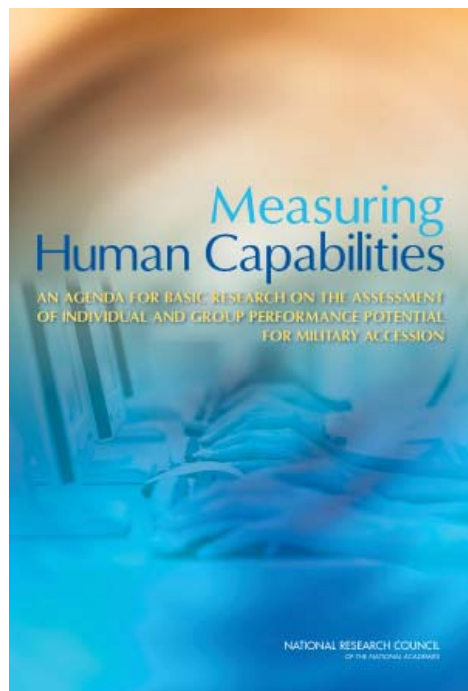


REPORT BRIEF

MEASURING HUMAN CAPABILITIES: AN AGENDA FOR BASIC RESEARCH ON THE ASSESSMENT OF INDIVIDUAL AND GROUP PERFORMANCE POTENTIAL FOR MILITARY ACCESSION



Selecting U.S. military enlisted recruits who do not succeed, for any number of reasons, comes at great expense in time and money invested in each recruit, in critical job vacancies, and ultimately in force readiness. The military's accession system is a carefully designed, selective process in which potential recruits are assessed through formal tests of cognitive knowledge, skill, and ability; recently developed tests of personality; and assessments of moral character and physical and medical readiness to serve. In many aspects, the process of selection and assignment is highly effective, but future assessments of performance potential may be entirely different from those used today, in what is assessed and in how it is assessed. What if future assessments could predict individual and group success in the U.S. Army with greater accuracy, allowing the military to screen in soldiers who will be highly satisfied with the Army experience in general and their occupational specialty in particular? What if the selection process could reduce subsequent challenges to unit success that result from soldiers with low motivation or other problem behaviors?

What if attrition rates before completion of service commitment could be reduced? While the military is a unique employer in many ways—for example, in its accession system, occupational and unit assignment process, and service commitment—it also shares many of the same interests as other organizations who seek to attract, select, and retain the best individuals into the fields and jobs in which they succeed. While criteria for selection should reflect the particular organization's values, the interests underlying these criteria are often cross-cutting.

In a new report, *Measuring Human Capabilities: An Agenda for Basic Research on the Assessment of Individual and Group Performance Potential for Military Accession* (2015), an expert committee of the National Research Council recommends a basic research agenda for the U.S. Army Research Institute for the Behavioral and Social Sciences to undertake to maximize the efficiency, accuracy, and effective use of human capability measurement in the military's process for selecting soldiers and assigning occupational specialties. Much of the committee's data gathering in support of this report was conducted during a public workshop held in April 2013,

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the presentations and discussions of which are summarized in a prior publication, *New Directions in Assessing Performance Potential of Individuals and Groups: Workshop Summary* (2013).

PERSONNEL SELECTION CRITERIA

Measures of individual difference that predict job performance can be subdivided into “can do” and “will do” predictors. The Armed Services Vocational Aptitude Battery (ASVAB) is a cognitive, knowledge, skill, and ability battery that focuses on “can do” skills. The ASVAB has documented accuracy for predicting enlistees’ technical performance following appropriate job-specific training. Recently, the ASVAB has been supplemented by the Tailored Adaptive Personality Assessment System (TAPAS), administered to certain military service candidates to assess “will do” personality attributes important for predicting job performance and risk of attrition. ASVAB and TAPAS are strong measures of the ability and personality domains they measure, but they do not predict outcomes of interest perfectly, nor do they predict all outcomes of importance to the military’s organizational values and missions. It is possible that by expanding or modifying its personnel selection criteria, the Army could improve the predictive accuracy of the selection process for enlisted service members.

A RESEARCH AGENDA TO IMPROVE SELECTION SYSTEMS

In this report, the committee recommends a basic research agenda to supplement the Army’s current enlisted soldier accession system with additional predictors of individual and collective performance that have the potential to improve the already-high quality of accession decisions. The topics included were carefully considered within a number of constraints, such as the need for pre-accession mass administration in a cost-effective manner. The committee focused on immediate research opportunities with high near-term payoff, but also considered research areas where future technological developments could significantly change the feasibility of operational use in the long term. The research agenda includes the identification and measurement of new predictor constructs (the attribute label attached to a measure, such as arithmetic

reasoning), the identification and prediction of new outcomes (e.g., teamwork behavior), and methods and methodology for assessing individual differences.

IDENTIFICATION AND MEASUREMENT OF NEW PREDICTOR CONSTRUCTS

Fluid Intelligence, Working Memory Capacity, Executive Attention, and Inhibitory Control. Successful job performance requires abilities in reasoning and problem solving that are not adequately assessed by crystallized intelligence tests of learned and acquired skills. The psychological, cognitive, and neurobiological mechanisms underlying fluid intelligence, working memory capacity, executive attention, and inhibitory control contribute to demonstrated emotional, behavioral, and impulse control important for success in many jobs. While the importance of individual differences in these constructs is known to impact job performance, research is needed to ascertain what the four constructs have in common and what makes each distinct from the others. Results from basic research into the underlying mechanisms would inform future development of efficient computer-automated assessment of relevant cognitive, personality, and physiological dimensions.

Cognitive Biases. Research into cognitive biases indicates humans are susceptible to errors in judgment or decisions when available information and choices are not thoroughly considered. However, thinking shortcuts may be necessary and even lead to better decisions in certain circumstances that require fast, nonconscious, or automatic decisions. To aid understanding of how cognitive biases affect decisions, especially considering

the speed at which critical decisions must sometimes be made in military environments, research should be conducted into stable individual differences that influence a tendency to engage in cognitive biases. Future research should examine potential correlates between

susceptibility to cognitive biases and results of traditional measures of personality and cognitive ability tests and information-processing factors (such as working memory, executive attention, and inhibitory control). Studies to understand how cognitive biases affect performance should also consider contextual factors; fast thinking might

Given the large numbers of potential soldiers screened each year and the high costs of decision errors, even small increases in the predictive accuracy of a selection system can be of great value.

be beneficial in some circumstances and lead to poor decision making in others.

Spatial Abilities. Spatial abilities—the ability to mentally manipulate, understand, and recall spatial relationships among objects—impact job performance in many career fields, including expanding technology careers that rely upon accurate and meaningful interactions with images, computer graphics, and data visualization. While the ASVAB currently includes one spatial ability measure, Assembling Objects, future research into the interrelationships among multiple facets of spatial ability as well as the degree to which sex differences are mitigated or accentuated by training or life experiences will ascertain the best measure of spatial ability for outcomes important for military job performance. Additionally, advances in technology have expanded available testing methods, and future research into the design and administration of spatial abilities tests will benefit from these developments.

IDENTIFICATION AND PREDICTION OF NEW OUTCOMES

Teamwork Behavior. Soldiers' ability to contribute to effective teamwork is a critical component to the success of the Army small unit. Additionally, the Army's expanding role in multinational coalitions, joint forces operations, and other ad hoc teams faces soldiers with new challenges and opportunities in teamwork. A military selection system that includes the identification of individual attributes predictive of success in a team environment could broadly enhance the collective capacity to perform. While there has been progress in identifying such attributes, further research is needed to expand understanding of and assessment metrics for team outcomes and effectiveness.

HYBRID TOPICS WITH JOINT FOCUS ON NEW PREDICTOR CONSTRUCTS AND PREDICTION OF NEW OUTCOMES

Hot Cognition: Defensive Reactivity, Emotional Regulation, and Performance under Stress. Success in many military environments and job occupations requires the ability to function well

in situations that elicit strong emotions, such as fear, anger, or extreme time pressure. Defensive reactivity, emotional regulation, and performance under stress can be collectively referred to as "hot cognition" constructs. Future research in this

The ASVAB and TAPAS are strong predictors of key outcomes of importance to the military, but they do not predict these outcomes perfectly—raising the question of whether prediction could be improved through measures of additional individual-difference constructs.

area is needed to explore measures of improved or diminished cognitive and behavioral performance and physiological markers of unconscious effects of emotion. The predictive validity of hot cognition measures requires an understanding of how hot cognition relates to and differs from other personality constructs (such as

Conscientiousness or Agreeableness) currently considered in the Army's selection system.

Adaptability and Inventiveness. Measures are needed to assess individuals' adaptability and inventiveness—the ability to act effectively in changing, challenging, and unpredictable environments. One promising line of inquiry is idea-generation measures, in which an open-ended task allows for evaluation of the frequency and quality of ideas generated by an individual. Another promising assessment method is the identification and development of narrow personality measures that are likely to yield stronger correlations to adaptability and inventiveness than are broad personality variables, such as Openness.

METHODS AND METHODOLOGY

Psychometrics and Technology. As future research identifies additional attributes of interest for selection purposes, it will be necessary to improve psychological-assessment measurement methods, emerging assessment technologies, and statistical analysis approaches in order to increase the precision, validity, efficiency, and security of assessments without demanding significantly additional testing time. Potential topics of research include, for example, further development of item generation; test assembly; rank, preference, and other response methods; and detection of and defense against test compromise. Future research is also needed on how best to collect and interpret applicant data from multiple sources, including data from experience, interactive assessments, and background information.

Situations and Situational Judgment Tests. Situational judgment tests offer unique testing oppor-

tunities that require test takers to use judgment to interpret, evaluate, and weight alternate courses of action in response to hypothetical real-world problems. Innovative formats for presenting and experiencing situations, such as immersive computer-generated graphics, will offer insight into how a prospective soldier might react to a particular military environment.

Assessment of Individual Differences through Neuroscience Measures. Current neuroscience measures may not be optimal for testing the performance capability of military recruits, but science-based strategies for monitoring neural activity may be useful for understanding test performance and for improving the validity of assessments. During assessments, neurophysiological biomarkers—measurements of bodily functions that provide insight into psychological state or behavior—can serve as robust and objective measures of test taker experiences such as anxiety, attention, and motivation. This information may provide insight for the design of test environments that facilitate performance reflecting actual skill levels and capacity, thereby increasing tests' accuracy.

IMPLEMENTATION OF THE RESEARCH AGENDA

The research agenda recommended by the committee includes many potential directions in which the Army may choose to develop its selection systems, based upon forward-looking consideration of personnel selection in the future. The research agenda is not prioritized, and the topics should be pursued at levels commensurate with the outcomes of greatest import to the Army. In a continued austere budget environment, implementation of any portion of the research agenda would reflect progress. However, quicker progress and potential to capitalize on synergies across projects would be more likely if multiple multifaceted projects were implemented simultaneously. In the committee's opinion, implementation of an effective and expeditious research program to enhance soldier selection would require a supplemental funding commitment to the ARI Foundational Science Research Unit in the range of \$3.5 million to \$7 million per year.

COMMITTEE ON MEASURING HUMAN CAPABILITIES: PERFORMANCE POTENTIAL OF INDIVIDUALS AND COLLECTIVES

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For More Information . . . This brief was prepared by the Board on Behavioral, Cognitive, and Sensory Sciences (BBCSS) based on the report *Measuring Human Capabilities: An Agenda for Basic Research on the Assessment of Individual and Group Performance Potential for Military Accession* (National Research Council, 2015). The study was sponsored by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect those of ARI. Copies of the report are available from the National Academies Press, 500 Fifth Street, NW, Washington, DC 20001; (800) 624-6242; <http://www.nap.edu> or via the BBCSS web page at <http://www.nationalacademies.org/bbcss>.

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