# Trends in Graduate Admissions Measures BUROS Big Issues in Testing Conference March 28, 2013

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Measurement is firmly grounded in systems of teaching and learning, and to support those activities, measurement also plays a critical role in selection, placement, and evaluation for accountability. Our experience and expertise as a field is deepest in the K-12 educational system, with similar expertise in licensure and certification in professional fields. Similarly, this expertise is strong in college admissions, but far less so in the arena of undergraduate education learning outcomes. The measurement expertise in the arenas of graduate and professional school selection, placement, and accountability evaluation is mixed. This presentation will introduce recent trends in graduate admissions measures, including the (re)introduction of multi-stage tests and new constructs.

### A Context for Graduate Admissions Testing

Learning matters. It matters to individuals, families, communities, and the world. But before we get too philosophical, let's be practical for a moment. Learning matters because it provides access to new opportunities for individuals and is the source of innovation and advancement for humanity. Information is the key to so much of what advances societies that learning has premium status in the global marketplace. Nations tout their academic prowess to advance their status in the global marketplace in hopes of occupying a larger share of world's intellectual capital.

The Commission on Pathways through Graduate School and into Careers (Wendler et al., 2012) reported that by 2020, jobs requiring master's degrees will increase 22% and those requiring doctorate or professional degrees will increase by 20%. This amounts to nearly 2.6 million new and replacement jobs requiring graduate-level degrees. The chairs of the Pathways Commission, Debra Stewart (President, Council of Graduate Schools) and Kurt Landgraf (President, Educational Testing Service), also chaired the earlier Commission on the Future of Graduate Education (Wendler et al., 2010), where they argued:

The United States' system of graduate education is a strategic national asset. Like all valuable assets, it must be attended to and nurtured in order to remain viable and strong. ...Our competitiveness in the global economy hinges on our ability to produce sufficient numbers of graduate-degree holders – people with the advanced knowledge and critical-thinking abilities to devise solutions to grand challenges such as energy independence, affordable health care, climate change and others. One of our greatest resources is our human talent, and as a nation we must invest in educating more of our population at the graduate level to ensure our capacity to innovate and to secure our intellectual leadership into the future. (Wendler et al., p. iii)

The challenge is clear. Educating more of the population at the graduate level presupposes we can identify those individuals who are prepared with the potential for success at the graduate level. The high costs of graduate education, for both institutions and individuals,

demands effective, efficient, and equitable selection processes. The cost of inappropriate selection and attrition, not only in real dollars invested, but also in terms of student indebtedness and lost opportunity costs, present an ethical imperative to continue pursue improvements in the admissions process.

# Measures in Graduate & Professional School Admissions

Measures in graduate admissions vary in multiple ways. There are specific admissions tests for several professional fields and more general exams measuring skills relevant to a variety of graduate programs. There are paper-pencil exams and computer administered exams. There are multiple-choice (MC) tests and essay tests. There are tests focused on content knowledge and others measuring broadly defined skills. The major tests in graduate and professional school admissions are described briefly in terms of their purpose and newest features. Each of the exams reviewed here have undergone multiple stages of revision and continue to serve important purposes.

Kuncel and Hezlett (2007) reviewed meta-analyses on the role of standardized tests in graduate program admissions, including the tests reviewed below as well as the Pharmacy College Admissions Test and the Miller Analogies Test. They reported four consistent findings:

(i) Standardized tests are effective predictors of performance in graduate school. (ii) Both tests and undergraduate grades predict important academic outcomes beyond grades earned in graduate school. (iii) Standardized admissions tests predict most measures of student success better than prior college academic records do. (iv) The combination of tests and grades yields the most accurate predictions of success. (p. 1080)

They argued that the fact that most tests include measures of verbal, quantitative, and analytical reasoning, as well as writing, is a reflection that advanced work in most fields requires these common skills. Finally, they point out that additional factors are uniformly important, including motivation and interest, which are typically obtained through letters of recommendation, personal statements, and interviews. We lack strong objective measures of these traits.

Camara, Packman, and Wiley (2013) suggested three primary benefits to graduate admissions testing, including standardization, efficiency, and opportunity. Standardization provides a common metric on which to judge potential success of students; efficiency is achieved through simple metrics to support decision making; opportunity is gained through providing students with another means to demonstrate readiness and likelihood of success.

Camara, Packman, and Wiley (2013) also reviewed the validity evidence regarding the major admissions tests described here, and presented fairness-related evidence as well. These issues are the important ones in the context of graduate and professional school admissions, but not the focus of this paper. Here I focus on features of these measures as statements of what we hope to claim about prospective students as part of the process of identifying those that will be successful in our programs and beyond. This is essentially the interpretive argument – *What are the intended claims and uses of graduate and professional school admissions tests?* This review is largely informed by documentation from the test publishers.

In this brief review of current practice, I describe the history and current structure and relatively salient claims of four major testing programs in the arena of graduate and professional education, including the Law School Admissions Test, the Medical College Admissions Test, the Graduate Management Admissions Test, and the Graduate Record Examination General Test.

### The Law School Admissions Test (LSAT)

The use of standardized test to support admissions to law schools began at the time of the origin of large-scale standardized assessments, with the earliest forms developed in the 1920s by psychologists and published by West and the Yale Law School admissions test in the 1930s (LaPiana, 2001). These were implemented in part to provide a check on undergraduate records from diverse institutions, to provide a common denominator. These early tests focused on verbal skills. As LaPiana (2001) tells the story, in the fall of 1947, representatives of Columbia, Yale, and Harvard law schools met with the president of the College Board (then the College Entrance Examination Board), Chauncey, to discuss the development of a common law school admissions test. The first LSAT was administered in 1948. The early form of the LSAT consisted of a measure of comprehension, analogies, syllogistic reasoning and measures to identify inconsistencies and practical judgment. The current version has been in place since 1991.

Information regarding the LSAT can be found at the website of the Law School Admission Council (LSAC, 2013), where it states "the LSAT is designed to measure skills that are considered essential for success in law school: the reading and comprehension of complex texts with accuracy and insight; the organization and management of information and the ability to draw reasonable inferences from it; the ability to think critically; and the analysis and evaluation of the reasoning and arguments of others." These descriptors are consistent with the three types of MC questions of the LSAT, including Reading Comprehension, Analytical Reasoning, and Logical Reasoning. In total, the test consists of five sections of MC items, one of which is a pilot or pre-equating section. In addition, there is a 35-minute writing sample which is not scored, but sent to the law schools with the LSAT scores. It is a 3.5 hour paper-form exam. The test can be taken up to three times within a two-year period.

A quick review of the sample items available online reveals a standard set of 5-option MC questions, based on high-level reading passages, logic problems, and complex options (see http://www.lsac.org/jd/pdfs/lsatpreparationweb.pdf). In some cases, the MC options themselves are quite lengthy – including options with over 30 words. The LSAT score is a scaled score ranging from 120 to 180 based on a transformation of the number correct score. There is no correction for guessing. The LSAC states that law schools primarily consider two main factors in admitting students, including prior academic performance and the LSAT score. In addition to LSAT scores, the LSAC provides a set of criteria that could be considered by law school admissions committees, including:

- Undergraduate grade-point average
- LSAT score
- Undergraduate course of study
- Graduate work, if any
- College attended
- Improvement in grades and grade distribution
- College curricular and extracurricular activities
- Ethnic/racial background
- Individual character and personality
- Letters of recommendation/evaluations

- Writing skills
- Personal statement or essay
- Work experience or other postundergraduate experiences
- Community activities
- Motivation to study and reasons for deciding to study law
- State of residency
- Obstacles that have been overcome
- Past accomplishments and leadership
- Anything else that stands out in an application

There are many elements in this list that are not captured in the LSAT itself. This leaves room for more information collection, interpretation, and consideration. The LSAT is required as part of the admissions process for most law schools, including those that are members of the American Bar Association. However, as in most arenas of standardized testing, there are discussions of eliminating its use as an absolute requirement and some law schools have begun to reduce its role in the admissions process, in part, to help diversify the eligible applicant pool.

The LSAC is exploring the feasibility of implementing computer testing for the LSAT. This includes studies of item cloning, various item selection methods, as well as technical issues related to equating and item exposure control. Researchers have explored other issues of interest to the LSAC including assessments of first-year law student critical case reading and reasoning ability, and equity issues related to gender, ethnicity, individuals with disabilities, and national origin (see http://www.lsac.org/lsacresources/research/gr/grants-reports.asp).

# The Medical College Admissions Test (MCAT)

The use of standardized testing to support selection of potentially successful medical college students began in 1928, during a period of high rates of attrition. Bowen (n.d.) argued that much of the improvements in medical education at that time was due to the MCAT, in that it advanced the quality of applicants. The Robert C. Byrd Health Sciences Center School of Medicine (West Virginia University, 2011) provided a brief history of the MCAT, where they stated that the goal in establishing such a test was to provide a process to help identify candidates with high enough aptitude to be successful. The early form of the MCAT was called the Scholastic Aptitude Test for Medical Students. By the 1940s, it was revised and modeled similarly to the SAT, including the measurement of verbal reasoning, mathematics, science, and topics of modern society. The test has undergone a small number of revisions; its current version has been in place since 1992 and the MCAT is currently under revision (2012-2015).

The MCAT is a MC exam focusing on problem solving, critical thinking, and knowledge of science concepts. The description here is based on the information provided by the Association of American Medical Colleges (AAMC, 2013), the publishers of the MCAT. The test is currently required by most US medical schools and select medical schools in several other English speaking nations. It currently covers content in the physical and biological sciences, verbal reasoning, and associated cognitive skills (higher order reasoning items such as understanding associations, hypothesis testing, scientific reasoning, evaluation, and the incorporation of new information). The test is scored in three sections, each resulting in a score on a 15-point scale, including physical sciences, biological sciences, and verbal reasoning. There has been a writing sample section for the MCAT, but this is not being administered in 2013.

Since 2007, the test has been administered in a linear computer-based format, taking approximately 5 hours. Because of scientific advances, transformations in health care, and the ever diversifying population, the AAMC recently completed a review of the MCAT resulting in a set of recommendations now being used for the development of the MCAT<sup>2015</sup> (AAMC, 2012). The new test may take over 6 hours (Collins, 2012). Major differences include a natural sciences section reflecting contemporary medical education; a section on psychological, social, and biological foundations of behavior; and a critical analysis and reasoning skills section based on passages from the social sciences and humanities. These sections are based on big ideas in the sciences and foundational concepts in each content area, detailed in the preview guide provided by the AAMC (2012). Each item is mapped to a content area, foundational concept, and skill.

The content-related skills include (a) knowledge of scientific concepts and principles, (b) scientific reasoning and problem solving, (c) reasoning about the design and execution of research, and (d) data-based and statistical reasoning. The critical analysis and reasoning skills include (a) comprehension, (b) reasoning with the text, and (c) reasoning beyond the text. The example items in the preview guide are standard 4-option MC items; however, each is tied to a set of specifications (content area, foundational concept, and skill). The MCAT<sup>2015</sup> will contain four sections each scored on the same 15-point scale.

Finally, the MCAT has been involved in many research efforts, much of which is under review and being utilized during the current revision efforts (see https://www.aamc.org/students/applying/mcat/admissionsadvisors/research/bibliography/).

#### The Graduate Management Admissions Test (GMAT)

The Admissions Test for Graduate Study in Business was first administered in 1954, after ongoing discussions between the deans of several prominent graduate programs and test developers from Educational Testing Service (ETS). The exam was intended to test relevant skills for success in graduate business programs and provide for a reliable economic tool to support selection (GMATix, 2008). Since its inception and the change of the name of the organizing council to the Graduate Management Admissions Council (GMAC) in 1976, nearly everything about the exam has changed, although the core skills being assessed are similar. Each section has undergone change over the years, largely in response to the demands of business school preparation and degree requirements (GMATix). The changes in the quantitative, verbal and comprehension, and reasoning skills areas are detailed in the GMAT history presented by GMATix (2008). The GMAC moved the ongoing development of the GMAT from ETS to ACT and Pearson VUE in 2006 with an agreement through 2022 (ACT, 2011). This partnership led to the inclusion of a new section on integrated reasoning and enhanced security, in the Next Generation GMAT, launched in 2012.

The GMAT is a computer adaptive test, adaptive at the item level (GMAC, 2013). The testing time is approximately 3.5 hours, with four sections, including analytical writing, integrated reasoning, and quantitative and verbal reasoning. The quantitative section includes data sufficiency and problem solving. The verbal section includes comprehension, critical reasoning, and sentence correction. The 30 minute analytical writing assessment is based on the analysis of a single argument, where scoring focuses on the analytical component of the writing. The complete list of analytical writing prompts are available online. The writing response is scored by two human readers and scores are averaged.

The addition of the integrated reasoning section is the most recent change and the most innovative section, involving graphic interpretation and multi-part or table analyses. Most items require multiple responses (all presented on the same screen) and all parts of a given question must be answered correctly to receive credit. Some items require manipulation of the data presented, such as the table analysis items that require the test taker to sort the data given some feature of the table in order to meet certain conditions. The multi-source reasoning items require the test taker to review multiple sources of data and determine which data are relevant for a specific problem (see http://www.gmac.com/why-gmac/gmac-news/gmnews/2011/august/next-generation-gmat-multi-source-reasoning.aspx).

The GMAC (2013) provides guidance on using GMAT scores, including to (a) avoid using a cutoff score, (b) not compare GMAT scores with scores on other tests, (c) use percentiles for comparing candidates, and (d) consider candidate characteristics that might affect performance (e.g., educational disadvantage and limited English proficiency). They encourage institutions to consider participating in the GMAT free validity study service to understand the relevance of GMAT use in local programs. In addition, the GMAC suggests that programs use multiple admissions criteria, including test scores in conjunction with academic skills, motivation, creativity, and interpersonal skills.

The GMAT is required by over 1900 business schools and administered to over 260,000 test takers a year (Camara, Packman, & Wiley, 2013). It has been the only test in this arena until recently, when ETS began marketing the GRE as a viable alternative (Jaschik, 2008). ETS (2013a) argues that the GRE potentially expands the applicant pool with a larger and more diverse test-taking population, measures similar skills in verbal and quantitative reasoning and analytical writing, and provides additional services such as the GRE Search Service (providing access to recruit qualified candidates with specific characteristics and score levels) and the GRE comparison tool containing a concordance table for GRE and GMAT scores (introduced in 2008). Since the GRE-Business campaign began a few years ago, over 1000 business schools accept the GRE as an alternative to the GMAT.

### The Graduate Record Examination General Test (GRE)

The GRE revised general test has been in operational administration since August 2011. It represents a moderate shift in construct and administration mode from the previous version. Several purposes were posited for the revision of the GRE general test, including the need to renorm and recenter the scale, update the constructs of verbal and quantitative reasoning, and revisit the current item-adaptive administration platform, as well as consider issues related to test security. The initial scales were defined in 1941, based on the standardization group of first-year graduate men in four eastern universities. These early verbal and quantitative scores were obtained from what was referred to as the Profile Tests (Shultz & Angoff, 1956). In 1949, the combined Aptitude Test was introduced. In 1952, Shultz and Angoff lead the effort to establish new scales based on 2095 examinees in 11 colleges (believed to be representative of the students taking the Aptitude test at the time) who took the Aptitude test and subject tests (then called Advanced major tests). This new scale was launched in 1952 and continued until 2011. As Golub-Smith (n.d.; approximately 2008) reported, since 1952, several important changes had occurred to the GRE general test including changes in item types, test length and timing, moving from formula-scoring to number-correct scoring, changes in statistical specifications, and the move to computer-adaptive testing in 1993. In addition, the population of students seeking admissions to graduate programs had become quite more diverse and international.

The GRE revised general test includes three measures: verbal reasoning, quantitative reasoning, and analytical writing. The GRE program also includes a series of subject-specific tests that have been shown to be highly predictive of subject-matter achievement in associated fields, but are beyond the focus of this discussion (see http://www.ets.org/gre for more information). The GRE revised general test (ETS, 2013b) is designed to be more closely aligned with the skills needed to be successful in contemporary graduate school programs and includes enhancements improving the test experience. The test moved from the item-adaptive format to a two-stage adaptive test, allowing students to change answers within each section before submitting responses. The test administration platform has several tools to support test takers, including an item flag to support identifying items needing review and an on-screen calculator

for some quantitative items. In the verbal reasoning section, antonyms and analogies have been replaced with richer verbal reasoning tasks, where the understanding of words, phrases, and passages is in context. The quantitative reasoning measure has been enhanced with additional forms of understanding quantitative information through data displays and mathematical models. The analytical writing measure requires two focused writing samples that present cogent analyses of an issue and an argument – all writing prompts are provided online. The written responses are currently scored by two human raters and scores are averaged. There is an effort underway to implement the previous practice of employing e-rater (see \*\*\*) as a reliability check on a single human rater, where discrepancies would be resolved by a second human rater when needed – in all cases, the resulting scores are based on the human rater(s) only.

New item formats have also been adopted in the verbal and quantitative reasoning sections. In the verbal section, some MC questions have more than a single correct option and all must be selected to respond correctly to the item. There are also select-in-passage items, requiring the test taker to click on the sentence that serves a given purpose in the passage. The quantitative section includes new MC items that might also require more than one correct option and numeric entry questions (constructed-response). In both sections, MC items may have three options or more, depending on the demands of the item.

The well-known ETS score scale of 200-800 was dropped to adopt a new scale of 130-170 in 1-point increments; the analytical writing scores go from 0-6 in half-point increments. This was done to be consistent with the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999), to avoid inappropriate inferences and comparisons to the previous constructs. The GRE is used by admissions and fellowship committees to support selection for graduate-level program admissions. ETS (2013c) recently released a summary of individuals who took the GRE revised general test during the first 11 months of administration. This included nearly 470,000 individuals who elected to take the GRE, of which about 68% were US citizens.

At the GRE website, ETS (2013d) specifies guidelines for score use, including to (a) use multiple criteria, (b) accept official GRE score reports only, (c) conduct local validity studies where possible, (d) maintain confidentiality, (e) consider the three separate scores as independent measures, (f) avoid decisions based on small score differences, (g) use appropriate percentile ranks to support candidate comparisons, and (f) transition to the new score scales rather than convert new scale scores back to the previous scales (concordance tables are provided). For most of these guidelines, tools are provided to support appropriate score use. They also list two primary limitations of the GRE:

- 1. It does not and cannot measure all the qualities that are important in predicting success in graduate study or in confirming undergraduate achievement.
- 2. It is an inexact measure; consequently, the standard error of measurement of the difference between test scores can serve as a reliable indication of real differences in applicants' academic knowledge and developed abilities.

The GRE program suggests that test scores should be used in conjunction with course grades, letters of recommendation, personal statements, samples of academic work, and professional experience (ETS, 2008); in addition, they suggest considering factors that may affect GRE performance, such as gender, race/ethnicity, age, first-generation-college status, and undergraduate performance.

# A Look across Measures: Common Purpose, Constructs, & Uses

At first glance, there are more common aspects than unique features across measures. First, the uniform purpose across measures is salient: to measure skills considered essential for success. However, the language differs slightly, from the notion of essential to prerequisite to relevant to needed:

- LSAT: to measure skills *considered essential* for success in law school.
- MCAT: to assess skills *prerequisite to the study* of medicine.
- GMAT: to measure skills *relevant for success* and to support selection.
- GRE: to measure skills *needed to succeed* and distinguish candidates.

Each test publisher also makes claims regarding the ability of the test scores to distinguish candidates and provides references to validity-related evidence to support admissions decisions.

Most measures are largely composed of MC items. Verbal skill is a primary and core concern in all areas of graduate and professional education. Analytical reasoning is also a common focus, although conceptualized somewhat differently by program area. From there we begin to see important differences. In the LSAT, logical reasoning is added; in the MCAT, content knowledge is relevant; in the GMAT, a new section on integrated reasoning was recently included in response to input from management school deans; and both the GMAT and GRE include a section on quantitative reasoning (see Table 1).

| Skill Sets across Admissions Measures of Graduate & Professional Schools |                                      |                                 |                        |                        |
|--|--------------------------------------|---------------------------------|------------------------|------------------------|
| Construct  | LSAT                                 | MCAT                            | GMAT                   | GRE                    |
| Verbal   | Reading comprehension                | Critical analysis and reasoning | Verbal reasoning       | Verbal reasoning       |
| Analytical   | Analytical<br>reasoning &<br>Writing |                                 | Analytical<br>writing  | Analytical<br>writing  |
| Quantitative   |                                      |                                 | Quantitative reasoning | Quantitative reasoning |
| OTHER unique   | Logical                              | Content                         | Integrated             |                        |
| skills:  | reasoning                            | knowledge                       | reasoning              |                        |

Table 1

Skill Sets across Admissions Measures of Graduate & Professional Schools

In addition, another strong common feature of these measures is the guidance provided to test score users. In all four cases, score use guidance strongly recommends (a) the use of official scores only (not self-reported scores), (b) the inclusion of other factors in the admissions decisions (many of which are suggested by the test publishers), and (c) the use of holistic review – using all relevant information in the admissions file to make selection decisions.

The core commonalities among these measures, the validity evidence gathered within each program and from across research efforts reported in meta-analyses, and the long-term and continuing use of these measures in the field speak loudly to their appropriateness, usefulness, and meaningfulness. They will continue to serve their important role for many years to come, but we also need to acknowledge the need for additional information to improve selection of students who will persist, make timely progress, and be successful.

# What We Need to Support & Enhance Admissions in Graduate & Professional Programs

The admissions testing programs described above uniformly recognize that the best use of standardized testing in the selection process is in conjunction with other available information in a candidate's admission file. We refer to this practice as *holistic review* – considering all relevant information available about the preparation and likely success of a candidate. The core components of these measures have stood the test of time, in use for half a century or more. Consistent with Kuncel and Hezlett (2007), some of these programs are pursuing the identification and development of additional standardized tools to support their programs, many of which fall under the umbrella term: *non-cognitive skills*. Such skills include motivation, engagement, persistence, teamwork, critical thinking, and many others – all of which have "cognitive" components, but are substantially different than specific content-related knowledge and skills. New tools are continually being developed and assessed, including two currently in use (and under continued development): LikeLive and the Personal Potential Index.

### LikeLive

LikeLive (2012) is a relatively new resource, recently acquired by ETS to expand their ability to provide innovative tools for educational institutions in the selection process and beyond (with important employment applications as well). The system is an online tool to conduct asynchronous interviews that are recorded and can be viewed when needed. The institution (e.g., admissions personnel) creates a standard set of questions (or sets of optional questions), candidates logon and answer the questions via video (with the option of limited repeats), and the admissions personnel can then review and annotate video submissions. Questions for the interview can be provided ahead of time or at the time the candidate logs onto the system. LikeLive suggests that the tool could be used for general admissions, scholarship selection, teaching assistant selection, and for other similar purposes. They suggest that among its benefits is to "add a personal dimension in determining candidate 'fit' or 'match' for school or program" (http://college.likelive.com/UnAuth/Pages/Benefits.aspx). It could be particularly useful for interviewing international students and replace costly and time consuming phone interviews. As long as the candidate uses a computer with a video camera, the interview can be completed anywhere. In the world of employment recruitment and hiring, LikeLive has important and promising benefits as well.

#### **Personal Potential Index**

The ETS Personal Potential Index (PPI; ETS, 2013e) was introduced as a standardized tool to supplement letters of recommendation. In graduate admissions, we recognize that not all individuals asked to write letters of recommendation know what characteristics to address or what to include or how to describe the factors that may lead to graduate and professional school success. The PPI is a web-based tool offered to individuals who have registered for the GRE, comprised of rating scales for six evidence-based attributes essential for graduate study,

including knowledge and creativity, resilience, communication skills, planning and organization, teamwork, and ethics and integrity. At the time of registration, the applicant invites individuals, ideally the writers of letters of recommendation, to complete the PPI on their behalf. This tool could be completed by multiple sources for a given candidate, where ratings are combined and summarized, including written commentary. The PPI system has the capacity to evaluate the ratings from given raters, providing normative information about the individuals whom they rate. ETS continues to conduct validity research on the meaning and use of the PPI scores.

### A Glimpse into the Future

We will continue to see research and development of so-called noncognitive measures. Many of these measures are being developed and evaluated by the organizations managing the testing programs described here. But there are others involved in such research. Having worked with several agencies and organizations involved in the development of noncognitive measures, I encourage readers to watch for new research efforts underway through projects funded by the Institute of Education Sciences (IES, 2013) and the Armed Services Vocational Aptitude Battery (ASVAB) program. The IES educational research program has funded a small number of projects investigating the development of assessment tools and programs related to success in higher education (see http://ies.ed.gov/funding/grantsearch/index.asp). The history of military testing is rich, including the Army Alpha and Army Beta tests, the first group-administered standardized tests measuring aptitudes for military service screening in 1917 (see http://officialasvab.com/). The ASVAB, introduced in 1968, includes subtests of school-related subject matter knowledge, as well as measures of knowledge and skills related to electronics information, auto and shop information, mechanical comprehension, and assembling objects. Various units of the military employ additional measures tapping into important characteristics related to successful selection, placement, and retention of personnel. In addition, the GRE Board continues to encourage ETS and the GRE program to investigate noncognitive measures and has recently funded research and development efforts to pursue new tools to support the identification and selection of candidates for graduate and professional educational programs, providing for new constructs to support holistic review of graduate and professional school candidates (see http://www.ets.org/gre/research).

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