0.55	0.16	A
2	-0.18	0.15	A	**31**	-0.11	0.16	A
3	-0.38	0.15	A	**32**	0.82	0.16	A
4	-0.25	0.14	A	**33**	0.92	0.16	A
5	-0.19	0.15	A	**34**	0.26	0.14	A
6	1.52	0.14	C+	**35**	-0.63	0.14	A
7	1.39	0.16	B+	**36**	-0.61	0.18	A
8	-0.21	0.15	A	**37**	0.70	0.17	A
9	-0.41	0.15	A	**38**	0.39	0.15	A
10	0.01	0.15	A	**39**	-0.76	0.18	A
11	-0.13	0.15	A	**40**	-0.29	0.15	A
12	-0.27	0.15	A	**41**	-0.20	0.15	A
13	-0.60	0.15	A	**42**	0.17	0.16	A
14	0.61	0.18	A	**43**	0.12	0.16	A
15	-0.15	0.17	A	**44**	0.29	0.15	A
16	-0.10	0.21	A	**45**	0.28	0.18	A
17	0.41	0.15	A	**46**	-0.41	0.17	A
18	0.10	0.13	A	**47**	0.20	0.16	A
19	0.09	0.14	A	**48**	0.12	0.15	A
20	-0.37	0.16	A	**49**	0.27	0.17	A
21	-1.23	0.14	B-	**50**	0.25	0.16	A
22	0.00	0.14	A	**51**	0.35	0.16	A
23	-0.23	0.15	A	**52**	-0.19	0.16	A
24	-0.62	0.15	A			**Total C-**	0
25	-0.66	0.14	A			**Total B-**	1
26	-0.39	0.15	A			**Total A**	49
27	0.48	0.20	A			**Total B+**	1
28	0.15	0.17	A			**Total C+**	1
29	0.91	0.18	A				

Table 13

Mode DIF Results for PSAT 10 Reading

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-0.29	0.22	A	**27**	0.05	0.23	A
2	-0.92	0.21	A	**28**	0.02	0.20	A
3	-0.21	0.21	A	**29**	-0.70	0.23	A
4	0.10	0.22	A	**30**	0.32	0.22	A
5	0.87	0.23	A	**31**	0.50	0.21	A
6	0.25	0.29	A	**32**	-0.23	0.21	A
7	0.39	0.21	A	**33**	0.66	0.22	A
8	0.26	0.24	A	**34**	0.89	0.24	A
9	-0.13	0.21	A	**35**	0.05	0.21	A
10	0.31	0.22	A	**36**	0.07	0.25	A
11	-0.82	0.25	A	**37**	0.30	0.27	A
12	-1.00	0.23	A	**38**	-0.36	0.24	A
13	-0.44	0.23	A	**39**	0.78	0.23	A
14	-0.84	0.23	A	**40**	-0.15	0.22	A
15	0.22	0.27	A	**41**	0.30	0.22	A
16	-0.06	0.23	A	**42**	0.23	0.23	A
17	-0.54	0.24	A	**43**	0.80	0.24	A
18	0.16	0.22	A	**44**	0.69	0.22	A
19	-0.30	0.25	A	**45**	0.79	0.23	A
20	-0.60	0.24	A	**46**	1.14	0.26	B+
21	-0.90	0.22	A	**47**	0.17	0.23	A
22	0.24	0.23	A			**Total C-**	0
23	-0.70	0.23	A			**Total B-**	0
24	-0.71	0.22	A			**Total A**	46
25	-0.29	0.23	A			**Total B+**	1
26	0.16	0.25	A			**Total C+**	0

Table 14

Mode DIF Results for PSAT 8/9 Reading

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-0.22	0.18	A	**25**	0.24	0.18	A
2	-0.48	0.18	A	**26**	-1.24	0.19	B-
3	-0.26	0.19	A	**27**	-0.45	0.19	A
4	-0.14	0.17	A	**28**	0.39	0.19	A
5	-0.24	0.21	A	**29**	-0.09	0.18	A
6	-0.38	0.21	A	**30**	0.93	0.18	A
7	-0.91	0.22	A	**31**	-0.07	0.19	A
8	0.21	0.18	A	**32**	-0.38	0.20	A
9	-0.24	0.33	A	**33**	-0.25	0.19	A
10	-0.09	0.22	A	**34**	-0.33	0.19	A
11	1.44	0.22	B+	**35**	-0.41	0.22	A
12	-0.17	0.20	A	**36**	0.55	0.19	A
13	0.13	0.17	A	**37**	0.08	0.18	A
14	-0.30	0.31	A	**38**	-0.58	0.20	A
15	-0.13	0.18	A	**39**	0.39	0.18	A
16	-0.20	0.29	A	**40**	-0.34	0.19	A
17	-0.63	0.18	A	**41**	0.45	0.19	A
18	0.04	0.18	A	**42**	1.13	0.20	B+
19	0.24	0.19	A			**Total C-**	0
20	0.19	0.18	A			**Total B-**	1
21	0.49	0.23	A			**Total A**	39
22	0.18	0.17	A			**Total B+**	2
23	0.81	0.18	A			**Total C+**	0
24	0.05	0.18	A				

Table 15

Mode DIF Results for SAT Writing and Language

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-0.20	0.18	A	**26**	-0.13	0.16	A
2	0.31	0.14	A	**27**	-0.32	0.15	A
3	-1.06	0.14	B-	**28**	0.55	0.14	A
4	-0.27	0.17	A	**29**	-0.44	0.15	A
5	-0.21	0.22	A	**30**	0.11	0.17	A
6	-0.17	0.15	A	**31**	-0.21	0.15	A
7	-0.49	0.15	A	**32**	0.98	0.16	A
8	-0.07	0.17	A	**33**	0.39	0.16	A
9	-0.38	0.21	A	**34**	-0.08	0.15	A
10	-0.61	0.14	A	**35**	-0.03	0.17	A
11	0.12	0.14	A	**36**	-0.16	0.16	A
12	-0.13	0.15	A	**37**	-0.13	0.16	A
13	0.76	0.15	A	**38**	0.02	0.16	A
14	-0.10	0.14	A	**39**	-0.56	0.17	A
15	-0.04	0.15	A	**40**	1.09	0.15	B+
16	0.44	0.16	A	**41**	0.35	0.15	A
17	-0.14	0.17	A	**42**	0.53	0.15	A
18	-0.08	0.14	A	**43**	-0.90	0.20	A
19	0.10	0.15	A	**44**	0.97	0.14	A
20	-0.06	0.15	A			**Total C-**	0
21	0.25	0.13	A			**Total B-**	1
22	-0.03	0.14	A			**Total A**	42
23	-0.96	0.17	A			**Total B+**	1
24	-0.05	0.14	A			**Total C+**	0
25	-0.17	0.23	A				

Table 16

Mode DIF Results for PSAT 10 Writing and Language

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-0.54	0.24	A	**26**	0.38	0.22	A
2	-0.37	0.22	A	**27**	-0.57	0.24	A
3	-0.22	0.21	A	**28**	0.31	0.23	A
4	0.09	0.23	A	**29**	-0.16	0.21	A
5	-0.02	0.23	A	**30**	-0.35	0.23	A
6	-0.28	0.26	A	**31**	0.61	0.21	A
7	0.03	0.23	A	**32**	0.35	0.26	A
8	-0.09	0.22	A	**33**	-0.50	0.23	A
9	0.65	0.22	A	**34**	0.22	0.22	A
10	0.21	0.21	A	**35**	0.10	0.22	A
11	-0.09	0.22	A	**36**	0.53	0.21	A
12	0.12	0.22	A	**37**	-0.22	0.24	A
13	-0.02	0.21	A	**38**	0.31	0.22	A
14	-0.59	0.23	A	**39**	-0.13	0.22	A
15	0.21	0.23	A	**40**	0.85	0.21	A
16	-0.17	0.22	A	**41**	-0.54	0.28	A
17	0.05	0.26	A	**42**	-1.05	0.28	B-
18	-0.34	0.21	A	**43**	-0.14	0.26	A
19	0.13	0.23	A	**44**	0.32	0.22	A
20	0.07	0.21	A			**Total C-**	0
21	0.20	0.24	A			**Total B-**	1
22	0.31	0.22	A			**Total A**	43
23	-0.14	0.23	A			**Total B+**	0
24	-0.31	0.22	A			**Total C+**	0
25	-0.22	0.23	A				

Table 17

Mode DIF Results for PSAT 8/9 Writing and Language

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-1.15	0.19	B-	**24**	0.48	0.24	A
2	-0.80	0.19	A	**25**	-0.15	0.18	A
3	-1.10	0.20	B-	**26**	-0.16	0.18	A
4	-0.13	0.19	A	**27**	-0.71	0.19	A
5	-0.25	0.21	A	**28**	0.27	0.19	A
6	-0.23	0.21	A	**29**	0.64	0.19	A
7	-0.74	0.18	A	**30**	0.39	0.20	A
8	0.24	0.18	A	**31**	0.65	0.19	A
9	-0.17	0.17	A	**32**	1.12	0.19	B+
10	0.06	0.16	A	**33**	-0.53	0.22	A
11	0.41	0.17	A	**34**	-0.28	0.21	A
12	0.09	0.17	A	**35**	0.29	0.18	A
13	-0.49	0.19	A	**36**	0.72	0.18	A
14	-0.33	0.17	A	**37**	0.60	0.19	A
15	-0.30	0.27	A	**38**	0.47	0.19	A
16	-0.27	0.21	A	**39**	0.86	0.20	A
17	-0.24	0.21	A	**40**	0.27	0.20	A
18	0.47	0.17	A			**Total C-**	0
19	-0.11	0.22	A			**Total B-**	2
20	-0.17	0.18	A			**Total A**	37
21	0.74	0.24	A			**Total B+**	1
22	0.09	0.18	A			**Total C+**	0
23	-0.78	0.20	A				

Table 18

Mode DIF Results for SAT Math

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-0.39	0.15	A	**13**	0.23	0.15	A
2	0.04	0.17	A	**14**	0.21	0.15	A
3	0.05	0.14	A	**15**	0.62	0.14	A
4	0.16	0.15	A	**16**	0.09	0.15	A
5	-0.15	0.14	A	**17**	-0.70	0.14	A
6	-0.23	0.16	A	**18**	-0.43	0.16	A
7	-0.22	0.14	A	**19**	0.72	0.17	A
8	-0.32	0.14	A	**20**	0.34	0.17	A
9	0.21	0.14	A	**21**	-0.34	0.14	A
10	0.19	0.14	A	**22**	-0.17	0.15	A
11	-0.04	0.14	A	**23**	-0.10	0.15	A
12	0.08	0.15	A	**24**	-0.23	0.14	A
13	0.27	0.14	A	**25**	0.01	0.15	A
14	0.11	0.16	A	**26**	-0.01	0.16	A
15	-0.79	0.18	A	**27**	0.04	0.14	A
16	-0.18	0.16	A	**28**	-0.57	0.19	A
17	0.80	0.18	A	**29**	-0.11	0.16	A
18	-0.14	0.28	A	**30**	-0.67	0.16	A
19	-0.17	0.22	A	**31**	0.71	0.16	A
20	-1.66	0.42	B-	**32**	0.59	0.18	A
1	0.02	0.20	A	**33**	0.60	0.16	A
2	-0.16	0.22	A	**34**	0.63	0.20	A
3	-0.24	0.18	A	**35**	0.66	0.17	A
4	-0.13	0.18	A	**36**	0.51	0.21	A
5	-0.27	0.15	A	**37**	0.34	0.17	A
6	0.53	0.17	A	**38**	-0.15	0.22	A
7	0.36	0.14	A			**Total C-**	0
8	-0.33	0.15	A			**Total B-**	1
9	-0.34	0.15	A			**Total A**	57
10	-0.13	0.14	A			**Total B+**	0
11	-0.37	0.15	A			**Total C+**	0
12	-0.09	0.15	A				

Note: The first 20 items are Math – No Calculator and the remaining items are Math With Calculator items. DIF for Math was conditioned on overall Math number correct scores.

Table 19

Mode DIF Results for PSAT 10 Math

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-0.29	0.37	A	**11**	-0.42	0.29	A
2	-0.78	0.31	A	**12**	0.06	0.22	A
3	0.47	0.29	A	**13**	-0.15	0.22	A
4	-0.39	0.23	A	**14**	-0.14	0.22	A
5	-0.18	0.22	A	**15**	0.33	0.22	A
6	0.24	0.23	A	**16**	0.03	0.23	A
7	0.31	0.22	A	**17**	0.97	0.22	A
8	-0.29	0.26	A	**18**	-0.22	0.24	A
9	-0.23	0.23	A	**19**	0.35	0.22	A
10	-0.10	0.22	A	**20**	0.68	0.20	A
11	0.31	0.21	A	**21**	0.63	0.21	A
12	0.82	0.23	A	**22**	0.25	0.21	A
13	-0.45	0.28	A	**23**	-0.63	0.26	A
14	-0.28	0.23	A	**24**	0.27	0.26	A
15	-0.65	0.29	A	**25**	-0.05	0.25	A
16	-0.44	0.37	A	**26**	-0.18	0.25	A
17	-1.12	0.66	A	**27**	-0.37	0.23	A
1	-0.59	0.25	A	**28**	0.16	0.27	A
2	0.11	0.26	A	**29**	-0.25	0.42	A
3	-0.68	0.26	A	**30**	0.17	0.24	A
4	-0.08	0.24	A	**31**	-0.14	0.28	A
5	-0.22	0.38	A			**Total C-**	0
6	0.17	0.26	A			**Total B-**	0
7	-0.97	0.28	A			**Total A**	48
8	-0.35	0.28	A			**Total B+**	0
9	0.34	0.23	A			**Total C+**	0
10	0.06	0.23	A				

Note: The first 17 items are Math – No Calculator and the remaining items are Math – Calculator items. DIF for Math was conditioned on overall Math number correct scores.

Table 20

Mode DIF Results for PSAT 8/9 Math

Item	DIF	SE	DIF Cat.	Item	DIF	SE	DIF Cat.
1	-0.12	0.21	A	**10**	-0.60	0.18	A
2	0.63	0.22	A	**11**	0.49	0.18	A
3	0.71	0.18	A	**12**	0.36	0.18	A
4	-0.47	0.19	A	**13**	-0.41	0.20	A
5	-0.26	0.18	A	**14**	-0.32	0.19	A
6	-0.71	0.19	A	**15**	0.69	0.18	A
7	0.23	0.17	A	**16**	0.07	0.18	A
8	-0.53	0.18	A	**17**	0.26	0.18	A
9	-0.28	0.18	A	**18**	0.48	0.19	A
10	-0.75	0.25	A	**19**	0.00	0.19	A
11	1.74	0.21	C+	**20**	-0.32	0.19	A
12	1.34	0.24	B+	**21**	-0.85	0.22	A
13	-0.10	0.36	A	**22**	-0.49	0.34	A
1	-0.50	0.23	A	**23**	-0.06	0.51	A
2	0.51	0.22	A	**24**	-0.84	0.24	A
3	0.56	0.26	A	**25**	-1.06	0.39	B-
4	-0.63	0.20	A			**Total C-**	0
5	-0.27	0.20	A			**Total B-**	1
6	0.22	0.20	A			**Total A**	35
7	-0.16	0.21	A			**Total B+**	1
8	-0.30	0.19	A			**Total C+**	1
9	0.49	0.19	A				

Note: The first 13 items are Math – No Calculator and the remaining items are Math – Calculator items. DIF for both Math tests were conditioned on overall Math number correct scores.

Impact of Command of Evidence Items on Mode Comparability

All tests in the SAT Suite of Assessments include Command of Evidence (COE) items, which require students to identify the portion of the text that serves as the best evidence for the conclusions they reach. In the PNP format, the multiple-choice options for COE items reference line numbers in a passage that represents possible portions of the text that provide this evidence. However, in the CBT format, line numbers are not used because of the need for “responsive design”; that is, the practice of building computer-based presentation formats that detect the user's screen size and orientation and change the layout accordingly. With

responsive design, passage text automatically wraps to optimize presentation. As a result, particular words or phrases cannot be tied to particular line numbers.

In the CBT format, each paragraph in a passage is numbered, and the multiple-choice options for Command of Evidence (COE) items reference paragraph numbers rather than line numbers. However, to further orient test takers in the absence of line numbers, the relevant phrases for each option are highlighted within the passage. Appendix D contains examples illustrating the differences in how a reading passage and COE items are represented in the PNP and CBT formats.

Table 21 presents mean differences and effect sizes between PNP and CBT performance on COE and Non-COE items across the three studies. For each study, the effect size for COE R items was below -0.25 and two to three times as large as any of the other effect sizes. For Reading Non-COE items, the effect sizes for Non-COE items were between -0.082 and -0.132 across the three studies, suggesting some evidence of mode differences favoring CBT testers for these items as well. Neither the COE WL nor the Non-COE WL items indicated any consistent pattern of mode difference across the three studies.

Table 21

Mean Differences and Effect Sizes for COE and Non-COE Items in Reading (R) and Writing and Language (WL)

Assessment	Item Set	Mean Dif.	Effect Size
SAT	COE R	-0.74	-0.32
	Non-COE R	-0.82	-0.10
	COE WL	0.09	0.05
	Non-COE WL	-0.38	-0.06
PSAT 10	COE R	-0.54	-0.26
	Non-COE R	-0.53	-0.08
	COE WL	0.00	0.01
	Non-COE WL	0.34	0.05
PSAT 8/9	COE R	-0.64	-0.27
	Non-COE R	-0.81	-0.13
	COE WL	-0.20	-0.10
	Non-COE WL	-0.48	-0.07

Note: Mean Differences are Mean of PNP minus CBT differences.

In summary, it appears that the COE item type contributed significantly to the mode differences seen for Reading in all three studies, and it is reasonable to assume that the cause is related to differences in the way test takers access the passages in answering COE items in PNP and CBT formats. This is consistent with the mode differences favoring CBT test takers in Reading, COE, as well as the cross-test Analysis in Science (SCI) and Analysis in History/Social Studies (HSS) scores. Both SCI and HSS include Reading COE items.

Mode Adjustments Through Score Equating Methodology

Based on the results of the mode comparability analyses across the three studies, equating methodology will be used to adjust the Reading, COE, SCI, and HSS CBT scores to account for the presence of mode differences. In each of the three studies, the existing PNP versions of the assessments were previously equated to the SAT, PSAT 10, or PSAT 8/9 scales, respectively. To adjust for mode effects, the CBT scores on these assessments were linked to the PNP versions using the equipercentile equating with post-smoothing. The resulting conversions for the four linked scores across the three studies are shown in Appendix E. Each table lists the raw score, the unrounded scale scores for PNP and CBT testers, the difference between unrounded scale scores, the rounded scale scores for PNP and CBT testers, the difference between rounded scale scores, and the percentage of CBT testers at each raw score point. The bottom of each table lists summary statistics for the unrounded and rounded scale scores for the PNP and CBT groups based on the equating results.

A more succinct summary of the differences between PNP and CBT results for the four scores across the three studies is presented in Figure 29, which plots differences between unrounded PNP and CBT scale scores (prior to equating) as a function of the unrounded PNP scale scores. The top left-hand plot is for the three Reading scores, the top right-hand plot is for the three COE scores, the bottom left-hand plot is for the three Science scores, and the bottom right-hand plot is for the three History/Social Studies scores. The Reading, Science, and History/Social Studies scores are vertically scaled across the SAT Suite (hence the different minimum and maximum scale scores in the overlaid plots). In comparison, the COE scores are on independent scales that range from 1 to 15 for each test. The unrounded scale score difference plots indicate a reasonable level of consistency across the three studies, particularly for scores above the chance level (around 15 for R, SCI, and HSS), with differences on the scale score metric generally between a half and one scale score point.

Mode Comparability Analyses for the SAT Essay

Table 22 presents the SAT Essay sample sizes for each mode across several background variables. These sample sizes differ slightly from those for the SAT multiple-choice sections shown in Table 2, because not all students participating in the study took the Essay. The results are aggregated across schools and indicate that the distributions of test takers by group are similar across mode. The most notable sample size difference is a slightly larger percentage of African American/black test takers in the CBT group. We verified within each school that differences in the numbers of students assigned to each condition in those groups were within sampling error. Thus, the differences at the aggregate level appear to be an artifact of the recruitment process and random assignment within schools.

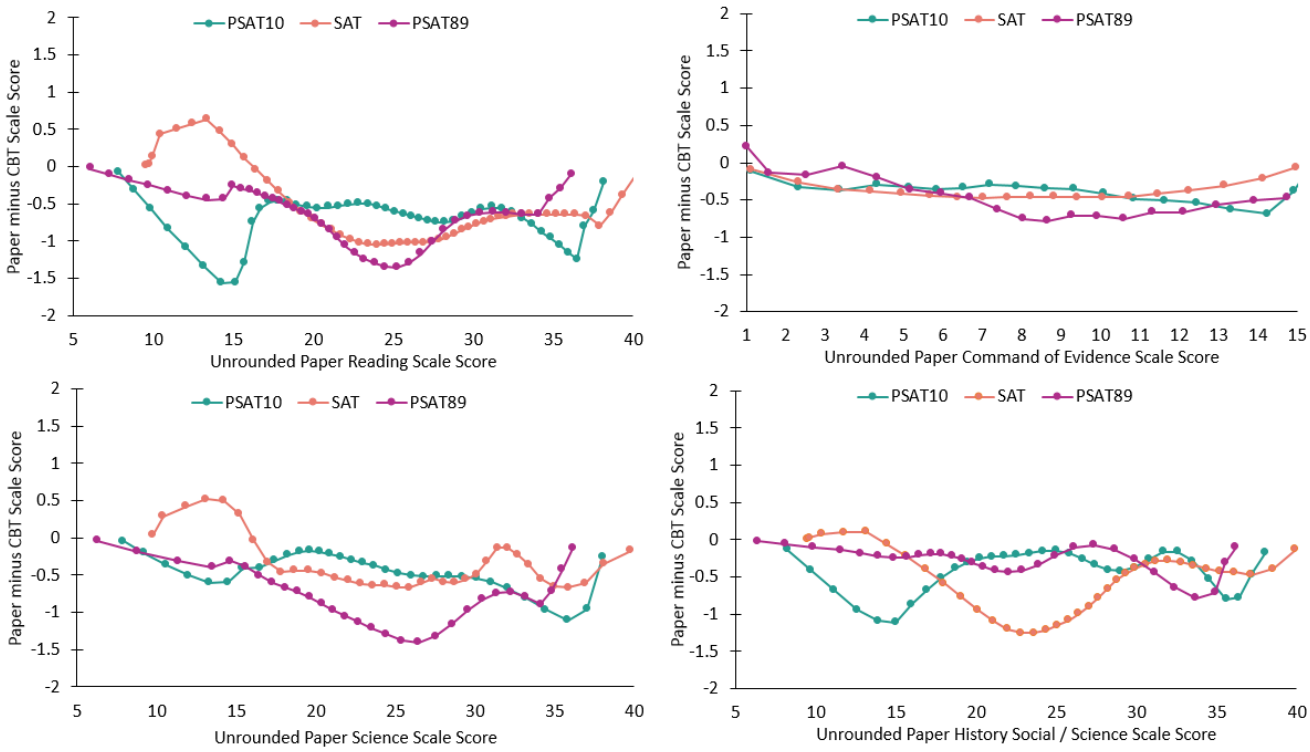


Figure 29. Unrounded Equating Difference Plots for Reading, Command of Evidence, Analysis in Science, and Analysis in History/Social Studies for SAT, PSAT 10, and PSAT 8/9

Table 23 presents the frequency distributions of essay scores across modes, including the distribution of zero-scored essays. For scores of zero, CBT test takers had a lower percentage being classified as off-topic or unreadable. For the Reading dimension, CBT test takers had a higher percentage of test takers getting scores of 2–4, a lower percentage getting scores of 5–7, and a similar percentage for scores of 8, as compared to PNP test takers. For the Analysis dimensions, CBT test takers had a higher percentage of test takers getting a score of 2, a lower percentage getting scores of 3–7, and a similar percentage getting a score of 8. In comparison to PNP test takers on the Writing dimension, CBT test takers had higher percentages of scores 2 and 3, similar percentages for scores of 4 and 8, and lower percentages for scores of 5–7.

Table 22

Sample Sizes by Background Variable for the SAT Essay Comparability Study

Background	PNP	CBT
Females	1,096 (50.0%)	1,130 (51.4%)
Males	1,094 (50.0%)	1,070 (48.6%)
Unknown/No Answer Sex	0 (0.0%)	0 (0.0%)
12th Graders	2,043 (93.3%)	2,048 (93.1%)
11th Graders	147 (6.7%)	152 (6.9%)
Am. Indian/Alaskan Native	21 (1.0%)	15 (0.7%)
Asian	86 (3.9%)	92 (4.2%)
Black/African American	212 (9.7%)	241 (11.0%)
Hispanic/Latino	612 (27.9%)	594 (27.0%)
Mexican	0 (0.0%)	0 (0.0%)
Puerto Rican	0 (0.0%)	0 (0.0%)
Other Hispanic/Latino	0 (0.0%)	0 (0.0%)
Native Hawaiian/Other Pacific Is.	8 (0.4%)	7 (0.3%)
White	970 (44.3%)	986 (44.8%)
Other Responses	5 (0.2%)	9 (0.4%)
No Response to Race/Ethnicity	276 (12.6%)	256 (11.6%)
English-Only Best Language	1,546 (70.6%)	1,596 (72.5%)
English & Spanish Best Language	0 (0.0%)	0 (0.0%)
Other Best Language	35 (1.6%)	35 (1.6%)
No Response to Best Language	609 (27.8%)	569 (25.9%)
Assessment Repeater	171 (7.8%)	128 (5.8%)

Table 24 presents the descriptive statistics, mean differences, effect sizes, and *p*-values for the *F*-tests for mean differences between modes on the three Essay dimension scores. For all three dimensions, the CBT test takers mean scores are lower than PNP test takers, by approximately one-fourth of a point. All results are statistically significant ($p < 0.0001$). The effect size for the Reading dimension is moderate and for both Writing and Analysis the effect sizes are borderline moderate. Because Essay scores are not transformed to a scale and average differences on each score dimension were less than half a point, no statistical adjustments for mode will be made.

Table 23

Frequency Distribution of Essay Scores by Dimension Across Mode

	Reading		Analysis		Writing	
Essay Score	PNP	CBT	PNP	CBT	PNP	CBT
0	2.4%	1.4%	2.4%	1.4%	2.4%	1.4%
2	9.4%	12.5%	35.9%	46.2%	9.2%	13.0%
3	12.8%	15.8%	22.4%	20.1%	13.3%	18.3%
4	25.0%	29.1%	19.7%	17.0%	27.1%	27.5%
5	23.3%	20.4%	11.3%	9.2%	22.6%	19.3%
6	21.6%	17.3%	6.2%	5.0%	20.9%	16.6%
7	4.4%	2.8%	1.8%	0.9%	3.7%	3.1%
8	1.0%	0.7%	0.3%	0.2%	0.8%	0.8%

Table 24

Between Mode Comparison of Essay Dimension Scores

	PNP			CBT					
Dimension	N	Mean	SD	N	Mean	SD	Mean Difference	Effect Size	F-test *p*-value
Reading	2137	4.53	1.39	2169	4.25	1.37	0.28	0.203	<0.0001
Writing	2137	4.48	1.36	2169	4.21	1.40	0.27	0.194	<0.0001
Analysis	2137	3.34	1.36	2169	3.09	1.29	0.26	0.193	<0.0001

Summary and Discussion

This report summarizes the results of three studies investigating the comparability of paper-and-pencil and computer-based versions of the SAT Suite of Assessments. Studies were carried out for the SAT and PSAT 8/9 assessments in October 2016, and for the PSAT 10 assessment in April 2018. For each study, participating test takers were randomly assigned to test in either PNP or CBT modes.

Overall, the results of the three studies indicated similar scores between PNP and CBT versions of the Writing and Language section and Math section across the SAT Suite. However, for the Reading Test there was consistent evidence across the three studies of slightly higher performance on the CBT versions compared to the PNP versions. The differences were between one-half point and one point on the Reading Test vertical score scale (which ranges from 6–40 across the three tests).

A significant portion of the mode differences found for Reading appears to be due to items measuring Command of Evidence, which requires students to identify the portion of the text that serves as the best evidence for an answer given to a previous question. Analyses of item p-plus values indicated consistently higher CBT performance on this item type on the Reading Test.

Consistent with this finding was evidence of higher CBT scores compared to PNP scores for the Command of Evidence subscore and cross-test Analysis in Science and Analysis in History/Social Studies measures, each of which includes Command of Evidence items from the Reading Test.

Patterns of raw score correlations among the various components were similar across modes in each of the three studies, suggesting that the test structures were similar for the PNP and CBT modes. In addition, DIF analyses found very few items that functioned either moderately or significantly differently across modes. Some differences in omit and not-reached rates were found between the PNP and CBT modes, with slightly higher percentages of CBT testers answering questions at the end of the test compared to PNP testers, particularly in the Math Test (for which the last several items require students to produce an original response). However, the differences in omit and not-reached rates did not seem to result in noticeable differences in performance across modes.

Based on the results of the three studies, equating methodology was applied to Reading Test scores, Command of Evidence scores, Analysis in Science cross-test scores, and Analysis in History/Social Studies cross-test scores to determine appropriate adjustments for mode differences seen for these measures. It is interesting to note that researchers investigating paper-and-pencil and online comparability of the ACT found similar evidence of mode differences on their Reading test and also applied equating methodologies to produce comparable scores across testing modes (Li, Yi, & Harris, 2016). Using the results of the comparability studies as a baseline, College Board will adjust the Reading, Command of Evidence, Analysis in Science, and Analysis in History/Social Studies scores on future computer-based testing forms of the SAT, PSAT 10, and PSAT 8/9.

Analyses of mode differences by subgroup across the three studies largely followed the overall mode difference trends. For most of the subgroups analyzed, CBT scores were consistently higher than PNP scores for Reading. In contrast, there was no consistent evidence of higher or lower performance on the CBT versions of either the Writing and Language test or Math test compared to the PNP performance.

Two findings regarding the performance of subgroups across PNP and CBT modes are worth noting. First, for the Hispanic group, the trends in relative performance across mode were slightly different compared to other subgroups, in that there was weaker evidence over the three studies of higher Reading scores for the CBT group compared to the PNP group, and some evidence in the PSAT 10 study of higher PNP scores compared to CBT scores in Writing and Language and Math. We are not aware of any literature that would have suggested this outcome. Second, although based on very small samples, for the Other Language Best groups there were differences in performance favoring the PNP testers over the CBT testers on each section in all three studies, with effect sizes as large as 0.50 for some of the comparisons.[2] It should be noted that the schools recruited for the comparability studies were not otherwise administering the SAT Suite online and may not have exposed their students to the preparation

[2] Perhaps contrary to these results, in K–12 testing, English language learners are increasingly being assessed by computer in the hope that computer-based item formats will provide better measurement of their English skills (c.f., Mitchell, 2015).

and practice for computer-based testing that might otherwise have been provided. In addition, no accommodations were requested (e.g., extended time, glossaries) for any of the students participating in the study.

The results of the mode comparability analyses for the SAT Essay indicated small but meaningful differences in each score dimension, with higher scores resulting for the PNP group compared to the CBT group. The cause of the differences in Essay scores across modes is not clear. Likely, some of this difference is due to raters and some of the difference is due to student ability. Previous literature suggests that raters can show some bias in favor of handwritten Essays (Way, Lin, & Kong 2008; Puhan et al., 2007; Arnold, et al., 1990). Other literature suggests that PNP versus CBT Essay performance may depend on whether students are testing with their preferred mode of composition (Horkay et al. 2006). The results of this study were based on randomly assigning students to mode and might not reflect performance differences that would occur in a school where students are used to composing using keyboards.

As we continue to administer the SAT Suite digitally, College Board will monitor the comparability of CBT and PNP performance on the various tests in the Suite to confirm the appropriateness of the mode adjustments to achieve comparable scores. We will also monitor the performance for various subgroups across testing modes as well as CBT versus PNP performance on the SAT Essay.

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Appendix A. Descriptive Statistics of SAT Raw and Scale Scores by Mode and Subgroup

Table A1

Descriptive Statistics of SAT Raw and Scale Scores by Mode for Females

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	1322	25.53	9.98	2.00	52.00	1322	25.36	5.25	10.00	40.00
	WL	1322	21.89	8.21	2.00	43.00	1322	25.23	5.38	10.00	39.00
	MSS	1322	25.76	9.73	6.00	57.00	1322	486.13	97.35	270.00	790.00
	WIC	1322	9.50	3.77	1.00	18.00	1322	8.09	3.22	1.00	15.00
	COE	1322	9.09	3.80	0.00	18.00	1322	8.27	2.51	1.00	15.00
	EOI	1322	11.14	5.08	1.00	24.00	1322	8.37	2.88	1.00	15.00
	SEC	1322	10.75	3.62	1.00	20.00	1322	7.84	2.89	1.00	15.00
	HOA	1322	9.02	3.91	1.00	19.00	1322	7.61	2.59	1.00	15.00
	PAM	1322	6.77	2.51	0.00	16.00	1322	7.76	2.50	1.00	15.00
	PSD	1322	8.08	3.57	0.00	17.00	1322	7.61	2.97	1.00	15.00
	HSS	1322	16.83	6.97	2.00	34.00	1322	25.07	5.22	10.00	39.00
	SCI	1322	17.34	6.83	1.00	35.00	1322	25.12	5.11	10.00	40.00
	ERW	.	.	.	.	.	1322	505.92	101.20	250.00	770.00
	Tot	.	.	.	.	.	1322	992.04	187.84	590.00	1540.00
CBT	R	1344	27.05	9.92	1.00	52.00	1344	26.16	5.23	10.00	40.00
	WL	1344	22.05	7.89	4.00	43.00	1344	25.34	5.18	12.00	39.00
	MSS	1344	26.06	9.22	5.00	56.00	1344	489.70	92.07	250.00	780.00
	WIC	1344	9.63	3.58	0.00	18.00	1344	8.22	3.05	1.00	15.00
	COE	1344	9.71	3.74	0.00	18.00	1344	8.67	2.48	1.00	15.00
	EOI	1344	11.12	4.85	1.00	24.00	1344	8.37	2.75	1.00	15.00
	SEC	1344	10.92	3.57	1.00	20.00	1344	7.96	2.86	1.00	15.00
	HOA	1344	9.27	3.79	1.00	19.00	1344	7.79	2.49	1.00	15.00
	PAM	1344	6.83	2.42	0.00	15.00	1344	7.83	2.41	1.00	15.00
	PSD	1344	8.08	3.40	0.00	17.00	1344	7.64	2.83	1.00	15.00
	HSS	1344	17.81	6.87	0.00	35.00	1344	25.82	5.12	10.00	40.00
	SCI	1344	17.91	6.68	1.00	35.00	1344	25.59	5.01	10.00	40.00
	ERW	.	.	.	.	.	1344	515.04	99.27	240.00	770.00
	Tot	.	.	.	.	.	1344	1004.74	179.45	570.00	1530.00

Table A2

Descriptive Statistics of SAT Raw and Scales Scores by Mode for Males

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	1285	25.57	10.01	4.00	52.00	1285	25.39	5.27	11.00	40.00
	WL	1285	20.92	8.18	2.00	43.00	1285	24.55	5.45	10.00	39.00
	MSS	1285	26.91	10.35	4.00	55.00	1285	497.17	103.02	240.00	770.00
	WIC	1285	9.41	3.61	1.00	18.00	1285	8.02	3.09	1.00	15.00
	COE	1285	8.83	3.83	0.00	18.00	1285	8.08	2.55	1.00	15.00
	EOI	1285	10.80	4.94	0.00	24.00	1285	8.18	2.83	1.00	15.00
	SEC	1285	10.13	3.77	1.00	20.00	1285	7.34	2.98	1.00	15.00
	HOA	1285	9.57	4.16	0.00	19.00	1285	7.95	2.75	1.00	15.00
	PAM	1285	6.95	2.69	0.00	16.00	1285	7.94	2.67	1.00	15.00
	PSD	1285	8.36	3.63	0.00	17.00	1285	7.85	3.01	1.00	15.00
	HSS	1285	16.98	7.28	1.00	35.00	1285	25.15	5.47	10.00	40.00
	SCI	1285	17.55	6.81	2.00	35.00	1285	25.29	5.08	12.00	40.00
	ERW	.	.	.	.	.	1285	499.39	102.22	210.00	780.00
	Tot	.	.	.	.	.	1285	996.55	193.30	560.00	1530.00
CBT	R	1270	27.17	10.35	2.00	52.00	1270	26.21	5.45	10.00	40.00
	WL	1270	21.35	7.94	3.00	44.00	1270	24.88	5.26	11.00	40.00
	MSS	1270	27.15	10.20	3.00	56.00	1270	499.75	101.42	220.00	780.00
	WIC	1270	9.75	3.60	0.00	18.00	1270	8.33	3.06	1.00	15.00
	COE	1270	9.51	3.81	0.00	18.00	1270	8.52	2.52	1.00	15.00
	EOI	1270	10.99	4.88	0.00	24.00	1270	8.29	2.78	1.00	15.00
	SEC	1270	10.36	3.64	0.00	20.00	1270	7.53	2.89	1.00	15.00
	HOA	1270	9.72	4.15	1.00	19.00	1270	8.08	2.76	1.00	15.00
	PAM	1270	6.97	2.61	1.00	16.00	1270	7.96	2.59	2.00	15.00
	PSD	1270	8.41	3.60	0.00	17.00	1270	7.88	2.98	1.00	15.00
	HSS	1270	17.99	7.13	1.00	35.00	1270	25.91	5.29	10.00	40.00
	SCI	1270	18.29	7.03	0.00	35.00	1270	25.84	5.26	10.00	40.00
	ERW	.	.	.	.	.	1270	510.87	101.49	210.00	780.00
	Tot	.	.	.	.	.	1270	1010.62	190.95	480.00	1530.00

Table A3

Descriptive Statistics of SAT Raw and Scale Scores by Mode for Asians

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	111	28.23	10.38	9.00	50.00	111	26.77	5.35	16.00	39.00
	WL	111	24.32	8.08	7.00	41.00	111	26.80	5.16	14.00	37.00
	MSS	111	32.64	10.73	13.00	57.00	111	554.05	103.71	350.00	790.00
	WIC	111	10.49	3.45	2.00	18.00	111	8.93	2.81	1.00	15.00
	COE	111	9.99	3.68	3.00	18.00	111	8.88	2.41	4.00	15.00
	EOI	111	12.53	5.02	3.00	23.00	111	9.15	2.81	3.00	15.00
	SEC	111	11.79	3.58	4.00	20.00	111	8.65	2.88	3.00	15.00
	HOA	111	11.55	4.04	3.00	19.00	111	9.24	2.65	3.00	15.00
	PAM	111	8.37	2.80	1.00	16.00	111	9.32	2.69	2.00	15.00
	PSD	111	9.96	3.79	2.00	17.00	111	9.14	3.04	2.00	15.00
	HSS	111	19.17	7.14	5.00	34.00	111	26.86	5.13	14.00	39.00
	SCI	111	19.77	7.09	6.00	34.00	111	26.90	5.19	16.00	38.00
	ERW	.	.	.	.	.	111	535.77	98.74	320.00	750.00
	Tot	.	.	.	.	.	111	1089.82	188.14	750.00	1520.00
CBT	R	129	30.31	11.09	11.00	51.00	129	27.86	5.77	17.00	39.00
	WL	129	25.22	8.45	11.00	44.00	129	27.37	5.37	18.00	40.00
	MSS	129	32.71	11.42	8.00	56.00	129	554.19	110.47	290.00	780.00
	WIC	129	10.64	3.97	2.00	18.00	129	9.03	3.31	1.00	15.00
	COE	129	11.26	3.86	3.00	18.00	129	9.75	2.62	4.00	15.00
	EOI	129	13.11	5.39	3.00	24.00	129	9.50	2.98	3.00	15.00
	SEC	129	12.12	3.57	4.00	20.00	129	8.95	2.87	3.00	15.00
	HOA	129	11.98	4.21	2.00	19.00	129	9.58	2.79	2.00	15.00
	PAM	129	8.33	3.11	2.00	16.00	129	9.28	2.99	3.00	15.00
	PSD	129	9.57	3.84	1.00	17.00	129	8.83	3.12	1.00	15.00
	HSS	129	20.08	7.66	6.00	34.00	129	27.40	5.52	16.00	39.00
	SCI	129	20.84	7.55	7.00	35.00	129	27.82	5.60	17.00	40.00
	ERW	.	.	.	.	.	129	552.33	106.74	370.00	780.00
	Tot	.	.	.	.	.	129	1106.51	207.93	680.00	1530.00

Table A4

Descriptive Statistics of SAT Raw and Scale Scores by Mode for African Americans

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	357	21.81	9.05	4.00	50.00	357	23.43	4.87	11.00	39.00
	WL	357	18.66	7.54	2.00	42.00	357	23.06	5.21	10.00	38.00
	MSS	357	22.00	8.41	4.00	53.00	357	448.18	87.26	240.00	750.00
	WIC	357	8.24	3.46	2.00	18.00	357	7.01	3.08	1.00	15.00
	COE	357	7.61	3.39	1.00	18.00	357	7.29	2.25	2.00	15.00
	EOI	357	9.34	4.53	1.00	24.00	357	7.36	2.70	1.00	15.00
	SEC	357	9.32	3.52	1.00	18.00	357	6.72	2.75	1.00	14.00
	HOA	357	7.58	3.56	0.00	17.00	357	6.63	2.46	1.00	13.00
	PAM	357	6.17	2.35	0.00	14.00	357	7.17	2.35	1.00	15.00
	PSD	357	6.68	3.09	0.00	17.00	357	6.46	2.72	1.00	15.00
	HSS	357	13.99	6.26	3.00	34.00	357	22.91	5.00	12.00	39.00
	SCI	357	14.67	6.09	2.00	35.00	357	23.12	4.67	12.00	40.00
	ERW	.	.	.	.	.	357	464.82	94.48	270.00	770.00
	Tot	.	.	.	.	.	357	913.00	168.71	560.00	1470.00
CBT	R	388	24.68	9.56	2.00	49.00	388	24.88	5.14	10.00	38.00
	WL	388	19.78	6.93	3.00	43.00	388	23.89	4.74	11.00	39.00
	MSS	388	23.13	8.25	3.00	53.00	388	460.26	85.14	220.00	750.00
	WIC	388	8.95	3.37	0.00	17.00	388	7.68	2.94	1.00	14.00
	COE	388	8.63	3.34	0.00	17.00	388	7.98	2.19	1.00	14.00
	EOI	388	9.74	4.29	0.00	24.00	388	7.61	2.53	1.00	15.00
	SEC	388	10.03	3.30	1.00	19.00	388	7.24	2.60	1.00	15.00
	HOA	388	8.10	3.42	1.00	18.00	388	7.04	2.32	1.00	14.00
	PAM	388	6.32	2.27	0.00	14.00	388	7.32	2.27	1.00	15.00
	PSD	388	7.12	3.15	0.00	17.00	388	6.85	2.73	1.00	15.00
	HSS	388	16.11	6.37	1.00	35.00	388	24.58	4.88	10.00	40.00
	SCI	388	16.04	6.51	0.00	35.00	388	24.15	5.04	10.00	40.00
	ERW	.	.	.	.	.	388	487.73	92.85	210.00	770.00
	Tot	.	.	.	.	.	388	947.99	164.56	480.00	1500.00

Table A5

Descriptive Statistics of SAT Raw and Scale Scores by Mode for Hispanics

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	674	23.34	8.90	5.00	49.00	674	24.25	4.68	12.00	38.00
	WL	674	19.40	7.27	4.00	43.00	674	23.60	4.93	12.00	39.00
	MSS	674	23.89	9.09	6.00	54.00	674	467.46	92.17	270.00	760.00
	WIC	674	8.59	3.37	1.00	17.00	674	7.34	2.97	1.00	14.00
	COE	674	8.13	3.50	0.00	18.00	674	7.64	2.30	1.00	15.00
	EOI	674	9.86	4.43	1.00	23.00	674	7.65	2.58	1.00	15.00
	SEC	674	9.55	3.45	1.00	20.00	674	6.88	2.73	1.00	15.00
	HOA	674	8.40	3.83	0.00	19.00	674	7.20	2.57	1.00	15.00
	PAM	674	6.49	2.44	0.00	15.00	674	7.49	2.44	1.00	15.00
	PSD	674	7.30	3.23	0.00	17.00	674	7.00	2.75	1.00	15.00
	HSS	674	15.19	6.35	2.00	34.00	674	23.91	4.79	10.00	39.00
	SCI	674	15.93	6.13	1.00	34.00	674	24.09	4.61	10.00	38.00
	ERW	.	.	.	.	.	674	478.49	90.50	270.00	760.00
	Tot	.	.	.	.	.	674	945.95	170.52	610.00	1520.00
CBT	R	648	23.73	9.18	2.00	52.00	648	24.46	4.88	10.00	40.00
	WL	648	18.81	7.05	5.00	42.00	648	23.19	4.79	12.00	38.00
	MSS	648	23.84	8.51	4.00	54.00	648	467.67	86.52	240.00	760.00
	WIC	648	8.45	3.32	0.00	18.00	648	7.23	2.94	1.00	15.00
	COE	648	8.47	3.45	2.00	18.00	648	7.86	2.26	3.00	15.00
	EOI	648	9.40	4.31	2.00	23.00	648	7.38	2.55	2.00	15.00
	SEC	648	9.41	3.38	0.00	19.00	648	6.77	2.68	1.00	15.00
	HOA	648	8.38	3.57	1.00	19.00	648	7.23	2.39	1.00	15.00
	PAM	648	6.50	2.36	1.00	15.00	648	7.50	2.34	2.00	15.00
	PSD	648	7.21	3.18	0.00	17.00	648	6.92	2.72	1.00	15.00
	HSS	648	15.48	6.39	3.00	34.00	648	24.13	4.88	12.00	39.00
	SCI	648	15.86	6.29	1.00	35.00	648	24.04	4.77	10.00	40.00
	ERW	.	.	.	.	.	648	476.53	90.75	260.00	770.00
	Tot	.	.	.	.	.	648	944.20	164.59	570.00	1480.00

Table A6

Descriptive Statistics of SAT Raw and Scale Scores by Mode for Whites

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	1065	28.80	9.81	4.00	52.00	1065	27.06	5.11	11.00	40.00
	WL	1065	23.92	8.20	4.00	43.00	1065	26.56	5.26	12.00	39.00
	MSS	1065	29.78	9.87	7.00	55.00	1065	526.17	96.29	280.00	770.00
	WIC	1065	10.58	3.64	1.00	18.00	1065	9.01	3.02	1.00	15.00
	COE	1065	10.13	3.78	1.00	18.00	1065	8.94	2.52	2.00	15.00
	EOI	1065	12.42	5.10	0.00	24.00	1065	9.09	2.83	1.00	15.00
	SEC	1065	11.51	3.60	1.00	20.00	1065	8.43	2.89	1.00	15.00
	HOA	1065	10.62	3.91	1.00	19.00	1065	8.64	2.53	1.00	15.00
	PAM	1065	7.39	2.59	1.00	16.00	1065	8.38	2.57	2.00	15.00
;	PSD	1065	9.51	3.52	1.00	17.00	1065	8.78	2.84	1.00	15.00
	HSS	1065	19.38	7.04	1.00	34.00	1065	26.93	5.14	10.00	39.00
	SCI	1065	19.77	6.64	2.00	35.00	1065	26.93	4.88	12.00	40.00
	ERW	.	.	.	.	.	1065	536.21	98.86	270.00	780.00
	Tot	.	.	.	.	.	1065	1062.38	183.34	580.00	1540.00
CBT	R	1103	30.51	9.41	7.00	52.00	1103	27.99	4.83	14.00	40.00
	WL	1103	24.24	7.83	4.00	43.00	1103	26.79	5.02	12.00	39.00
	MSS	1103	29.64	9.52	6.00	54.00	1103	524.87	92.81	270.00	760.00
	WIC	1103	10.83	3.34	2.00	18.00	1103	9.24	2.74	1.00	15.00
	COE	1103	10.78	3.70	1.00	18.00	1103	9.35	2.47	2.00	15.00
	EOI	1103	12.57	4.84	2.00	24.00	1103	9.20	2.66	2.00	15.00
	SEC	1103	11.67	3.56	1.00	20.00	1103	8.57	2.87	1.00	15.00
	HOA	1103	10.67	3.88	1.00	19.00	1103	8.68	2.52	1.00	15.00
	PAM	1103	7.40	2.48	1.00	15.00	1103	8.40	2.47	2.00	15.00
	PSD	1103	9.38	3.41	1.00	17.00	1103	8.68	2.74	1.00	15.00
	HSS	1103	20.39	6.53	0.00	35.00	1103	27.71	4.67	10.00	40.00
	SCI	1103	20.39	6.38	5.00	35.00	1103	27.43	4.65	15.00	40.00
	ERW	.	.	.	.	.	1103	547.75	93.62	290.00	780.00
	Tot	.	.	.	.	.	1103	1072.62	173.85	580.00	1510.00

Table A7

Descriptive Statistics of SAT Raw and Scale Scores by Mode for English Only Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	1839	27.21	9.92	4.00	52.00	1839	26.25	5.17	11.00	40.00
	WL	1839	22.76	8.13	2.00	43.00	1839	25.80	5.30	10.00	39.00
	MSS	1839	27.97	9.98	4.00	55.00	1839	508.28	98.48	240.00	770.00
	WIC	1839	10.04	3.65	1.00	18.00	1839	8.55	3.08	1.00	15.00
	COE	1839	9.56	3.78	0.00	18.00	1839	8.56	2.50	1.00	15.00
	EOI	1839	11.74	5.00	1.00	24.00	1839	8.72	2.81	1.00	15.00
	SEC	1839	11.03	3.65	1.00	20.00	1839	8.06	2.90	1.00	15.00
	HOA	1839	9.93	4.01	0.00	19.00	1839	8.19	2.62	1.00	15.00
	PAM	1839	7.14	2.59	0.00	16.00	1839	8.14	2.58	1.00	15.00
	PSD	1839	8.81	3.55	0.00	17.00	1839	8.23	2.90	1.00	15.00
	HSS	1839	18.10	7.10	1.00	35.00	1839	26.01	5.25	10.00	40.00
	SCI	1839	18.60	6.72	2.00	35.00	1839	26.07	4.97	12.00	40.00
	ERW	.	.	.	.	.	1839	520.51	99.66	250.00	780.00
	Tot	.	.	.	.	.	1839	1028.79	186.63	560.00	1540.00
CBT	R	1913	28.88	9.84	2.00	52.00	1913	27.12	5.13	10.00	40.00
	WL	1913	23.09	7.80	4.00	44.00	1913	26.05	5.06	12.00	40.00
	MSS	1913	28.06	9.72	3.00	56.00	1913	509.27	95.80	220.00	780.00
	WIC	1913	10.32	3.45	0.00	18.00	1913	8.82	2.88	1.00	15.00
	COE	1913	10.22	3.73	1.00	18.00	1913	8.99	2.48	2.00	15.00
	EOI	1913	11.86	4.83	1.00	24.00	1913	8.80	2.70	1.00	15.00
	SEC	1913	11.22	3.53	1.00	20.00	1913	8.21	2.83	1.00	15.00
	HOA	1913	10.05	3.95	1.00	19.00	1913	8.29	2.59	1.00	15.00
	PAM	1913	7.16	2.54	0.00	16.00	1913	8.16	2.53	1.00	15.00
	PSD	1913	8.78	3.46	0.00	17.00	1913	8.21	2.82	1.00	15.00
	HSS	1913	19.18	6.78	0.00	35.00	1913	26.83	4.93	10.00	40.00
	SCI	1913	19.26	6.73	0.00	35.00	1913	26.58	5.01	10.00	40.00
	ERW	.	.	.	.	.	1913	531.67	96.76	250.00	780.00
	Tot	.	.	.	.	.	1913	1040.95	180.56	590.00	1530.00

Table A8

Descriptive Statistics of SAT Raw and Scale Scores by Mode for English and Other Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	401	22.68	8.84	5.00	49.00	401	23.89	4.69	12.00	38.00
	WL	401	19.01	7.60	4.00	43.00	401	23.31	5.15	12.00	39.00
	MSS	401	23.51	9.35	6.00	55.00	401	463.34	95.11	270.00	770.00
	WIC	401	8.42	3.37	1.00	18.00	401	7.20	2.97	1.00	15.00
	COE	401	7.94	3.46	1.00	18.00	401	7.53	2.27	2.00	15.00
	EOI	401	9.63	4.61	0.00	23.00	401	7.51	2.71	1.00	15.00
	SEC	401	9.39	3.58	2.00	20.00	401	6.75	2.82	1.00	15.00
	HOA	401	8.27	3.81	1.00	19.00	401	7.13	2.57	1.00	15.00
	PAM	401	6.28	2.49	0.00	15.00	401	7.28	2.48	1.00	15.00
	PSD	401	7.17	3.30	0.00	17.00	401	6.88	2.82	1.00	15.00
	HSS	401	14.83	6.17	2.00	34.00	401	23.64	4.70	10.00	39.00
	SCI	401	15.47	6.20	2.00	35.00	401	23.74	4.70	12.00	40.00
	ERW	.	.	.	.	.	401	472.02	92.85	280.00	760.00
	Tot	.	.	.	.	.	401	935.36	174.53	610.00	1530.00
CBT	R	368	23.65	8.81	7.00	49.00	368	24.42	4.64	14.00	38.00
	WL	368	18.80	7.18	4.00	43.00	368	23.19	4.87	12.00	39.00
	MSS	368	23.95	8.94	4.00	56.00	368	468.48	90.68	240.00	780.00
	WIC	368	8.36	3.39	1.00	18.00	368	7.14	3.00	1.00	15.00
	COE	368	8.59	3.29	2.00	17.00	368	7.95	2.15	3.00	14.00
	EOI	368	9.37	4.36	1.00	23.00	368	7.38	2.57	1.00	15.00
	SEC	368	9.44	3.47	0.00	20.00	368	6.79	2.74	1.00	15.00
	HOA	368	8.52	3.71	1.00	18.00	368	7.33	2.47	1.00	14.00
	PAM	368	6.52	2.33	1.00	16.00	368	7.51	2.29	2.00	15.00
	PSD	368	7.10	3.28	0.00	17.00	368	6.81	2.82	1.00	15.00
	HSS	368	15.35	6.32	3.00	32.00	368	23.99	4.86	12.00	36.00
	SCI	368	15.72	6.09	1.00	34.00	368	23.95	4.59	10.00	38.00
	ERW	.	.	.	.	.	368	476.11	89.04	280.00	750.00
	Tot	.	.	.	.	.	368	944.59	166.86	570.00	1530.00

Table A9

Descriptive Statistics of SAT Raw and Scale Scores by Mode for Other Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	40	19.40	9.39	8.00	48.00	40	22.05	5.17	15.00	37.00
	WL	40	17.05	8.18	6.00	39.00	40	21.83	5.64	13.00	36.00
	MSS	40	23.55	11.15	8.00	57.00	40	462.00	112.98	290.00	790.00
	WIC	40	7.73	3.71	2.00	18.00	40	6.53	3.34	1.00	15.00
	COE	40	6.88	3.65	1.00	16.00	40	6.75	2.39	2.00	13.00
	EOI	40	8.68	4.70	3.00	22.00	40	6.90	2.65	3.00	14.00
	SEC	40	8.38	3.87	2.00	17.00	40	6.03	3.03	1.00	13.00
	HOA	40	8.03	4.42	1.00	19.00	40	6.88	3.07	1.00	15.00
	PAM	40	6.90	2.78	3.00	15.00	40	7.88	2.71	4.00	15.00
	PSD	40	6.88	4.02	0.00	17.00	40	6.58	3.46	1.00	15.00
	HSS	40	13.23	6.65	5.00	34.00	40	22.40	5.28	14.00	39.00
	SCI	40	13.68	6.96	1.00	34.00	40	22.25	5.57	10.00	38.00
	ERW	.	.	.	.	.	40	438.75	101.28	310.00	730.00
	Tot	.	.	.	.	.	40	900.75	203.66	640.00	1520.00
CBT	R	41	17.27	5.70	9.00	40.00	41	21.07	3.21	16.00	33.00
	WL	41	14.61	3.89	5.00	25.00	41	20.29	3.04	12.00	28.00
	MSS	41	21.56	7.18	13.00	42.00	41	444.88	74.17	350.00	640.00
	WIC	41	6.07	2.40	3.00	13.00	41	5.02	2.27	2.00	11.00
	COE	41	6.39	1.90	3.00	11.00	41	6.54	1.31	4.00	9.00
	EOI	41	6.95	2.83	2.00	15.00	41	5.95	1.87	2.00	11.00
	SEC	41	7.66	2.09	3.00	11.00	41	5.37	1.59	2.00	8.00
	HOA	41	7.46	2.98	2.00	16.00	41	6.71	1.99	2.00	12.00
	PAM	41	6.02	2.39	1.00	11.00	41	7.02	2.39	2.00	12.00
	PSD	41	6.32	2.39	2.00	12.00	41	6.24	2.23	2.00	11.00
	HSS	41	11.56	3.62	6.00	22.00	41	21.27	3.07	16.00	29.00
	SCI	41	11.83	3.97	3.00	25.00	41	21.02	3.17	13.00	31.00
	ERW	.	.	.	.	.	41	413.66	55.89	290.00	590.00
	Tot	.	.	.	.	.	41	858.54	114.93	700.00	1180.00

Appendix B. Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode and Subgroup

Table B1

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for Females

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	616	23.10	7.56	1.00	44.00	616	24.46	4.40	9.00	37.00
	WL	616	21.31	7.73	4.00	43.00	616	24.49	5.05	12.00	38.00
	MSS	616	22.96	8.42	5.00	47.00	616	463.43	82.02	250.00	750.00
	WIC	616	9.07	3.76	0.00	18.00	616	8.60	2.77	1.00	15.00
	COE	616	8.62	3.03	1.00	17.00	616	8.43	2.21	2.00	15.00
	EOI	616	10.71	4.30	1.00	24.00	616	8.44	2.45	2.00	15.00
	SEC	616	10.60	4.03	1.00	20.00	616	8.67	2.39	2.00	15.00
	HOA	616	8.91	3.22	1.00	16.00	616	7.79	2.61	2.00	15.00
	PAM	616	5.43	2.78	0.00	14.00	616	7.80	2.46	1.00	15.00
	PSD	616	8.11	3.24	1.00	16.00	616	7.85	2.31	2.00	15.00
	HSS	616	15.86	5.54	3.00	31.00	616	24.14	4.57	13.00	37.00
	SCI	616	17.05	5.60	2.00	31.00	616	23.95	4.33	11.00	37.00
	ERW	.	.	.	.	.	616	489.56	87.70	260.00	750.00
	Tot	.	.	.	.	.	616	952.99	158.37	570.00	1450.00
CBT	R	606	24.29	7.96	5.00	46.00	606	25.15	4.59	13.00	38.00
	WL	606	20.96	7.89	5.00	44.00	606	24.25	5.17	13.00	38.00
	MSS	606	22.93	8.45	6.00	47.00	606	464.08	82.43	260.00	750.00
	WIC	606	9.17	3.63	1.00	18.00	606	8.67	2.66	1.00	15.00
	COE	606	9.08	3.24	2.00	18.00	606	8.78	2.35	3.00	15.00
	EOI	606	10.60	4.42	1.00	24.00	606	8.38	2.50	2.00	15.00
	SEC	606	10.36	4.11	0.00	20.00	606	8.49	2.46	1.00	15.00
	HOA	606	8.70	3.20	1.00	16.00	606	7.59	2.54	2.00	15.00
	PAM	606	5.47	2.83	0.00	14.00	606	7.88	2.54	1.00	15.00
	PSD	606	8.22	3.20	1.00	16.00	606	7.96	2.30	2.00	15.00
	HSS	606	16.10	5.56	4.00	31.00	606	24.33	4.59	14.00	37.00
	SCI	606	17.75	5.90	3.00	32.00	606	24.52	4.71	12.00	38.00
	ERW	.	.	.	.	.	606	493.98	91.75	290.00	760.00
	Tot	.	.	.	.	.	606	958.05	161.95	630.00	1480.00

Table B2

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for Males

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	561	21.35	8.40	3.00	45.00	561	23.43	4.93	11.00	37.00
	WL	561	19.16	7.95	1.00	41.00	561	23.01	5.28	9.00	37.00
	MSS	561	22.58	9.17	5.00	47.00	561	459.77	90.22	250.00	750.00
	WIC	561	8.38	3.72	0.00	18.00	561	8.09	2.76	1.00	15.00
	COE	561	7.81	3.43	0.00	17.00	561	7.82	2.55	1.00	15.00
	EOI	561	9.86	4.33	0.00	23.00	561	7.94	2.50	1.00	15.00
	SEC	561	9.30	4.22	1.00	20.00	561	7.89	2.52	2.00	15.00
	HOA	561	8.67	3.49	1.00	16.00	561	7.62	2.85	2.00	15.00
	PAM	561	5.09	2.98	0.00	14.00	561	7.46	2.68	1.00	15.00
	PSD	561	8.25	3.45	0.00	16.00	561	7.96	2.47	1.00	15.00
	HSS	561	14.87	6.03	1.00	31.00	561	23.33	4.99	10.00	37.00
	SCI	561	16.17	6.35	2.00	32.00	561	23.32	5.02	11.00	38.00
	ERW	.	.	.	.	.	561	464.44	97.02	230.00	730.00
	Tot	.	.	.	.	.	561	924.21	176.74	490.00	1480.00
CBT	R	529	22.23	8.22	3.00	46.00	529	23.93	4.78	11.00	38.00
	WL	529	18.74	7.67	6.00	42.00	529	22.72	5.14	13.00	37.00
	MSS	529	22.35	8.98	6.00	48.00	529	458.02	88.37	260.00	760.00
	WIC	529	8.49	3.69	1.00	18.00	529	8.17	2.71	1.00	15.00
	COE	529	8.37	3.40	0.00	17.00	529	8.27	2.51	1.00	15.00
	EOI	529	9.69	4.30	1.00	23.00	529	7.84	2.46	2.00	15.00
	SEC	529	9.05	4.04	1.00	20.00	529	7.75	2.42	2.00	15.00
	HOA	529	8.35	3.40	0.00	16.00	529	7.40	2.75	1.00	15.00
	PAM	529	5.12	2.88	0.00	14.00	529	7.52	2.59	1.00	15.00
	PSD	529	8.33	3.55	0.00	16.00	529	8.02	2.57	1.00	15.00
	HSS	529	15.36	5.94	2.00	32.00	529	23.74	4.91	11.00	38.00
	SCI	529	16.41	6.30	2.00	31.00	529	23.52	4.92	11.00	37.00
	ERW	.	.	.	.	.	529	466.50	93.19	260.00	740.00
	Tot	.	.	.	.	.	529	924.52	171.03	600.00	1480.00

Table B3

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for Asians

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	45	23.73	7.10	12.00	42.00	45	24.80	4.11	18.00	35.00
	WL	45	22.24	7.30	9.00	40.00	45	25.11	4.77	15.00	36.00
	MSS	45	27.53	9.62	8.00	45.00	45	507.56	96.30	300.00	720.00
	WIC	45	9.56	3.64	2.00	17.00	45	8.98	2.66	3.00	14.00
	COE	45	8.71	2.58	4.00	15.00	45	8.49	1.80	5.00	13.00
	EOI	45	11.20	4.00	2.00	22.00	45	8.69	2.26	3.00	15.00
	SEC	45	11.04	3.82	4.00	18.00	45	8.93	2.18	5.00	13.00
	HOA	45	10.33	3.40	4.00	16.00	45	9.07	2.88	4.00	15.00
	PAM	45	6.80	3.32	0.00	14.00	45	8.93	2.82	1.00	15.00
	PSD	45	9.49	3.41	2.00	16.00	45	8.82	2.36	3.00	15.00
	HSS	45	16.71	5.08	7.00	29.00	45	24.87	4.20	17.00	36.00
	SCI	45	18.53	5.34	9.00	29.00	45	25.16	4.19	18.00	34.00
	ERW	.	.	.	.	.	45	499.11	82.70	360.00	710.00
	Tot	.	.	.	.	.	45	1006.67	157.00	690.00	1280.00
CBT	R	42	25.81	9.55	10.00	46.00	42	25.98	5.52	17.00	38.00
	WL	42	22.36	8.70	6.00	43.00	42	25.17	5.61	13.00	38.00
	MSS	42	26.93	10.23	10.00	47.00	42	506.67	107.65	330.00	750.00
	WIC	42	9.07	3.95	3.00	17.00	42	8.64	2.80	4.00	14.00
	COE	42	10.19	3.58	1.00	17.00	42	9.50	2.62	2.00	15.00
	EOI	42	11.21	4.70	1.00	23.00	42	8.74	2.71	2.00	15.00
	SEC	42	11.14	4.58	3.00	20.00	42	8.98	2.80	4.00	15.00
	HOA	42	9.93	3.29	5.00	16.00	42	8.71	2.91	5.00	15.00
	PAM	42	6.62	3.73	0.00	14.00	42	8.71	3.29	1.00	15.00
	PSD	42	9.69	3.71	3.00	16.00	42	9.12	3.04	4.00	15.00
	HSS	42	18.07	6.25	6.00	32.00	42	25.95	5.21	16.00	38.00
	SCI	42	18.95	6.72	7.00	31.00	42	25.55	5.58	16.00	37.00
	ERW	.	.	.	.	.	42	511.43	107.53	300.00	730.00
	Tot	.	.	.	.	.	42	1018.10	202.16	680.00	1470.00

Table B4

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for African Americans

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	113	17.78	6.93	3.00	40.00	113	21.34	4.14	11.00	34.00
	WL	113	16.39	6.21	4.00	39.00	113	21.18	4.40	12.00	35.00
	MSS	113	17.73	6.95	5.00	41.00	113	412.83	70.56	250.00	640.00
	WIC	113	6.88	3.17	0.00	15.00	113	6.99	2.38	1.00	13.00
	COE	113	6.72	2.79	1.00	15.00	113	7.04	2.11	2.00	13.00
	EOI	113	8.32	3.49	1.00	20.00	113	7.09	2.10	2.00	14.00
	SEC	113	8.07	3.50	2.00	19.00	113	7.25	2.13	3.00	14.00
	HOA	113	7.05	2.80	2.00	14.00	113	6.31	2.13	2.00	12.00
	PAM	113	4.17	2.12	0.00	11.00	113	6.78	2.19	1.00	12.00
	PSD	113	6.19	3.02	0.00	16.00	113	6.58	2.27	1.00	15.00
	HSS	113	12.04	5.18	1.00	30.00	113	21.01	4.29	10.00	36.00
	SCI	113	13.06	5.43	3.00	31.00	113	20.88	4.27	12.00	37.00
	ERW	.	.	.	.	.	113	425.13	78.62	230.00	690.00
	Tot	.	.	.	.	.	113	837.96	137.31	490.00	1330.00
CBT	R	145	20.78	7.35	7.00	45.00	145	23.11	4.27	15.00	37.00
	WL	145	17.27	6.84	7.00	38.00	145	21.73	4.72	14.00	34.00
	MSS	145	18.34	7.03	6.00	45.00	145	419.38	71.67	260.00	720.00
	WIC	145	7.83	3.26	2.00	17.00	145	7.67	2.37	3.00	14.00
	COE	145	7.65	3.12	2.00	18.00	145	7.77	2.32	3.00	15.00
	EOI	145	8.74	4.02	3.00	23.00	145	7.28	2.34	4.00	15.00
	SEC	145	8.52	3.58	1.00	17.00	145	7.46	2.12	2.00	12.00
	HOA	145	7.06	2.89	1.00	15.00	145	6.36	2.21	2.00	14.00
	PAM	145	4.18	2.39	0.00	14.00	145	6.70	2.37	1.00	15.00
	PSD	145	6.69	2.79	1.00	15.00	145	6.91	1.98	2.00	14.00
	HSS	145	13.48	4.92	3.00	29.00	145	22.19	4.09	13.00	36.00
	SCI	145	14.79	5.31	6.00	32.00	145	22.30	4.18	15.00	38.00
	ERW	.	.	.	.	.	145	448.41	82.77	310.00	710.00
	Tot	.	.	.	.	.	145	867.79	139.78	630.00	1430.00

Table B5

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for Hispanics

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	297	20.57	7.29	1.00	43.00	297	22.99	4.33	9.00	36.00
	WL	297	18.01	6.77	4.00	41.00	297	22.37	4.70	12.00	37.00
	MSS	297	20.91	7.81	6.00	46.00	297	443.97	77.30	260.00	740.00
	WIC	297	7.83	3.43	0.00	17.00	297	7.71	2.58	1.00	14.00
	COE	297	7.61	3.02	0.00	17.00	297	7.68	2.23	1.00	15.00
	EOI	297	9.14	3.72	1.00	23.00	297	7.59	2.20	2.00	15.00
	SEC	297	8.86	3.77	1.00	20.00	297	7.66	2.26	2.00	15.00
	HOA	297	8.21	3.12	1.00	16.00	297	7.23	2.46	2.00	15.00
	PAM	297	4.75	2.69	0.00	14.00	297	7.18	2.46	1.00	15.00
	PSD	297	7.46	3.00	1.00	15.00	297	7.39	2.13	2.00	14.00
	HSS	297	14.23	5.28	3.00	30.00	297	22.79	4.34	13.00	36.00
	SCI	297	15.20	5.29	2.00	32.00	297	22.53	4.11	11.00	38.00
	ERW	.	.	.	.	.	297	453.60	83.57	250.00	730.00
	Tot	.	.	.	.	.	297	897.58	149.10	550.00	1450.00
CBT	R	311	20.54	7.57	3.00	44.00	311	22.96	4.45	11.00	37.00
	WL	311	17.32	6.29	5.00	36.00	311	21.86	4.43	13.00	33.00
	MSS	311	19.39	6.87	6.00	43.00	311	429.87	67.71	260.00	680.00
	WIC	311	7.57	3.32	1.00	18.00	311	7.51	2.48	1.00	15.00
	COE	311	7.78	2.98	1.00	16.00	311	7.83	2.17	2.00	14.00
	EOI	311	8.87	3.43	2.00	20.00	311	7.43	2.01	3.00	14.00
	SEC	311	8.45	3.59	1.00	18.00	311	7.37	2.15	2.00	13.00
	HOA	311	7.35	2.99	0.00	15.00	311	6.54	2.26	1.00	14.00
	PAM	311	4.50	2.22	0.00	14.00	311	7.06	2.19	1.00	15.00
	PSD	311	7.05	2.78	0.00	15.00	311	7.15	1.93	1.00	14.00
	HSS	311	13.75	5.02	2.00	28.00	311	22.41	4.10	11.00	35.00
	SCI	311	15.00	5.62	3.00	31.00	311	22.40	4.31	12.00	37.00
	ERW	.	.	.	.	.	311	448.23	81.69	260.00	680.00
	Tot	.	.	.	.	.	311	878.10	136.37	600.00	1340.00

Table B6

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for Whites

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	497	24.78	7.90	9.00	45.00	497	25.44	4.56	16.00	37.00
	WL	497	22.90	8.07	6.00	43.00	497	25.48	5.10	13.00	38.00
	MSS	497	25.68	8.58	5.00	47.00	497	489.54	82.48	250.00	750.00
	WIC	497	9.95	3.70	1.00	18.00	497	9.23	2.68	1.00	15.00
	COE	497	9.21	3.24	1.00	17.00	497	8.84	2.39	2.00	15.00
	EOI	497	11.69	4.46	2.00	24.00	497	8.99	2.50	3.00	15.00
	SEC	497	11.21	4.20	2.00	20.00	497	9.00	2.49	3.00	15.00
	HOA	497	9.76	3.26	1.00	16.00	497	8.47	2.73	2.00	15.00
	PAM	497	5.95	2.93	0.00	14.00	497	8.23	2.50	1.00	15.00
	PSD	497	9.35	3.19	1.00	16.00	497	8.71	2.31	2.00	15.00
	HSS	497	17.30	5.65	3.00	31.00	497	25.32	4.70	13.00	37.00
	SCI	497	18.54	5.79	4.00	31.00	497	25.12	4.56	13.00	37.00
	ERW	.	.	.	.	.	497	509.22	90.12	310.00	720.00
	Tot	.	.	.	.	.	497	998.75	161.58	590.00	1460.00
CBT	R	513	25.67	7.77	8.00	46.00	513	25.95	4.47	16.00	38.00
	WL	513	22.29	8.18	6.00	44.00	513	25.08	5.25	13.00	38.00
	MSS	513	25.51	8.64	7.00	48.00	513	488.71	83.32	280.00	760.00
	WIC	513	9.96	3.60	1.00	18.00	513	9.24	2.64	1.00	15.00
	COE	513	9.58	3.26	0.00	18.00	513	9.16	2.37	1.00	15.00
	EOI	513	11.39	4.61	1.00	24.00	513	8.81	2.58	2.00	15.00
	SEC	513	10.90	4.20	0.00	20.00	513	8.81	2.52	1.00	15.00
	HOA	513	9.55	3.16	1.00	16.00	513	8.30	2.60	2.00	15.00
	PAM	513	6.01	2.94	0.00	14.00	513	8.33	2.52	1.00	15.00
	PSD	513	9.35	3.36	1.00	16.00	513	8.73	2.47	2.00	15.00
	HSS	513	17.54	5.62	4.00	31.00	513	25.53	4.67	14.00	37.00
	SCI	513	19.01	5.87	4.00	31.00	513	25.50	4.71	13.00	37.00
	ERW	.	.	.	.	.	513	510.27	91.39	290.00	760.00
	Tot	.	.	.	.	.	513	998.99	163.51	620.00	1480.00

Table B7

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for English-Only Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	871	23.09	8.10	3.00	45.00	871	24.45	4.71	11.00	37.00
	WL	871	21.12	8.08	4.00	43.00	871	24.33	5.26	12.00	38.00
	MSS	871	23.72	8.67	5.00	47.00	871	470.71	83.88	250.00	750.00
	WIC	871	9.13	3.80	0.00	18.00	871	8.63	2.80	1.00	15.00
	COE	871	8.56	3.27	0.00	17.00	871	8.38	2.41	1.00	15.00
	EOI	871	10.73	4.45	1.00	24.00	871	8.46	2.53	2.00	15.00
	SEC	871	10.39	4.23	1.00	20.00	871	8.55	2.51	2.00	15.00
	HOA	871	9.13	3.30	1.00	16.00	871	7.96	2.70	2.00	15.00
	PAM	871	5.49	2.84	0.00	14.00	871	7.86	2.48	1.00	15.00
	PSD	871	8.55	3.33	0.00	16.00	871	8.16	2.38	1.00	15.00
	HSS	871	15.97	5.86	1.00	31.00	871	24.23	4.86	10.00	37.00
	SCI	871	17.24	6.05	2.00	32.00	871	24.12	4.77	11.00	38.00
	ERW	.	.	.	.	.	871	487.77	93.81	230.00	750.00
	Tot	.	.	.	.	.	871	958.48	167.04	490.00	1480.00
CBT	R	879	24.08	8.02	5.00	46.00	879	25.02	4.63	13.00	38.00
	WL	879	20.67	7.95	6.00	44.00	879	24.04	5.21	13.00	38.00
	MSS	879	23.27	8.73	6.00	48.00	879	467.20	85.09	260.00	760.00
	WIC	879	9.23	3.64	1.00	18.00	879	8.71	2.67	1.00	15.00
	COE	879	9.02	3.32	0.00	18.00	879	8.75	2.43	1.00	15.00
	EOI	879	10.54	4.47	1.00	24.00	879	8.33	2.54	2.00	15.00
	SEC	879	10.14	4.11	1.00	20.00	879	8.38	2.45	2.00	15.00
	HOA	879	8.76	3.25	1.00	16.00	879	7.68	2.61	2.00	15.00
	PAM	879	5.43	2.87	0.00	14.00	879	7.83	2.54	1.00	15.00
	PSD	879	8.53	3.37	1.00	16.00	879	8.16	2.44	2.00	15.00
	HSS	879	16.28	5.75	3.00	32.00	879	24.48	4.76	13.00	38.00
	SCI	879	17.69	6.02	3.00	32.00	879	24.48	4.78	12.00	38.00
	ERW	.	.	.	.	.	879	490.67	92.87	290.00	760.00
	Tot	.	.	.	.	.	879	957.87	166.47	620.00	1480.00

Table B8

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for English and Other Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	146	20.48	7.30	1.00	41.00	146	22.96	4.35	9.00	35.00
	WL	146	18.29	6.92	5.00	40.00	146	22.53	4.82	13.00	36.00
	MSS	146	21.00	8.27	7.00	46.00	146	445.27	83.47	280.00	740.00
	WIC	146	7.97	3.38	2.00	17.00	146	7.83	2.50	3.00	14.00
	COE	146	7.60	3.01	1.00	14.00	146	7.63	2.22	2.00	12.00
	EOI	146	9.39	3.77	2.00	21.00	146	7.66	2.23	3.00	14.00
	SEC	146	8.90	3.77	1.00	20.00	146	7.64	2.25	2.00	15.00
	HOA	146	8.27	3.24	1.00	16.00	146	7.28	2.60	2.00	15.00
	PAM	146	4.89	2.94	0.00	14.00	146	7.27	2.69	1.00	15.00
	PSD	146	7.36	3.01	1.00	15.00	146	7.36	2.15	2.00	14.00
	HSS	146	14.27	5.27	4.00	28.00	146	22.82	4.31	14.00	35.00
	SCI	146	15.24	5.18	2.00	28.00	146	22.58	3.91	11.00	33.00
	ERW	.	.	.	.	.	146	454.93	84.70	260.00	710.00
	Tot	.	.	.	.	.	146	900.21	155.89	590.00	1450.00
CBT	R	205	20.91	7.67	3.00	44.00	205	23.18	4.49	11.00	37.00
	WL	205	17.20	6.81	5.00	43.00	205	21.72	4.75	13.00	38.00
	MSS	205	19.99	7.39	6.00	46.00	205	436.39	74.90	260.00	740.00
	WIC	205	7.44	3.37	1.00	18.00	205	7.41	2.49	1.00	15.00
	COE	205	7.83	3.04	1.00	17.00	205	7.85	2.19	2.00	15.00
	EOI	205	8.80	3.74	2.00	23.00	205	7.37	2.18	3.00	15.00
	SEC	205	8.40	3.73	0.00	20.00	205	7.32	2.27	1.00	15.00
	HOA	205	7.58	3.07	0.00	16.00	205	6.74	2.44	1.00	15.00
	PAM	205	4.71	2.53	0.00	14.00	205	7.20	2.46	1.00	15.00
	PSD	205	7.16	2.97	0.00	16.00	205	7.24	2.14	1.00	15.00
	HSS	205	13.99	5.16	2.00	28.00	205	22.60	4.26	11.00	35.00
	SCI	205	15.08	5.76	2.00	31.00	205	22.52	4.51	11.00	37.00
	ERW	.	.	.	.	.	205	448.93	84.73	260.00	730.00
	Tot	.	.	.	.	.	205	885.32	146.74	610.00	1460.00

Table B9

Descriptive Statistics of PSAT 10 Raw and Scale Scores by Mode for Other Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	21	19.86	7.18	11.00	39.00	21	22.57	4.27	17.00	34.00
	WL	21	16.76	6.56	7.00	32.00	21	21.52	4.64	14.00	31.00
	MSS	21	22.76	13.17	6.00	45.00	21	460.95	139.60	260.00	720.00
	WIC	21	6.95	3.49	1.00	16.00	21	7.00	2.88	1.00	14.00
	COE	21	7.71	2.49	4.00	13.00	21	7.95	1.86	5.00	12.00
	EOI	21	8.71	3.48	2.00	15.00	21	7.29	2.00	3.00	11.00
	SEC	21	8.05	3.76	2.00	18.00	21	7.19	2.23	3.00	13.00
	HOA	21	8.48	4.74	1.00	16.00	21	7.71	4.04	2.00	15.00
	PAM	21	5.67	4.40	0.00	14.00	21	7.67	4.08	1.00	15.00
	PSD	21	7.81	4.19	2.00	15.00	21	7.62	2.99	3.00	14.00
	HSS	21	13.67	5.58	6.00	27.00	21	22.43	4.52	16.00	33.00
	SCI	21	14.81	5.64	8.00	30.00	21	22.38	4.53	17.00	36.00
	ERW	.	.	.	.	.	21	440.95	84.73	320.00	650.00
	Tot	.	.	.	.	.	21	901.90	209.25	640.00	1350.00
CBT	R	26	15.62	6.58	8.00	31.00	26	20.00	3.95	16.00	29.00
	WL	26	14.15	4.79	5.00	25.00	26	19.62	3.67	13.00	27.00
	MSS	26	17.73	8.17	6.00	36.00	26	408.85	84.73	260.00	580.00
	WIC	26	5.88	2.12	3.00	11.00	26	6.31	1.57	4.00	10.00
	COE	26	5.88	3.00	1.00	14.00	26	6.38	2.28	2.00	12.00
	EOI	26	7.77	3.01	1.00	16.00	26	6.85	1.93	2.00	11.00
	SEC	26	6.38	3.07	3.00	15.00	26	6.19	1.77	4.00	11.00
	HOA	26	6.35	3.59	1.00	12.00	26	5.77	2.61	2.00	10.00
	PAM	26	4.27	2.46	1.00	11.00	26	6.77	2.53	3.00	12.00
	PSD	26	6.62	3.05	1.00	15.00	26	6.96	2.36	2.00	14.00
	HSS	26	10.73	3.99	5.00	18.00	26	20.00	3.21	15.00	26.00
	SCI	26	12.04	5.05	3.00	26.00	26	20.19	3.86	12.00	31.00
	ERW	.	.	.	.	.	26	396.15	67.06	310.00	550.00
	Tot	.	.	.	.	.	26	805.00	133.78	600.00	1100.00

Appendix C. Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode and Subgroup

Table C1

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for Females

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	893	24.17	7.84	2.00	41.00	893	23.45	4.66	9.00	35.00
	WL	893	21.87	8.04	1.00	39.00	893	22.11	5.07	7.00	35.00
	MSS	893	16.35	6.92	0.00	38.00	893	433.46	86.18	120.00	720.00
	WIC	893	10.22	3.76	1.00	18.00	893	8.47	3.41	1.00	15.00
	COE	893	9.81	3.83	0.00	18.00	893	8.49	2.75	1.00	15.00
	EOI	893	11.67	5.06	0.00	24.00	893	8.12	3.01	1.00	15.00
	SEC	893	10.20	3.51	0.00	16.00	893	8.29	3.47	1.00	15.00
	HOA	893	6.55	3.07	0.00	16.00	893	7.95	2.67	1.00	15.00
	PSD	893	7.70	3.10	0.00	16.00	893	7.73	2.73	1.00	15.00
	HSS	893	15.71	5.42	1.00	29.00	893	22.52	4.90	8.00	36.00
	SCI	893	13.65	5.30	0.00	27.00	893	22.71	4.72	6.00	35.00
	ERW	.	.	.	.	.	893	455.53	92.46	160.00	690.00
	Tot	.	.	.	.	.	893	888.99	168.31	310.00	1410.00
CBT	R	913	25.38	7.95	1.00	42.00	913	24.17	4.81	7.00	36.00
	WL	913	22.22	8.35	0.00	40.00	913	22.35	5.37	6.00	36.00
	MSS	913	16.90	7.21	2.00	38.00	913	440.76	90.05	180.00	720.00
	WIC	913	10.50	3.82	0.00	18.00	913	8.73	3.46	1.00	15.00
	COE	913	10.58	3.96	0.00	18.00	913	9.04	2.85	1.00	15.00
	EOI	913	12.02	5.24	0.00	24.00	913	8.30	3.12	1.00	15.00
	SEC	913	10.20	3.55	0.00	16.00	913	8.32	3.49	1.00	15.00
	HOA	913	6.73	3.17	0.00	16.00	913	8.09	2.74	1.00	15.00
	PSD	913	7.96	3.18	0.00	16.00	913	7.95	2.84	1.00	15.00
	HSS	913	16.01	5.49	1.00	29.00	913	22.83	5.05	8.00	36.00
	SCI	913	14.67	5.55	0.00	28.00	913	23.59	5.01	6.00	35.00
	ERW	.	.	.	.	.	913	465.21	96.94	150.00	710.00
	Tot	.	.	.	.	.	913	905.97	176.30	400.00	1410.00

Table C2

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for Males

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	894	22.57	8.28	2.00	41.00	894	22.57	4.83	9.00	35.00
	WL	894	20.02	8.32	2.00	39.00	894	20.99	5.24	8.00	35.00
	MSS	894	17.14	7.87	2.00	38.00	894	443.00	98.19	180.00	720.00
	WIC	894	9.72	3.93	0.00	18.00	894	8.03	3.54	1.00	15.00
	COE	894	8.99	3.87	0.00	18.00	894	7.90	2.79	1.00	15.00
	EOI	894	10.85	5.11	0.00	24.00	894	7.61	3.08	1.00	15.00
	SEC	894	9.18	3.71	1.00	16.00	894	7.28	3.62	1.00	15.00
	HOA	894	6.79	3.48	0.00	16.00	894	8.18	3.02	1.00	15.00
	PSD	894	8.16	3.54	0.00	16.00	894	8.18	3.18	1.00	15.00
	HSS	894	15.06	5.84	1.00	29.00	894	22.08	5.28	8.00	36.00
	SCI	894	13.26	5.70	0.00	28.00	894	22.40	5.08	6.00	35.00
	ERW	.	.	.	.	.	894	435.54	96.25	190.00	700.00
	Tot	.	.	.	.	.	894	878.53	183.91	470.00	1390.00
CBT	R	874	24.23	8.23	3.00	42.00	874	23.51	4.87	10.00	36.00
	WL	874	21.00	8.23	3.00	39.00	874	21.60	5.15	10.00	35.00
	MSS	874	17.41	7.65	1.00	38.00	874	446.83	94.95	150.00	720.00
	WIC	874	10.09	3.88	0.00	18.00	874	8.38	3.49	1.00	15.00
	COE	874	9.88	4.03	0.00	18.00	874	8.53	2.91	1.00	15.00
	EOI	874	11.47	5.07	0.00	23.00	874	7.98	3.02	1.00	15.00
	SEC	874	9.54	3.63	0.00	16.00	874	7.62	3.56	1.00	15.00
	HOA	874	6.93	3.40	0.00	16.00	874	8.27	2.96	1.00	15.00
	PSD	874	8.31	3.40	0.00	16.00	874	8.31	3.06	1.00	15.00
	HSS	874	15.42	5.76	1.00	29.00	874	22.37	5.25	8.00	36.00
	SCI	874	14.47	5.66	0.00	28.00	874	23.47	5.09	6.00	35.00
	ERW	.	.	.	.	.	874	451.11	95.20	230.00	700.00
	Tot	.	.	.	.	.	874	897.94	181.72	430.00	1410.00

Table C3

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for Asians

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	199	27.01	8.00	8.00	41.00	199	25.25	4.93	15.00	35.00
	WL	199	24.71	8.37	3.00	38.00	199	23.97	5.42	10.00	34.00
	MSS	199	21.88	8.43	6.00	38.00	199	502.21	104.30	290.00	720.00
	WIC	199	11.55	3.84	0.00	18.00	199	9.69	3.52	1.00	15.00
	COE	199	11.28	3.94	1.00	18.00	199	9.54	2.84	2.00	15.00
	EOI	199	13.47	5.45	2.00	23.00	199	9.13	3.16	2.00	15.00
	SEC	199	11.24	3.39	1.00	16.00	199	9.33	3.43	1.00	15.00
	HOA	199	8.85	3.83	1.00	16.00	199	9.95	3.38	3.00	15.00
	PSD	199	9.77	3.36	2.00	16.00	199	9.61	3.12	3.00	15.00
	HSS	199	18.43	5.86	4.00	29.00	199	25.28	5.70	13.00	36.00
	SCI	199	15.89	5.43	1.00	27.00	199	24.72	4.97	9.00	35.00
	ERW	.	.	.	.	.	199	492.21	98.79	260.00	680.00
	Tot	.	.	.	.	.	199	994.42	193.06	570.00	1390.00
CBT	R	221	28.66	7.11	8.00	42.00	221	26.19	4.62	15.00	36.00
	WL	221	26.32	7.70	9.00	39.00	221	25.05	5.21	15.00	35.00
	MSS	221	23.27	8.43	6.00	38.00	221	519.86	105.07	290.00	720.00
	WIC	221	12.15	3.42	2.00	18.00	221	10.24	3.19	1.00	15.00
	COE	221	12.14	3.52	2.00	18.00	221	10.17	2.54	3.00	15.00
	EOI	221	14.58	4.98	4.00	23.00	221	9.80	2.87	3.00	15.00
	SEC	221	11.74	3.16	1.00	16.00	221	9.89	3.32	1.00	15.00
	HOA	221	9.49	3.67	2.00	16.00	221	10.47	3.17	4.00	15.00
	PSD	221	10.29	3.38	2.00	16.00	221	10.08	3.14	3.00	15.00
	HSS	221	19.12	5.47	6.00	29.00	221	25.90	5.59	15.00	36.00
	SCI	221	17.53	5.33	5.00	28.00	221	26.26	4.90	16.00	35.00
	ERW	.	.	.	.	.	221	512.44	93.18	300.00	690.00
	Tot	.	.	.	.	.	221	1032.31	189.63	600.00	1410.00

Table C4

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for African Americans

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	225	19.17	7.47	2.00	35.00	225	20.56	4.15	9.00	30.00
	WL	225	17.19	7.09	1.00	37.00	225	19.20	4.33	7.00	33.00
	MSS	225	12.65	5.63	1.00	34.00	225	386.13	76.09	150.00	660.00
	WIC	225	8.08	3.48	1.00	16.00	225	6.54	3.05	1.00	14.00
	COE	225	7.71	3.62	0.00	17.00	225	7.00	2.65	1.00	14.00
	EOI	225	9.05	4.43	0.00	21.00	225	6.49	2.66	1.00	13.00
	SEC	225	8.14	3.33	1.00	16.00	225	6.27	3.15	1.00	15.00
	HOA	225	5.10	2.60	0.00	14.00	225	6.69	2.24	1.00	15.00
	PSD	225	6.01	2.78	0.00	15.00	225	6.28	2.34	1.00	15.00
	HSS	225	12.36	5.02	1.00	26.00	225	19.57	4.12	8.00	34.00
	SCI	225	10.66	4.67	0.00	24.00	225	20.07	4.05	6.00	32.00
	ERW	.	.	.	.	.	225	397.51	79.17	160.00	630.00
	Tot	.	.	.	.	.	225	783.64	142.83	310.00	1280.00
CBT	R	263	20.11	7.87	4.00	39.00	263	21.16	4.38	11.00	34.00
	WL	263	16.93	7.42	0.00	36.00	263	19.04	4.53	6.00	32.00
	MSS	263	12.73	5.14	2.00	31.00	263	388.40	69.16	180.00	610.00
	WIC	263	8.14	3.63	0.00	17.00	263	6.59	3.21	1.00	15.00
	COE	263	7.88	3.77	1.00	18.00	263	7.12	2.77	2.00	15.00
	EOI	263	8.81	4.56	0.00	21.00	263	6.40	2.81	1.00	13.00
	SEC	263	8.12	3.42	0.00	16.00	263	6.29	3.15	1.00	15.00
	HOA	263	5.13	2.46	0.00	12.00	263	6.70	2.10	1.00	13.00
	PSD	263	6.05	2.54	0.00	13.00	263	6.30	2.14	1.00	13.00
	HSS	263	12.49	5.10	3.00	27.00	263	19.83	4.15	12.00	35.00
	SCI	263	11.11	4.86	1.00	26.00	263	20.47	4.24	9.00	34.00
	ERW	.	.	.	.	.	263	401.98	83.12	220.00	660.00
	Tot	.	.	.	.	.	263	790.38	141.36	400.00	1220.00

Table C5

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for Hispanics

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	342	20.45	7.51	2.00	40.00	342	21.26	4.28	9.00	35.00
	WL	342	17.65	7.17	3.00	36.00	342	19.49	4.34	10.00	32.00
	MSS	342	13.67	5.20	0.00	34.00	342	401.17	67.54	120.00	660.00
	WIC	342	8.48	3.53	1.00	17.00	342	6.91	3.13	1.00	15.00
	COE	342	8.04	3.30	0.00	16.00	342	7.25	2.40	1.00	13.00
	EOI	342	9.31	4.32	1.00	22.00	342	6.73	2.68	1.00	14.00
	SEC	342	8.34	3.38	0.00	16.00	342	6.43	3.29	1.00	15.00
	HOA	342	5.35	2.33	0.00	13.00	342	6.92	1.96	1.00	14.00
	PSD	342	6.73	2.64	0.00	15.00	342	6.84	2.29	1.00	15.00
	HSS	342	13.32	4.83	1.00	26.00	342	20.43	4.03	8.00	34.00
	SCI	342	11.38	4.78	0.00	27.00	342	20.71	4.19	6.00	35.00
	ERW	.	.	.	.	.	342	407.46	81.43	220.00	650.00
	Tot	.	.	.	.	.	342	808.63	135.83	370.00	1310.00
CBT	R	346	21.03	7.85	5.00	41.00	346	21.66	4.47	12.00	35.00
	WL	346	17.33	7.16	1.00	37.00	346	19.29	4.39	7.00	33.00
	MSS	346	13.43	5.38	1.00	36.00	346	398.32	69.65	150.00	690.00
	WIC	346	8.29	3.62	1.00	17.00	346	6.77	3.19	1.00	15.00
	COE	346	8.47	3.79	0.00	18.00	346	7.52	2.76	1.00	15.00
	EOI	346	9.25	4.46	0.00	23.00	346	6.65	2.74	1.00	15.00
	SEC	346	8.08	3.26	0.00	15.00	346	6.19	3.08	1.00	13.00
	HOA	346	5.35	2.57	0.00	16.00	346	6.91	2.19	1.00	15.00
	PSD	346	6.59	2.65	0.00	16.00	346	6.74	2.27	1.00	15.00
	HSS	346	13.16	5.13	2.00	29.00	346	20.29	4.34	10.00	36.00
	SCI	346	11.82	4.97	0.00	28.00	346	21.14	4.36	6.00	35.00
	ERW	.	.	.	.	.	346	409.57	83.74	230.00	670.00
	Tot	.	.	.	.	.	346	807.89	142.56	430.00	1360.00

Table C6

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for Whites

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	608	26.45	6.75	6.00	41.00	608	24.74	4.16	13.00	35.00
	WL	608	24.09	7.16	3.00	39.00	608	23.48	4.61	10.00	35.00
	MSS	608	19.42	6.84	4.00	38.00	608	471.22	82.04	240.00	720.00
	WIC	608	11.58	3.19	2.00	18.00	608	9.68	2.96	1.00	15.00
	COE	608	10.71	3.45	1.00	18.00	608	9.11	2.44	2.00	15.00
	EOI	608	13.13	4.57	2.00	24.00	608	9.01	2.67	2.00	15.00
	SEC	608	10.96	3.16	1.00	16.00	608	9.01	3.18	1.00	15.00
	HOA	608	7.70	3.10	0.00	16.00	608	8.95	2.72	1.00	15.00
	PSD	608	9.18	3.01	2.00	16.00	608	9.05	2.75	3.00	15.00
	HSS	608	17.49	4.80	3.00	29.00	608	24.07	4.60	12.00	36.00
	SCI	608	15.62	4.89	1.00	28.00	608	24.43	4.46	9.00	35.00
	ERW	0	.	.	.	.	608	482.12	82.30	260.00	700.00
	Tot	0	.	.	.	.	608	953.34	152.40	560.00	1390.00
CBT	R	763	27.66	6.72	1.00	42.00	763	25.47	4.22	7.00	36.00
	WL	763	24.54	7.29	4.00	40.00	763	23.77	4.67	11.00	36.00
	MSS	763	19.35	6.70	5.00	38.00	763	470.94	80.26	270.00	720.00
	WIC	763	11.70	3.22	1.00	18.00	763	9.81	2.97	1.00	15.00
	COE	763	11.63	3.45	1.00	18.00	763	9.77	2.46	2.00	15.00
	EOI	763	13.48	4.59	1.00	24.00	763	9.18	2.68	1.00	15.00
	SEC	763	11.06	3.18	1.00	16.00	763	9.13	3.21	1.00	15.00
	HOA	763	7.63	3.01	1.00	16.00	763	8.86	2.66	3.00	15.00
	PSD	763	9.21	2.99	1.00	16.00	763	9.08	2.76	2.00	15.00
	HSS	763	17.51	4.80	1.00	29.00	763	24.09	4.65	8.00	36.00
	SCI	763	16.60	4.79	0.00	28.00	763	25.30	4.45	6.00	35.00
	ERW	0	.	.	.	.	763	492.41	83.15	220.00	710.00
	Tot	0	.	.	.	.	763	963.36	152.27	570.00	1390.00

Table C7

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for English Only Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	1165	24.93	7.51	4.00	41.00	1165	23.87	4.51	11.00	35.00
	WL	1165	22.41	7.85	2.00	39.00	1165	22.44	4.98	8.00	35.00
	MSS	1165	17.83	7.28	3.00	38.00	1165	451.79	89.49	210.00	720.00
	WIC	1165	10.73	3.62	0.00	18.00	1165	8.92	3.30	1.00	15.00
	COE	1165	10.07	3.73	0.00	18.00	1165	8.67	2.66	1.00	15.00
	EOI	1165	12.10	4.97	0.00	24.00	1165	8.38	2.95	1.00	15.00
	SEC	1165	10.31	3.41	0.00	16.00	1165	8.38	3.39	1.00	15.00
	HOA	1165	7.08	3.26	0.00	16.00	1165	8.41	2.84	1.00	15.00
	PSD	1165	8.42	3.23	0.00	16.00	1165	8.39	2.90	1.00	15.00
	HSS	1165	16.40	5.28	1.00	29.00	1165	23.13	4.90	8.00	36.00
	SCI	1165	14.37	5.34	0.00	28.00	1165	23.34	4.80	6.00	35.00
	ERW	.	.	.	.	.	1165	463.02	90.21	190.00	700.00
	Tot	.	.	.	.	.	1165	914.82	168.37	520.00	1390.00
CBT	R	1426	25.73	7.81	1.00	42.00	1426	24.37	4.74	7.00	36.00
	WL	1426	22.46	8.08	0.00	40.00	1426	22.50	5.15	6.00	36.00
	MSS	1426	17.75	7.35	1.00	38.00	1426	451.12	90.93	150.00	720.00
	WIC	1426	10.75	3.68	0.00	18.00	1426	8.96	3.35	1.00	15.00
	COE	1426	10.69	3.90	0.00	18.00	1426	9.12	2.81	1.00	15.00
	EOI	1426	12.26	5.04	0.00	24.00	1426	8.45	2.98	1.00	15.00
	SEC	1426	10.20	3.50	0.00	16.00	1426	8.30	3.47	1.00	15.00
	HOA	1426	7.07	3.25	0.00	16.00	1426	8.37	2.83	1.00	15.00
	PSD	1426	8.39	3.28	0.00	16.00	1426	8.35	2.95	1.00	15.00
	HSS	1426	16.24	5.47	1.00	29.00	1426	23.04	5.07	8.00	36.00
	SCI	1426	15.19	5.47	0.00	28.00	1426	24.06	4.97	6.00	35.00
	ERW	.	.	.	.	.	1426	468.65	93.78	150.00	710.00
	Tot	.	.	.	.	.	1426	919.77	174.92	400.00	1410.00

Table C8

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for English and Other Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	291	21.62	8.47	2.00	40.00	291	22.05	4.98	9.00	35.00
	WL	291	19.20	7.98	3.00	38.00	291	20.47	5.01	10.00	34.00
	MSS	291	15.74	7.56	0.00	37.00	291	426.29	96.02	120.00	710.00
	WIC	291	9.08	3.83	0.00	18.00	291	7.44	3.43	1.00	15.00
	COE	291	8.66	3.79	0.00	18.00	291	7.67	2.76	1.00	15.00
	EOI	291	10.21	4.88	1.00	22.00	291	7.22	2.95	1.00	14.00
	SEC	291	8.99	3.64	1.00	16.00	291	7.10	3.60	1.00	15.00
	HOA	291	6.35	3.30	0.00	16.00	291	7.77	2.84	1.00	15.00
	PSD	291	7.36	3.30	0.00	16.00	291	7.43	2.95	1.00	15.00
	HSS	291	14.34	5.85	1.00	28.00	291	21.50	5.33	8.00	36.00
	SCI	291	12.41	5.44	0.00	27.00	291	21.67	4.82	6.00	35.00
	ERW	.	.	.	.	.	291	425.19	95.58	220.00	680.00
	Tot	.	.	.	.	.	291	851.48	182.45	370.00	1360.00
CBT	R	281	22.07	8.45	5.00	42.00	281	22.30	4.87	12.00	36.00
	WL	281	19.07	8.60	1.00	38.00	281	20.42	5.44	7.00	34.00
	MSS	281	15.39	7.77	2.00	38.00	281	421.89	99.07	180.00	720.00
	WIC	281	8.86	4.06	1.00	18.00	281	7.26	3.63	1.00	15.00
	COE	281	8.81	3.95	0.00	18.00	281	7.76	2.87	1.00	15.00
	EOI	281	10.24	5.30	0.00	23.00	281	7.21	3.19	1.00	15.00
	SEC	281	8.83	3.75	0.00	16.00	281	6.98	3.60	1.00	15.00
	HOA	281	6.19	3.41	0.00	16.00	281	7.63	2.93	1.00	15.00
	PSD	281	7.33	3.31	0.00	16.00	281	7.42	2.92	1.00	15.00
	HSS	281	14.26	5.92	2.00	29.00	281	21.38	5.34	10.00	36.00
	SCI	281	12.56	5.69	1.00	28.00	281	21.83	5.06	9.00	35.00
	ERW	.	.	.	.	.	281	427.15	98.47	230.00	690.00
	Tot	.	.	.	.	.	281	849.04	187.50	450.00	1410.00

Table C9

Descriptive Statistics of PSAT 8/9 Raw and Scale Scores by Mode for Other Best Language

		Raw Scores					Scale Scores				
Form	Score Tier	N	MEAN	SD	MIN	MAX	N	MEAN	SD	MIN	MAX
PNP	R	41	15.93	5.72	6.00	32.00	41	18.83	2.96	13.00	28.00
	WL	41	15.61	6.07	8.00	35.00	41	18.46	3.59	14.00	31.00
	MSS	41	12.88	5.12	6.00	27.00	41	391.22	65.39	290.00	560.00
	WIC	41	6.39	2.53	3.00	15.00	41	5.15	2.19	2.00	13.00
	COE	41	6.22	3.04	1.00	15.00	41	5.88	2.23	2.00	12.00
	EOI	41	7.63	4.00	3.00	21.00	41	5.68	2.49	3.00	13.00
	SEC	41	7.98	2.44	3.00	14.00	41	6.00	2.40	2.00	12.00
	HOA	41	5.05	2.34	1.00	11.00	41	6.68	1.97	3.00	12.00
	PSD	41	6.41	2.56	2.00	12.00	41	6.61	2.10	3.00	11.00
	HSS	41	10.54	4.17	4.00	22.00	41	18.20	3.27	13.00	29.00
	SCI	41	9.44	3.76	3.00	21.00	41	19.17	3.18	14.00	30.00
	ERW	.	.	.	.	.	41	372.93	58.23	300.00	590.00
	Tot	.	.	.	.	.	41	764.15	106.44	610.00	1030.00
CBT	R	40	16.40	5.39	7.00	27.00	40	19.08	2.72	14.00	25.00
	WL	40	14.08	4.62	4.00	24.00	40	17.30	2.64	11.00	23.00
	MSS	40	12.63	4.94	6.00	25.00	40	387.75	64.03	290.00	530.00
	WIC	40	6.40	2.93	1.00	13.00	40	5.13	2.53	1.00	11.00
	COE	40	6.35	2.46	1.00	12.00	40	6.10	1.91	2.00	10.00
	EOI	40	6.80	2.53	2.00	12.00	40	5.18	1.65	2.00	8.00
	SEC	40	7.28	2.99	1.00	13.00	40	5.48	2.64	1.00	11.00
	HOA	40	5.05	2.34	2.00	11.00	40	6.73	1.97	4.00	12.00
	PSD	40	5.93	2.40	1.00	10.00	40	6.20	2.05	2.00	10.00
	HSS	40	10.70	4.06	4.00	19.00	40	18.35	2.97	13.00	25.00
	SCI	40	9.30	2.82	4.00	15.00	40	19.03	2.22	15.00	23.00
	ERW	.	.	.	.	.	40	363.75	46.06	260.00	480.00
	Tot	.	.	.	.	.	40	751.50	93.71	590.00	990.00

Appendix D. Examples of Reading Passage and Command of Evidence Question in PNP and CBT Formats

Table D1

Sample PNP Reading Passage and Command of Evidence Item

I liked the cement mixer and played with it as much as or more than I played with the other toy vehicles I owned. At some point, several weeks or months after the holidays, however, my biological parents led me to believe that it was a magic and/or highly unusual cement mixer. Probably my mother told me this in a moment of adult boredom or whimsy, and then my father came home from work and joined in, also in a whimsical way. The magic—which my mother likely reported to me from her vantage on our living room's sofa, while watching me pull the cement mixer around the room by its rope, idly asking me if I was aware that it had magical properties, no doubt making sport of me in the bored half-cruel way that adults sometimes do with small children, playfully telling them things that they pass off to themselves as "tall tales" or "childlike inventions," unaware of the impact those tales may have (since magic is a serious reality for small children). The "magic" was that, unbeknown to me, as I happily pulled the cement mixer behind me, the mixer's main cylinder or drum—the thing that, in a real cement mixer, mixes the cement; I do not know the actual word for it—rotated, went around and around on its horizontal axis, just as the drum on a real cement mixer does. It did this, my mother said, only when the mixer was being pulled by me and only, she stressed, when I wasn't looking. She insisted on this part, and my father later backed her up: the magic was not just that the drum of a solid wood object without batteries rotated but that it did so only when unobserved, stopping whenever observed. If, while pulling, I turned to look, my parents somberly maintained, the drum magically ceased its rotation. How was this? I never, even for a moment, doubted what they'd told me. This is why it is that adults and even parents can, unwittingly, be cruel: they cannot imagine doubt's complete absence. They have forgotten.

The point was that months were henceforward spent by me trying to devise ways to catch the drum rotating. Evidence bore out what they had told me: turning my head obviously and unsubtly around always stopped the rotation of the drum. I also tried sudden whirls. I tried having someone else pull the cement mixer. I tried incremental turns of the head

3

Which choice provides the best evidence for the answer to the previous question?

A) Lines 31-37 ("The 'magic' … does")
B) Lines 43-45 ("If … rotation")
C) Lines 47-49 ("This … absence")
D) Lines 51-53 ("The point … rotating")

Table D2

Sample CBT Reading Passage and Command of Evidence Item

3 I liked the cement mixer and played with it as much as or more than I played with the other toy vehicles I owned. At some point, several weeks or months after the holidays, however, my biological parents led me to believe that it was a magic and/or highly unusual cement mixer. Probably my mother told me this in a moment of adult boredom or whimsy, and then my father came home from work and joined in, also in a whimsical way. The magic—which my mother likely reported to me from her vantage on our living room's sofa, while watching me pull the cement mixer around the room by its rope, idly asking me if I was aware that it had magical properties, no doubt making sport of me in the bored half-cruel way that adults sometimes do with small children, playfully telling them things that they pass off to themselves as "tall tales" or "childlike inventions," unaware of the impact those tales may have (since magic is a serious reality for small children). The "magic" was that, unbeknown to me, as I happily pulled the cement mixer behind me, the mixer's main cylinder or drum—the thing that, in a real cement mixer, mixes the cement; I do not know the actual word for it—rotated, went around and around on its horizontal axis, just as the drum on a real cement mixer does. It did this, my mother said, only when the mixer was being pulled by me and only, she stressed, when I wasn't looking. She insisted on this part, and my father later backed her up: the magic was not just that the drum of a solid wood object without batteries rotated but that it did so only when unobserved, stopping whenever observed. If, while pulling, I turned to look, my parents somberly maintained, the drum magically ceased its rotation. How was this? I never, even for a moment, doubted what they'd told me. This is why it is that adults and even parents can, unwittingly, be cruel: they cannot imagine doubt's complete absence. They have forgotten.

4 The point was that months were henceforward spent by me trying to devise ways to catch the drum rotating. Evidence bore out what they had told me: turning my head obviously and unsubtly around always stopped the rotation of the drum. I also tried sudden whirls. I tried having someone else pull the cement mixer. I tried incremental turns of the head while pulling ("incremental"

3

GUEST, GUEST

Which choice provides the best evidence for the answer to the previous question?

Ⓐ "The 'magic' . . . does" (paragraph 3)

Ⓑ "If . . . rotation" (paragraph 3)

Ⓒ "This . . . absence" (paragraph 3)

Ⓓ "The point . . . rotating" (paragraph 4)

Appendix E. Equating Conversion Tables for Mode Adjustments in Reading, Command of Evidence, Analysis in Science, and Analysis in History/Social Studies

Table E1

SAT R Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	% Digital Examinees
0	9.58781	9.59813	0.01032	10	10	0	0.00%
1	9.76343	9.79787	0.03444	10	10	0	0.04%
2	9.95889	10.09794	0.13905	10	10	0	0.15%
3	10.43235	10.87033	0.43798	10	11	1	0.08%
4	11.49757	12.00561	0.50804	11	12	1	0.08%
5	12.45860	13.03125	0.57264	12	13	1	0.23%
6	13.34490	13.97885	0.63396	13	14	1	0.19%
7	14.17513	14.64330	0.46817	14	15	1	0.50%
8	14.96196	15.24463	0.28267	15	15	0	0.54%
9	15.71271	15.82730	0.11459	16	16	0	0.88%
10	16.43448	16.39305	-0.04143	16	16	0	0.99%
11	17.14370	16.95167	-0.19202	17	17	0	1.26%
12	17.86965	17.52130	-0.34835	18	18	0	1.80%
13	18.57794	18.09415	-0.48379	19	18	-1	1.91%
14	19.26478	18.66145	-0.60333	19	19	0	2.72%
15	19.92485	19.22088	-0.70398	20	19	-1	2.37%
16	20.55583	19.76812	-0.78771	21	20	-1	2.41%
17	21.16358	20.30535	-0.85823	21	20	-1	2.83%
18	21.75581	20.83483	-0.92098	22	21	-1	3.90%
19	22.33516	21.35984	-0.97532	22	21	-1	2.98%
20	22.90075	21.88335	-1.01740	23	22	-1	3.48%
21	23.44953	22.40597	-1.04355	23	22	-1	3.37%
22	23.97799	22.92608	-1.05192	24	23	-1	3.29%
23	24.48595	23.44002	-1.04593	24	23	-1	3.25%
24	24.97816	23.94350	-1.03466	25	24	-1	3.18%
25	25.46191	24.43645	-1.02546	25	24	-1	3.40%
26	25.94399	24.92233	-1.02167	26	25	-1	3.21%
27	26.42855	25.40730	-1.02125	26	25	-1	3.21%
28	26.91618	25.89773	-1.01844	27	26	-1	3.10%
29	27.40454	26.39779	-1.00674	27	26	-1	3.21%
30	27.89054	26.90789	-0.98266	28	27	-1	3.40%
31	28.37118	27.42438	-0.94680	28	27	-1	3.94%
32	28.84501	27.94168	-0.90333	29	28	-1	3.29%
33	29.31183	28.45451	-0.85732	29	28	-1	3.33%
34	29.77201	28.95980	-0.81220	30	29	-1	2.64%
35	30.22725	29.45644	-0.77081	30	29	-1	2.52%
36	30.68043	29.94499	-0.73544	31	30	-1	2.72%

(Table continues next page)

Table E1 (Continued)

	Unrounded			Rounded			% Digital Examinees
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	
37	31.13569	30.42801	-0.70769	31	30	-1	2.10%
38	31.59597	30.90978	-0.68619	32	31	-1	2.22%
39	32.06464	31.39476	-0.66987	32	31	-1	2.33%
40	32.54417	31.88669	-0.65748	33	32	-1	2.22%
41	33.03649	32.38864	-0.64785	33	32	-1	1.80%
42	33.54298	32.90274	-0.64024	34	33	-1	1.76%
43	34.06947	33.43054	-0.63893	34	33	-1	1.30%
44	34.61977	33.97729	-0.64249	35	34	-1	0.77%
45	35.19094	34.54825	-0.64269	35	35	0	0.92%
46	35.78540	35.14216	-0.64323	36	35	-1	1.03%
47	36.40716	35.76137	-0.64579	36	36	0	1.07%
48	37.07289	36.41064	-0.66225	37	36	-1	0.80%
49	37.91457	37.11601	-0.79856	38	37	-1	0.65%
50	38.61118	37.98990	-0.62128	39	38	-1	0.19%
51	39.32554	38.94327	-0.38227	39	39	0	0.27%
52	40.10851	39.96885	-0.13966	40	40	0	0.15%
Mean	25.42463	25.42474		25.37399	25.31331		
Median	25.46191	25.40730		25.00000	25.00000		
Mode	24.48595	27.42438		24.00000	27.00000		
SD	5.23321	5.24295		5.25834	5.20253		
Skewness	0.11776	0.08991		0.15958	0.13691		
Kurtosis	-0.54477	-0.45081		-0.51793	-0.41117		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E2

PSAT 10 R Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
0	7.84889	7.77299	-0.07589	8	8	0	0.00%
1	8.79718	8.48776	-0.30943	9	8	-1	0.00%
2	9.84780	9.27645	-0.57136	10	9	-1	0.00%
3	10.94082	10.10864	-0.83218	11	10	-1	0.09%
4	12.05445	10.96433	-1.09011	12	11	-1	0.00%
5	13.17936	11.83571	-1.34365	13	12	-1	0.09%
6	14.27916	12.71370	-1.56545	14	13	-1	0.09%
7	15.13828	13.58466	-1.55362	15	14	-1	0.26%
8	15.70819	14.42067	-1.28752	16	14	-2	0.35%
9	16.20592	15.45328	-0.75264	16	15	-1	1.23%
10	16.70765	16.14776	-0.55989	17	16	-1	1.85%
11	17.23360	16.75508	-0.47852	17	17	0	2.20%
12	17.78897	17.33052	-0.45845	18	17	-1	2.56%
13	18.37565	17.89462	-0.48103	18	18	0	2.56%
14	18.99108	18.47275	-0.51833	19	18	-1	3.35%
15	19.63054	19.08151	-0.54903	20	19	-1	3.61%
16	20.28679	19.72587	-0.56092	20	20	0	4.32%
17	20.94725	20.39669	-0.55056	21	20	-1	4.58%
18	21.60056	21.07241	-0.52815	22	21	-1	3.70%
19	22.23975	21.73403	-0.50573	22	22	0	4.41%
20	22.86001	22.36599	-0.49401	23	22	-1	5.29%
21	23.45673	22.95479	-0.50194	23	23	0	4.14%
22	24.02894	23.50007	-0.52887	24	24	0	4.14%
23	24.57985	24.01431	-0.56554	25	24	-1	4.41%
24	25.11398	24.51205	-0.60193	25	25	0	4.05%
25	25.63538	25.00278	-0.63259	26	25	-1	4.41%
26	26.14783	25.48649	-0.66134	26	25	-1	4.41%
27	26.65612	25.96384	-0.69228	27	26	-1	3.52%
28	27.16578	26.44265	-0.72313	27	26	-1	3.35%
29	27.68129	26.93666	-0.74463	28	27	-1	3.79%
30	28.20948	27.46179	-0.74770	28	27	-1	3.52%
31	28.75802	28.02871	-0.72931	29	28	-1	2.91%
32	29.32914	28.64225	-0.68690	29	29	0	2.56%
33	29.92167	29.29276	-0.62891	30	29	-1	2.11%
34	30.53460	29.95845	-0.57614	31	30	-1	1.94%
35	31.16595	30.61470	-0.55126	31	31	0	2.20%
36	31.80782	31.24384	-0.56398	32	31	-1	1.41%

(Table continues next page)

Table E2 (Continued)

	Unrounded			Rounded			% Digital Examinees
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	
37	32.44838	31.83516	-0.61322	32	32	0	1.67%
38	33.07770	32.38602	-0.69168	33	32	-1	0.79%
39	33.69159	32.90591	-0.78567	34	33	-1	0.70%
40	34.28702	33.40918	-0.87785	34	33	-1	1.23%
41	34.86274	33.89504	-0.96770	35	34	-1	0.44%
42	35.42346	34.36076	-1.06269	35	34	-1	0.26%
43	35.97674	34.81218	-1.16455	36	35	-1	0.53%
44	36.50402	35.25871	-1.24531	37	35	-2	0.44%
45	36.94579	36.14643	-0.79936	37	36	-1	0.35%
46	37.54383	36.94274	-0.60109	38	37	-1	0.18%
47	38.16600	37.95718	-0.20882	38	38	0	0.00%
Mean	23.94181	23.94437		23.97111	23.89515		
Median	24.02894	24.01431		24	24		
Mode	24.02894	22.36599		23	25		
SD	4.65798	4.64030		4.68380	4.66407		
Skewness	0.19898	0.21840		0.17189	0.19363		
Kurtosis	-0.30593	-0.33876		-0.35858	-0.34902		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E3

PSAT 8/9 R Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
0	6.10487	6.06909	-0.03578	6	6	0	0.00%
1	7.31462	7.20727	-0.10735	7	7	0	0.17%
2	8.52436	8.34545	-0.17892	9	8	-1	0.00%
3	9.73411	9.48363	-0.25048	10	9	-1	0.06%
4	10.94386	10.62181	-0.32205	11	11	0	0.11%
5	12.15360	11.75999	-0.39362	12	12	0	0.17%
6	13.36335	12.91483	-0.44852	13	13	0	0.45%
7	14.42479	13.98577	-0.43902	14	14	0	0.56%
8	14.96739	14.71486	-0.25253	15	15	0	0.90%
9	15.53672	15.23327	-0.30345	16	15	-1	1.29%
10	16.04600	15.73058	-0.31541	16	16	0	1.18%
11	16.55445	16.18712	-0.36732	17	16	-1	1.40%
12	17.03818	16.63493	-0.40324	17	17	0	2.07%
13	17.49890	17.06353	-0.43537	17	17	0	2.85%
14	17.95318	17.47384	-0.47934	18	17	-1	2.07%
15	18.40294	17.87901	-0.52394	18	18	0	2.41%
16	18.84796	18.27947	-0.56849	19	18	-1	2.63%
17	19.28008	18.67327	-0.60681	19	19	0	3.19%
18	19.70222	19.05517	-0.64706	20	19	-1	2.74%
19	20.12413	19.42536	-0.69877	20	19	-1	2.52%
20	20.55756	19.79001	-0.76755	21	20	-1	3.02%
21	21.01528	20.15883	-0.85645	21	20	-1	3.41%
22	21.50581	20.54466	-0.96115	22	21	-1	3.41%
23	22.03409	20.96430	-1.06979	22	21	-1	3.58%
24	22.59742	21.42913	-1.16829	23	21	-2	4.03%
25	23.19582	21.95011	-1.24571	23	22	-1	3.86%
26	23.83638	22.53113	-1.30525	24	23	-1	4.92%
27	24.52250	23.17494	-1.34757	25	23	-2	4.64%
28	25.24529	23.89384	-1.35145	25	24	-1	4.70%
29	25.98808	24.69101	-1.29706	26	25	-1	4.76%
30	26.72964	25.55028	-1.17936	27	26	-1	5.09%
31	27.45663	26.43945	-1.01719	27	26	-1	5.43%
32	28.17332	27.31703	-0.85629	28	27	-1	4.76%
33	28.89389	28.15913	-0.73476	29	28	-1	3.53%
34	29.64130	28.97560	-0.66570	30	29	-1	3.19%
35	30.42319	29.79537	-0.62782	30	30	0	2.97%
36	31.24734	30.63238	-0.61497	31	31	0	2.07%

(Table continues next page)

Table E3 (Continued)

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
37	32.12724	31.50616	-0.62108	32	32	0	2.46%
38	33.08314	32.43992	-0.64323	33	32	-1	1.18%
39	34.08901	33.43949	-0.64952	34	33	-1	1.01%
40	34.77786	34.34945	-0.42841	35	34	-1	0.56%
41	35.46672	35.17100	-0.29572	35	35	0	0.50%
42	36.15557	36.05700	-0.09857	36	36	0	0.17%
Mean	22.96455	22.98265		23.00560	22.98265		
Median	22.59742	23.00000		23	23		
Mode	22.59742	21.00000		25	21		
SD	4.78862	4.80169		4.76573	4.80169		
Skewness	0.26460	0.22982		0.21409	0.22982		
Kurtosis	-0.46189	-0.40062		-0.47763	-0.40062		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E4

SAT COE Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
0	1.12461	1.03413	-0.09048	1	1	0	0.08%
1	2.34195	2.07743	-0.26451	2	2	0	0.42%
2	3.33761	2.97703	-0.36058	3	3	0	0.92%
3	4.16323	3.78299	-0.38024	4	4	0	2.60%
4	4.93571	4.52679	-0.40892	5	5	0	4.55%
5	5.67206	5.23075	-0.44131	6	5	-1	6.24%
6	6.37139	5.90677	-0.46462	6	6	0	7.88%
7	7.02938	6.55732	-0.47206	7	7	0	9.33%
8	7.64340	7.17952	-0.46388	8	7	-1	9.83%
9	8.23051	7.77351	-0.45701	8	8	0	9.53%
10	8.81468	8.35623	-0.45845	9	8	-1	8.38%
11	9.41678	8.95269	-0.46409	9	9	0	8.11%
12	10.05298	9.58722	-0.46576	10	10	0	7.42%
13	10.73374	10.27978	-0.45396	11	10	-1	7.15%
14	11.46679	11.04425	-0.42254	11	11	0	5.62%
15	12.26713	11.89425	-0.37288	12	12	0	4.59%
16	13.16499	12.85734	-0.30765	13	13	0	3.79%
17	14.13538	13.92709	-0.20829	14	14	0	2.56%
18	14.98501	14.92413	-0.06088	15	15	0	0.99%
Mean	8.22304	8.22398		8.17568	8.28424		
Median	8.23051	7.77351		8	8		
Mode	7.64340	7.17952		8	7		
SD	2.56280	2.56916		2.53097	2.54871		
Skewness	0.35341	0.32548		0.28489	0.36928		
Kurtosis	-0.22599	-0.24603		-0.12760	-0.16929		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E5

PSAT 10 COE Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
0	1.12659	1.01246	-0.11413	1	1	0	0.09%
1	2.32884	2.00038	-0.32847	2	2	0	0.44%
2	3.37817	3.00753	-0.37063	3	3	0	1.15%
3	4.32333	4.02668	-0.29666	4	4	0	3.44%
4	5.14002	4.81040	-0.32962	5	5	0	4.32%
5	5.84003	5.47950	-0.36053	6	5	-1	7.14%
6	6.52187	6.18625	-0.33562	7	6	-1	12.33%
7	7.19238	6.89743	-0.29495	7	7	0	9.07%
8	7.87617	7.55760	-0.31857	8	8	0	9.96%
9	8.59718	8.25385	-0.34333	9	8	-1	11.81%
10	9.33636	8.98316	-0.35320	9	9	0	11.37%
11	10.08650	9.67234	-0.41416	10	10	0	7.05%
12	10.85398	10.36850	-0.48549	11	10	-1	7.67%
13	11.63519	11.12606	-0.50914	12	11	-1	4.93%
14	12.44307	11.90600	-0.53707	12	12	0	4.14%
15	13.33731	12.70965	-0.62765	13	13	0	2.73%
16	14.23969	13.55584	-0.68384	14	14	0	1.59%
17	14.91549	14.53351	-0.38198	15	15	0	0.62%
18	15.30687	15.23313	-0.07374	15	15	0	0.18%
Mean	8.11348	8.11520		8.13849	8.10044		
Median	7.87617	8.25385		8	8		
Mode	7.87617	6.18625		9	8		
SD	2.39393	2.39976		2.39622	2.46967		
Skewness	0.21713	0.22928		0.05426	0.26231		
Kurtosis	-0.19701	-0.20382		-0.10697	-0.11665		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E6

PSAT 8/9 COE Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
0	1.02488	0.81493	-0.20995	1	1	0	0.17%
1	1.58024	1.44140	-0.13884	2	1	-1	0.62%
2	2.52996	2.36036	-0.16959	3	2	-1	1.57%
3	3.44652	3.39560	-0.05092	3	3	0	2.80%
4	4.32305	4.12920	-0.19385	4	4	0	3.25%
5	5.16441	4.80667	-0.35774	5	5	0	6.21%
6	5.95996	5.54652	-0.41343	6	6	0	6.66%
7	6.69887	6.22585	-0.47302	7	6	-1	6.32%
8	7.38353	6.75904	-0.62449	7	7	0	6.60%
9	8.02862	7.27852	-0.75010	8	7	-1	7.33%
10	8.65373	7.87183	-0.78190	9	8	-1	8.73%
11	9.27841	8.57171	-0.70670	9	9	0	9.07%
12	9.92094	9.20742	-0.71352	10	9	-1	7.55%
13	10.59971	9.84898	-0.75073	11	10	-1	8.45%
14	11.32740	10.65936	-0.66804	11	11	0	8.06%
15	12.11200	11.44999	-0.66201	12	11	-1	7.05%
16	12.96529	12.39999	-0.56530	13	12	-1	5.37%
17	13.92125	13.41339	-0.50785	14	13	-1	3.02%
18	14.74880	14.28058	-0.46822	15	15	0	1.18%
Mean	8.21953	8.23279		8.19362	8.23279		
Median	8.02862	8.00000		8.00000	8.00000		
Mode	6.69887	9.00000		7.00000	9.00000		
SD	2.74577	2.71831		2.78524	2.71831		
Skewness	-0.02318	-0.17473		-0.03312	-0.17473		
Kurtosis	-0.48104	-0.29060		-0.53609	-0.29060		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E7

SAT SCI Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	% Digital Examinees
0	9.78126	9.82373	0.04247	10	10	0	0.04%
1	10.40968	10.70144	0.29176	10	11	1	0.15%
2	11.84859	12.27541	0.42682	12	12	0	0.11%
3	13.11162	13.63243	0.52081	13	14	1	0.46%
4	14.21244	14.71161	0.49917	14	15	1	0.57%
5	15.20856	15.52992	0.32136	15	16	1	0.77%
6	16.11676	16.08415	-0.03261	16	16	0	0.69%
7	16.96489	16.64116	-0.32372	17	17	0	1.57%
8	17.82437	17.36636	-0.45801	18	17	-1	2.26%
9	18.69263	18.25906	-0.43357	19	18	-1	3.37%
10	19.55376	19.11521	-0.43855	20	19	-1	3.86%
11	20.39720	19.92122	-0.47598	20	20	0	4.44%
12	21.21827	20.68125	-0.53702	21	21	0	4.78%
13	22.03093	21.45766	-0.57327	22	21	-1	5.39%
14	22.83325	22.22109	-0.61216	23	22	-1	5.01%
15	23.60368	22.96940	-0.63428	24	23	-1	5.24%
16	24.35422	23.72509	-0.62913	24	24	0	5.28%
17	25.12114	24.46433	-0.65681	25	24	-1	5.36%
18	25.90450	25.23367	-0.67083	26	25	-1	5.39%
19	26.65629	26.05831	-0.59798	27	26	-1	5.09%
20	27.36635	26.81609	-0.55026	27	27	0	4.09%
21	28.06020	27.46586	-0.59434	28	27	-1	3.67%
22	28.75325	28.14888	-0.60437	29	28	-1	4.71%
23	29.44353	28.88670	-0.55683	29	29	0	3.79%
24	30.12163	29.63375	-0.48788	30	30	0	4.02%
25	30.77994	30.46573	-0.31421	31	30	-1	4.25%
26	31.42315	31.29352	-0.12963	31	31	0	3.25%
27	32.06380	31.92797	-0.13583	32	32	0	2.41%
28	32.72003	32.49366	-0.22637	33	32	-1	2.10%
29	33.40991	33.04339	-0.36652	33	33	0	1.95%
30	34.15097	33.60585	-0.54512	34	34	0	1.49%

(Table continues next page)

Table E7 (Continued)

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
31	34.96322	34.31153	-0.65169	35	34	-1	1.61%
32	35.87391	35.20356	-0.67035	36	35	-1	1.07%
33	36.94572	36.33464	-0.61107	37	36	-1	0.99%
34	38.10641	37.76046	-0.34596	38	38	0	0.50%
35	39.82015	39.64989	-0.17027	40	40	0	0.27%
Mean	25.22624	25.22416		25.20176	25.13466		
Median	25.12114	25.23367		25	25		
Mode	22.03093	21.45766		24	24		
SD	5.13242	5.14097		5.09487	5.11740		
Skewness	0.12440	0.12009		0.12614	0.14375		
Kurtosis	-0.55224	-0.52057		-0.50652	-0.52580		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E8

PSAT 10 SCI Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
0	7.90112	7.86035	-0.04077	8	8	0	0.00%
1	9.19370	8.99664	-0.19706	9	9	0	0.00%
2	10.60839	10.24893	-0.35946	11	10	-1	0.09%
3	12.02045	11.51815	-0.50230	12	12	0	0.18%
4	13.34120	12.73715	-0.60406	13	13	0	0.26%
5	14.48760	13.89218	-0.59543	14	14	0	0.35%
6	15.40021	14.99436	-0.40585	15	15	0	1.23%
7	16.47341	16.07088	-0.40253	16	16	0	2.11%
8	17.43744	17.13021	-0.30723	17	17	0	2.47%
9	18.26759	18.03543	-0.23216	18	18	0	3.79%
10	18.97696	18.79217	-0.18479	19	19	0	5.90%
11	19.62114	19.45024	-0.17090	20	19	-1	4.41%
12	20.24551	20.06273	-0.18278	20	20	0	4.76%
13	20.87699	20.66634	-0.21065	21	21	0	5.29%
14	21.54446	21.29216	-0.25230	22	21	-1	5.46%
15	22.24623	21.95008	-0.29616	22	22	0	6.26%
16	22.95413	22.62326	-0.33088	23	23	0	5.73%
17	23.67279	23.30196	-0.37083	24	23	-1	6.43%
18	24.42970	24.00286	-0.42684	24	24	0	5.11%
19	25.21898	24.74174	-0.47724	25	25	0	5.55%
20	26.01496	25.51123	-0.50374	26	26	0	5.02%
21	26.81272	26.29698	-0.51573	27	26	-1	3.79%
22	27.61017	27.09515	-0.51502	28	27	-1	4.76%
23	28.41021	27.90195	-0.50826	28	28	0	4.05%
24	29.23730	28.72080	-0.51649	29	29	0	4.32%
25	30.10633	29.56365	-0.54268	30	30	0	2.11%

(Table continues next page)

Table E8 (Continued)

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
26	31.02999	30.43948	-0.59052	31	30	-1	2.91%
27	32.04148	31.36684	-0.67465	32	31	-1	1.85%
28	33.17412	32.37565	-0.79847	33	32	-1	1.50%
29	34.45932	33.49714	-0.96218	34	33	-1	1.85%
30	35.85129	34.74779	-1.10349	36	35	-1	1.23%
31	37.06774	36.11003	-0.95771	37	36	-1	1.15%
32	38.04929	37.79170	-0.25759	38	38	0	0.09%
Mean	23.68770	23.69422		23.64911	23.70220		
Median	22.95413	23.30196		23	23		
Mode	22.95413	23.30196		24	23		
SD	4.66662	4.66705		4.68080	4.65639		
Skewness	0.43069	0.41980		0.35507	0.37709		
Kurtosis	-0.05385	-0.09415		-0.05459	-0.16728		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E9

PSAT 8/9 SCI Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	% Digital Examinees
0	6.26892	6.23124	-0.03768	6	6	0	0.17%
1	8.80677	8.62022	-0.18655	9	9	0	0.28%
2	11.34461	11.03370	-0.31091	11	11	0	0.56%
3	13.50230	13.10750	-0.39481	14	13	-1	0.56%
4	14.64476	14.33329	-0.31147	15	14	-1	1.51%
5	15.57649	15.19353	-0.38296	16	15	-1	1.79%
6	16.44899	15.94647	-0.50252	16	16	0	2.52%
7	17.27596	16.67838	-0.59759	17	17	0	3.41%
8	18.07085	17.40635	-0.66449	18	17	-1	4.81%
9	18.84525	18.12352	-0.72173	19	18	-1	4.98%
10	19.60716	18.81439	-0.79277	20	19	-1	5.20%
11	20.36289	19.48045	-0.88244	20	19	-1	6.04%
12	21.11507	20.14324	-0.97183	21	20	-1	5.54%
13	21.87633	20.82514	-1.05119	22	21	-1	5.88%
14	22.66421	21.53888	-1.12533	23	22	-1	6.49%
15	23.49907	22.29153	-1.20755	23	22	-1	5.48%
16	24.40393	23.10946	-1.29447	24	23	-1	6.49%
17	25.40755	24.02725	-1.38030	25	24	-1	6.27%
18	26.46892	25.06927	-1.39965	26	25	-1	5.32%
19	27.54374	26.22132	-1.32242	28	26	-2	5.76%
20	28.58418	27.42408	-1.16010	29	27	-2	5.09%
21	29.56691	28.59797	-0.96894	30	29	-1	4.09%
22	30.50746	29.68350	-0.82397	31	30	-1	3.81%
23	31.41081	30.67256	-0.73824	31	31	0	2.41%
24	32.29465	31.57109	-0.72356	32	32	0	1.96%
25	33.21168	32.41770	-0.79398	33	32	-1	1.73%

(Table continues next page)

Table E9 (Continued)

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Raw	Examinees
26	34.14973	33.26262	-0.88710	34	33	-1	0.67%
27	34.82123	34.11023	-0.71100	35	34	-1	0.73%
28	35.49274	35.06695	-0.42579	35	35	0	0.45%
29	36.16425	36.02232	-0.14193	36	36	0	0.00%
Mean	22.57223	22.54057		22.55568	22.54057		
Median	21.87633	22.00000		22	22		
Mode	19.60716	22.00000		20	22		
SD	4.89002	4.93325		4.90407	4.93325		
Skewness	0.23331	0.25771		0.26868	0.25771		
Kurtosis	-0.20691	-0.25757		-0.20915	-0.25757		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E10

SAT HSS Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	% Digital Examinees
0	9.52444	9.52542	0.00097	10	10	0	0.04%
1	9.61957	9.64268	0.02311	10	10	0	0.08%
2	10.37125	10.44420	0.07295	10	10	0	0.04%
3	11.79478	11.89238	0.09760	12	12	0	0.34%
4	13.15509	13.26262	0.10752	13	13	0	0.57%
5	14.43933	14.38194	-0.05739	14	14	0	1.26%
6	15.65048	15.43168	-0.21880	16	15	-1	1.72%
7	16.85144	16.45006	-0.40139	17	16	-1	2.22%
8	17.99617	17.40979	-0.58638	18	17	-1	2.95%
9	19.07938	18.30702	-0.77237	19	18	-1	3.56%
10	20.09664	19.15548	-0.94117	20	19	-1	3.56%
11	21.05197	19.96326	-1.08871	21	20	-1	4.28%
12	21.95373	20.75580	-1.19793	22	21	-1	4.51%
13	22.80443	21.55151	-1.25292	23	22	-1	4.40%
14	23.60421	22.35121	-1.25300	24	22	-2	5.24%
15	24.35809	23.14578	-1.21232	24	23	-1	5.01%
16	25.07430	23.92303	-1.15128	25	24	-1	4.71%
17	25.75988	24.68052	-1.07936	26	25	-1	5.16%
18	26.41752	25.42178	-0.99574	26	25	-1	4.40%
19	27.04647	26.15115	-0.89532	27	26	-1	5.09%
20	27.64636	26.86634	-0.78002	28	27	-1	3.86%
21	28.21801	27.56064	-0.65738	28	28	0	4.97%
22	28.76976	28.22755	-0.54221	29	28	-1	3.98%
23	29.33114	28.87316	-0.45798	29	29	0	4.36%
24	29.92192	29.53470	-0.38722	30	30	0	3.83%
25	30.55682	30.22823	-0.32859	31	30	-1	3.86%
26	31.24400	30.95530	-0.28870	31	31	0	3.14%
27	31.98335	31.70517	-0.27819	32	32	0	3.29%
28	32.76339	32.46251	-0.30088	33	32	-1	1.99%
29	33.56750	33.22248	-0.34502	34	33	-1	2.22%
30	34.39066	33.99816	-0.39250	34	34	0	1.45%

(Table continues next page)

Table E10 (Continued)

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
31	35.24094	34.81540	-0.42554	35	35	0	1.57%
32	36.12825	35.69242	-0.43583	36	36	0	1.15%
33	37.14896	36.67819	-0.47077	37	37	0	0.73%
34	38.52308	38.13320	-0.38988	39	38	-1	0.31%
35	39.90461	39.77395	-0.13066	40	40	0	0.15%
Mean	25.09353	25.09100		25.11009	25.07804		
Median	25.07430	25.42178		25	25		
Mode	20.09664	22.35121		24	22		
SD	5.32433	5.32811		5.34265	5.42514		
Skewness	-0.01518	-0.01837		-0.01280	-0.05368		
Kurtosis	-0.53038	-0.51706		-0.51910	-0.50392		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E11

PSAT 10 HSS Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	% Digital Examinees
0	8.22693	8.09215	-0.13479	8	8	0	0.00%
1	9.68080	9.27645	-0.40436	10	9	-1	0.00%
2	11.13467	10.46074	-0.67393	11	10	-1	0.09%
3	12.58854	11.64504	-0.94350	13	12	-1	0.09%
4	13.89007	12.80411	-1.08596	14	13	-1	0.35%
5	14.97940	13.86431	-1.11509	15	14	-1	0.70%
6	15.98417	15.11716	-0.86701	16	15	-1	1.67%
7	16.94059	16.26499	-0.67560	17	16	-1	2.73%
8	17.85309	17.33996	-0.51313	18	17	-1	5.37%
9	18.69657	18.31115	-0.38542	19	18	-1	3.08%
10	19.48598	19.18269	-0.30329	19	19	0	5.73%
11	20.24196	19.99364	-0.24832	20	20	0	7.05%
12	20.99164	20.76496	-0.22669	21	21	0	5.29%
13	21.75699	21.53494	-0.22205	22	22	0	6.52%
14	22.54174	22.33274	-0.20900	23	22	-1	6.52%
15	23.34585	23.16453	-0.18131	23	23	0	6.96%
16	24.16485	24.01173	-0.15313	24	24	0	5.55%
17	24.98418	24.83781	-0.14637	25	25	0	5.37%
18	25.81007	25.63033	-0.17974	26	26	0	5.64%
19	26.63788	26.38377	-0.25411	27	26	-1	4.58%
20	27.44594	27.10345	-0.34249	27	27	0	3.88%
21	28.22855	27.82449	-0.40406	28	28	0	3.96%
22	29.02227	28.60441	-0.41786	29	29	0	4.67%
23	29.87352	29.49954	-0.37398	30	29	-1	3.00%
24	30.77939	30.51288	-0.26651	31	31	0	3.44%
25	31.68438	31.52047	-0.16391	32	32	0	3.00%

(Table continues next page)

Table E11 (Continued)

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
26	32.56543	32.40062	-0.16482	33	32	-1	1.23%
27	33.48340	33.19830	-0.28510	33	33	0	1.06%
28	34.53174	33.99693	-0.53480	35	34	-1	0.88%
29	35.60110	34.80189	-0.79921	36	35	-1	0.44%
30	36.39509	35.62012	-0.77497	36	36	0	0.88%
31	37.19563	36.72681	-0.46881	37	37	0	0.18%
32	38.06521	37.89546	-0.16975	38	38	0	0.09%
Mean	23.73753	23.73727		23.75616	23.74802		
Median	23.34585	23.16453		23	23		
Mode	22.54174	19.99364		23	22		
SD	4.76473	4.75846		4.79024	4.86048		
Skewness	0.25484	0.25599		0.28581	0.24500		
Kurtosis	-0.35255	-0.37421		-0.35121	-0.39033		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.

Table E12

PSAT 8/9 HSS Raw to Scale Score Conversions Across Modes

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Diff.	Examinees
0	6.36843	6.34864	-0.01979	6	6	0	0.00%
1	8.10528	8.04591	-0.05937	8	8	0	0.11%
2	9.84214	9.74319	-0.09895	10	10	0	0.28%
3	11.57899	11.44046	-0.13853	12	11	-1	0.56%
4	12.82619	12.64482	-0.18137	13	13	0	0.62%
5	13.89305	13.67137	-0.22167	14	14	0	1.51%
6	14.84776	14.60357	-0.24420	15	15	0	2.01%
7	15.70380	15.46942	-0.23438	16	15	-1	3.13%
8	16.48068	16.27212	-0.20856	16	16	0	3.30%
9	17.19623	17.00625	-0.18997	17	17	0	4.36%
10	17.86691	17.67387	-0.19303	18	18	0	4.76%
11	18.50165	18.28279	-0.21886	19	18	-1	4.31%
12	19.11279	18.85704	-0.25576	19	19	0	4.76%
13	19.74838	19.44267	-0.30571	20	19	-1	5.76%
14	20.43648	20.07576	-0.36072	20	20	0	5.43%
15	21.18818	20.77782	-0.41036	21	21	0	5.82%
16	22.00677	21.57275	-0.43402	22	22	0	6.88%
17	22.89810	22.48438	-0.41372	23	22	-1	6.04%
18	23.88474	23.54235	-0.34239	24	24	0	6.38%
19	24.95358	24.74228	-0.21130	25	25	0	7.33%
20	26.10891	26.01109	-0.09782	26	26	0	5.48%
21	27.34789	27.27802	-0.06987	27	27	0	4.92%
22	28.63420	28.49994	-0.13425	29	28	-1	4.53%
23	29.90589	29.64035	-0.26553	30	30	0	3.58%
24	31.14101	30.69885	-0.44216	31	31	0	2.41%
25	32.39183	31.74672	-0.64512	32	32	0	1.68%

(Table continues next page)

Table E12 (Continued)

	Unrounded			Rounded			% Digital
Raw	PNP	CBT	Diff.	PNP	CBT	Raw	Examinees
26	33.69185	32.90749	-0.78436	34	33	-1	1.96%
27	34.91466	34.20647	-0.70819	35	34	-1	1.23%
28	35.54880	35.24209	-0.30671	36	35	-1	0.50%
29	36.18293	36.07786	-0.10507	36	36	0	0.34%
Mean	22.30456	22.32289		22.30106	22.32289		
Median	21.18818	22.00000		21	22		
Mode	21.18818	22.00000		20	22		
SD	5.11524	5.13593		5.10012	5.13593		
Skewness	0.37871	0.36750		0.39657	0.36750		
Kurtosis	-0.32916	-0.36648		-0.31415	-0.36648		

Note: A negative number in the Diff column (which represents the CBT column minus the-PNP column) indicates the digital conversion results in a lower scale score for the digital examinee; a positive value indicates the digital conversion results in a higher scale score for the digital examinee.