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Officer Individual Differences: Predicting Long-Term Continuance and Performance in the U.S. Army

Stephen J. Zaccaro
Senior Research Fellow, Consortium Research Fellows Program

Veronica L. Gilrane, Jordan M. Robbins, and Lindsey N. Bartholomew
Consortium Research Fellows, George Mason University

Mark C. Young and Robert N. Kilcullen
U.S. Army Research Institute

Shane Connelly
University of Oklahoma

Winnie Young
Consultant

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MICHELLE SAMS, Ph.D.

Director

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Peter J. Legree, U.S. Army Research Institute
Bridget Boyle, U.S. Army Research Institute

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14. ABSTRACT *(Maximum 200 words)*: This project investigated individual differences in knowledge, skills, abilities, and personality traits as contributors to long-term career continuance and performance. The research was done to help inform the implementation of new officer selection tests. This effort built upon an existing dataset consisting of test scores from an extensive test battery administered to Army officers in 1992 and 1993. Long-term criteria (i.e., career continuance and highest rank achieved) were retrieved from the Officer Longitudinal Research Data Base (OLRDB), which contained officer personnel records updated through FY 2008. Several individual difference measures were found to predict long-term officer continuance and advancement, such as: complex problem solving, creative thinking skills, tolerance for ambiguity, and responsibility. These findings will help inform ARI's ongoing research efforts to develop new selection tests for officer candidates that enhance officer career continuance and performance. Particular attention should be directed at measures of complex problem solving and creative thinking skills as these were found to be efficient predictors of the criteria of interest. In addition, these cognitively based selection tools may be supplemented with social, motivational, and personality measures.

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Stephen J. Zaccaro, Veronica L. Gilrane, Jordan M. Robbins, and Lindsey N. Bartholomew
Consortium Research Fellows Program

Mark C. Young and Robert N. Kilcullen
U.S. Army Research Institute

Shane Connelly
University of Oklahoma

Winnie Young
Consultant

Personnel Assessment Research Unit
Tonia S. Heffner, Chief

U.S. Army Research Institute for the Behavioral and Social Sciences
6000 6th Street, Bldg. 1464
Fort Belvoir, VA 22060

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OFFICER INDIVIDUAL DIFFERENCES: PREDICTING LONG-TERM CONTINUANCE AND PERFORMANCE IN THE U.S. ARMY

EXECUTIVE SUMMARY

Research Requirement:

A key mission of the U.S. Army officer corps is to train and develop individuals to be successful leaders. To support this requirement, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) officer research program seeks to develop new selection tests for officer candidates that enhance officer career continuance and performance. Recent ARI efforts have focused on predicting continuance and performance in pre-commissioning programs (Putka, 2009; Russell & Tremble, 2011; Young, Ardison, & Babin, 2011). However, because these efforts have utilized relatively new samples of officer candidates, the long-term validity of these measures was not known.

This report describes a unique effort to examine the *long-term* validity of officer selection measures. Specifically, the purpose of this project is to re-examine a historical dataset collected by ARI in order to identify predictors of continuance and advancement over the course of officers' Army careers. In an effort to minimize talent loss in the U.S. Army officer corps, the current effort sought to identify high potential predictors that will be evaluated for integration into ARI's current officer candidate selection battery.

Procedure:

To facilitate long-term prediction of continuance and performance, a longitudinal database was developed by expanding upon an existing dataset containing scores from a selection battery administered in 1992 and 1993 to 1,819 Army officers who ranged from second lieutenant (O1) to full colonel (O6). The experimental selection battery was extensive, and included a wide range of measures pertaining to knowledge, skills, abilities, and personality attributes. The criterion measures (i.e., continuance and highest rank achieved) came from the Officer Longitudinal Research Data Base (OLRDB), which contained officer personnel records updated through FY 2008 (i.e., 15-16 years following data collection). The resultant data set, labeled the Long-Term Officer Longitudinal Validation Database (LTOLVD), contains 640 officers who were in the Active Component of the Army as of 2008. Validation analyses using the LTOLVD were conducted to evaluate the relationships between the experimental selection tests and long-term officer career outcomes.

Findings:

An investigation of long-term continuance and performance in the Army indicated several interesting patterns of prediction. Complex problem solving, creative thinking, and responsibility were consistent, positive predictors of both continuance and highest rank attained in the Army. A control variable, marital status, was also positively associated with the criteria of interest. The results are consistent with the scholarly leadership literature, suggesting that higher

order thinking skills, creativity, and motivational attributes associated with operating in ill-defined, complex environments play an important role in officer advancement to senior leadership levels.

Utilization and Dissemination of Findings:

These results help inform the development of selection batteries in ARI's current officer research program, which seeks to develop new measures for selecting officer candidates that enhance career continuance and performance. For example, ARI has leveraged the results of this research to initiate a new research program that will develop an automated scoring system for the creative thinking test used in this research. This represents a first step toward transitioning this measure from a research setting to Initial Operational Testing and Evaluation (IOT&E). The creative thinking measure will be integrated into ARI's new officer selection test battery if positive results are obtained in the IOT&E.

OFFICER INDIVIDUAL DIFFERENCES: PREDICTING LONG-TERM CONTINUANCE AND PERFORMANCE IN THE U.S. ARMY

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Officer Individual Differences: Predicting Long-Term Continuance and Performance in the U.S. Army[1]

Introduction

Statement of the Problem

The officer corps of the U.S. Army is built upon the foundation of individuals who volunteer for service and choose to pursue a career as an officer. Army officers engage in vital missions and assignments that foster the accumulation of substantial experience-based knowledge and wisdom. They also receive excellent and extensive training as Soldiers and leaders. The Army invests considerable financial and human resources in training before and after officers are commissioned, and relies on a closed personnel system that promotes solely from within. As a result, excessive officer separation rates, whether voluntary or involuntary, can lead to a restricted promotion system and a decrease in overall productivity and military readiness (Gencer, 2002). Accordingly, understanding the factors that contribute to career-long continuation and advancement of these officers remains a vital concern to the U.S. Army.

Most prior published and unpublished research has focused primarily on contextual variables to examine continuance and/or advancement. For example, several studies have identified family strains (Huffman, Culbertson, & Castro, 2008; Johnson, Hezlett, Mael, & Schneider, 2009; Lakhani & Fugita, 1993), work dissatisfaction and unmet expectations (Johnson et al., 2009; Young, Kubiask, Legree, & Tremble, 2010), competing civilian jobs, stress-inducing events, pre-existing mental or physical problems, poor acculturation to the Army, and financial issues (Young et al., 2010) as factors that have a negative influence on Army continuance. Positive predictors of Army continuance include supervisor support (Dupré & Day, 2007), job security and pay (Chaffin, Hamilton, & Czrew, 2008; Johnson, et al., 2009; Young, et al., 2010; Lakhani & Fugita, 1993), reenlistment bonuses (Carrell & West, 2007; Young et al., 2010), camaraderie (Johnson et al., 2009), work satisfaction (Capon, Chernyshenko, & Stark, 2007; Johnson, Sachau, & Englert, 2010), organizational identification (Johnson, et al., 2010), educational and leadership opportunities (Young et al., 2010), as well as patriotism and commitment to the Army (Capon et al., 2007; Gade, Tiggle, & Schumm, 2003; Johnson et al., 2010; Young et al., 2010; Lakhani & Fugita, 1993; Langkamer & Ervin, 2009). While the aforementioned variables represent important factors in an officer's decision to remain in the Army, these measures are not feasible for use in a selection battery. Consequently, there is a need to seek and identify additional factors for officer selection that contribute to continuance and advancement.

Most of the aforementioned studies emphasize situational and attitudinal predictors of continuance/advancement. Few studies have focused on the stable individual differences predictive of retention and promotion that are concomitant with continuance in the Army. Capon et al. (2007) argued that dispositions influenced military retention through their effects on work

[1] This 2012 report was completed in support of the U.S. Army Research Institute's work program #311, "Enhancing Officer Selection, Assignment, and Retention."

attitudes. They found that attributes related to core self evaluations (e.g., self esteem, generalized self efficacy, locus of control, and neuroticism) influenced intentions to reenlist by affecting job satisfaction. Weiss, Ilgen, and Borman (2010) argued that demographic differences such as marital status and individual differences in one's work background (e.g., previous work experiences) were associated with retention of Army enlisted Soldiers. However, their model did not explore in more detail the role of knowledge, skills, and abilities (KSAs) or personality attributes. Another model of officer retention was tested by Schneider and colleagues (2011) with the support of the U.S. Army Research Institute (ARI). Although the researchers examined several person variables, including marital status and Army-consistent values, the primary contribution of this effort was the predictive power of affective commitment in company grade officer retention. Further, Schneider and colleagues' (2011) model emphasized the role of time; however, the majority of their analyses were conducted with cross-sectional data.

The purpose of the present effort was to identify KSAs and personality attributes that are associated with (a) long-term continuance in the U.S. Army, and (b) the highest rank achieved as an officer. The identification of these attributes will help inform ARI's ongoing program of research focused on developing new measures for selecting officer candidates (Putka, 2009; Russell & Tremble, 2011). The initial focus of ARI's program has been on predicting continuance and performance in pre-commissioning programs (Putka, 2009; Russell & Tremble, 2011; Young, Ardison, & Babin, 2011). However, the long-term goal is to develop selection measures that predict not just near-term outcomes but also long-term career continuance and advancement. The purpose of this project is to re-examine a historical dataset collected by ARI in order to identify predictors of long-term officer career continuance and advancement. High potential predictor measures identified in this project will be evaluated for integration into ARI's current officer candidate selection battery. The sample described in this report provides a unique opportunity to examine the relationships between selection measures and officer career outcomes tracked over a 15-year period.

The data used to identify KSAs in the present effort came from a cross-sectional investigation of individual differences and leadership that was conducted in the early 1990s (Connelly et al., 2000; Zaccaro, Mumford, Connelly, Marks, & Gilbert, 2000). These data were then linked to data on continuance and rank attained from current U.S. Army records. In the next section of this report we briefly describe the KSAs and personality attributes that were analyzed in this research.

Individual Differences and Military Retention

The KSAs and personality attributes examined in this effort rest on two elements related to Army continuance. First, Army continuance is closely associated with promotion. At the ranks of second lieutenant through major, the Army utilizes an "up-or-out" strategy where officers are either promoted or not retained. At the rank of major and higher, officers can stay in that rank for the remainder of their career. However, a second element is also important to consider. Perceptions of lack of advancement in career progression can hasten decisions to separate, especially if attractive alternatives exist in the private sector (Young et al., 2010). Thus, predictors of Army continuance from the ranks of second lieutenant to major are likely to be those related to leader promotion.

Several studies examined personal attributes related to leadership and performance promotion within organizations. Bray, Campbell, and Grant (1974) found that *cognitive attributes*, such as creativity, planning, and decision making, *social attributes*, such as human relations and verbal communication skills, *motivational attributes*, such as desire for advancement, energy, and high work standards, and *personality attributes*, such as tolerance for ambiguity were associated with advancement and promotion over a 20-year period in a sample of managers at AT&T. Stamp (1988) found that conceptual capacity, which reflects ability to build complex mental models and engage in complex problem solving, was associated with managerial level attained 4-13 years later in a sample of organizational managers. In the sample used in the current effort, Connelly et al. (2000) found that measures of general cognitive abilities, motivation, personality, and complex problem solving skills contributed incremental variance in concurrently predicting self-reported, verifiable leader achievement (e.g., letters of commendation, in-grade raises). This criterion measure was based on Campbell's (1987) measure of leader achievement. Taken together, this research suggests that cognitive, social, motivational, and personality attributes will be associated with promotion through the leadership ranks in the Army, and therefore continuance.

A second factor contributing to continuance relates to work assignments, particularly those which are developmental in nature, that officers experience in their careers. As with enlisted Soldiers (Weiss et al., 2010), when officers experience challenging and growth-oriented work assignments and missions, they may be more likely to perceive greater opportunities for advancement in the Army, and therefore are more likely to continue serving. Accordingly, individual attributes that relate to (a) selection for such assignments, (b) motivation to engage in such assignments, and (c) skills in learning from such assignments may in turn determine continuance in the US Army (Tesluk & Jacobs, 1998). In support of this argument, Bray et al. (1974) found that the cognitive, motivational, social, and personality attributes that predicted promotion also predicted the likelihood of managers being given challenging assignments in their career.

The association of Army career continuance with challenging work assignments and leadership promotion suggests that continuance may be predicted by a range of individual differences associated with (a) cognitive attributes, such as creative thinking, and complex problem solving skills, (b) social skills that foster social perceptiveness and the capacity to interact effectively with many different kinds of people and groups, (c) motivational attributes related to desire to achieve and advance in one's career, as well as attributes such as stress tolerance and generalized self efficacy that promote persistence, and (d) personality attributes that foster one's ability to work and thrive in complex environments. Table 1 indicates by category the variables that were examined in this research as possible predictors of Army continuance and highest rank attained.

The objective of the current effort was to identify which of these attributes would be the most significant predictors of continuance. The results of this research will help inform the construction of a battery of measures that can be used to identify those officers that are most likely to (a) be promoted through officer ranks, and therefore (b) be more likely to remain in the Army through career completion.

Table 1 ***Individual Difference Predictors of (a) Army Continuance and (b) Highest Rank Attained***

Cognitive Attributes	***Cognitive Attributes Definition***	***Method***
• Verbal Reasoning	The ability to combine separate pieces of information and to form conclusions on the basis of that information. (Ruch & Ruch, 1980).	Multiple choice
• Complex Problem Solving Skills	The ability to utilize generation skills (problem construction, information encoding and category search), category specification, synthesis or category combination and reorganization, and implementation skills (idea evaluation, solution implementation, and solution monitoring). (Mumford, Zaccaro, Harding, Fleishman, & Reiter-Palmon, 1991)	Constructed Response
• Creative Thinking	The extent to which creative thinking reflected leadership domain relevant attributes, including idea complexity, abstract (principled) thinking, consideration of time span, positive outcome sensitivity, and negative outcome sensitivity (Mumford, Marks, Connelly, Zaccaro, & Johnson, 1998).	Constructed Response
• Writing	Assessment of one's writing ability with respect to the dimensions delineated by Hayes and Flower (1986): planning of ideas, generation of text, revision, quality and originality.	Constructed Response
Social Attributes	***Social Attributes Definition***	
• Networking Skills*	The willingness to meet and socialize with well-connected or important people at work (Mele, 2009).	Background Data
• Emotional Perceptiveness*	The ability to accurately perceive non-verbal emotional expressions (Halberstadt, Ruffman, Murray, Taumoepeau, & Ryan, 2011).	Background Data
• Interpersonal Insight*	The ability to quickly size up or 'read' someone who is new (London, 1994).	Background Data
• Consideration Leadership Style*	The degree to which a leader shows concern and respect for followers, looks out for their welfare, and expresses appreciation and support (Bass, 1990).	Background Data

Table 1 ***(continued)***

• Structuring Leadership Style*	The degree to which a leader defines and organizes his role and the roles of followers, is oriented toward goal attainment, and establishes well-defined patterns and channels of communication (Fleishman et al., 1991).	Background Data
• Verbal Expression Skills*	The willingness to explain things to others, to be persuasive, and to act as the spokesperson for the group (Riggio, 1986).	Background Data
Motivational/Personality Attributes	***Motivational/Personality Attributes Definition***	
• Flexibility	The willingness to entertain new approaches to solving problems. Creating new plans and ideas, and initiating and accepting change and innovation (Martin & Anderson, 1998).	Background Data
• Extroversion*	The tendency to be talkative and outgoing. Extroverts find social interactions rewarding and are able to make friends easily, establish rapport with others, and are good at meeting and greeting others (Barrick & Mount, 1991).	Background Data
• Dominance	The tendency to attempt to control environment and to influence or direct other people; to expresses opinions forcefully; and to enjoy the role of leader and assume it spontaneously (Personality Research Form, Jackson, 1989).	True-False
• Achievement Orientation*	The willingness to give one's best effort and to work hard toward achieving difficult objectives (Bass, 2008).	Background Data
• Stress Tolerance*	The tendency to maintain one's composure under pressure, and remain calm and in control of one's emotions instead of feeling anxious and worried (Elliot, Shewchuk, Hagglund, Rybarczyk, & Harkins 1996).	Background Data
• Self Efficacy*	The feeling that one has successfully overcome work obstacles in the past and that one will continue to do so in the future (Wood & Bandura, 1989).	Background Data
• Learning Goal Orientation*	The willingness to engage in activities for the sake of learning something new, and the enjoyment of such activities (Dweck, 1986).	Background Data

Table 1 ***(continued)***

• Status Seeking*	The desire to achieve status, prestige, and admiration from others. The need to be recognized and looked up to by others (Lampel & Bhalla, 2007).	Background Data
• Openness	The active seeking and appreciation of experiences for their own sake (Costa & McCrae, 1985).	Self-Report
• Responsibility	Being conscientious and following through on commitments (California Personality Inventory, Gough & Bradley, 1996).	Self-Report
• Agreeableness*	The tendency to establish and maintain cooperative and supportive working relationships with others (Barrick & Mount, 1991).	Background Data
• Tolerance for Ambiguity*	The ability to tolerate work situations where the correct goal or path to the goal is vague and ill-defined (MacDonald. 1970).	Background Data

Note: *These measures were developed in accordance with procedures for constructing biographical data (Kilcullen, White, Mumford, & Mack, 1995).

Method

Subjects

The data for this effort came partially from an archival dataset (Connelly et al., 2000; Zaccaro et al., 2000) that included measures of the variables noted in Table 1. The original sample, tested from 1992 to 1993, consisted of 1,819 Amy officers ranging in ranks from second lieutenant (O1) to full colonel (O6). The sample included officers from both the Active and Reserve Components (see Zaccaro et al., 2000 for a detailed description).

The sample for the current effort was limited to those officers from the Active Component. Participants who were originally in the Army National Guard or Army Reserves were excluded because the job requirements and retention issues in the Reserve Component are known to differ from those of the Active Component (Headquarters Department of the Army, 2010).

Measures of continuance in the Army and highest rank achieved were derived from the Officer Longitudinal Research Data Base (OLRDB), which contained officer personnel records updated through FY 2008. A matching of the Active Army cases in the 1992/1993 dataset against the OLRDB yielded a total of 640 officers. This updated database was labeled the Long-Term Officer Longitudinal Validation Database (LTOLVD; Young, Gilrane, Robbins,

Bartholomew, & Young, 2011).[2] The majority of officers who were excluded from the LTOLVD were non-Active Army officers (i.e., National Guard or Army Reserves). A smaller number of cases were excluded from the final database due to missing identification, death, or permanent disability. As of 1993, 63 participants in the LTOLVD held the rank of second lieutenant, 62 held the rank of first lieutenant, 177 held the rank of captain, 167 held the rank of major, 144 held the rank of lieutenant colonel, and 27 held the rank of full colonel. This sample included 102 female officers. Officers served primarily in combat arms (infantry, armor, aviation, field artillery, and air defense artillery), 58.1%; combat support (military police, chemical, signal, and military intelligence, and corps of engineers), 17.8%; and combat service support (transportation, ordnance, quartermaster, adjutant general, finance corps,), 24.1%.

Of the 640 officers in the original sample, 187 were still in the Active Component of the U.S. Army as of September 2008. (This was the most current date for which OLDRD records were available at the time the LTOLVD was developed).

Measures

The measures of cognitive, social, and motivational/personality attributes came from the data collected from 1992 to1993. The measurement battery included a number of constructed response measures to assess cognitive skills, as well as a number of multiple-choice questionnaires to assess the remaining attributes. Several of these measures are described in Zaccaro et al. (2000). Measures for which responses were open-ended were rated by three trained coders. Strong inter-rater reliability was found (see Zaccaro et al., 2000 for details).

Cognitive Attributes

The cognitive attributes data set included measures to assess the cognitive skills of verbal reasoning, complex problem solving skills, creative thinking, and writing.

Verbal reasoning skills were assessed using the Employee Aptitude Survey Verbal Reasoning Test (Ruch & Ruch, 1980). This test measures the ability to think logically, requiring respondents to combine separate pieces of information in order to identify whether certain conclusions are true or not. The test is 30-items long and has a 5-minute time limit. Six different sets of facts are provided, and five possible conclusions (items) are listed for each set. Respondents indicate whether each conclusion is true, false, or uncertain based on the set of facts provided. Ruch, Stang, McKillip, and Dye (1994) provide a reliability estimate of .82 for the 30-item measure.

Complex problem solving skills were assessed with two measures, each given to one-half of the original sample. Each measure presented military problem scenarios to the participants and asked them to provide a solution. In one of the measures, participants provided their solutions in response to a series of cued prompts that related to different phases of complex

[2] The authors wish to thank Michael Ingerick for his work in constructing this large and complex database. This effort was conducted under contract with the Human Resources Research Organization (HumRRO).

problem solving. In the second measure, which used a different set of scenarios, participants simply indicated their solution without any prompts. These responses were then scored by judges and used to create an overall score for complex problem solving (Zaccaro et al., 2000). In the present research, the two sets of complex problem solving measures exhibited comparable effects on related variables. Therefore, to minimize loss of sample size that resulted by only half of the original sample receiving each measure, the scores on each were converted to z-scores, then combined across the entire sample into a single measure labeled "complex problem solving skills."

Creative thinking was measured using the Consequences A test from Christensen, Merrifield, and Guilford (1953). This test presented respondents with unusual events (e.g., "gravity is cut in half") and asked them to indicate likely consequences. Responses were rated for quality, originality, realism, time frame of consequences, positive outcome sensitivity, negative outcome sensitivity, complexity, and abstract or principle-based thinking, with subsequent scores combined into an overall index of creative thinking skills relevant to leadership (Mumford et al., 1998).

Writing skills were assessed with the Alternative Headlines Test from Guildford and Hoepfner (1966). Participants were given a news headline and were asked to rewrite it in a new way. These responses were rated for planning, generating, revision, quality, and originality.

Social attributes

Social attributes were measured using rational biodata scales, which were developed in several stages. First, the social skills most likely to be associated with leader effectiveness were identified based upon a literature review. Next, the relevant constructs were reviewed and candidate biodata items referring to *past behaviors and life events* were generated for each construct. The items were reviewed for construct relevance, response variability, readability, non-intrusiveness, and social desirability. A consensus was reached on the best items for each construct, and response options were rationally scored on a continuum to reflect the presumed relationship between the response and the construct measured. Item scores were then summed to form scale scores.

Research on the convergent and discriminant validity of rational biodata scales developed in this manner suggests that the biodata scales measure the intended constructs and, by virtue of being behaviorally-oriented, may be more predictive and less fakable compared to traditional measurement methods (Kilcullen, et al, 1995). The rational biodata scales used in the current effort measured social skills previously linked to leadership in the literature (Zaccaro, LaPort, & Jose, in press), including: networking skills, emotional perceptiveness, interpersonal insight, consideration leadership style, structuring leadership style, and verbal expression skills. Table 1 provides these constructs with corresponding definitions.

Motivational/Personality Attributes

Rational biodata scales were also developed to measure motivational/personality constructs using the same procedure described in the previous section. These attributes included: achievement orientation, flexibility, extroversion, stress tolerance, self efficacy, learning goal orientation, status seeking, responsibility, agreeableness, and tolerance for ambiguity. In addition, dominance, openness, and responsibility were measured using the Jackson Personality Research Form (Jackson, 1989), the NEO-PI (Costa & McCrae, 1980, 1985; McCrae & Costa, 1987, 1991), and the California Psychological Inventory (Gough & Bradley, 1996), respectively.

Socially Desirable Responding

A 'response distortion' scale designed to detect socially desirable responding to the self-report measures (e.g., Motivational/Personality Attributes) was included in the test battery. Previous research indicates that this scale shows good convergent and discriminant validity with a previously validated temperament scale measuring the same type of response distortion (Kilcullen, et al, 1995).

Criterion Variables.

Two of the criterion measures extracted from the OLRDB were used in the present effort: *continuance in the Army* and *highest rank achieved.* Continuance was assessed by determining the total number of years the participant served (or continues to serve) as a commissioned officer in the Army. Highest rank achieved was assessed by noting the officer's rank upon leaving the Army (or his/her current rank if still serving in the Army) and converting it into a number score (1 = second lieutenant; 10 = general).

Results

Table 2 documents the officers' rank when data collection began and their rank achieved in 2008. Out of the 187 officers who were still in the Active Component of the U.S. Army as of September 2008, 6 officers attained the rank of general officer. Table 3 indicates the means, standard deviations, and zero-order correlations for the variables in this research. Marital status as of 1993 (0 = single; 1 = married) and gender (1 = male; 2 = female) were included in the dataset as covariates. Also, participants were coded in terms of whether they received the cued or uncued problem solving measure; this coding allowed us to control for the type of measure used to assess complex problem solving skills.

Table 2 ***Crosstabs of Rank at Time of Research Participation (1992/1993) and Rank Achieved in 2008***

Rank at Time of Research Participation	**Sample Size at Time of Research Participation**	**Rank in 2008**							
		Major	Lieutenant Colonel	Colonel	Major General	Lieutenant General	General	Separated[a]	Total in 2008
Second Lieutenant	63	27	0	0	0	0	0	36	27
First Lieutenant	62	3	25	0	0	0	0	34	28
Junior Captain	105	3	54	2	0	0	0	46	59
Senior Captain	72	2	8	12	0	0	0	50	22
Major	167	0	0	45	0	0	0	122	45
Lieutenant Colonel	144	0	0	0	4	1	1	138	6
Colonel	27	0	0	0	0	0	0	27	0
(Total Sample)	640								
Sample Size in 2008	----------	35	87	59	4	1	1	453	187

The psychometric statistics of the predictor battery are presented in Table 3a, along with predictor scale intercorrelations and bivariate validities for predicting career continuance and highest rank achieved. For the Social and Motivational/Personality attributes, coefficient alphas are presented along the diagonals. Alpha reliabilities of .60 and above are considered acceptable for rational biodata scales due to the heterogeneous nature of prior behavior (Mumford & Owens, 1987). An inspection of Table 3a reveals that all of the rational biodata scales used in this research have acceptable alphas of .60 or higher.

Table 3a ***Descriptive Statistics and Correlations Among Variables in the Prediction Models***

	Variable	M	SD	1	2	3	4	5	6	7	8	9
Criterion	1. Continuance[a]	20.58	7.41	--								
	2. Highest Rank Achieved	4.85	1.16	.89***	--							
Control	3. Socially desirable responding	.43	.14	-.09*	-.11**	--						
	4. Gender[b]	1.07	.26	-.14***	-.10*	.04	--					
	5. Marital Status[c]	.78	.41	.40***	.38***	-.10*	-.18***	--				
	6. Measurement form[d]	.49	.50	.04	.04	.04	-.03	.02	--			
Cognitive Attributes	7. Verbal Reasoning	25.48	5.27	.10*	.10*	-.02	.02	.09+	-.03	--		
	8. Complex Problem Solving	.23	1.05	.41***	.40***	-.07	-.11*	.25***	.03	.12**	.93	
	9. Creative Thinking	2.67	.44	.42***	.40***	-.10*	-.04	.20***	.04	.20***	.48***	.82
	10. Headlines/ Writing	2.30	.39	.23***	.24***	-.06	-.03	.20***	-.02	.20***	.28***	.27***
Social Attributes	11. Networking Skills	2.42	.75	-.17***	-.19***	.04	.01	-.19***	-.03	-.22***	-.18***	-.17***
	12. Emotional Perceptiveness	3.65	.56	-.07	-.06	-.12**	.08*	-.10*	.03	.04	.01	.04
	13. Interpersonal Insight	3.67	.62	-.03	-.02	-.15***	.01	-.11**	.04	.09*	.00	.09*
	14. Consideration Leadership Style	3.40	.50	-.08*	-.08+	-.11*	.09*	-.13**	-.03	.02	-.04	-.01
	15. Structuring Leadership Style	3.68	.44	.03	.07	-.11**	-.01	.02	-.01	.14**	.08*	.19***
	16. Verbal Expression Skills	3.53	.52	-.08*	-.07+	-.09*	-.10*	-.08*	.00	.14**	.00	.09*
Motivational/ Personality Attributes	17. Flexibility	3.54	.48	.00	-.01	-.09*	.00	-.10*	.01	.10*	.01	.14**
	18. Extroversion	3.19	.65	-.06	-.06	-.06	.10*	-.07+	-.02	-.13**	-.04	-.05
	19. Dominance	25.60	2.14	.01	.00	-.06	-.16***	.04	.01	.02	.01	.04
	20. Achievement Orientation	3.78	.43	.20***	.22***	-.14**	-.03	.13**	.12**	.16***	.19***	.24***
	21. Stress Tolerance	3.57	.49	.16***	.17***	-.16***	-.11**	.12**	.14**	.08+	.12**	.16***
	22. Self Efficacy	2.96	.51	.05	.04	-.12**	-.11**	.05	.10*	.00	.05	.11**

Table 3a *(continued)*

23. Learning Goal Orientation	3.33	.67	-.14**	-.13**	-.09*	-.07+	-.07+	.01	.04	-.06	.01
24. Status Seeking	2.70	.65	-.16***	-.15***	.11**	-.03	-.14**	-.03	-.08+	-.07	-.16***
25. Openness	134.99	27.94	.08+	.08+	-.08*	.02	.04	-.07	.21***	.15***	.22***
26. Responsibility	57.19	4.37	.26***	.28***	-.12**	.02	.14**	.03	.19***	.25***	.28***
27. Agreeableness	3.65	.44	.10*	.07+	-.14***	.12**	.07+	-.01	-.02	.11*	.14**
28. Tolerance for Ambiguity	3.21	.37	.15***	.15***	-.05	-.10*	.08+	.05	.11*	.13**	.20***

Note:+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; *N* range= 498-639; Numbers along the diagonal represent coefficient alphas and IRRs; [a]Continuance was measured by total years of service; [b]Gender coded as 1= male, 2=female; [c]Marital status coded as 0=single, 1= married, [d]Complex problem solving measurement form coded as 0 = Completed the PSSKILL 1 = Completed the TLTOT

Table 3b ***Descriptive Statistics and Correlations Among Variables in the Prediction Models***

	Variable	M	SD	10	11	12	13	14	15	16	17	18
Criterion	1.Continuance[a]	20.58	7.41									
	2.Highest Rank Achieved	4.85	1.16									
Control	3. Socially desirable responding	.43	.14									
	4. Gender[b]	1.07	.26									
	5. Marital Status[c]	.78	.41									
	6. Measurement form	.49	.50									
Cognitive Attributes	7. Verbal Reasoning	25.48	5.27									
	8. Complex Problem Solving	.23	1.05									
	9. Creative Thinking	2.67	.44									
	10.Headlines/Writing	2.3	.39	.82								
Social Attributes	11. Networking Skills	2.42	.75	-.16***	.68							
	12. Emotional Perceptiveness	3.65	.56	-.03	.08+	.72						
	13. Interpersonal Insight	3.67	.62	-.03	.13**	.65***	.86					
	14. Consideration Leadership Style	3.40	.50	-.07	.25***	.60***	.50***	.73				
	15. Structuring Leadership Style	3.68	.44	.02	.04	.46***	.44***	.58***	.78			
	16. Verbal Expression Skills	3.53	.52	-.05	.10*	.40***	.47***	.50***	.65***	.77		
Motivational/ Personality Attributes	17. Flexibility	3.54	.48	-.04	.11**	.49***	.47***	.54***	.60***	.64***	.76	
	18. Extroversion	3.19	.65	-.16***	.34***	.33***	.28***	.46***	.28***	.30***	.31***	.65
	19. Dominance	25.60	2.14	-.03	.15***	.17***	.19***	.29***	.28***	.35***	.24***	.18***
	20. Achievement Orientation	3.78	.43	.14**	-.20***	.25***	.29***	.13**	.39***	.27***	.25***	.05
	21. Stress Tolerance	3.57	.49	.09*	-.25***	.14***	.18***	.03	.15***	.18***	.09*	.05
	22. Self Efficacy	2.96	.51	.01	-.05	.11*	.18***	.12**	.09*	.14**	.05	.21***
	23. Learning Goal Orientation	3.33	.67	-.07+	.10*	.20***	.15***	.28***	.36***	.39***	.46***	.10*

Table 3b *(continued)*

24. Status seeking	2.70	.65	-.08+	.40***	.06	.05	.14**	.06	.11**	.10*	.12**
25. Openness	134.99	27.94	.08+	-.06	.09*	.05	.09*	.22***	.21***	.26***	.07+
26. Responsibility	57.19	4.37	.16***	-.18***	.06	.06	.05	.12**	.07	.10*	-.01
27. Agreeableness	3.65	.44	.00	.09*	.44***	.34***	.48***	.40***	.28***	.48***	.43***
28. Tolerance for Ambiguity	3.21	.37	.06	-.13**	.13**	.24***	.16***	.36***	.38***	.29***	.15***

Note:+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; *N* range= 498-639; Numbers along the diagonal represent coefficient alphas and IRRs; [a]Continuance was measured by total years of service; [b]Gender coded as 1= male, 2=female; [c]Marital status coded as 0=single, 1= married, [d]Complex problem solving measurement form coded as 0 = Completed the PSSKILL 1 = Completed the TLTOT

Table 3c ***Descriptive Statistics and Correlations Among Variables in the Prediction Models***

	Variable	M	SD	19	20	21	22	23	24	25	26	27	28
Criterion	1.Continuance[a]	20.58	7.41										
	2.Highest Rank Achieved	4.85	1.16										
Control	3. Socially desirable responding	.43	.14										
	4. Gender[b]	1.07	.26										
	5. Marital Status[c]	.78	.41										
	6. Measurement form[d]	.49	.50										
Cognitive Attributes	7. Verbal Reasoning	25.48	5.27										
	8. Complex Problem Solving	.23	1.05										
	9. Creative Thinking	2.67	.44										
	10.Headlines/Writing	2.3	.39										
Social Attributes	11. Networking Skills	2.42	.75										
	12. Emotional Perceptiveness	3.65	.56										
	13. Interpersonal Insight	3.67	.62										
	14. Consideration Leadership Style	3.40	.50										
	15. Structuring Leadership Style	3.68	.44										
	16. Verbal Expression Skills	3.53	.52										
Motivational/ Personality Attributes	17. Flexibility	3.54	.48										
	18. Extroversion	3.19	.65										
	19. Dominance	25.60	2.14	.63									
	20. Achievement Orientation	3.78	.43	.20***	.70								
	21. Stress Tolerance	3.57	.49	.20***	.64***	.82							
	22. Self Efficacy	2.96	.51	.19***	.36***	.63***	.75						
	23. Learning Goal Orientation	3.33	.67	.19***	.19***	.05	.02	.68					

Table 3c *(continued)*

Variable	M	SD	19	20	21	22	23	24	25	26	27	28
24. Status seeking	2.70	.65	.06	-.25***	-.43***	-.35***	.01	.77				
25. Openness	134.99	27.94	.09*	.17***	.10*	.05	.14**	-.05	.84			
26. Responsibility	57.19	4.37	.13**	.03***	.25***	.11**	.13**	-.14**	.16***	.61		
27. Agreeableness	3.65	.44	.08*	.24***	.11**	.07+	.21***	-.05	.13**	.16***	.65	
28. Tolerance for Ambiguity	3.21	.37	.21***	.53***	.51***	.45***	.21***	-.26***	.16***	.19***	.08+	.77

Note:+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; *N* range= 498-639; Numbers along the diagonal represent coefficient alphas and IRRs; [a]Continuance was measured by total years of service; [b]Gender coded as 1= male, 2=female; [c]Marital status coded as 0=single, 1= married, [d]Complex problem solving measurement form coded as 0 = Completed the PSSKILL 1 = Completed the TLTOT

Continuance

An examination of the correlations indicate that socially desirable responding, gender, marital status, verbal reasoning skills, complex problem solving skills, creative thinking, writing skills, networking skills, consideration leadership style, verbal expression skills, achievement orientation, stress tolerance, learning goal orientation, status seeking, responsibility, agreeableness, and tolerance for ambiguity were significantly correlated with continuance. The strongest positive correlates were marital status (r = .40, p <.001), complex problem solving skills (r = .41, p <.001), creative thinking (r = .42, p <.001), writing skills (r = .23, p <.001), achievement orientation (r = .20, p <.001), stress tolerance (r = .16, p <.001), responsibility (r = .26, p <.001), and tolerance for ambiguity (r = .15, p <.001). The strongest negative correlates were gender (r = -.14, p <.001), networking skills (r = -.17, p <.001), learning goal orientation (r = -.14, p =.001), and status seeking (r = -.16, p <.001). Additionally, continuance was positively correlated with the other criterion variable, highest rank achieved (r = .89, p <.001).

A hierarchical regression was used to determine the relative contributions of cognitive, social, and motivational/personality attributes, entered in that order, based on prior research that places primacy on cognitive capacities in facilitating acquisition of developmental assignments and promotion (Bray, et al., 1974, Stamp, 1988). Control variables: socially desirable responding, gender, marital status, and measurement form were entered at the first step. Table 4 indicates the results of this analysis. A significant increment in variance explained was found for the entry of cognitive attributes (ΔR^2 =.15, p < .001). The set of social variables did not add a significant increment in variance explained when entered in the third step (ΔR^2 =.01, p = .31). However, the entry of personality variables in the last step resulted in a significant increase in variance explained (ΔR^2 =.04, p < .01). In the last step, the following attributes yielded significant standardized regression coefficients: gender (β = -.10, p < .05), marital status (β = .25, p < .001), complex problem solving skills (β = .16, p < .001), creative thinking skills (β = .22, p < .001), verbal expression skills (β = -.13, p < .05), flexibility (β = .12, p < .05), learning goal orientation (β = -.16, p < .001), and responsibility (β = .11, p < .01). Self efficacy (β = -.10, p < .10) was marginally associated with continuance. To test for ordering effects, three additional hierarchical regressions were computed by entering the cognitive, social, and motivational/personality attributes in the first step. These analyses did not reveal any evidence of ordering effects.

A backwards regression procedure was used to identify the strongest predictors of continuance among the attributes in this research. The results of this procedure are shown in Table 4 - only the first and last steps are indicated. Our findings indicate that 8 variables remained as significant predictors of continuance. These variables were gender (β = -.09, p < .05), marital status (β = .27, p < .001), complex problem solving skills (β = .17, p < .001), creative thinking skills (β = .23, p < .001), verbal expression skills (β = -.15, p < .01), flexibility (β = .12, p < .05), learning goal orientation (β = -.15, p < .001), and responsibility (β = .12, p <.01). Tolerance for ambiguity was marginally associated with continuance (β = .08, p < .10).

Table 4 ***Regression Analyses with Continuance[a] as the Dependent Variable***

	Standardized Betas				Backwards Regression	
Variable and Statistic	Step 1	Step 2	Step 3	Step 4	Initial Step	Final Step
Step 1.						
Socially Desirable Responding	-.05	-.02	-.02	-.02	-.02	
Gender[b]	-.07	-.05	-.07+	-.10*	-.10*	-.09*
Marital Status[c]	.39***	.28***	.27***	.25***	.25***	.27***
Measurement Form	.03	.02	.02	.02	.02	
Step 2.						
Verbal Reasoning Score		-.01	.00	-.01	-.01	
Complex Problem Solving		.19***	.19***	.16***	.16***	.17***
Creative Thinking		.25***	.26***	.22***	.22***	.23***
Headlines - Writing		.05	.04	.03	.03	
Step 3.						
Networking Skills			-.03	.02	.02	
Emotional Perceptiveness			-.06	-.08	-.08	
Interpersonal Insight			.05	.01	.01	
Consideration Leadership Style			.03	.04	.04	
Structuring Leadership Style			.02	-.02	-.02	
Verbal Expression Skills			-.12*	-.13*	-.13*	-.15**
Step 4.						
Flexibility				.12*	.12*	.12*
Extroversion				.01	.01	
Dominance				-.01	-.01	
Achievement Orientation				.06	.06	
Stress Tolerance				.03	.03	
Self Efficacy				-.10+	-.10+	
Learning Goal Orientation				-.16***	-.16***	-.15***
Status seeking				-.05	-.05	
Openness				-.02	-.02	
Responsibility				.11**	.11**	.12**
Agreeableness				.03	.03	
Tolerance for Ambiguity				.07	.07	.08+
R^2	.17	.32	.33	.38	.38***	.36
ΔR^2	.17***	.15***	.01	.04**	--	--

Note: + $p < .10$, * $p < .05$, ** $p < .01$,*** $p < .001$; [a]Continuance was measured by total years of service;
[b]Gender coded as 1= male, 2=female; [c]Marital status coded as 0=single, 1= married

Highest Rank Achieved

An examination of the correlations (see Table 3) indicates that socially desirable responding, gender, marital status, verbal reasoning, complex problem solving, creative thinking, writing, networking skills, consideration leadership style, achievement orientation, stress tolerance, learning goal orientation, status seeking, responsibility, and tolerance for ambiguity were significantly correlated with highest rank achieved. The strongest positive correlates were marital status (r = .38, p <.001), complex problem solving (r = .40, p <.001), creative thinking (r = .40, p <.001), writing skills (r = .24, p <.001), achievement orientation (r = .22, p <.001), stress tolerance (r = .17, p <.001), responsibility (r = .28, p <.001), and tolerance for ambiguity (r = .15, p <.001). The strongest negative correlates were networking skills (r = -.19, p <.001) and status seeking (r = -.15, p <.001).

Table 5 indicates the results of the hierarchical regression analysis completed on the variable highest rank achieved. A significant increment in variance explained was found for the entry of control variables and cognitive attributes (ΔR^2 =.14, p < .001). The set of social variables did not add a significant increment in variance explained when entered in the next to last step (ΔR^2 =.01, p = .1810). However, entry of motivational/personality variables in the last step resulted in a significant increase in variance explained (ΔR^2 =.04, p < .01). In the last step, the following attributes yielded significant standardized regression coefficients: marital status (β = .22, p < .001), complex problem solving skills (β = .17 p < .001), creative thinking (β = .19, p < .001), verbal expression skills (β = -.14, p < .05), self efficacy (β = -.11, p <.05), learning goal orientation (β = -.15, p <.01), and responsibility (β = .13, p <.01).

The results of a backwards procedure performed on the potential predictors of highest rank achieved are shown in Table 5- only the first and last steps are indicated. These results indicate that 6 variables remained as significant predictors of the highest rank officers achieved in their career. These were marital status (β = .24, p < .001), complex problem solving skills (β = .17, p < .001), creative thinking skills (β = .21, p < .001), achievement orientation (β = .10, p < .05), learning goal orientation (β = -.13, p < .01), and responsibility (β = .13, p <.01). Verbal expression skills (β = -.08, p <.10), self efficacy (β = -.07, p <.10) and tolerance for ambiguity (β = .09, p <.10) were marginally associated with highest rank attained.

Table 5 ***Regression Analyses with Highest Rank Achieved as the Dependent Variable***

Variable and Statistic	Standardized Betas				Backwards Regression	
	Step 1	Step 2	Step 3	Step 4	Initial Step	Final Step
Step 1.						
Socially Desirable Responding	-.07+	-.04	-.04	-.04	-.04	
Gender[a]	-.03	-.02	-.03	-.05	-.05	
Marital Status[b]	.36***	.26***	.24***	.22***	.22***	.24***
Measurement Form	.03	.02	.02	.02	.02	
Step 2.						
Verbal Reasoning Score		-.01	-.01	-.02	-.02	
Complex Problem Solving		.20***	.19***	.17***	.17***	.17***
Creative Thinking		.23***	.22***	.19***	.19***	.21***
Headlines - Writing		.08+	.07	.05	.05	
Step 3.						
Networking Skills			-.05	.00	.00	
Emotional Perceptiveness			-.06	-.07	-.07	
Interpersonal Insight			.06	.02	.02	
Consideration Leadership Style			.00	.01	.01	
Structuring Leadership Style			.09	.06	.06	
Verbal Expression Skills			-.13*	-.14*	-.14*	-.08+
Step 4.						
Flexibility				.10	.10	
Extroversion				.04	.04	
Dominance				-.01	-.01	
Achievement orientation				.07	.07	.10*
Stress Tolerance				.05	.05	
Self Efficacy				-.11*	-.11*	-.07+
Learning Goal Orientation				-.15**	-.15**	-.13**
Status seeking				-.04	-.04	
Openness				-.03	-.03	
Responsibility				.13**	.13**	.13**
Agreeableness				-.02	-.02	
Tolerance for Ambiguity				.06	.06	.09+
R^2	.15	.29	.31	.35	.35***	.33
ΔR^2	.15***	.14***	.01	.04**	--	--

Note: + $p < .10$, * $p < .05$, ** $p < .01$,*** $p < .001$; [a]Continuance was measured by total years of service; [b]Gender coded as 1= male, 2=female; [c]Marital status coded as 0=single, 1= married

Discussion

The objective of this research project was to identify cognitive, motivational, social, and personality measures that predict long-term continuance and advancement among officers in the U.S. Army. Table 6 summarizes our findings.

Complex problem solving skills, creative thinking skills, and responsibility were consistent predictors of both long-term career continuance and advancement among U.S. Army officers. The findings with respect to cognitive skill sets are consistent with the notion that leadership represents a form of problem solving in ill-defined and complex social domains (Mumford, Zaccaro, Harding, Jacobs & Fleishman, 2000). As well, Jacobs and Jacques (1991) suggest that ambiguity and complexity increase as the officer progresses to more senior levels of leadership. Leadership problems become more multifaceted and less defined, often presenting novel and unfamiliar parameters. Their successful resolution requires more complex thinking skills and creativity. Officer success in such activities should foster promotion potential. In addition to complex problem solving and creative thinking skills, motivational variables, such as flexibility and achievement orientation, were predictors of continuance and advancement, respectively. These dispositional variables may give officers the proactive coping skills needed to tolerate and operate in the uncertainty inherent in these environments.

It is interesting to note that several predictors, including learning goal orientation, and verbal expression skills, *negatively* predicted long-term career continuance and advancement. It could be that officers high in these characteristics, especially verbal expression skills, tend to value appearances over substance, and that the Army's promotion system is good at detecting these differences. Also, the up-or-out promotion system, at least through the rank of captain may foster a performance goal-oriented climate that is not necessarily conducive to those high in learning goal orientation.

In terms of informing ARI's ongoing efforts to develop new selection tests for officer candidates, the results herein reinforce the importance of some characteristics currently measured by these tests. Thus, this research suggests that it may be useful to incorporate measures of creative thinking skills, complex problem-solving skills, flexibility, achievement orientation, and responsibility into ARI's officer candidate selection batteries. In this regard, ARI has initiated a research program to develop an automated scoring system for the creative thinking assessment (i.e., the Consequences Test) as a first step towards transitioning this measure from a research setting to an Initial Operational Test and Evaluation (IOT&E). Positive results for predicting continuance and performance in an IOT&E will lead to the integration of this measure into ARI's new officer selection test battery.

With respect to demographic factors, marital status was a consistent predictor of continuance and advancement. Bryant et al., (2010) noted that "married [enlisted] Soldiers are in a position to take advantage of the variety of benefits the Army has to offer and are not alone in managing their lives outside their work responsibilities" (p. 35). Accordingly, they are more likely to reenlist and stay in the Army. A similar dynamic may exist for commissioned officers as well. Additionally, gender was found to be negatively related to officer continuance, suggesting that male officers remained in the Army longer than female officers. These findings

are consistent with previous research demonstrating gender differences in continuance commitment among U.S. Army officers (Karrasch, 2003). Karrasch noted that male officers are more likely to have more years of service invested in the Army than female officers and are more likely to have spouses who do not work outside of the home. Therefore, the cost of leaving the Army may be higher for male as compared to female Army officers.

We also noted the high correlation between continuance and highest rank achieved, $r = .89$. This is not surprising given that an increased probability of reaching a higher rank would probably keep officers in the Army. However, promotion in the Army is not merely a function of tenure, especially after the rank of captain during the time period covered by the data set. Effectiveness in lower ranks and the completion of particular kinds of experiences also contribute to promotion. Thus, while we can expect these two variables to be highly correlated, we still believe that they reflect conceptually different constructs.

This research has a few methodological limitations that are worthy of note. First, our experimental selection battery was not administered to the Army officers until after most had already been commissioned for some period of years. Accordingly, there is a retrospective element to the continuance criterion (i.e., years of service since the time of commissioning) developed for our predictive validation. We recognize that our research design would necessarily have excluded some junior officers who would have separated very early in their careers. Accordingly, the range of test scores obtained from our sample was likely to be somewhat restricted. The same would apply to the continuance criterion scores for our sample (which excludes some officers who had an early separation). Another research limitation is that a subsample of our subjects (n = 187) were still serving in the Army at the time we performed these analysis. In these cases, the continuance criterion was not fully mature, placing a restriction on the observed ranges of scores that were used in the validation. Considering the various methodological limitations mentioned here, we believe that the research findings we reported are likely to be conservative.

Although this research identified several knowledge, skills, abilities, and other characteristics (KSAOs) that were associated with career-long continuance and advancement for Army officers, it did not examine the mechanism by which these individual differences affect long-term outcomes. It may be the case that certain KSAOs are associated with, for example, the attainment of challenging work assignments. Further analyses are necessary to determine how KSAOs operate to influence career continuance and advancement.

Table 6 ***Significant Predictors of Continuance and Highest Rank Achieved***

Unique Predictors of Continuance[a]	Unique Predictors of Highest Rank Attained
• Gender[b] - • Marital status[c] + • Complex problem solving skills + • Creative thinking skills + • Verbal Expression Skills - • Flexibility[d] + • Learning goal orientation – • Responsibility +	• Marital status[c] + • Complex problem solving skills + • Creative thinking skills + • Verbal Expression Skills[d] - • Achievement Orientation + • Learning Goal Orientation – • Responsibility +

Note. Unless otherwise indicated, all of the above predictors were significant for both hierarchical and backwards regressions. - negative relationship; + positive relationship; [a]Continuance was measured by total years of service; [b]Gender coded as 1=male, 2=female; [c]Marital status coded as 0=single, 1= married; [d]Significant only in hierarchical regression analyses

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