Validity Results for the Marine Corps Job Performance Measurement Project

by

Paul W. Mayberry
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The Marine Corps is in the process of conducting a long-term research effort to validate the Armed Services Vocational Aptitude Battery (ASVAB) against measures of job performance. Recently, testing for the infantry occupational field was completed. This paper examines three aspects of the Marine Corps validation research effort that may have implications for Marine Corps manpower issues:

- Validity of the ASVAB in the prediction of job performance
- Differential validity of ASVAB aptitude composites in the prediction of job performance across infantry occupational specialties
- Interaction of aptitude and experience in the prediction of job performance.

ASVAB Validity

The Marine Corps initially selected the infantry occupational field because it is the largest and is often the most controversial in terms of establishing prerequisite aptitude requirements. In total, over 2500 Marines were tested in five military occupational specialties (MOSs). The findings for each MOS were particularly noteworthy – ASVAB was found to be highly valid as a predictor of hands-on performance. Validity coefficients for the prediction of hands-on performance by the General Technical (GT) aptitude composite ranged from 0.48 to 0.68, see table 1. Such results contradict the common belief that anyone can function as an infantryman; in fact, aptitude is very relevant to the successful performance of infantry job requirements. These findings strongly support the continued use of ASVAB in the selection and classification of recruits.

A second significant outcome relates to the second-term unit leaders. The magnitude of the validity coefficient for this group also indicates the robust ability of aptitude to predict second-term performance. Again, those individuals in the second-term with higher aptitudes tend to become better performers. This outcome has significant implications for the types of individuals that the Marine Corps should recruit so as to be able to maintain qualified personnel in future years to man its leadership positions.
TABLE 1
VALIDITY OF ASVAB IN PREDICTING
HANDS-ON PERFORMANCE

<table>
<thead>
<tr>
<th>MOS</th>
<th>GT Validity</th>
<th>AFQT Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample</td>
<td>Corrected</td>
</tr>
<tr>
<td>0311 Rifleman</td>
<td>0.47</td>
<td>0.62</td>
</tr>
<tr>
<td>0331 Machinegunner</td>
<td>0.50</td>
<td>0.68</td>
</tr>
<tr>
<td>0341 Mortarman</td>
<td>0.42</td>
<td>0.48</td>
</tr>
<tr>
<td>0351 Assaultman</td>
<td>0.41</td>
<td>0.50</td>
</tr>
<tr>
<td>0369 Second-term unit leader</td>
<td>0.48</td>
<td>0.60</td>
</tr>
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</table>

Differential Validity of ASVAB Aptitude Composites

The ASVAB is composed of 10 subtests which the Marine Corps combines into 4 aptitude composites that are used to classify recruits into occupational specialties. The extent to which these composites can differentially predict performance across all Marine Corps jobs is paramount to the use of ASVAB and the proper allocation of personnel into areas for which they have the greatest potential to perform.

The four Marine Corps aptitude composites are: general technical (GT), mechanical maintenance (MM), electronics repair (EL), and clerical/administrative (CL). (Although the AFQT is also an aptitude composite, it is not explicitly used by the Marine Corps for selection and classification purposes; rather, it is a quality indicator used for tracking trends in accessions.) The GT composite is used for classification of recruits into infantry specialties.

Figure 1 plots the corrected validities for each infantry specialty by each of the aptitude composites. Despite the relatively high magnitude of these validities, the MM composite is a better predictor of infantry performance, particularly for the rifleman (0311) and mortarman (0341) specialties. The EL composite is comparable to MM for the machinegunners (0331) and assaultmen (0351). In all cases, the CL composite is substantially lower, implying that it is only a mediocre predictor of infantry performance. These results provide empirical support for differential validity.
by aptitude composite and even slight differentiation across specialties. Also, the findings indicate that the Marine Corps could significantly benefit by using MM to classify recruits into the infantry specialties. However, before implementing such findings, additional investigation is required to determine if any possible unacceptable implications would result.

In addition to the hands-on performance tests, the Marine Corps also administered a written job knowledge test (JKT). This test was parallel in content to the hands-on tests but administered in paper-and-pencil form. Using the JKT as the performance criterion resulted in higher overall validities, primarily due to the common testing medium (i.e., both the ASVAB and JKT are written tests). The validities of the aptitude composites against the JKT scores are shown in figure 2. It is interesting to note the lack of differential validity by the four aptitude composites using JKT as the performance criterion. Contrasted to the findings for the hands-on test, the MM composite is now the worse composite for three specialties and CL predicts infantry performance almost as well as the other composites. Given that the ASVAB has historically been validated against training grades and that training grades are based on tests similar to the JKT, it is not surprising that researchers have found the ASVAB to have limited differential predictive validity. Hands-on performance has been defined by the Joint Service Job Performance Measurement (JPM) Working Group as the benchmark performance criterion against which the ASVAB should be validated. These findings demonstrate that indeed the ASVAB does have differential validity against a high fidelity performance measure.

Interaction of Aptitude and Hands-on Performance

The relationship between hands-on performance tests and job experience is important for establishing the measurement validity of hands-on tests. The expectation is that hands-on test performance should increase with experience as job incumbents acquire higher levels of proficiency through on-the-job training and more advanced instruction. Also, to the extent that aptitude is a valid predictor of performance, personnel with high aptitude should out-perform their counterparts with low aptitude. The interesting question involves the interaction of both of these variables and the prediction of performance: do high and low aptitude individuals differ in their performance across all levels of experience or can experience compensate for lower aptitude? The Marine Corps infantry project examined this aptitude-experience interaction by investigating three “indicators” of experience: time in service, pay grade, and recency of task performance.

Figure 3 plots the mean hands-on performance for both high and low AFQT personnel (I-IIIA versus IIIB-IV) at various time-in-service intervals for the four first-term infantry specialties. The results indicate that performance differences
between high and low AFQT individuals were generally large for inexperienced personnel, but that these performance differences tend to lessen as time in service increases. The trend towards decreasing performance differences over time in service has been found in the Marine Corps initial JPM study and by some of the other Services as well. The finding has typically been explained by either a ceiling effect on the test or that higher aptitude personnel are promoted to supervisor positions and no longer perform the tasks on which they were tested. Neither of these explanations appear reasonable given the Marine Corps investigation of the other two indicators of experience. In addition, the Marine Corps specifically designed its tests so that examinees were tested on job requirements beyond their level of responsibility so as to preclude the possibility of a ceiling effect.

When examining the performance differences between high and low aptitude personnel using pay grade as the experience measure, such leveling-off trends are nonexistent. Figure 4 illustrates this continuously improving performance trend. The performance of Marines in pay grades E4-E5 is superior to Marines in pay grades E3 and E1-E2, and high aptitude personnel are always better performers than low aptitude personnel. Thus, it is evident that the Marine Corps promotion system is properly advancing its higher performers. It appears that the time-in-service definition of experience is contaminated at high levels by low performing personnel who have not been promoted to the ranks that would be consistent with their time in service.

The final indicator of experience – recency of task performance – has possible implications for addressing the interaction of aptitude and frequency of training. Is training able to compensate for lower aptitude in the prediction of job performance? Loosely translating training as the recency of task performance, figure 5 shows the tradeoffs between aptitude and performance recency. Given comparable levels of recency of task performance, high aptitude personnel always significantly outperform low aptitude personnel. In fact, low aptitude persons with recent task performance (less than six months) are comparable to high aptitude persons who have only limited task performance (greater than six months). The same is true for low aptitude persons with limited task performance being comparable to high aptitude persons with only task instruction but no opportunity to perform the task. Such findings speak strongly to the need for high quality personnel because training or refresher task performance is not always possible in time of conflict.
Fig. 1: Corrected validities of hands-on total score and aptitude composite score by MOS.

Fig. 2: Corrected validities of job knowledge test and aptitude composite score by MOS.
FIG. 3: MEAN HOPT SCORES BY AFQT AND TIME IN SERVICE FOR INFANTRY RIFLEMAN

FIG. 4: MEAN HOPT SCORES BY AFQT AND PAY GRADE FOR INFANTRY RIFLEMAN
FIG. 5: MEAN HOPT SCORES BY AFQT AND RECENCY OF TASK PERFORMANCE
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