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Guiding the way to higher education

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Preparation for College Admission Exams

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The views and opinions expressed in this report are solely those of the author and not necessarily those of NACAC.

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NACAC Introduction

In September 2008, NACAC released the Report of the Commission on the Use of Standardized Tests in Undergraduate Admission. NACAC appointed this commission to determine the extent to which current practice regarding test score use reflects the conclusions made in the National Research Council's 1999 Myths and Tradeoffs report, and to make recommendations to NACAC, institutions of higher education and other stakeholder groups that will encourage reassessment of test usage and foster renewed discussion about the appropriate role of standardized admission tests as higher education continues to evolve.

One of the primary concerns addressed by NACAC's Testing Commission is the inequality that may result from uneven access to test preparation resources. The commission's set of recommendations related to test preparation included the following:

- Test Preparation Research: NACAC pursue relationships with academic researchers and foundations that may support an extended "objective assessment" of the effects of test coaching methods to provide current, unbiased information to colleges and universities.
- Building the Base of Research: High schools and colleges share their own institutional research on test preparation to fully develop a knowledge center on test preparation.
- Considerations for Admission Formulas: Admission policymakers and practitioners remain aware of the implications of inequitable access to test preparation as they design and implement index systems.
- Comprehensive College Preparation: Secondary schools offering test preparation do so as part of a continuum of college preparatory activities that includes other informational coursework about the admission process.
- Collecting Promising Test Preparation Research: High schools and other organizations submit research to NACAC with the purpose of establishing a trusted source for best practice and professional development.

This discussion paper, authored by Dr. Derek Briggs, represents one of NACAC's first post-Testing Commission steps in advancing the knowledge base and dialogue about test preparation. It describes various types of test preparation programs and summarizes the existing academic research on the effects of test preparation on standardized test scores. The paper also presents newly published data collected by the author in cooperation with NACAC and its members about how colleges are currently using test scores in the process of making admission decisions.

Summary of Test Preparation Research

The existing academic research base indicates that, on average, test preparation efforts yield a positive but small effect on standardized admission test scores. Contrary to the claims made by many test preparation providers of large increases of 100 points or more on the SAT, research suggests that average gains are more in the neighborhood of 30 points. Although extensive, the academic research base does have limitations. Most notably, few published studies have been conducted on students taking admission tests since 2000. Only two studies have been published on the effects for ACT scores, and no studies have been published since the 2005 change to the SAT, which added the Writing section among other changes. In addition, many previous studies were conducted on small samples or had other methodological flaws. Additional large-scale studies of test preparation—including both the ACT and SAT and examining a variety of test preparation methods—will be important to understanding more about the relative value of different types of test preparation. However, even with these caveats in mind, students and families would be wise to consider whether the cost of a given test preparation option is worth what is likely to be a small gain in test scores.

How Score Increases Influence Colleges

The paper also conducts new research to ascertain how small gains in test scores might have practical significance in admission decisions based on how admission officers evaluate scores. A survey of NACAC-member colleges unexpectedly revealed that in a substantial minority of cases, colleges report either that they use a cut-off test score in the admission process or that a small increase in test score could have a significant impact on an applicant's chances of being admitted. These realities are likely to complicate the decisions of students and families trying to determine how best to allocate resources (both time and money) for the transition to college.

Future Directions for Admission Professionals: Affirmation of Testing Commission

Based on the information collected in the NACAC-member survey, the author cautions that admission professionals —particularly those at more selective institutions—"should be careful about the use of SAT or ACT scores to make fine-grained distinctions between applicants. This is important because a 20 point SAT Math difference between two college applicants could be explained by measurement error, differential access to coaching or both." The author strongly recommends that admission counselors receive training to emphasize this issue, which reinforces a primary recommendation of NACAC's Testing Commission that both college admission officers and school counselors need access to training on the fundamentals of standardized test score interpretation.

The content of this discussion paper also points to the need for continued research on the effects of test preparation, particularly as it becomes more widely accessible through a variety of formats and delivery systems. Although the existing academic research base suggests a consensus on the magnitude of test preparation effects, some important practical questions remain unanswered:

- Is the newest version of the SAT more or less "coachable" than previous versions, which have been the subject of academic studies? What is the magnitude of test preparation effects for the ACT?
- Are there certain characteristics of particular test prep programs (quality, setting, duration) that may result in higher than average test score increases?
- Is the magnitude of test preparation effects influenced by any student characteristics that have yet to be identified?
- Are commercial forms of test preparation any more effective than student-driven test preparation?

As recommended by the NACAC Testing Commission, NACAC will continue to play a role in increasing the research base in order to provide the best information to students and families about how to allocate test preparation resources and to provide guidance and training to admission offices about appropriate use of test scores in admission decisions.

About the Author

Derek Briggs is chair of the Research and Evaluation Methodology Program at the University of Colorado at Boulder, where he also serves as an associate professor of quantitative methods and policy analysis. His research agenda focuses upon building sound methodological approaches for the valid measurement and evaluation of growth in student achievement. Examples of his research interests in the area of educational measurement include 1) evaluating the use of developmental (i.e., vertical) score scales to assess student achievement over time, and 2) modeling student understanding longitudinally through the use of diagnostic learning progressions.

Dr. Briggs is a member of numerous professional organizations. He has given research presentations at the annual meetings of the American Educational Research Association, the National Council on Measurement in Education, and the Psychometric Society, as well as at places such as the National Research Council, The College Board, Educational Testing Service, RAND, and the University of California (Berkeley, Los Angeles and Santa Barbara).

Introduction

Most students who take a college admission test spend time preparing themselves for the exam. Some students do practice problems via the Internet, some work through exercises in practice books. Some students go so far as to pay for commercial forms of preparation that may involve a formal class or even one-on-one tutoring. The immediate goal of all such preparatory activities is to improve subsequent performance on an admission test over and above what would have been obtained otherwise. In turn, higher test scores should improve a student's likelihood of college admission, if all other characteristics of a student's application profile are held constant. The potential benefits of test preparation are clear, but they must be balanced by the associated costs in both money and time. Do the benefits that can be expected for the typical student outweigh the costs? This is the fundamental question addressed in the present report.

The purposes of this report are to 1) describe and summarize formal and informal methods of admission test preparation; 2) synthesize and summarize existing academic research on the effects of admission test preparation; 3) arrive at conclusions about the effectiveness of test preparation for admission testing; and 4) suggest future research needs in this area. The report concludes with recommendations to admission officers and high school counselors for implementing policies and training that can account for the effects of test preparation in the college admission process.

Sources of Data

Two principal sources of data are used in this report. The first was a survey developed by the author and staff from the National Association for College Admission Counseling (NACAC) to obtain information about the way that standardized test scores are used and interpreted to make admission decisions at four-year, degree-granting postsecondary institutions in the United States. The NACAC Test Preparation Survey (referred to hereafter as the "NACAC Survey") was sent to the directors of admission at 1,075 postsecondary institutions with a NACAC membership. All of these institutions are four-year colleges (not-for-profit, baccalaureate-granting, Title IV-participating). A total of 246 institutions completed the survey for a response rate of 23 percent. The second source of data derives from the US Department of Education's Integrated Postsecondary Education Data System (IPEDS). Because each institution to whom a NACAC survey was sent has a known IPEDS identification code, it was possible to evaluate the comparability of NACAC survey responders and non-responders with respect to a subset of variables in the IPEDS data. Comparisons between NACAC survey responders and non-responders are made explicitly in Tables 1–3. These results indicate that, in general, those postsecondary institutions that responded to the NACAC survey are similar to non-responders with respect to geographic region, public vs. private control, highest degree offered, admission requirements, and selectivity. (This similarity is illustrated graphically in Figure 1, which contrasts the distribution of admission rates for responders and non-responders.) The only noticeable differences are that survey responders tended to come from institutions that are somewhat larger, more costly and enroll students with slightly higher SAT and ACT scores than the institutions of non-responders.

Table 1. Selected Demographics of Postsecondary Institutions in NACAC Survey		
	Non-Responders (%)	**Responders (%)**
Geographic Region[1]		
New England	10	13
Mideast	22	21
Great Lakes	16	20
Plains	12	10
Southeast	23	18
Southwest	5	4
Rocky Mountains	3	1
Far West	9	12
Type of Institution		
Public	33	34
Private	67	66
Highest Degree Offered		
Master Degree or PhD	82	82
Bachelors Degree	18	18

Notes: Number of postsecondary institutions not responding and responding to survey equals 829 and 246 respectively. Values in cells represent sample percentages.

[1]Percentages may not add to 100 due to rounding.

Table 2. Admission Characteristics of Postsecondary Institutions in NACAC Survey		
	Non-Responders	**Responders**
Admission Rate	66% (18.3)	66% (18.7)
Enrollment Rate	39% (15.3)	39% (15.5)
Total Enrollment (# of full-time and part-time students)	977 (1,167)	1,224 (1,489)
Cost (Dollars)		
In-state tuition	$15,988 (9,652)	$16,382 (9,791)
Out-of-state tuition	$18,384 (7,244)	$19,238 (7,162)
SAT Math Score of Enrolled Students[1]		
25th Percentile	491 (72)	508 (72)
75th Percentile	600 (67)	618 (66)
SAT Critical Reading Score of Enrolled Students[1]		
25th Percentile	485 (68)	500 (65)
75th Percentile	597 (67)	608 (63)
ACT Composite Score of Enrolled Students[2]		
25th Percentile	20.4 (3.3)	21.1 (3.5)
75th Percentile	25.4 (3.2)	26.1 (3.1)

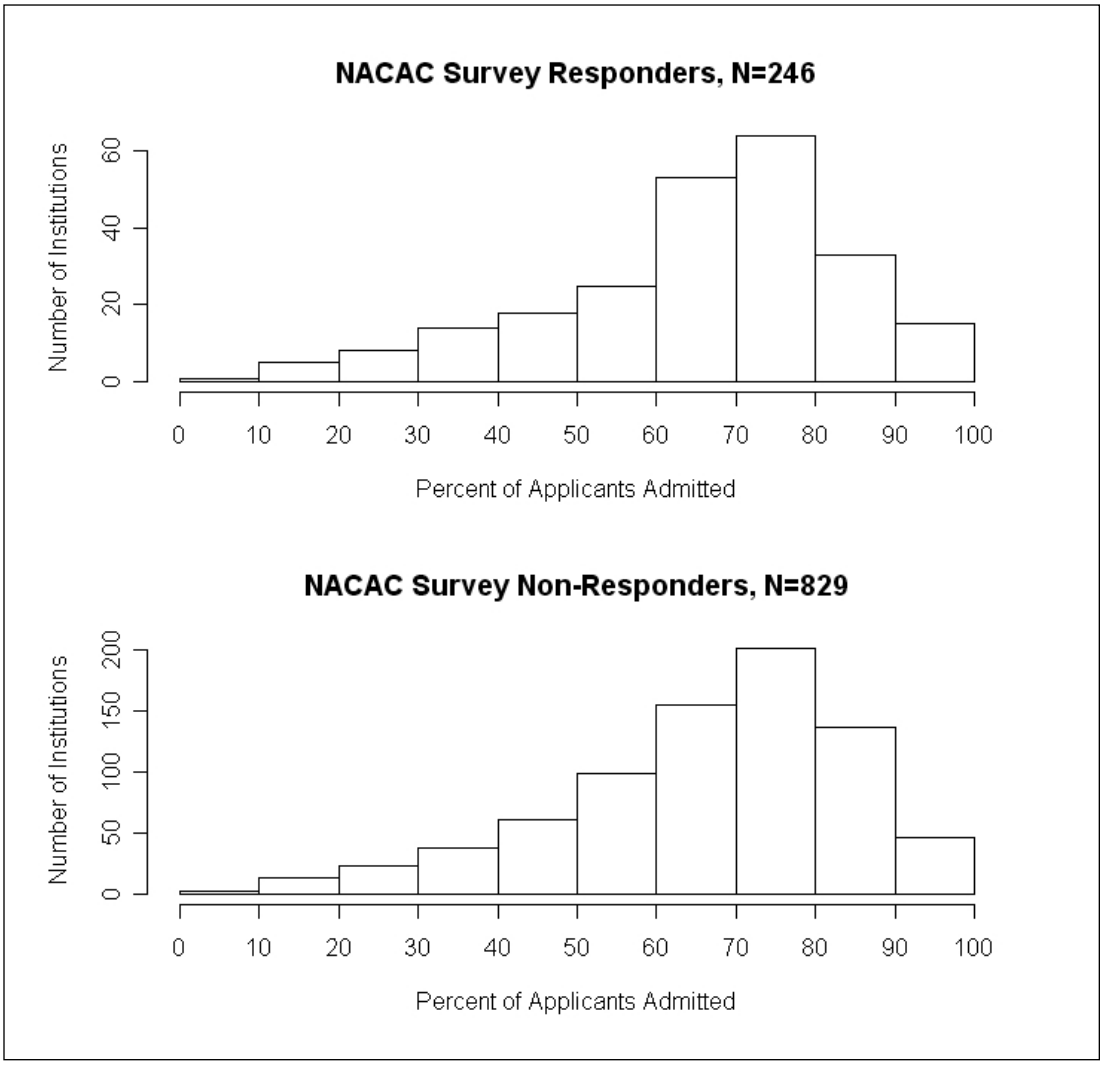
Notes: Number of postsecondary institutions not responding and responding to survey equals 829 and 246 respectively. Values in each cell represent means and standard deviations computed across each sample of institutions.

[1]Only provided by institutions with at least 60% of enrolled students submitting SAT scores. N = 658 for survey non-responders, N = 213 for survey responders.
[2]Only provided by institutions with at least 60% of enrolled students submitting ACT scores. N = 640 for survey non-responders, N = 203 for survey responders.

Table 3. Admission Requirements of Postsecondary Institutions in NACAC Survey		
Proportion of Institutions Requiring the Following Components from Student Applicants	**Non-Responders (%)**	**Responders (%)**
High School Transcript	89	92
Admission Test Scores	86	89
High School GPA	76	78
High School Rank	74	71
Completion of College Preparatory Program	39	43

Note: Number of postsecondary institutions not responding and responding to survey equals 829 and 246 respectively.

Figure 1. Selectivity of Postsecondary Institutions Responding and Not Responding to the NACAC Survey on Test Preparation.



The Use of Standardized Tests for College Admission

Standardized tests play a prominent role in the college admission process. Out of the 246 institutions responding to the NACAC survey, 73 percent (180) indicated that they used the SAT as a tool for admission decisions, 81 percent (198) indicated that they used the ACT, and 89 percent (219) indicated that they used one or the other. Table 4 summarizes the responses from institutions when asked whether test scores are used 1) holistically (i.e., as part of a portfolio of evidence), 2) as part of a quantitative index and/or 3) to define a cut-off threshold for admission. Most institutions report using test scores holistically, followed by a smaller subset that report using the scores as part of a index to define a cut-off threshold for admission.

Table 4. Specific Uses of Test Scores to Inform Admission Decisions

In what way are test scores used to make admission decisions at your institution?

Method	ACT Scores	SAT Scores
Holistically	78%	76%
Quantitative Index	32%	31%
Define Cut-off Threshold	24%	21%

N = 198 institutions using ACT scores, 180 using SAT scores.

When asked to rate the importance of test scores to admission decisions ("How important are the following criteria in admission decisions made at your institution?" Options: No/Limited/Moderate/Considerable Importance), 58 percent (127) of institutions chose "considerable importance," with an average response between the categories of "moderate" and "considerable" importance. Only two other admission criteria were given higher ratings than test scores: strength of curriculum and grades in college prep courses. These findings remained the same when institutions were asked to rank the importance of the various criteria for admission relative to one another.

Admission Test Preparation

What College Admission Tests Measure

Both the ACT and SAT exams are intended to provide measures of a student's "college readiness." Superficially, the ways both ACT Inc. and The College Board define what each exam measures are quite similar.

> Your ACT scores are a measure of your current level of educational development in English, mathematics, reading, and science—and writing, if you took the ACT Plus Writing. Knowledge and skills in these areas are generally essential for admission to college and are considered important for success in college studies (ACT Inc, Using Your ACT Results 2008/2009, p. 3).

> The SAT tests students' basic knowledge of subjects they have learned in the classroom—such as reading, writing, and math—in addition to how students think, solve problems and communicate. The SAT tells students how well they use the skills and knowledge they have attained in and outside of the classroom (The College Board, The SAT Program Handbook, 2008, p. 1).

The ACT

The ACT exam, developed and administered by ACT Inc., consists of four principal test sections: English, Math, Reading, and Science. The 215 multiple-choice items across these sections are administered over the course of four hours. Recently, ACT Inc. has also made a writing section available; this section includes one open-ended essay response which adds an additional 30 minutes of testing time. Scores for students taking the writing section are incorporated into an overall English/Writing test score. Test scores are provided for each ACT test section along with a single composite score (computed as the average across sections). The ACT score scale ranges from one to 36 with increments of one. The standard error of measurement associated with test scores range between 1.5 and two points on the individual sections, with a standard error of measurement of about one point associated with the composite score. When ACT scores are reported to students and colleges, they include both scale scores and the expression of those scores as a percentile rank relative to the national distribution of test-takers. As of 2008, the cost of taking the ACT without the writing section was $31; the cost with the writing section was $46. The mean composite score for roughly 1.4 million students taking the ACT in 2008 was 21.1.

The SAT

The SAT, developed and administered by The College Board, consists of three principal test sections: Mathematics, Critical Reading[1] and Writing. The full exam (in contrast to the ACT, the writing section is not optional) is administered to students across 10 testing sections that span three hours and 45 minutes and 171 unique items. The mathematics section consists of both multiple-choice and constructed-response items, the critical reading section consists solely of multiple-choice items, and the writing section consists of both multiple-choice items and one essay response. Each SAT test section is scored on a scale from 200 to 800 with increments of 10 points. The standard error of measurement associated with the Mathematics and Critical Reading sections is typically about 30 points; the standard error of measurement associated with the Writing section is about 40 points. Like the ACT, SAT scores are reported to students and colleges along with a percentile rank relative to the national distribution of test-takers. As of 2008, the cost of taking the SAT was $45. In 2008, more than 1.5 million students took the exam, and the mean scores on the Math, Critical Reading and Writing sections were 515, 502 and 494 respectively.

There is, however, an important historical distinction between the two exams. In its inception as a tool for college admission in the late 1940s, the SAT was devised as a test of aptitude, and its acronym—the Scholastic Aptitude Test—reflected this belief. Over time, both the format of the test and the position of its developers as to the construct it measures has changed. Messick (1980) and Anastasi (1981) suggested that standardized tests can be conceptualized as solely measuring either achievement or aptitude, and that the SAT falls somewhere in between these two poles. Messick wrote:

[1] Prior to March 2005, this section was known as the verbal section of the exam: the SAT-V.

> The Scholastic Aptitude Test was developed as a measure of academic abilities, to be used toward the end of secondary school as a predictor of academic performance in college… The SAT was explicitly designed to differ from achievement tests in school subjects in the sense that its content is drawn from a wide variety of substantive areas, not tied to a particular course of study, curriculum or program. Moreover, it taps intellectual processes of comprehension and reasoning that may be influenced by experiences outside as well as inside the classroom… The specific item content on the SAT attempts to sample the sort of cognitive skills underlying college-level performance (1980, p. 7).

A key element in Messick's description of the SAT, and one which The College Board has maintained in subsequent revisions to the exam, is the notion that the SAT measures reasoning abilities that are developed gradually over the years of primary and secondary schooling that precede college. While these reasoning abilities should be associated with a student's curricular exposure, there is no explicit link made between the high school curriculum and the content of the SAT.

In contrast, the developers of the ACT have long emphasized the link between the content of its tests of English, math, reading, and science and the high school curricula of American schools.

> The ACT is curriculum-based. The ACT is not an aptitude or an IQ test. Instead, the questions on the ACT are directly related to what students have learned in high school courses in English, mathematics and science. Because the ACT tests are based on what is taught in the high school curriculum, students are generally more comfortable with the ACT than they are with traditional aptitude tests or tests with narrower content (www.act.org/news/aapfacts.html).

In other words, with respect to the aptitude-achievement continuum described above, the ACT has always been promoted as an achievement test, and ACT Inc. makes evidence available that supports a link between the content of most college preparatory high school curricula and its tests. Nonetheless, it is worth noting that the scores for corresponding sections of the SAT and ACT exams are both similarly reliable (Alpha coefficient of about 0.9) and tend to be very strongly correlated (between 0.8 and 0.9). Correspondence tables between the two tests are available (and widely used) to transform a score on the SAT to a score on the ACT and vice versa.[2]

[2] See for example, www.act.org/aap/concordance/index.html or http://professionals.collegeboard.com/data-reports-research/sat/sat-act

Methods of Test Preparation

The following elements are typically at the core of any method of test preparation: content review, item practice and orientation to the format of the test (i.e., development of "testwiseness"). Both The College Board and ACT Inc. encourage students to prepare for their admission exams in this manner, and to this end, an overview of the tests and practice items are readily available at their respective Web sites.[3] Going a step further, students may decide to purchase a book of practice exams for a nominal fee and use this as a basis for preparation in the weeks leading up to an official examination. These methods of test preparation can be classified as informal or "student-driven." Test preparation crosses the line into more formal territory—what is referred to as "coaching"—when the preparation is no longer structured by the student but by an official instructor (i.e., a coach) who places an emphasis on the teaching of specific test-taking strategies. All forms of test coaching share one common characteristic: the presumption that students being coached will perform substantially better on a given admission test than if they had not been coached. Most coaching programs require students to pay a fee—sometimes quite substantial—for such services. The three most prominent examples of this kind of commercial coaching include 1) classroom-based courses offered by Kaplan and The Princeton Review, 2) online coaching (with or without a "virtual" tutor) and 3) private one-on-one or small group tutoring in-person.

The premise of coaching programs is that engaging in such activities will have a positive effect on students' subsequent test performance. For students applying to selective postsecondary institutions that use SAT or ACT scores to make admission decisions, if coaching causes a significant increase in test performance, this might significantly increase the likelihood of admission. There are two key issues: First, to what extent does coaching have an effect on test performance? Second, if coaching has an effect, is it big enough to significantly increase a student's prospects for admission at a selective postsecondary institution?

In the next section the existing research that has attempted to quantify these potential benefits is reviewed, but before doing so it is important to make a distinction between the ***effect*** of coaching and the observation (or claim) that students who prepare for a test in a particular way typically have large score gains. For example, companies and individual tutors that offer coaching for the SAT routinely promise (or imply) that their customers will increase their combined test section scores from a previous administration of the exam by anywhere from 100 points or more. Whether such promises are accurate is itself doubtful (c.f., Smyth, 1990). Regardless, the question of interest would not be whether students increase their scores from one testing to the next, but whether such an increase can be validly attributed to the coaching that preceded it. In general, to make such an attribution requires the availability of a comparable group of students that take the test twice but are not coached. If the score gains of coached students are significantly larger than the score gains of uncoached students, this would constitute a positive coaching effect. Since uncoached students will on average also improve their scores just by retaking the test,[4] an estimate of the effect of coaching will always be smaller than the observed score gains for coached students. For more on this distinction between gains and effects that is the root of many common misconceptions, see Powers and Camara, 1999; Briggs, 2004.

[3] The College Board mails one previously disclosed SAT form to all students who register for the test.

[4] For example, see http://professionals.collegeboard.com/profdownload/Avg_Scores_of_Repeat_Test_Takers.pdf

The Effects of Admission Test Preparation

Since 1953, there have been more than 30 studies conducted to evaluate the effect of coaching on specific sections of the SAT, and two studies conducted to evaluate the effect with respect to the ACT. The characteristics of the SAT studies and estimated coaching effects are summarized in Tables A-1 and A-2 in the appendix of this report. The reviews of coaching and its effect on SAT performance have been almost as numerous as the individual studies under review. Fourteen reviews, listed in appendix A have been conducted on subsets of these studies between 1978 and 2005. While one might assume from this that the empirical effectiveness of coaching on SAT performance has been well-established, this is only somewhat true. One principal reason for this is that the vast majority of coaching studies conducted over a 40 year period between 1951 and 1991 tended to involve small samples that were not necessarily representative of the national population of high school seniors taking college admission exams, and of the programs offering test coaching. In addition, a good number of these studies contained a variety of methodological flaws that compromised the validity of their conclusions.

Nonetheless, over the past 10 years evidence has emerged from three large-scale evaluations of coaching that point to a consensus position about its average effects on admission exams. This consensus is as follows:

- Coaching has a positive effect on SAT performance, but the magnitude of the effect is small.
- The effect of coaching is larger on the math section of the exam (10–20 points) than it is for the critical reading section (5–10 points).
- There is mixed evidence with respect to the effect of coaching on ACT performance. Only two studies have been conducted. The most recent evidence indicates that only private tutoring has a small effect of .4 points on the math section of the exam.

The next two subsections substantiate these statements, primarily on the basis of large-scale studies conducted by Powers and Rock (1999), Briggs (2002) and Briggs and Domingue (2009).

Powers and Rock Study (1995–1996 test-takers)

The study by Powers and Rock (1999) was the first to provide national estimates for the effect of commercial coaching programs. Powers and Rock surveyed a stratified random sample of 3,311 students who had taken the SAT nationally between the fall of 1995 and the spring of 1996. A total of 2,086 students (63 percent) responded to the survey. Students were asked to indicate by what method and how long they had prepared for the SAT. Those reporting that they had participated in coaching from a commercial company were prompted to specify the name of the organization providing the service. Powers and Rock estimated a series of coaching effects using a variety of statistical models to adjust for pre-existing differences between coached and uncoached students using variables measuring socioeconomic status, academic achievement and motivation. In their simplest model, coaching effects were estimated by simply comparing the mean SAT score changes among coached students to those among uncoached students. These effects

amounted to eight points on the verbal section (SAT-V)[5] and 18 points on the math section (SAT-M), both statistically significant. Interestingly, the use of more complex statistical models had little impact on the estimated coaching effects.

Powers and Rock examined separately the subset of students in their sample who reported that they had been coached by either Kaplan or The Princeton Review, two of the most widely known commercial test preparation companies. For one company, an estimated coaching effect on the SAT-M of 33 points was significantly larger than the overall effect of about 18 points, but other than this, the estimated coaching effects remained fairly consistent with those from the pooled estimates.

Studies by Briggs (1990–1992 test-takers), and Briggs and Domingue (2002–2004 test-takers)

Three compelling features of the Briggs (2002) and Briggs and Domingue (2009) studies are that 1) they were both based on nationally representative samples of American high school students gathered through surveys administered by the National Center for Education Statistics; 2) the latter study was a replication of the former study using a new longitudinal cohort of students; and 3) these studies included evaluations of the effects of multiple forms of test preparation on both the SAT and ACT. The sample for the Briggs study derives from the National Education Longitudinal Study of 1988 (NELS); the sample for the Briggs and Domingue study derives from the Educational Longitudinal Study of 2002 (ELS). The admission test-taking time frame for the NELS data was between 1990 (grade 10) and 1992 (grade 12); the respective timeframe for the ELS data was between 2002 (grade 10) and 2004 (grade 12). Students in each NELS and ELS cohort were categorized into four mutually exclusive groups as a function of whether survey information indicated that they had taken particular combinations of college admission exams.[6] These groups and changes in the proportions of students in them from 1992 to 2004 are shown in Table 5.

Table 5. Changes in Admission Test-Taking Patterns Among American High School Seniors from 1992 to 2004.

Admission Test-taking Pattern	NELS (1992)	ELS (2004)
POP1: Took PSAT or PLAN and SAT or ACT	28.8%	26.3%
POP2: Took SAT or ACT, but not PSAT or PLAN	22.1%	37.1%
POP3: Took PSAT or PLAN but not SAT or ACT	3.9%	6.2%
POP4: Did not take the PSAT, PLAN, SAT, or ACT	45.2%	30.4%

Note: The percentages in these cells are relative to the population weighted numbers of American high school students in the NELS and ELS cohorts. The 1992 population size was 2,820,927; the 2004 population size was 2,914,759.

[5] Since the three studies reviewed in this section all involved students taking admission exams prior to March 2005, the SAT-CR section is denoted by its acronym at that time SAT-V.

[6] The PLAN and the PSAT/NMQST (hereafter referred to as simply the PSAT) are essentially pre-tests for the ACT and SAT respectively. Students who take these "pre-tests" tend to be more academically motivated, socioeconomically advantaged or both. The PLAN did not exist during the early 1990s, so it was not part of the NELS data. Hence the mutually exclusive groups formed from NELS data were based only on test-taking patterns with respect to the PSAT, SAT and ACT.

As Table 5 indicates, while only about 51 percent of high school seniors took admission tests in 1992, by 2004 this proportion had increased to a little over 63 percent. Both NELS and ELS samples were asked exactly the same questions about how they had prepared to take either the SAT or ACT.

To prepare for the SAT and/or ACT, did you do any of the following?[7]

A. Take a special course at your high school
B. Take a course offered by a commercial test preparation service
C. Receive private one-to-one tutoring
D. Study from test preparation books
E. Use a test preparation computer program

Table 6. Changes in Test Preparation Activities from 1992 to 2004.

Test Preparation Activity	POP1		POP2	
	2004	Change since 1992	2004	Change since 1992
High School Course	22%	-1	20%	+4
Commercial Course	16%	+3	14%	+5
Private Tutor	9%	+3	10%	+2
Books	63%	+1	60%	-4
Computer Program	36%	+21	36%	+25

Note: POP1 = Took PSAT or PLAN and SAT or ACT; POP2 = Took SAT or ACT, but not PSAT or PLAN

Table 6 shows the frequency distribution of the different test preparation activities listed on both the NELS and ELS surveys for those high school students in the POP1 and POP2 test-taking groups. The columns of the table with the label "2004" reflect the population weighted proportions for the ELS samples responding in the fall of 2004. The columns labeled "Change since 1992" indicate the magnitude of the percentage point increase (or decrease) relative to the proportions that were reported by the NELS samples responding in the fall of 1992. The most dramatic—though not unexpected—change since 1992 is the increase in computer-based test preparation due to the growth of the Internet, which took off during the mid-1990s. The use of high school courses, commercial coaching, private tutoring, and books has generally either remained constant or slightly increased.

[7] Students were also asked whether they had prepared with a video in both surveys, but this category was excluded by Briggs and Domingue because such use was never widespread to begin with, and is largely nonexistent as of 2008. Note also that the computer program category is likely to have changed meaning from the use of something akin to a CD-rom in 1992 to use of the internet in 2004.

Using the NELS data, Briggs compared the average score gains for the sample of 3,492 students taking both the PSAT and SAT as a function of whether students had used or not used different forms of test preparation. The only methods of test preparation to have a significant effect on SAT-V and SAT-M score gains were formal modes of coaching: use of a private tutor and enrollment in a commercial coaching class. The magnitude of the effects was small—about 20 points and 10 points on the SAT-M and SAT-V respectively. These effect estimates were also optimistic in the sense that they did not control for preexisting differences in socioeconomic status, academic background and motivation among the groups of students being compared.

The effects of commercial coaching were subsequently estimated for all students taking either the SAT or ACT after controlling for confounding variables using a linear regression model similar to those that had been specified in the analysis by Powers and Rock. Briggs concluded that the average commercial coaching effect on the SAT-M was about 15 points, while the average effect on the SAT-V was about eight points. With respect to the ACT, Briggs found no evidence for a coaching effect on the math section of the exam, a small positive effect of .55 on the English section of the test and a surprising small negative effect of -.66 on the reading section of the test. No statistically significant coaching effects were found on any sections of the SAT or ACT for students who had not previously taken the PSAT (students in the POP2 sample).

More recently, using the ELS data, Briggs and Domingue also evaluated the effects of different forms of test preparation on both the SAT and ACT for students in the POP1 and POP2 samples.

- Among the 3,146 students who had taken the SAT, enrollment in a commercial course and private tutoring were found to have a small but positive and statistically significant effect on SAT-M scores of about 13 and 15 points respectively.
- For the subset of students taking the SAT who had previously taken the PSAT, the use of a computer program was found to have a small but statistically significant negative effect on SAT-M scores of seven points.
- For students who had not previously taken the PSAT, the use of books had a small but statistically significant positive effect on SAT-M score of seven points.
- No forms of test preparation had statistically significant positive effects on SAT-V scores. In fact, for students who had not previously taken the PSAT, enrollment in a special high school class to prepare for the SAT was associated with a statistically significant *negative* effect of 10 points on the SAT-V.
- Among the students who had taken the PLAN and the ACT, the only forms of test preparation to have statistically significant effects were private tutoring and the use of books. The former had an effect of .43 on ACT-M scores; the latter had an effect of .6 on ACT-E scores.
- For students who took the ACT but did not take the PLAN, no forms of preparation had significant effects on test performance.

Limitations in the Research Literature

There are four principal reasons why the consensus position across most prior coaching studies—that coaching programs typically have either a small effect or no effect on admission test performance—may not tell the full story about the effectiveness of admission test coaching programs.

1) *Heterogeneity of coaching quality and coaching effects.* In most of the available empirical studies, the form of test preparation being evaluated can be classified as coaching because it involves an instructor that is teaching students not just the content represented on the test, but specific strategies for answering test questions correctly. However, coaching can differ in its quality, setting and duration. In the large-scale evaluations that have been conducted, these sorts of fine-grained distinctions about the characteristics of different coaching programs are unavailable. It is possible that there are specific high-quality coaching programs with larger effects than the average effects found in these studies. For one such example, see Kaplan, 2005. In addition, it may be that coaching is somewhat more or less effective for certain kinds of students. The studies by Briggs, and Briggs and Domingue suggest that coaching is more effective for students with strong academic backgrounds and high socioeconomic status who underperformed on the PSAT.
2) *The design of studies evaluating coaching vary in quality.* The optimal design for an evaluation of the effect of test preparation would involve the random assignment of students into different preparatory conditions. To date no such study has been successfully conducted on a large scale. Instead, existing coaching studies typically make some form of statistical adjustment that takes into account known differences in the characteristics of coached and uncoached students. There is no guarantee that such adjustments will be successful.[8]
3) *The changing format of admission tests.* The SAT has undergone substantial changes to its format over the years (Lawrence et al, 2004). The SAT of 2008 bears scant resemblance to the SAT administered from 1953 through 1992, the period during which the bulk of coaching studies were conducted. Beyond the addition of a writing section in 2006, the types of items thought to be most coachable in the critical reading and math sections have been replaced (antonyms and analogies in the critical reading section; quantitative comparisons in the mathematics section). Some similar changes are also evident with the ACT, which added an (optional) writing section in 2006. To date, there have been no studies that have evaluated the effects of coaching for the newest versions of the SAT and ACT. Of particular interest would be an evaluation of the effect of coaching on the new writing sections that have been added to both tests.[9]
4) *The emergence of computer-based coaching.* Over the past 10 years, there has been a dramatic increase in the availability of computer-based coaching options via the Internet. It is very likely that as of 2008, a majority of students taking the SAT or ACT are preparing by taking advantage of practice test items available at a variety of Web sites both commercially and for free. Little is known about the efficacy of specific Internet-based coaching services.

[8] However, to the extent that coaching estimates are biased, it seems likely that they will have been overestimated, since omitted variables such as student motivation are probably positively correlated with admission test performance and coaching status.

[9] See Hardison and Sackett (2008) for a recent study that has evaluated, in a more general sense, the susceptibility of writing samples on standardized tests to "rules-based" coaching.

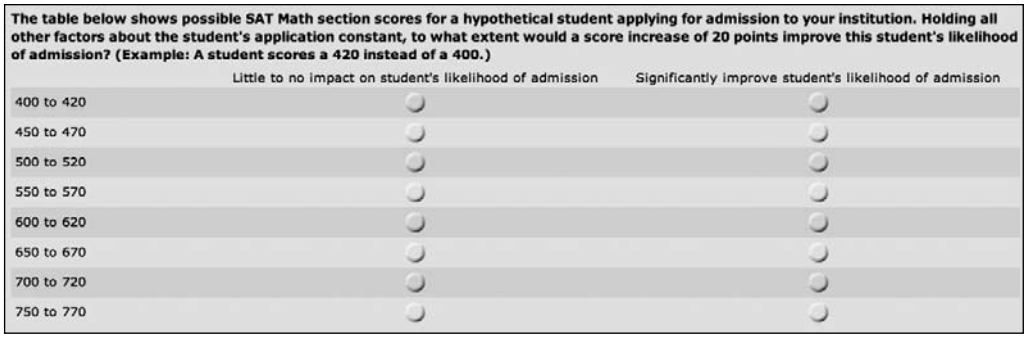
While these are all legitimate limitations in the research literature, and are suggestive of areas for further study, they do little to undermine one key central message: To the extent that coaching has an effect on admission test scores, such effects are considerably smaller than that which has been implied or promised by most commercial coaching companies. However, whether these effects are in some sense practically significant is another issue altogether, one that is addressed in the next section.

The Practical Significance of Coaching Effects

From a psychometric standpoint, when the average effects of coaching are attributed to individual students who have been coached, these effects cannot be distinguished from measurement error. Recall that the standard error of measurement on any section of the SAT tends to be about 30 points; for the ACT it is between 1.5 and two points. Using this as a benchmark, none of the coaching effects estimated in the large-scale studies by Powers and Rock, Briggs, and Briggs and Domingue are practically significant. On the other hand, if marginal college admission decisions are made on the basis of very small differences in test scores, a small coaching effect might be practically significant after all.

To investigate this, the postsecondary institutions responding to the NACAC survey were given the prompt shown in Figure 2. In this prompt, the key idea was to ask whether, after "holding all other factors about the student's application constant," a score increase of 20 points on the SAT-M would "significantly improve a student's likelihood of admission." Note that each row of the prompt represents a different starting point on the underlying SAT score scale, and is therefore a distinct item. A similar prompt was provided for the Critical Reading section of the SAT, however the hypothetical test score increase was 10 points rather than 20.

Figure 2. NACAC Survey Prompt About Impact of Test Score Increase on Admission Decisions



The table below shows possible SAT Math section scores for a hypothetical student applying for admission to your institution. Holding all other factors about the student's application constant, to what extent would a score increase of 20 points improve this student's likelihood of admission? (Example: A student scores a 420 instead of a 400.)

	Little to no impact on student's likelihood of admission	Significantly improve student's likelihood of admission
400 to 420	○	○
450 to 470	○	○
500 to 520	○	○
550 to 570	○	○
600 to 620	○	○
650 to 670	○	○
700 to 720	○	○
750 to 770	○	○

There were a total of 130 out of 246 admission counselors who indicated that their postsecondary institutions used the SAT to make admission decisions and who responded to all prompts about score increases on the SAT-M and SAR-CR. These institutions were further subdivided into those who admitted less than 50 percent of their applicants ("more selective," N=33) and those who admitted 50 percent or more of their applicants ("less selective," N=97). Finally, the proportion of respondents endorsing option two ("Significantly improve student's likelihood of admission") was plotted by selectivity for each of the eight SAT scale score options for the items described in Figure 2. The results are shown in Figures 3 and 4.

Figure 3. Practical Significance of Coaching Effect on SAT-Math

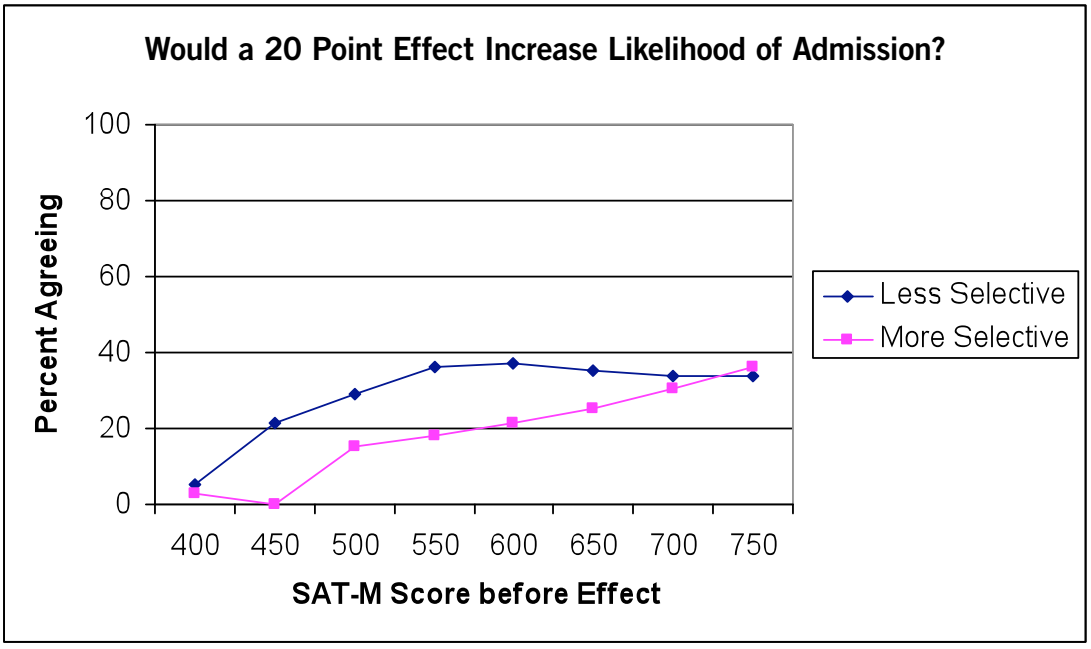
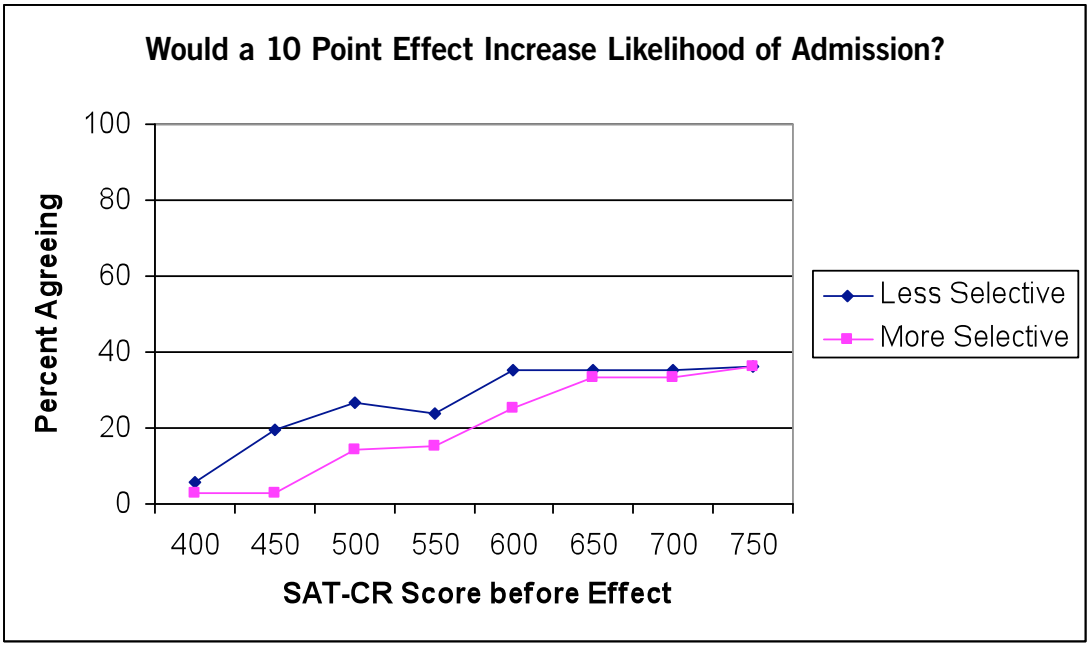


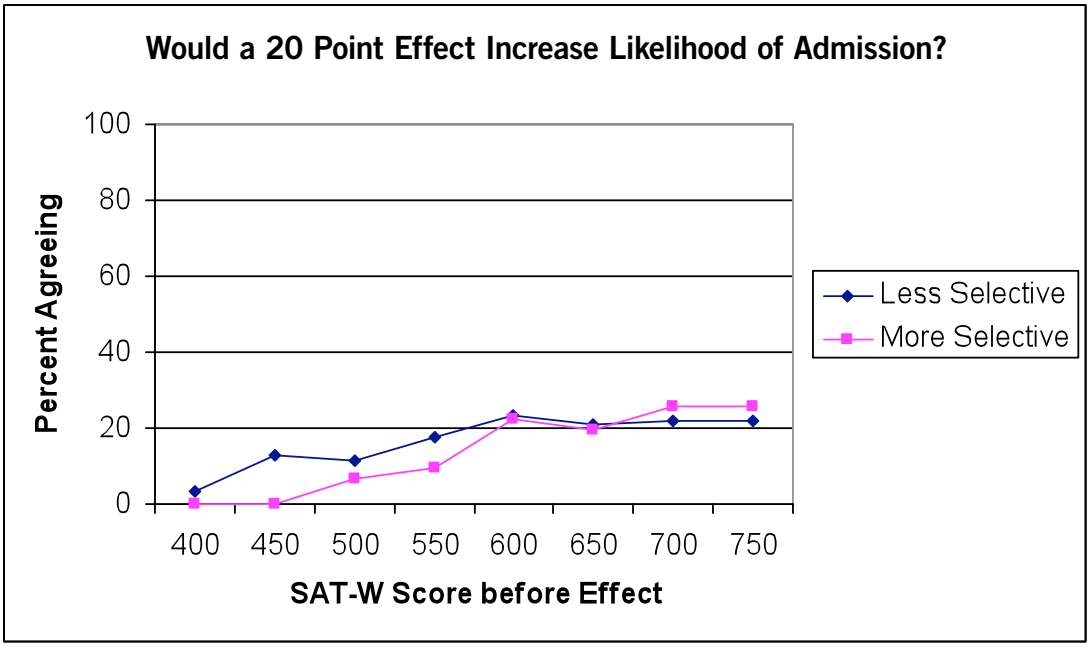
Figure 4. Practical Significance of Coaching Effect on SAT-Critical Reading



These results indicate that in some cases more than one third of postsecondary institutions agreed that a score increase on the SAT-M of 20 points, or a score increase on the SAT-CR of 10 points, would "significantly improve student's likelihood of admission." This proportion tends to rise as the base level of the SAT score before the 20 or 10 point score improvement rises. This is especially true for the more selective institutions. At lower scores on the SAT scale, a small score increase does the most to improve a student's chances of admission at less selective institutions; at higher scores, the same increase appears to have an equally large or even larger impact at more selective institutions. This is probably because at the most selective institutions, the SAT scores of applicants fall in a relatively narrow range at the top end of the scale, artificially magnifying the importance of a 10 or 20 point score difference.

The score improvements of 10 and 20 points for the SAT-CR and SAT-M were chosen to reflect the sorts of score increases the average student might be likely to experience because of coaching. Since there is no evidence as to the size of the coaching effect on the SAT-W section, the same prompt was posed with hypothetical score increases of 20 points, under the assumption that it might be possible for coaching to produce the same effect on the writing section as has been found on the math section. A total of 117 out of 245 institutions using SAT scores to make admission decisions responded to this prompt. The results are shown in Figure 5. Here the impact of score increases—while still considerable—is smaller than that shown in Figures 3 and 4, perhaps because the writing section is relatively new and has less of a history as a device for high-stakes admission decisions.

Figure 5. Practical Significance of Coaching Effect on SAT-Writing



The results displayed in Figures 3 through 5 might be considered surprising since a case could be made that the psychometrically "correct" response about the role of a 10 to 20 point score improvement at the level of an individual student is that it should "have little to no impact on a student's likelihood of admission." Indeed, the College Board makes this point in its *SAT Program Handbook*:

> When comparing section scores, remember that the student's true score is not a single number—a test-taker may score slightly higher in one area but still be equal in both skills. There must be a 60 point difference between critical reading and mathematics scores, and an 80-point difference between writing and another section, before more skill can be assumed in one area than another (p. 28).

Along these lines, in the document *Guidelines on the Uses of College Board Test Scores and Related Data*, The College Board gives a specific example of a use that should be avoided: "Making decisions about otherwise qualified students based only on small differences in test scores" (p. 16).[10]

[10] These College Board documents can be found at http://professionals.collegeboard.com/testing/sat-reasoning/about and www.collegeboard.com/research.

The results here seem to indicate that at some postsecondary institutions such advice has gone unread or is not being taken to heart. Those institutions agreeing that a 10 or 20 point score increase would improve a student's chance of admission were much more likely to have responded that the SAT is used to define a cut-off threshold for admission. At such institutions, a 10 or 20 point coaching effect is clearly very practically significant if it crosses a cut-off threshold. Although similar prompts were not provided with respect to the ACT exam, it is very likely that such small differences in ACT scores would have similar impacts on admission decisions. In fact, in the documents it makes available to postsecondary institutions (see www.act.org/aap/resources.html).[11] ACT Inc. makes little to no mention about the role that measurement error plays in test score interpretations.

The Costs of Test Preparation

Beyond that which occurs naturally during students' years of schooling, the only free test preparation is no test preparation at all. This is because all test preparation involves two costs: monetary cost and opportunity cost. The monetary cost of test preparation is relatively transparent. Practice items and tests for student-driven preparation from the SAT and ACT are available online for no cost or in books for a nominal cost (between $10 and $20). Commercial coaching is available for a considerable cost ($400 online, $1,100 for a physical class, $100–200 per hour for in-person tutoring). In contrast, opportunity cost depends upon the duration of test preparation. Any time spent preparing for an admission exam is time that could have otherwise been spent doing other sorts of activities that might either improve students' chances of college admission or better prepare them for the challenges that await once they matriculate. Hence test preparation with low opportunity cost will tend to constrain the number of hours students spend, while test preparation with high opportunity cost does not.

The costs associated with different forms of test preparation are used to characterize the axes in Figure 6, where the horizontal axis represents monetary cost and the vertical axis represents opportunity cost. Though in reality the axes represent a continuum, for simplicity, three levels of cost have been specified on each axis: none, small or large. With respect to opportunity cost, 10–20 hours of preparation is classified as small to medium. This would represent a student that spends four weekend days the month before the test taking and reviewing a preliminary practice exam (three to five hours), reviewing content and practicing items (four to eight hours) and taking and reviewing a final practice exam (three to five hours). On the other hand, 40 hours or more of preparation is classified as large. This represents the same amount of time as a single high school course meeting 45 minutes a day over the length of a semester.[12]

[11] The relevant documents are entitled "Your Guide to the ACT", "2008-2009 User Handbook" and "Using ACT Scores in Admission and Placement Decisions: An Update."

[12] One could argue that coaching programs that involve this amount of student contact time in preparation for a single SAT or ACT test section would seem more reasonably classified as traditional instruction. Previous researchers have used 40 hours as a threshold between short- and long-term preparation (Jackson 1980), but clearly there is ample gray in this distinction.

There are essentially seven relevant cells in Figure 6 that can be used to distinguish methods of test preparation by their combination of monetary and opportunity cost. The names and test preparation activities of hypothetical students have been inserted to illustrate some important differences in the costs students incur, depending upon how they choose to prepare. The differences depicted in Figure 6 raise at least three important empirical questions.

1) Is some test preparation better than none? This would ideally involve comparing the admission test performance of students like Denny to the performance of all the other hypothetical students in Figure 6. (Such comparisons were made in the recent study by Briggs and Domingue, 2009.)
2) Does the duration of test preparation matter? This would ideally involve comparing the admission test performance of students like Eric, Naomi and Matilda to the performance of students like Lucinda, Jane, Seppy, and John. (For examples of studies addressing this issue, see Messick and Jungeblut, 1982 and Briggs, 2005. In short, there is evidence of a moderate correlation between the duration of coaching, and the size of the estimated coaching effect.)
3) Are commercial forms of coaching better than free/cheap forms of coaching or student-driven test preparation? This would ideally involve comparing the admission test performance of students like Matilda, Seppy and John to the performance of students like Eric, Lucinda, Naomi, and Jane. (There are no examples of studies that have adequately addressed this issue.)

Figure 6. The Costs of Different Forms of Test Preparation

Opportunity Cost (Time)				
Large (30–40 hrs)	**Eric** 40 hours of prep using online practice items and tests. ($0)	**Naomi** 35 hours of prep using two practice books that include "tips and tricks." ($30)	**Matilda** 40 hours of prep from Kaplan Classroom Course ($1,050) or The Princeton Review Classroom Course. ($1,100)
Small to Medium (10–20 hrs)	**Lucinda** 12 hours of prep using online practice items at official test Web site. ($0)	**Jane** 12 hours of prep using online practice items and tests at The College Board's "Official SAT Online Course" ($70) or "ACT Online Prep." ($20)	**Seppy** 12 hours of prep using Kaplan's "SAT Online." ($400) **John** 20 hours of prep using a Kaplan personal tutor. ($130 per hr)
None	**Denny** Does no specific preparation for tests.	NA	NA
	None	Small (< $100)	Large (≥$400)

Monetary Cost ($) →

Caveat Emptor

Commercial test preparation services for standardized exams represent a multibillion dollar industry. While it is difficult to find exact numbers, the market-based research firm Eduventures Inc. (cited in report by Buckleitner (2006)), puts the annual revenues at more than $4 billion. Two of the most well-known coaching companies, The Princeton Review and Kaplan, offer students "guarantees" that they will improve their test scores. For example, according to the Kaplan Web site:

> "College admission officers agree: your SAT score is considered the 2nd most important factor in the college application process behind grades in college prep courses (According to the *State of College Admission* report 2007). Kaplan will ensure you score higher on the SAT—guaranteed, or your money back" (Retrieved from www.kaptest.com/sat on December 7, 2008).

Likewise at The Princeton Review Web site:

> "90 percent of our SAT students get into one of their top-choice schools… Taking the SAT in the winter or spring of 2009? Our SAT Comprehensive Classroom Course will give you the skills you need to get the score you need, guaranteed" (Retrieved from www.princetonreview.com on December 7, 2008).

These guarantees can be misleading unless consumers read the fine print, which can be extensive. Consider, for example, the fine print for the Kaplan guarantee:

> You must be enrolled in a Kaplan full classroom, tutoring or online course that began on or after August 11, 2003, and attend all required classes or make-up sessions, complete all required tests and complete all of your required homework as outlined on your student home page. If you feel that you are not ready to take the exam or are not satisfied with your score on the actual exam, you may repeat the full course for free for classroom and online students, and complete the full classroom course for free plus purchase additional tutoring hours at $75/hour for tutoring students. Your free repeat course must prepare you for a test date within the next three months or the next available test date. If your total score is not higher on the actual exam than your earlier, official test score or your Kaplan diagnostic (if you did not take the actual test before), you may repeat the full program for free or get a full refund. To invoke the Higher Score Guarantee, you must notify Kaplan within 90 days after the date your course access ends. To be eligible for the refund, you must present a copy of your official score report, your diagnostic score results and your course materials at the time you invoke the guarantee (Retrieved from www.kaptest.com/sat on December 7, 2008).

Similarly involved fine print is provided by The Princeton Review with regard to its guarantees. One aspect of this fine print that merits additional attention is the noted use of "diagnostic" pretests for coached students who had not previously taken the SAT or ACT. In an investigation of SAT coaching programs in the late 1980s, Smyth (1990) suggested that one way companies can point to apparent score gains among their clients is to administer them an unofficial pretest that is in fact harder than an official exam. Relative to this artificially low baseline score, even highly ineffective coaching might appear successful. The exposé by Smyth also revealed that virtually all instances of extravagant claims of "typical" SAT score gains of 100 points or greater were either undocumented or based upon highly self-selected and/or small samples of students.

The fastest growing market for commercial test preparation is in the online environment. In a study conducted for Consumer Reports WebWatch, Buckleitner (2006) recruited 20 high school juniors to evaluate 10 online SAT test preparation services over a four week period. Students were randomly assigned to evaluate two Internet-based services each, and their progress and experiences were monitored by adult researchers. The key findings reported by Buckleitner were as follows:

- Online services come with aggressive advertising. Students may be inundated with messages from college and military recruiters or offers for financial aid.
- In six out of 10 services, errors were found in practice tests (e.g., grammatical problems, questions with no answers, missing sections of text, etc.).
- Higher price and reputation do not necessarily make for better products. The only free service that was tested (Number2.com) performed "exceptionally well" relative to more expensive competitors (The Princeton Review, Kaplan).
- Technical issues abound. Older Web browsers may not work, and some services require the use of "cookies" which can be intrusive.
- Students' privacy protection is often unclear. Some sites were very vague about what student information would be shared and with whom.

In summary, note that there is no incentive for coaching companies to formally evaluate the effectiveness of their products as part of a controlled experiment. The actual effect of coaching that would be found when the test performance of a "treatment" group of coached students is compared to that of a "control" group of uncoached students will inevitably be smaller when contrasted with the gains of a single group of students before and after they have been coached. Given that the public appears to believe that coaching will improve scores substantially rather than marginally (despite decades of empirical evidence to the contrary), coaching companies have avoided taking any action that might dispel such misconceptions. Hence when it comes to commercial coaching programs, the message is "buyer beware."

Conclusion

There are three principal conclusions to be drawn from this report:

1) All students should be encouraged to prepare before taking admission tests, but the potential benefits of test preparation must be balanced against both financial cost and opportunity cost.
2) Because empirical evidence suggests that the average effects of commercial coaching programs are small, students should be counseled to consider less costly forms of test preparation available by using books or the Internet. High school students and their families should be counseled to be wary of coaching rip-offs.
3) As it has been found that even small test score increases may increase a student's chances of admission at selective institutions, if money and time are no object, commercial coaching or private tutoring may well be worth the cost. *However, this will primarily be true for students with above average admission test scores in the first place.*

The last of the conclusions above is one that reflects the current reality of test use for college admission. Selective postsecondary institutions should be careful about the use of SAT or ACT scores to make fine-grained distinctions between applicants. This is important because a 20 point SAT-M difference between two college applicants could be explained by measurement error, differential access to coaching or both. It is strongly recommended that admission counselors receive training that emphasizes this point.

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Appendix A: Summaries of SAT Coaching Studies

Table A-1. SAT Coaching Study Sample Characteristics

Study	Sample Size[1] (Coached/Total)		Grade Level	School Type	Location	Year(s) Tested	SES of Sample[2]
	SAT-V	SAT-M					
UNCONTROLLED STUDIES							
School-based Coaching							
Pallone (1960)	100	NA	Pre-college	1 private (all male)	Washington, DC	1959	High
Marron (1965)	714	715	11th, 12th	10 private (all male)	Washington, DC	1962	High
Johnson [Atlanta and NY sites] (1984)	117	116	11th	multiple public (all Black, urban)	New York, Georgia	1983–94	Low
Commercial Coaching							
Kaplan (2001)	NA	18	12th	multiple public and private	Connecticut	1999–2000	High
Computer-based Coaching							
Coffin (1987)	18	18	11th, 12th	1 public (urban)	Massachusetts	1986–87	Low
OBSERVATIONAL STUDIES							
School-based coaching							
Dyer (1953)	225/418	225/418	12th	2 private (all male)	NR	1951–52	High
French (1955)	161/319	161/319	12th	3 public	Michigan, Massachusetts	1954	High
Dear (1958)	60/586	60/586	12th	multiple public and private	New Jersey, New York, Pennsylvania	1956–57	High
Kintisch (1978)	38/76	NA	12th	1 public (suburban)	Pennsylvania	1976–78	NR
Burke (1986)	50/100	50/100	11th, 12th	1 public (suburban)	Georgia	1984–85	Mixed
Schroeder (1988)	NA	21/54	11th	2 public (urban)	Georgia	1987	Mixed
Schroeder (1992)	NA	59/95	NR	1 public (urban)	New York	1991–92	High
Wrinkle (1996)	18/36	NA	9th, 10th, 11th	1 public (suburban)	Texas	NR	High
Commercial Coaching							
Frankel (1960)	45/90	45/90	12th	1 public (urban)	New York	1958	High
Whitla (1962)	52/104	50/100	11th	multiple public and private	Massachusetts	1959	High
FTC: BRO/BCP (1978)	556/2,122	556/2,122	11th, 12th	multiple public and private (urban)	New York	1974–77	Mixed
Whitla (1988)	341/1,558	341/1,558	12th	multiple public and private	USA	1986–87	High
Zuman [high-SES sample] (1988)	21/55	21/55	11th	multiple public (urban)	New York	1985–86	High
Smyth (1989)	200/438	200/438	12th	8 private (suburban)	Baltimore, Washington, DC	1987–88	High
Snedecor (1989)	264/535	264/535	12th	10 public and private	Pennsylvania	1988–89	High
Smyth (1990)	631/1,132	631/1,132	12th	14 private (suburban)	Maryland, New Jersey	1989	High
Powers and Rock (1999)	427/2,086	427/2,086	11th, 12th	multiple public and private	USA	1995–96	Mixed
Briggs (2001)	379/2,554	379/2,554	11th, 12th	multiple public and private	USA	1991–92	Mixed
Kaplan (2005)	NA	34/90	12th	multiple public and private	Connecticut	1999–2004	High
Briggs and Domingue (2009)	450/2,311	450/2,311	11th, 12th	multiple public and private	USA	2002–2004	Mixed
RANDOMIZED STUDIES							
School-based Coaching							
Roberts and Oppenheim (1966)	154/265	188/310	12th	18 public (all Black, urban and rural)	Tennessee	1965	Low
Evans and Pike (1972)	NA	288/417	11th	12 public (urban and suburban)	New Jersey, Ohio, Pennsylvania	1970–71	Mixed
Alderman and Powers (1980)	239/559	NA	11th	8 public and private	7 northeastern states	1977–78	Mixed
Johnson [San Francisco site] (1984)	23/35	23/35	11th	multiple public (all Black, urban)	California	1983–94	Low
Shaw (1992)	61/122	61/122	12th	3 public (suburban)	California	1988	Mixed
Commercial Coaching							
Zuman [low-SES sample] (1988)	16/33	16/33	11th	multiple public (urban)	New York	1985–86	Low
Computer-based Coaching							
Hopmeier (1982)	42/71	61/93	9th, 10th, 11th	1 public (suburban)	Florida	NR	Mixed
Laschewer (1985)	13/27	13/27	11th	1 private (suburban Catholic)	New York	NR	Mixed
Curran (1988)	204/408	204/408	11th	4 private (Catholic)	Massachusetts	1986–87	Mixed
Holmes and Keffer (1995)	28/58	NA	12th	1 public (rural)	Georgia	1990	Mixed
McClain (1999)	40/60	40/60	12th	public (suburban)	Maryland	1998	Low

NOTES: [1] Samples presented here are summed across all coached and uncoached subsamples considered in given study unless otherwise noted.
[2] Approximate socioeconomic status (parental income, education, occupation) of sample on average according to author.
NA = not applicable; NR = not reported

Table A-2. SAT Coaching Study Effect Estimates

Study	Design Intent	Coaching Type	Statistical Approach	Pre-test	Post-test	SAT-V		SAT-M	
						Effect	Stat Sig	Effect	Stat Sig
Dyer (1953)	Observational	School-based	Regression	Retired SAT	Official SAT	5	<.05	13	<.01
French (1955)	Observational	School-based	Regression	Retired SAT	Official SAT	18	<.01	6	<.01
Dear (1958)	Observational	School-based	Regression	Retired SAT	Official SAT	-2	NS	21	<.01
Kintisch (1972)	Observational w/ matching	School-based	NR	Official SAT	Official SAT	14	NR	No coaching	
Burke (1986)	Observational w/ matching	School-based	ANOVA	Official PSAT	Official SAT	45	<.01	No coaching	
Schroeder (1988)	Observational	School-based	Regression	Retired SAT	Retired SAT	No coaching		21	NS
Schroeder (1992)	Observational	School-based	Regression	Official PSAT	Official SAT	No coaching		46	<.05
Wrinkle (1996)	Observational w/ matching	School-based	Regression	Official PSAT or SAT I	Official SATI	31	<.01	No coaching	
Frankel (1960)	Observational w/ matching	Commercial	t-test	Official SAT	Official SAT	8	NS	9	NS
Whitla (1962)	Observational w/ matching	Commercial	ANOVA	Official SAT	Official SAT	11	NS	-5	NS
FTC: BRO/BCP (1978) [Company A]	Observational	Commercial	Regression	Official PSAT or SAT	Official SAT	28	<.01	24	<.01
FTC: BRO/BCP (1978) [Company B]	Observational	Commercial	Regression	Official PSAT or SAT	Official SAT	2	NS	4	NS
Whitla (1988)	Observational	Commercial	NR	Self-reported, official PSAT or SAT	Self-reported, official SAT	11	NR	16	NR
Zuman [high-SES] (1988)	Observational	Commercial	Regression	Official PSAT	Official SAT for treatment/ retired SAT for control	52	<.001	58	<.001
Smyth (1989)	Observational	Commercial	ANOVA	Official PSAT or SAT	Official SAT	6	NS	32	<.01
Snedecor (1989)	Observational	Commercial	NR	Self-reported, official PSAT or SAT	Self-reported, official SAT	0	NS	15	NC
Smyth (1990)	Observational	Commercial	Regression	Official PSAT or SAT	Official SAT	9	<.01	18	<.01
Powers and Rock (1999)	Observational	Commercial	Regression, PSM, IV, HM, Belson	Official PSAT or SAT I	Official SAT I	6	NS	18	<.01
Briggs (2001)	Observational	Commercial	Regression, HM	Official PSAT	Official SAT	6	<.05	15	<.05
Kaplan (2005)	Observational	Commercial	ANOVA	Official SAT	Official SAT	No coaching		63	<.01
Briggs and Domingue (2009)	Observational	Commercial	Regression, PSM	Official PSAT	Official SAT	4	NS	12	<.05
Roberts and Oppenheim (1966)	Randomized	School-based	t-test	Retired PSAT	Retired PSAT	14	NS	8	NS
Evans and Pike (1972)	Randomized	School-based	MANOVA	Retired SAT	Retired SAT	No coaching		17[a]	<.05
Alderman and Powers (1980)	Randomized	School-based	Regression	Official PSAT	Retired SAT	8[b]	<.05	No coaching	
Johnson (1984)	Randomized	School-based	t-test	Shortened, retired SAT	Shortened, retired SAT	121[c]	<.05	57[c]	<.05
Shaw (1992)	Randomized	School-based	ANOVA	None	Official SAT	21	NS	6	NS
Zuman [low-SES] (1988)	Randomized	Commercial	Regression	Official PSAT	Official SAT for treatment/ retired SAT for control	-1	NS	57	<.001
Hopmeier (1982)	Randomized	Computer-based	ANOVA	None	Retired SAT (over two days)	57	<.05	37	<.05
Laschewer (1985)	Randomized Solomon 4 Group	Computer-based	MANOVA, Regression	Retired SAT	Retired SAT	-1	NS	12	NS
Holmes and Keffer (1995)	Randomized Solomon Four Group	Computer-based	F-test	Retired SAT-V	Retired SAT-V	39	<.03	No coaching	
McClain (1999)	Randomized	Computer-based	Regression	Official SAT I	Official SAT I	d		d	

Effects only reported for studies involving control groups.
NR = Not Reported NS = Not Significant
[a] Average effect across three item format treatments; these are hypothetical effects if all items on the SAT-M were the same format.
[b] Average effect across eight schools; evidence of poor student motivation among control groups.
[c] Interpretation of effects threatened by severe sample attrition; no attempt made to control for group differences statistically.
[d] Effect not reported for each test section, only for combined sections.

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