

# Evaluation of the Armed Services Vocation Aptitude Battery (ASVAB)

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Psychological testing has been used in several industries since the 19<sup>th</sup> century. At this time, over 100,000 tests are being produced annually with no signs of slowing down. The Armed Services Vocation Aptitude Battery, or ASVAB, was produced by and promptly distributed by the Department of Defense (DOD) to promote career exploration. Currently, over one million men and women each year take this test to determine their career choice. The ASVAB is designed using the Item Response Theory (IRT) and can be taken by pencil and paper or on the computer. Scoring is calculated using a standard and weighted score. Research shows this examination to be highly reliable and valid, after previous errors had been corrected. Many recruiters say the ASVAB is a crucial tool for recruitment and would lose over half of their recruits if it was ever discontinued. Weaknesses of the exam include lack of parental consent, possible self-doubt, and elimination of postsecondary attendance. Further studies are needed to determine the exact negative repercussions. Errors notwithstanding, the ASVAB is a solid examination with proven successful track record. Future endeavors in this exam should only address the two issues previously stated.

## INTRODUCTION

Psychological testing has been used since the 19<sup>th</sup> century and has evolved to over 100,000 tests being produced every year as of 2010 (Cohen & Swerdlik, 2010). Not only has the psychological community benefited from this massive production, but the private businesses, military and educational systems have also benefited. Each test produced is developed for use within a specific population to determine a specific or general attribute. The Armed Services Vocation Aptitude Battery (ASVAB) created by the Department of Defense (DOD) is no exception.

The DOD began offering eleventh and twelfth grade high school students the chance to take the ASVAB free of charge to promote career exploration in 1968 (Laurence *et al.*, 1998). This was also an aim to improve recruitment procedures in place at the time. The goal of the test, besides recruitment, was to inform students of the possible positions that they would be qualified for in the armed services. It wasn't until the 1985-1986 school year that tenth graders were allowed to take the examination, thus promoting greater recruitment as information was supplied for three years versus two (Laurence *et al.*, 1998). By 1976, all branches of the military adopted the ASVAB to determine eligibility of recruits, selection of occupation, and classification of specialties for enlisted personnel. As of today, this test is used to determine the career choices for over 1.3 million men and women every year across the United States (Sperl *et al.*, 1992).

## TEST CONSTRUCTION AND ADMINISTRATION

The current version of the ASVAB being used was created in 2002 as a cooperative endeavor between the DOD and the nation's schools (Baker, 2002). The ASVAB design is based on the Item Response Theory (IRT) model which focuses on the responses given by examinees on each *item* of the test versus the overarching test-level focus commonly used in the classical test theory (Kolen *et al.* 1996). The current edition contains nine sections designed to test applicants on areas from mathematics, English, spatial, and technical subjects. This newer version also includes information for students not considering enlistment like postsecondary school information, career exploration, and career choices in general.

Another aspect of the ASVAB is the Armed Forces Qualification Test (AFQT) which is computed using the scores from four ASVAB subtests: Arithmetic Reasoning, Mathematics Knowledge, Paragraph Comprehension, and Word Knowledge. This score is reported as a percentile between 1 and 99. These four areas are used to determine the overall ASVAB score and initial eligibility of applications to the armed forces. The AFQT can also help determine military career placement and suitability.

The ASVAB is conducted at the Military Entrance Processing Station, also known as MEPS. Currently, there are over 65 MEPS locations across the United States and Puerto Rico (USMEPCOM, 2011) so they can accommodate as many people as possible. For those wishing to join the military that are not close to any MEPS location, they can request to take the exam at Military Entrance Test (MET) sites which are often located in Federal government office buildings, National Guard armories, or Reserve centers. To take the exam, the testtaker must provide current state identification and be on time as start time is strictly monitored. Any person that arrives late will be turned away (Riebs & Reeves, 2005).

MET sites use a paper-and-pencil format which takes approximately three to four hours to complete, including administrative tasks and instructions. The answers are then sent

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Subtest	Acronym	Test Material	# of items	Time Limit (min)
Word Knowledge	WK	Meaning of selected words	35	11
Arithmetic Reasoning	AR	Reasoning required to perform arithmetic processes	30	36
Mechanical Comprehension	MC	Understanding and application of various mechanical principles	25	19
Automotive & Shop Information	AS	Knowledge and familiarity with tools and shop practices	25	11
Electronics Information	EI	Identification or application of simple electric or electronics knowledge	20	9
Mathematics Knowledge	MK	Application of learned mathematics principles	25	24
General Science	GS	Knowledge of or about physical, chemical, and life properties	25	11
Paragraph Comprehension	PC	Understanding of written material from brief paragraphs	15	13
Assembling Objects	AO	Basic construction concepts and principles	25	15
<b>Total</b>			<b>225</b>	<b>149</b>

Table 1. Armed Forces Qualification Test, paper-and-pencil version.

to a MEPS center for scanning and scoring. Results will be forwarded to recruiters within ten days of completion for review. However, the AFQT is usually calculated immediately upon completion of the exam and sent to recruiters within 24 hours. The subtest and corresponding subtest item information for the paper-and-pencil version are included in Table 1.

Unlike the MET sites, MEPS administers the exam through a computer program called the CAT-ASVAB. This is an adaptive test that is completed at the testtakers own pace. While there are time limits imposed on each subset, examinees usually complete each section well ahead of time expiring (Riebs & Reeves, 2005). On average, with administrative tasks and instructions, the CAT-ASVAB only takes, on average, about 1 ½ hours to complete. The subtest and subtest item information for the CAT-ASVAB is included in Table 2. Unlike paper-and-pencil examinations, a testtaker cannot review or change their response once an answer has been submitted. However, this test will be scored immediately after the test session and is available within 4 hours to the recruiter (Riebs & Reeves, 2005).

**SCORING**

Scoring the ASVAB is quite complicated and takes a bit of mathematics to complete. First off, only the AFQT score is used as the overall ASVAB score as stated earlier. To calculate this raw score, the testtaker must compute their Verbal Expression (VE) score, which is the scaled score of Word Knowledge (WK) added to Paragraph Comprehension (PC) (see Tables 1 & 2). This score is then added to the Arithmetic Reasoning (AR) and Mathematics Knowledge (MK) score. Then they must compare their score to the standard chart. The AFQT raw score is computed with the formula (Segal *et al.*, 1997):

$$AFQT = 2VE + AR + MK$$

Unfortunately, the AR and MK scores shown on the ASVAB Score Sheet are not the values used to determine the testtaker's raw score. This is because the values shown indicate the amount of correct responses, which is used for job qualifications. But the military uses a weighted score for these subtests, assigning higher points to difficult questions and lower points to easy questions (Segal *et al.* 1997). Unfortunately, these weighted scores are not shown on the score card and there is no way to retrieve the information from the DOD. After calculating the raw AFQT score, the results are compared to a standardized chart to determine a testtakers overall ASVAB percentile score (available through the website listed under references).

**TECHNICAL EVALUATION**

According to research done by Avila *et al.* (2011), the reliability of the ASVAB is extremely high with alternate-form reliability coefficients between .93 and .94 for composite scores. They have also examined the test-retest reliability and found that to be highly correlated as well. Previous versions of the exam have had significant differences in reliability, especially the set used in the late 1980s. This set required testtakers to complete their responses in brackets which did not have to be filled in completely allowing for faster response times. Ree and Wagner (1990) believed these response sets led to inflated results so they conducted an experiment on over 500 male Air Force recruits to determine if different testing formats could influence the results of the test. Variations in the format of the answer sheet accounted for almost all the significant differences in test scores (Ree & Wegner, 1990). Even though the forms were identical in content, the layout differed dramatically resulting in lower

Subtest	Acronym	Test Material	# of items	Time Limit (min)
Word Knowledge	WK	Meaning of selected words	16	8
Arithmetic Reasoning	AR	Reasoning required to perform arithmetic processes	16	39
Mechanical Comprehension	MC	Understanding and application of various mechanical principles	11	6
Automotive & Shop Information	AS	Knowledge and familiarity with tools and shop practices	11	7
Electronics Information	EI	Identification or application of simple electric or electronics knowledge	16	8
Mathematics Knowledge	MK	Application of learned mathematics principles	16	20
General Science	GS	Knowledge of or about physical, chemical, and life properties	16	8
Paragraph Comprehension	PC	Understanding of written material from brief paragraphs	11	22
Assembling Objects	AO	Basic construction concepts and principles	16	16
<b>Total</b>			<b>129</b>	<b>134</b>

Table 2. Armed Forces Qualification Test, CAT-ASVAB version.

scores. Because of this study, ASVAB books are now a set format consisting of “bubble in” answer grids which are graded through a computer scanning program.

Across MEPS centers, the exam is now administered through a computer program designated CAT-ASVAB. This is an intuitive test much like the current GRE which examines several difficulty levels. Because of the intuitive testing, the ASVAB has become a more reliable measure of testtakers candidacy for employment in the armed services. For example, Moreno *et al.* (1984) concluded that "CAT can achieve the same measurement precision as a conventional test, with half the number of items." Cudeck (1984) claims CAT testing could and should become the future replacement for conventional testing due to the high correlation between results (> 0.97 correlation).

Validity can be established through good test construction methodology and correlations to current subtests, in this case a high correlation to the General Aptitude Test Battery (GATB) and the Differential Aptitude Tests (DAT). According to Palmer and Busciglio (1994), one of the “greatest threats to the long-term validity of any aptitude test is the possibility of confounding true ability with differential practice and coaching effects.” Studies have shown that with increased practice testing on spatial and psychomotor items, subjects scored significantly higher than those in the control group (Palmer & Busciglio, 1994). However, only small gains were achieved when coached on verbal and mathematical items. Since there are over a dozen study manuals, and what students commonly refer to as "cheat guides," for the current ASVAB, not including all the books and manuals for past editions, the likelihood of informal coaching is high among testtakers.

A formal study surveyed a sample of testtakers upon completion of the ASVAB and found that over a quarter of all subjects received some type of coaching with over half of them

receiving coaching from a recruiter (Palmer & Busciglio, 1994). Offering coaching to recruits is common practice among recruiters. They typically provide information to testtakers about what items are on the exams, provide hints on how to solve problems, and offer reference material like practice exams. Regardless of the amount of coaching offered, however, the validity of the test is not affected by the results. As with other standardized tests, those testtakers that have prepared and studied the test material will score higher than those who have not.

Other studies have also confirmed the high validity of the ASVAB based on a broad range of observed validities (Avila *et al.*, 2011). While the test is not predictive for civilian jobs, it is valid for predicting success in military careers. The composite test scores of military training grades are significantly correlated with eventual job performance and remain positive over an extended length of time (Avila *et al.*, 2011). This shows that applicants who do pursue an armed forces career will typically perform their job better than someone obtaining a civilian position, mainly because they will be better matched based upon their skill level in a military career.

#### STRENGTHS AND WEAKNESSES

The Army, Navy, and Marine Corps designated strong recruitment as a result of the ASVAB promotion and examination, with a steady lead base ranging from 17% to 19% (Laurence *et al.*, 1998). The Air Force, on the other hand, indicated that more than ¼ of their new recruits were contracted through the ASVAB program. Even with a relatively stable recruitment base from this test, over a third of all recruiters stated they did not receive proper training on marketing the examination to students nationwide. This lack of training could indicate why the recruitment rate is so low on such a nationwide initiative. Even so, over 70% of recruiters said their recruiting

numbers would fall dramatically if this program was ever discontinued (Laurence *et al.*, 1998).

Approximately three quarters of both male and female participants in the ASVAB program become interested because they wish to engage in career exploration (Baker, 2002). The other quarter does not see how this examination would be relevant to their career goals or simply has no wish to participate. Several important strengths of this test help students make gains in areas of self-knowledge, occupational knowledge, and learning how to make the two coexist (Baker, 2002). Unfortunately, this is also a weakness because some students may feel that their career aptitude is equivalent to what the ASVAB scores them at; therefore, they may not attempt undergraduate studies or any type of postsecondary training in general. This "occupational assessment" may seem like they only option they have based on how they have scored.

Likewise, students that were considering armed services to help pay for postsecondary education may find they are ineligible for enlistment. Several students felt that if they couldn't get past the "simple ASVAB, how could [they] make it in college?" (Baker, 2002). In these instances, this test could cause a drop in postsecondary attendance and career ambitions. However, there have not been significant studies focused on the latter example; this is a scenario examined but not explored at this time.

One final consideration is regarding the lack of parental consent for students to take this test. Typically, schools are allowed to administer the exam in place of MEPS or MET centers when enrollment rates are high enough. However, since the school is not required to gain parental consent, students may

be subjected to the examination regardless of whether they considered a future in the military or not. Likewise, once the results are released, students may receive unsolicited phone calls, letters, emails, and messages from recruiters attempting to recruit them. Future endeavors should attempt to correct this situation by allowing parents a voice in the process or waiting until the student reaches age of consent.

### CONCLUSION

At this time, the DOD will continue to administer the ASVAB to high school sophomores, juniors, and seniors unless a better model is developed. However, due to the extremely high reliability and validity of this examination, psychologists are not likely to promote a change in the near future. In the meantime, steps should be taken to address the lack of parental consent as well as ensuring a detailed informed consent for testtakers. This will help ensure students understand the implications and future actions resulting from completing this voluntary exam. Additional literature provided to the school should be offered to students as well, including recruitment and statistical data regarding their demographic. Other than the two major issues previously address, the ASVAB is a solid examination that has stood the test of time and will hopefully continue to do so.

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