Technical Report 1355

Validating Future Force Performance Measures (Army Class): Concluding Analyses

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Human Resources Research Organization

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14. ABSTRACT *(Maximum 200 words)*:

The Army needs the best personnel to meet challenging and constantly changing demands. Accordingly, it is seeking recommendations on new predictor measures, in particular, measures of non-cognitive attributes (e.g., interests, values, temperament) that could enhance entry-level Soldier selection and classification decisions. The U. S. Army Research Institute for the Behavioral and Social Sciences (ARI) conducted concurrent and longitudinal criterion-related validity examinations of new measures to inform these recommendations. Data on experimental predictors were collected from over 600 Soldiers in the concurrent effort and about 11,000 Soldiers in the longitudinal effort. In the longitudinal examination, criterion data were collected from Solders at three career points—end of training, after about 12-24 months in-service, and again about a year later. In the present report, we expanded on previous analyses conducted in this "Army Class" program of research by (a) modeling the latent structure of the predictor and criterion space; (b) examining Soldier performance, attitudes, and continuance over time; (c) examining the individual differences that best predict Soldier outcomes; and (d) examining mediators and moderators of this predictive evidence, with particular emphasis on the role of Military Occupational Specialty. Results represent a significant extension of previous Army enlisted Soldier performance and continuance research.

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VALIDATING FUTURE FORCE PERFORMANCE MEASURES (ARMY CLASS): CONCLUDING ANALYSES

EXECUTIVE SUMMARY

Research Requirement:

The U.S. Army's personnel selection and accessioning system must be flexible enough to select the best potential Soldiers under rapidly changing circumstances and classify them into military occupational specialties (MOS) that will maximize their performance. Given the high volume of Soldiers the Army accesses each year, it is critically important that they identify the best candidates out of a population of individuals that must already meet stringent minimum standards for enlistment. To accomplish these objectives, the Army relies heavily on the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB has an excellent track record for predicting Soldier performance; however, it only covers a limited portion of the individual differences that previous research has found to be predictive of performance. This is particularly true of non-cognitive attributes, such as interests, values, and temperament. The primary objective of the "Army Class" research program is to recommend new experimental predictor measures that offer the greatest potential to enhance new Soldier selection and classification. This capstone technical report summarizes seven years of Army Class research and expands on analyses conducted previously.

Procedure:

The Army Class program of research comprises two validation studies—a Concurrent Validation and a Longitudinal Validation. In the Concurrent Validation, predictor and criterion data were collected from 635 Soldiers in five target MOS who had been in service for 9 to 48 months. The predictor instruments included (a) two temperament-oriented measures (the Rational Biodata Inventory [RBI] and Work Suitability Inventory [WSI]), (b) two person-environment fit measures (the Work Preferences Assessment [WPA] and Work Values Inventory [WVI]), and (c) a Predictor Situational Judgment Test (PSJT). Criterion data, including Job Knowledge Tests (JKTs) and a self-report attitudinal survey were collected in the same session. Performance ratings were also collected from Soldiers' supervisors.

In the Longitudinal Validation, predictor data were collected from about 11,000 entry-level enlisted Soldiers. Roughly half of these Soldiers were drawn from job-specific samples targeting six entry-level MOS, while the other half was drawn from an Army-wide sample with no MOS-specific requirements. The experimental predictor instruments were administered to new Soldiers as they entered the Army through one of four reception battalions. The predictor measures included (a) three temperament measures (Assessment of Individual Motivation [AIM], Tailored Adaptive Personality Assessment System [TAPAS], and RBI), (b) the PSJT, and (c) two measures of person-environment (P-E) fit (the WPA and Army Knowledge Assessment [AKA]).

Training performance criterion measures were administered to Soldiers in six job-specific longitudinal validation samples. These measures included (a) MOS-Specific JKTs, (b) MOS-specific and Army-wide performance ratings collected from training instructors and peers, and (c) a questionnaire measuring Soldiers' experiences and attitudes towards the Army through Initial Military Training (IMT). Next, we collected in-unit job performance data from Soldiers in both the MOS-specific and Army-wide samples, most of whom had been in the Army for 12-24 months. The criterion measures were similar to those administered at the end of training, with only the MOS-specific sample receiving the MOS-specific criterion measures. Finally, we conducted another in-unit data collection of Soldiers in the MOS-specific and Army-wide samples, this time when Soldiers would have been in the Army on average about 3 years. The same criterion measures were administered in both the first and second in-unit data collections. For all Regular Army Soldiers, we also obtained data on attrition and re-enlistment from administrative records.

In both the Concurrent and Longitudinal Validation projects, we obtained Soldier ASVAB scores from administrative records.

The purpose of this report is to draw on the richness of the Army Class data to meet the following objectives:

1. Model the latent structure of the predictor and criterion space to better understand the constructs underlying the Army Class instruments.

2. Examine Soldier performance, attitudes, and continuance over time.

3. Examine the individual differences that best predict Soldier performance, attitudes, and continuance over time.

4. Examine mediators and moderators of this predictive evidence, with particular emphasis on the mediating role of Soldier attitudes and the moderating role of MOS.

Findings:

In examining the latent structure of the predictor and criterion space, we found the following:

1. *Most of the predictor scales could be classified reliably into eight factors*. These eight factors were Achievement Orientation, Affect Management, Agreeableness, Conscientiousness, Practical Intelligence, Openness, Fitness Orientation, and Surgency. Other scales that previous research has shown to be predictive of key Soldier criteria, but not classified into one of the eight factors were treated separately in subsequent analyses. These scales were Internal Locus of Control, Army Affective Commitment, and Cognitive Aptitude, as measured by the Armed Forces Qualification Test (AFQT).

2. *In general, analyses supported more fine-grained criterion measurement*. In our analysis, higher-order factors (e.g., overall fit) were evaluated against lower order factors (e.g., Army and MOS-specific fit). In nearly every case, analysis supported the lower-order factors, suggesting that there are a number of meaningful differences among the criteria administered, despite high intercorrelations observed in previous Army Class reports.

In examining Soldier performance, attitudes, and continuance over time, we found the following:

1. *Soldiers' attitudes and continuance intentions tended to decrease through their first term of service, but generally stayed above the mid-point of the scale*.

2. *Soldiers' performance was generally stable over their first term; however, Physical Fitness did increase significantly from training to their first unit of assignment*.

3. *Attrition over Soldiers' first term of service can be characterized by three groups representing "early leavers," "late leavers," and "stayers."* Soldiers separating for medical standards reasons tended to be early leavers, while Soldiers separating for character, performance, and other reasons tended to be late leavers. Consistent with previous research, rates of attrition were highest in the early months before leveling off after about one year.

In examining the individual differences that best predict Soldier performance, attitudes, and continuance, we found the following:

1. *The predictor factors were strongly related to attitudinal and continuance intentions outcomes at multiple points in time*. The relationship was strongest at end of training, and decreased at the two in-unit data collections. The strongest predictors of Soldier attitudes at the end of training were the Army Affective Commitment and Affect Management factors. However, at the two in-unit data collections, the strongest predictors were related to more capability-oriented constructs, such as Internal Locus of Control, Cognitive Aptitude, and Practical Intelligence.

2. *Multiple latent factors predicted change in attitudes over Soldiers' first term of service*. Army Affective Commitment and Surgency were associated with more negative Soldier attitudes over time, while Achievement Orientation and Agreeableness were associated with more positive Soldier attitudes over time.

3. *Prediction of Soldier performance and attrition was dominated by two factors: Cognitive Aptitude and Fitness Orientation*. In addition to those two factors, Affect Management, Army Affective Commitment, and Internal Locus of Control also predicted performance and attrition. Agreeableness was also associated with a positive change in Soldier Effort over their first term of service. Overall however, many outcomes, such as Soldier Effort, Peer Support, and Counterproductive Work Behaviors, were not strongly related to the predictor factors.

4. *Soldier re-enlistment after their first term of service was predicted by Cognitive Aptitude, Internal Locus of Control, and Conscientiousness*. Higher Cognitive Aptitude was associated with a lower propensity to re-enlist, consistent with previous research. Internal Locus of Control and Conscientiousness were both associated with a higher propensity to re-enlist.

Finally, in examining the mediators and moderators of the estimates reported above, we found the following:

1. *The relationship between the predictor factors and key outcomes (i.e., performance and attrition) are either partially or fully mediated by Soldier attitudes and continuance intentions*. These results suggest that these attitudes at certain points in time may be reasonable proxies for the performance and continuance outcomes of ultimate interest.

2. *Multiple predictor factors exhibited significant variability in validity across MOS throughout a Soldier's first term*. Many of the predictors exhibiting the most variability across MOS were found to be unrelated to key outcomes in the predictive analyses described above, suggesting that these factors may have high classification potential. For example, Conscientiousness was weakly related to MOS Fit in the full sample, but was found to be positively predictive of MOS Fit in some MOS, and negatively predictive in others in our analysis.

We believe the analyses presented here represent a significant extension of previous Army research regarding enlisted Soldier performance and attrition.

Utilization and Dissemination of Findings:

These findings provide useful information to Army researchers interested in examining Soldier performance and continuance. The results will also be useful to Army personnel managers in guiding future assessment development activities.

VALIDATING FUTURE FORCE PERFORMANCE MEASURES (ARMY CLASS): CONCLUDING ANALYSES

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VALIDATING FUTURE FORCE PERFORMANCE MEASURES (ARMY CLASS): CONCLUDING ANALYSES

CHAPTER 1: INTRODUCTION

Deirdre J. Knapp, Matthew T. Allen (HumRRO), & Kimberly S. Owens (ARI)

Background

The U.S. Army's personnel selection and accessioning system faces unique challenges. The scope and structure of the Army's manpower needs change rapidly depending on current force requirements and potential conflicts around the globe. Thus, the Army's selection and accessioning system must be flexible enough to select the best potential Soldiers and classify them into military occupational specialties (MOS) that will maximize their performance. Adding to this challenge is an incredibly high flow of applicants. To illustrate, the Army accessed over 100,000 Soldiers in FY2011 and around 140,000 in FY2010 (Heffner, Campbell, & Drasgow, 2011). Given this volume, it is critically important that the Army be able to identify the *best* candidates, not just any candidates, out of a population of individuals that must already meet stringent minimum standards for enlistment. To meet these challenges, the Army relies heavily on standardized testing – primarily the Armed Services Vocational Aptitude Battery (ASVAB) – to identify high potential individuals. The ASVAB has an excellent track record for predicting Soldier performance overall and within specialties (Welsh, Kucinkas, & Curran, 1990); however, it only covers a limited portion of the individual differences that previous research has found to be predictive of performance (Drasgow, Embretson, Kyllonen, & Schmitt, 2006; Schmidt & Hunter, 1998).

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) undertook a 7-year effort to evaluate various non-cognitive measures to supplement the ASVAB and improve Soldier selection and classification. This effort is called *Validating Future Force Performance Measures*, or "Army Class." Non-cognitive measures are designed to assess aspects of an applicant's personality, temperament, values, and interpersonal skills in contrast to the cognitive and knowledge-based domains measured by the ASVAB. The goal behind non-cognitive measures is not only to predict Soldier performance in various specialties, but also to predict Soldier performance *uniquely* from the ASVAB. Consequently, previous reports in the Army Class research program have examined the predictive efficacy and classification potential of individual non-cognitive instruments, such as the Rational Biodata Inventory (RBI) and Work Preferences Assessment (WPA) (Ingerick, Diaz, & Putka, 2009; Knapp & Heffner, 2009; Knapp, Owens, & Allen, 2012), incrementally beyond the ASVAB. Researchers conducted these analyses in preparation for an Initial Operational Test and Evaluation (IOT&E) of one or more of these instruments for selection and classification (an effort that is ongoing, see Knapp & Heffner, 2011). However, in the pursuit of finding the "best bet" non-cognitive measures to select Soldiers and classify them into their MOS, researchers had fewer opportunities to address other fundamental questions germane to future Army research and to extant research regarding Soldier performance. Questions such as: "Do Soldier attitudes, separation behaviors, and performance outcomes change over their first term of service?" and "What individual differences predict key Soldier outcomes?"

The objective of this report is to draw on the richness of the Army Class data to enhance our understanding of Soldiers' performance, attitudes, and continuance throughout their first term of service, and the individual differences that best predict these outcomes. Specifically, we seek to achieve the following:

1. Model the latent structure of the predictor and criterion space to better emphasize the constructs underlying the Army Class instruments rather than the measurement methods.
2. Examine Soldier performance, attitudes, and continuance over time.
3. Examine the individual differences that best predict Soldier performance, attitudes, and continuance over time.
4. Examine mediators and moderators of this predictive evidence, with particular emphasis on the mediating role of Soldier attitudes and the moderating role of MOS.

Before examining these objectives in more detail, we first describe the Army Class research that has been conducted to date, the Army Soldier selection process, and finally, the framework of the current report.

Overview of the Army Class Research Program

The Army Class research program continues three separate but related efforts that ARI has pursued since 2000 to ensure the Army is provided with the best personnel to meet the demands of the 21st century: *Maximizing Noncommissioned Officer (NCO) Performance for the 21st Century* (NCO21; Knapp, McCloy, & Heffner, 2004)*; New Predictors for Selecting and Assigning Future Force Soldiers* (Select21; Knapp, Sager, & Tremble, 2005); and *Performance Measures for 21st Century Soldier Assessment* (PerformM21; Knapp & Campbell, 2006). The NCO21 research identified and validated non-cognitive predictors of NCO performance for use in the junior NCO promotion system. The Select21 research provided new personnel tests to improve the ability to select and assign first-term Soldiers with the highest potential for future jobs. The Select21 effort validated new and adapted prior individual difference measures against criteria representing both technical and non-technical aspects of performance. Finally, the PerformM21 research examined the feasibility of instituting routine competency assessments for enlisted personnel. Because of their unique but complementary emphases, these three research efforts provided a strong theoretical and empirical foundation for the Army Class program. The foundation for these research projects is the Army's seminal *Project A*, a 12-year enlisted personnel selection and classification research program conducted in the 1980s and early 1990s (Campbell & Knapp, 2001).

Early stages of the Army Class effort focused on three activities. The first explored the idea that job knowledge tests (JKTs) could potentially be used to facilitate reclassification of experienced Soldiers by assessing knowledge and skills applicable to their new MOS, then focusing retraining on areas of deficiency. Given the extraordinary resources required to conduct classification research in a system with over 150 occupations, a second early activity involved obtaining recommendations for feasibly performing large-scale classification research from an expert panel (Campbell et al., 2007). The third activity was a concurrent validation of the battery of experimental pre-enlistment predictor and

criterion measures developed in Select21 (Knapp et al., 2005). The goal of the concurrent validation was to supplement the Select21 database to better support classification analyses because the Select21 job-specific samples were insufficient for this purpose. Although the classification analyses using the combined Select21/Army Class concurrent validation database were still based on a relatively small sample of incumbent Soldiers in the target MOS, results indicated that the experimental predictor measures showed promise for enhancing the classification of entry-level Soldiers (Ingerick et al., 2009).

In 2007, the Army Class longitudinal criterion-related validation effort was initiated with the administration of experimental predictor measures to over 11,000 Soldiers. The measures assessed aspects of Soldier temperament, interests, and expectations using a number of scales (ranging from 1 to 15 per instrument). At the same time, the emphasis of the Army Class research shifted to more fully focus on initial Soldier selection—a topic of great interest to Army policymakers. This heightened interest in immediate improvements to the Soldier selection process was also reflected in the initiation of a companion ARI project entitled *Expanded Enlistment Eligibility Metrics (EEEM)*. The EEEM effort had a shorter timeframe for making recommendations to the Army about the use of new pre-enlistment tests to supplement the ASVAB. The EEEM project capitalized on the Army Class longitudinal validation and led to the addition of two experimental pre-enlistment measures to the research predictor set—an experimental version of the Assessment of Individual Motivation (AIM) and the Tailored Adaptive Personality Assessment System (TAPAS).

In 2008, training performance criterion data were collected for the longitudinal validation sample as Soldiers completed Advanced Individual Training (AIT) or One-Station Unit Training (OSUT). Some data were collected using assessments developed for Army Class and other data were obtained from administrative databases, on variables like attrition and training course scores. For the Army Class effort, the analyses examined the extent to which the experimental pre-enlistment measures from Select21 predicted training criteria using the full training criterion sample (Knapp & Heffner, 2009). The EEEM analyses were conducted earlier in the year using training criteria collected to that point with the goal of identifying predictors to recommend to the Army for immediate use in an IOT&E (Knapp, Heffner, & White, 2011).

In 2009, we collected in-unit job performance data on Soldiers from the longitudinal validation sample when most would have been working in their units for 12 to 24 months. A second round of in-unit job performance data collections were conducted in 2010-2011. These data were merged into a master database with the predictor and criterion data collected previously in 2007 and 2008. Analyses conducted throughout the research examined (a) the psychometric quality of the predictor and criterion measures and (b) the extent to which each experimental measure predicted Soldier performance, attitudes, and continuance (Knapp et al., 2012).

As the Army Class research program comes to a close, we have developed extensive documentation of this important research database and conducted additional analyses to (a) address fundamental research questions of interest to the Army and personnel researchers and (b) use innovative techniques to model the outcomes of interest (i.e., Soldier performance, attitudes, and continuance) in more complex ways. The results shed light on the underlying processes that

drive Soldier outcomes, with implications for Army selection and accessioning policies, as well as future ARI research. This report describes this capstone analysis work.[1]

Current Report

Previous ARI reports describe the Army Class data collection instruments (Moriarty, Campbell, Heffner, & Knapp, 2009; Knapp et al., 2005; Knapp & Tremble, 2007), the concurrent validation effort (Ingerick et al., 2009), the predictor and training criterion data collections (Knapp & Heffner, 2009), the EEEM research (Knapp & Heffner, 2010), and the in-unit data collections (Knapp et al., 2012) in detail. In Chapter 2 of the current report, we provide a summary of the concurrent and longitudinal validation methodologies, as well as a description of the instruments used in this research. Readers interested in more detailed information should consult the relevant technical reports.

In the remainder of this report, we describe the results of new analyses conducted on the Army Class datasets constructed in earlier phases. The analyses can be divided into three major components.

In the first component, we examine the latent structure of the predictor (Chapter 3) and criterion (Chapter 4) spaces. This activity serves a number of purposes. First, it reduces the number of predictors and criteria we examine to a more manageable set, which allows for a more diverse array of analyses that would be prohibitive with a large number of predictors. It also allows for a big picture understanding of the findings because it reduces the volume of results. Second, relying on latent construct scores rather than scores from individual instruments reduces the confounding influence of method factors on the results.

The second major component of the analyses is to take the results from Chapters 3 and 4 and model aspects of the criterion space—covered in Chapters 5, 6, and 7. In each chapter we accomplish three objectives: (a) model the criterion category of interest over a Soldier's first term of service, (b) examine the efficacy of the individual difference factors identified in Chapter 3 in predicting these outcomes and the change of these outcomes over time, and (c) identify the mediators of the predictor/criterion relationships established. Given the complexity of these models and challenges associated with the data (e.g., missing data across time points), each chapter relies on innovative data analysis approaches to gain a complete understanding of these three issues. Chapter 5 examines Soldier attitudes (e.g., Army fit and commitment) and self-reported continuance cognitions using a combination of Latent Growth Modeling (LGM) and Full Information Maximum Likelihood (FIML) to account for missing data. Chapter 6 uses similar approaches to Chapter 5, but examines Soldier performance (e.g., effort and physical fitness). Chapter 7 uses Discrete-Time Survival Mixture Analysis (DTSM) to model the structure of attrition in Soldiers' first term of enlistment, and *when* a Soldier is likely to separate given his or her individual difference profile. The authors of this chapter also examine the efficacy of the latent scores identified in Chapter 3 in predicting re-enlistment.

[1] We have also produced a brief non-technical report summarizing the method and findings of the Army Class longitudinal validation research (R. C. Campbell, Owens, & Knapp, 2012).

The third major analysis involves examining MOS as a moderator of the predictor/criterion relationship (Chapter 8). This set of analyses is distinct from previous Army Class classification analyses in that we examine differential validity across MOS rather than operational classification, which has practical constraints such as the number of slots available in each MOS (Ingerick et al., 2009; Trippe, Ingerick, & Diaz, 2012). The chapter uses Hierarchical Linear Modeling (HLM) to examine differential validity for attitudinal and performance outcomes, and Multilevel Event History Analysis (MLEHA) for differential prediction of attrition over time.

Finally, in the Chapter 9, we discuss the implications of all of the above analyses as a whole for both future research and Army policy, and tie these results in with the findings from previous Army Class reports.

CHAPTER 2: RESEARCH DESIGN AND EXECUTION

Jing Jin & Matthew T. Allen (HumRRO)

Overview

In this chapter, we describe the research design and execution of the *Army Class* project. We adopted two approaches for evaluating non-cognitive measures to improve the selection and classification of enlisted Soldiers: (a) a concurrent validation (CV) and (b) a longitudinal validation (LV). First, we describe the CV research, including its design, procedure, and participants. Next, we describe the three LV data collections (the end of training [EOT] data collection and the two in-unit data collections [IU1 and IU2]), including specific information about the research design, procedure, and participants. We then describe the predictor and criterion measures administered as part of the Army Class project in detail. We conclude with a summary of the research design and execution.

Concurrent Validation (CV)

The goal of the concurrent validation was to supplement the Select21 database to better support classification analyses because the Select21 MOS-specific samples were insufficient for this purpose. More information about the concurrent validation effort can be found in Ingerick et al., (2009).

Design and Procedure

In 2006, the project team administered the experimental pre-enlistment predictor measures and performance criterion measures to first-term enlisted Soldiers who had been in service for 9 to 48 months. Researchers drew the concurrent validation sample from a set of five targeted MOS selected based on size and representation of a diversity of job requirements:

- 11B (Infantryman)
- 19K (Armor Crewman)
- 25U (Signal Support System Specialist)
- 68W (Health Care Specialist)
- 91B (Wheeled Vehicle Mechanic)[2]

Sample

Researchers collected data from 635 Soldiers, 522 of whom met time-in-service and prior service criteria. To enhance comparability with the Army Class LV effort, we limited the Army Class CV analysis sample to Soldiers with less than 48 months in service and with no prior military service. Therefore, the sample size numbers in this table are smaller than the numbers reported in the original research (Ingerick et al., 2009). Demographic information about the sample is

[2] At the time this research was conducted, 68W was "91W Health Care Specialist." The MOS was changed to 68W in 2006. We label this MOS 68W to reduce confusion when comparing the Army Class CV and LV samples. Similarly, "63B Light Wheeled Vehicle Mechanic" was changed to 91B in 2009.

displayed in Table 2.1. Note that females are underrepresented in this sample relative to the whole Army (about 15% of the Army, see http://www.army.mil/women/today.html), in part due to the large proportion of the sample coming from Maneuver Fires and Effects MOS (11B and 19K).

Table 2.1. Demographic Characteristics for the CV Sample

Subgroup	*n*	*%*
Gender		
Male	497	95.2
Female	25	4.8
Race		
White	414	79.3
Black	60	11.5
Other	48	9.2
Ethnicity		
White Non-Hispanic	340	65.1
Hispanic	100	19.2
MOS		
11B	229	43.9
19K	72	13.8
25U	60	11.5
68W	78	14.9
91B	83	15.9
Totals	522	100.0

Note. The sample sizes for individual demographic variables vary due to missing data. Excludes Soldiers with more than 48 months in service and with prior military service.

Longitudinal Validation (LV)

The Army Class LV project extended the CV research by collecting predictor and criterion measures at separate points in time. We administered predictor measures at Soldier's initial entry into the Army, and collected criterion data at the end of training, after 1 to 2 years in service, and after 3 years in service.

Design and Procedure

The longitudinal validation research was designed as a four-phase effort. First, we administered the predictors to Soldiers representing all Components (Regular Army, U. S. Army Reserve, and U. S. Army National Guard) during their initial in-processing at one of four Army Reception Battalions, beginning in mid-2007 and continuing through early 2008. Soldiers represented two samples: (a) a job-specific samples targeting six entry-level MOS, as listed below, and (b) an Army-wide sample with no MOS-specific requirements:

- 11B (Infantryman)
- 19K (Armor Crewman)
- 31B (Military Police)

- 68W (Health Care Specialist)
- 88M (Motor Transport Operator)
- 91B (Light Wheeled Vehicle Mechanic)

One MOS sampled in the CV research, 25U (Signal Support System Specialist), was not included in the LV research because of difficulty reaching these widely-dispersed Soldiers. Instead, we sampled two additional MOS (31B and 88M). In the second phase, training criterion measures were administered to the job-specific sample of Soldiers upon completion of their Initial Military Training (IMT)—either one-station unit training (OSUT) or advanced individual training (AIT)—beginning in the fall of 2007 and continuing through September 2008. We refer to this phase as the End of Training (EOT) data collection.

In the third phase, from early to mid-2009, the first round of in-unit job performance criterion measures were administered to Soldiers in the longitudinal validation sample, regardless of MOS, when most of them had been in the Army for 12 to 24 months. We refer to this phase as the In-Unit 1 (IU1) data collection.

The fourth phase replicated the third phase with another round of in-unit job performance criterion measures during 2010-2011, when Soldiers had been in the Army on average for three years. We refer to this phase as the In-Unit 2 (IU2) data collection. The predictor data were collected in a proctored setting using paper and pencil measures. The majority of the criterion data collections used computerized, proctored, self-paced assessments. Both the Soldiers and their Supervisors participated in the criterion data collections. More information regarding the longitudinal validation effort can be found in Knapp and Heffner (2009), and Knapp et al., 2012).

Sample

Predictor data were initially collected from 11,065 entry-level Soldiers, 10,814 of whom were eligible for the research (i.e., had no prior service). Sample sizes and specific demographic information for each phase of the longitudinal data collections are provided in Table 2.2.

Table 2.2. Demographic Characteristics for the Predictor, End of Training, In-Unit 1, and In-Unit 2 Samples

	Predictor Sample		Training Sample		In-Unit 1 Sample		In-Unit 2 Sample	
Subgroup	*n*	%	*n*	%	*n*	%	*n*	%
Gender								
Male	8,646	80.0	2,083	90.8	1,280	80.7	914	86.0
Female	2,113	19.5	207	9.0	301	19.0	145	13.6
Race								
White	8,431	78.0	1,976	86.1	1,239	78.1	822	77.3
Black	1,527	14.1	157	6.8	197	12.4	150	14.1
Other	818	7.6	154	6.7	144	9.1	87	8.2
Ethnicity								
White Non-Hispanic	7,541	69.7	1,776	77.4	1,104	69.6	724	68.1
Hispanic	1,527	14.1	323	14.1	239	15.1	164	15.4
MOS								
11B/X	1,790	16.6	671	29.3	311	19.6	215	20.2
19K	581	5.4	471	20.5	95	6.0	82	7.7
31B	1,484	13.7	716	31.2	212	13.4	129	12.1
68W	307	2.8	136	5.9	39	2.5	26	2.5
88M	512	4.7	72	3.1	61	3.8	26	2.5
91B	472	4.4	219	9.5	65	4.1	35	3.3
Army-Wide	5,654	52.3	9	0.4	803	50.6	550	51.7
Component								
Regular Army	5,370	49.7	1,387	60.5	1,054	66.4	937	88.2
ARNG	3,793	35.1	694	30.3	322	20.3	81	7.6
USAR	1,651	15.3	213	9.3	211	13.3	45	4.2
Totals	10,814	100.0	2,294	21.2	1,587	14.7	1,063	9.8

Note. The Training Sample reflects the number of Soldiers that participated in the EOT data collection, not the number for which we had administrative training data. The "%" figures in the "Totals" row represent percent of the predictor sample. The sample sizes for individual demographic variables vary due to missing data. These data exclude Soldiers with prior military service.

Predictor Instruments

Instruments were selected based on their potential for predicting first-term Soldier performance and retention not already predicted by existing tools (i.e., the ASVAB and Education Tier, described below). In the following sections, we describe various predictor measures included in the Army Class CV and LV data collections. We classified the predictors into four groups: (a) baseline, (b) cognitive, (c) temperament, and (d) person-environment fit (see Table 2.3 for a summary). The majority of experimental predictor measures were collected in both CV and LV with a few exceptions: Work Suitability Inventory (WSI) and Work Values Inventory (WVI) were administered only in the CV effort; Assessment of Individual Motivation (AIM) and Tailored Adaptive Personality Assessment System (TAPAS) were administered only in the LV effort. A complete list of the component scales for all of these predictor instruments can be found in Appendix A. Other than the baseline predictors (which were obtained from Soldiers' personnel records), all of the predictor measures were administered in a proctored setting. In the Army Class CV research, the instruments were computer-administered, while in the LV research, the instruments were administered in a paper/pencil format.

Table 2.3. Summary of Predictor Measures in Army Class

Predictor Measures	Concurrent	Longitudinal
Baseline Predictors		
Armed Services Vocational Aptitude Battery (ASVAB)	√	√
Armed Forces Qualification Test (AFQT)	√	√
Education Tier		√
Cognitive Predictors		
Assembling Objects (AO)	√	√
Temperament Predictors		
Assessment of Individual Motivation (AIM)		√[a]
Tailored Adaptive Personality Assessment System (TAPAS)		√[a]
Rational Biodata Inventory (RBI)	√	√
Work Suitability Inventory (WSI)	√	
Predictor Situational Judgment Test (PSJT)	√	√[b]
Person-Environment (P-E) Fit Predictors		
Work Preferences Assessment (WPA)	√	√
Army Knowledge Assessment (AKA)		√
Work Values Inventory (WVI)	√	

[a] Administered to one-third of the sample. [b] Administered to two-thirds of the sample.

Baseline Predictors

Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB measures specific cognitive abilities and aptitudes predictive of entry-level Soldier performance. It consists of the following ten subtests: General Science (GS), Arithmetic Reasoning (AR), Math Knowledge (MK), Word Knowledge (WK), Paragraph Comprehension (PC), Auto Information (AI), Shop Information (SI), Mechanical Comprehension (MC), Electronics Information (EI), and Assembling Objects (AO). For classification to an MOS, the applicants' ASVAB subtest scores are aggregated to form nine Aptitude Area (AA) composites, which are then compared to the minimum AA score(s) set for each MOS.

Armed Forces Qualification Test (AFQT). AFQT is a weighted composite of four ASVAB subtests (AR, MK, WK, and PC), and is considered a measure of general cognitive aptitude. AFQT is used in conjunction with Education Tier and medical and moral screens to evaluate applicants for enlistment. Examinees are classified into categories based on their AFQT percentile scores (Category I = 93–99, Category II = 65–92, Category IIIA = 50–64, Category IIIB = 31–49, Category IV = 10–30, Category V = 1–9).

Education Tier. Education Tier classifies an applicant's educational credential into one of three categories. Tier 1 generally constitutes a high school diploma or more (e.g., a college degree), while Tier 2 generally constitutes a non-high school diploma (e.g., a General Educational Development [GED] credential). Tier 3 applicants (no high school credential) are not allowed to enlist and the number of Tier 2 Soldiers allowed to enlist is restricted. In previous Army Class LV reports (e.g., Knapp et al., 2012), Education Tier was used as the primary basis for comparison when evaluating the experimental measures as predictors of first-term Solider attrition, because high school diploma status is strongly predictive of attrition (Knapik, Jones, Hauret, Darakjy, & Piskator, 2004), and is used as a basis for screening AFQT Category IIIB and IV applicants.

Cognitive Predictors

Assembling Objects (AO). AO is a subset of ASVAB assessing spatial ability. The items are graphical in nature, requiring respondents to visualize how an object will look when its parts are put together correctly. AO is currently administered as part of the ASVAB, but until recently had not been used to screen or select Army applicants. AO is now included in the Two Tier Attrition Screen (TTAS) used to screen applicants who have not earned a high school diploma.

Temperament Predictors

Assessment of Individual Motivation (AIM). The AIM built on the seminal work of the Assessment of Background and Life Experiences (ABLE; White & Young, 1998), a non-cognitive measure developed as part of Project A (White, Young, & Rumsey, 2001), and was added to the Army Class longitudinal validation as part of the EEEM initiative (Allen, Cheng, & Ingerick, 2010). It measures six temperament characteristics predictive of first-term Soldier attrition and performance: Dependability (Non-Delinquency), Adjustment, Physical Conditioning, Leadership, Work Orientation, and Agreeableness. The AIM uses 30 forced-choice items, each consisting of four behavioral statements (i.e., tetrads). Respondents are asked to self-select the statement that is most descriptive of them and the statement that is least descriptive of them. A quasi-ipsative scoring method generated four construct scores for each item (i.e., one score for each stem) based on whether the respondents indicated the stem was most like them, least like them, or neither. Scale scores were obtained by averaging (across items) the scores for stems measuring the same construct. The reliability estimates were all acceptable (ranging from .70 to .78). The AIM is currently used operationally as part of the Tier Two Attrition Screen (TTAS; White, Young, Heggestad, Stark, Drasgow, & Piskator, 2004).

Tailored Adaptive Personality Assessment System (TAPAS-95s). The TAPAS-95s was also added to the Army Class project as part of the EEEM effort. The original TAPAS is an item response theory (IRT)-based computerized adaptive personality testing platform capable of measuring up to 22 lower-order facets of the Big Five Factor model (Goldberg, 1990), plus Physical Conditioning (Stark, Hulin, Drasgow, & Lopez-Rivas, 2006). The TAPAS-95s administered in the LV research was a static, non-adaptive surrogate where each Soldier received the same number ($k = 95$) and sequence of personality items. It measures 12 dimensions (facets) or temperament characteristics including: Achievement, Curiosity, Non-Delinquency, Dominance, Even-Temper, Attention-Seeking, Intellectual Efficiency, Order, Physical Conditioning, Tolerance, Cooperation/Trust, and Optimism. It uses a multidimensional pairwise preference (MDPP) format in which respondents indicate which of two statements is most like them. This format has been shown to be more resistant to applicants' attempts to fake good. A detailed presentation of the TAPAS is provided in the EEEM technical report (Stark, Chernyshenko, & Drasgow, 2009). Reliability cannot be estimated because of the MDPP response format. Further refinements to the TAPAS are ongoing in support of operational use of the TAPAS for selecting first term enlisted Soldiers (e.g., Knapp, Heffner, & White, 2011).

Rational Biodata Inventory (RBI). The RBI measures temperament and motivational characteristics important for entry-level Soldier performance and retention. The RBI was part of

the Select21 research (Kilcullen, Putka, McCloy, & Van Iddekinge, 2005), and built on previous ARI biodata instruments (e.g., the Assessment of Right Conduct) that have highly successful track records for predicting job performance in the Army (e.g., Kilcullen, Goodwin, Chen, Wisecarver, & Sanders, 2002; Kilcullen, Mael, Goodwin, & Zazanis, 1999; Kilcullen, White, Sanders, & Hazlett, 2003). Items ask respondents about their past behaviors, experiences, and reactions to previous life events using Likert-style response options (e.g., the extent to which they enjoyed thinking about the "plusses and minuses" of alternative approaches to solving a problem). The RBI used in the Army Class CV effort included nine scales thought to be useful for entry-level Soldier classification, including: Army Affective Commitment, Cognitive Flexibility, Cultural Tolerance, Fitness Motivation, Gratitude, Diplomacy, Respect for Authority, Stress Tolerance, and Team Orientation. The RBI used in the LV effort covered all 14 attributes of the Select21 research, with one scale (Team Orientation) deleted from CV research and six scales added (Peer Leadership, Achievement, Hostility to Authority, Self-Efficacy, Internal Locus of Control, and Narcissism). For both the CV and LV data collections, a 7-item lie scale was added to screen out socially desirable responses (though this screen was not used in any subsequent analyses). Most of the reliability estimates approached or exceeded .70. The substantive scales with fairly low internal consistency reliability estimates were Gratitude (α = .54 for CV, α = .43 for LV) and Narcissism (α = .55 for LV). Versions of the RBI are currently being tested for selecting officers (e.g., Putka, 2009; Putka, Kilcullen, Tremble, Wasko, & Shaw, 2009; Russell, Allen, & Babin, 2011; Russell & Tremble, 2011).

Work Suitability Inventory (WSI). The WSI measures respondents' beliefs about the types of work they would perform best. The measure's content is based on a slightly modified version of the temperament taxonomy that underlies the Occupational Information Network's (O*NET's) work styles domain (Borman, Kubisiak, & Schneider, 1999), and was originally developed as part of Select21 (McCloy & Putka, 2005a). Respondents rank-order 16 statements describing different types of work required of entry-level Soldiers (e.g., work that requires leading, taking charge, giving direction) in terms of how well they would perform the work (from most successfully to least successfully). The WSI yields a score for each of the 16 temperament characteristics that can then be combined or modified in multiple ways based on additional data to achieve one or more of the Army's personnel management objectives. The WSI was only included in the CV effort because it needs to be computer-administered. Due to the ipsative nature of the WSI, no internal consistency reliability estimates were provided for the WSI scales.

Predictor Situational Judgment Test (PSJT). The PSJT measures respondents' judgment and decision-making across situations commonly encountered by recruits prior to or during their first-term of enlistment (e.g., dealing with a difficult co-worker). The PSJTs used in the CV and LV research were shortened from the original Select21 measure and included only 20 items (Waugh & Russell, 2005). The PSJT targets five kinds of situations or dimensions important to first-term Soldier performance: Adaptability to Changing Conditions, Relating to and Supporting Peers, Teamwork, Self-Management, and Self-Directed Learning. Each item consists of a description of a problem situation and a list of four alternative actions that the respondent might take in that situation. Respondents rate the effectiveness of each action on a 1 to 7 scale (from "Ineffective" to "Very Effective"), and the keyed effectiveness ratings are based on experts' judgments. The PSJT yields a single, total score that demonstrated a high level of reliability (α = .85 for the CV sample and .86 for the LV sample).

Person-Environment (P-E) Fit Predictors

Work Preferences Assessment (WPA). The WPA measures respondents' preferences for (or interests in) various work activities, work environments, and learning opportunities offered by different jobs (e.g., repairing machines or equipment). As with many of the above measures, it was developed as part of the Select21 research (Van Iddekinge, Putka, & Sager, 2005a). Items ask respondents to rate how important a series of characteristics are to their ideal job using a 5-point Likert-type scale (1 = "Extremely unimportant to have in my ideal job" to 5 = "Extremely important to have in my ideal job"). Content is based on Holland's (1997) theory of vocational personality and work environment, including 72 items categorized into six types (or dimensions): Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). The WPA yields six dimension scores (corresponding to each of the six RIASEC dimensions) and 14 facet scores (corresponding to facets underlying the six RIASEC dimensions). The facet of Clear Procedure had the lowest reliability in both samples (α = .62 for CV, α = .64 for LV), whereas the remaining facets all reached acceptable reliability levels (ranging from .68 to .92).

Army Knowledge Assessment (AKA). The AKA measures respondents' understanding or expectations about the kinds of work activities and settings typically offered by the Army. Respondents are asked to read a brief description of six work settings and then rate the extent to which they think each setting describes the Army. Like the WPA, content is based on Holland's (1997) theory of vocational personality and work environment. However, the AKA differs from the WPA in that it indicates whether respondents have realistic expectations about the interests that Army life supports, whereas the WPA indicates whether respondents are interested in what Army life offers. The AKA was only included in the longitudinal validation. With the exception of Realistic Interests, which had a reliability estimate of .76, estimates for the remaining scales were high, ranging from .81 to .89.

Work Values Inventory (WVI). The WVI was also developed as part of Select21 (Van Iddekinge et al., 2005a) and measures the value respondents place on different work characteristics (e.g., opportunity to learn new skills, make decisions on one's own). Content is primarily based on Dawis and Lofquist's (1984) Theory of Work Adjustment. The WVI consists of a series of 28 statements, each describing a work characteristic that is potentially reinforced by a job. Each statement corresponds to a work value construct. Respondents rank order the 28 statements in terms of their importance to their ideal job. After ranking the 28 statements, respondents then denote which work characteristics reflected in the statements are important to have on their ideal job and which ones are unimportant to have on their ideal job. Like the WSI, the WVI yields a score for each work value that can then be combined or modified in multiple ways based on additional data to achieve one or more of the Army's personnel management objectives. As with WSI, WVI was included only in the CV effort. Due to the ipsative nature of the WVI, internal consistency reliability cannot be estimated.

Criterion Measures

The Army Class project included two sets of criterion measures representing two higher-order dimensions of performance: "can do" (technical, maximal performance) and "will do" (motivational, typical performance). "Can do" criterion measures include both MOS-specific and

Army-wide Job Knowledge Tests, and "will do" criterion measures include Army Life Questionnaire and Performance Rating Scales. In addition, administrative records from Army personnel databases were also collected. The majority of the criterion measures were gathered across all four data collection points, with a few variations in the specific scales included.

Army Life Questionnaire (ALQ)

The ALQ was designed to measure Soldiers' self-reported attitudes and experiences about the Army and their MOS that are predictive of first-term attrition and retention (Strickland, 2005). The original 99-item form of the ALQ was developed in the Select21 project (Van Iddekinge, Putka, & Sager, 2005b). Various forms of the ALQ were included in different phases of the Army Class project (summarized in Table 2.4). Specifically, the CV ALQ consisted of eight attitudinal scales intended to measure Soldiers' satisfaction and perceived fit with the Army and with their MOS, as well as their career intentions. The LV-EOT ALQ consisted of 13 scales, with six measuring Soldier's attitudes similar to CV research, and seven measuring Soldier's performance and adjustment during IMT. The LV-IU1/IU2 ALQ consisted of seven scales measuring attitudes, four measuring objective performance, and two measuring deployment tempo and adjustment. The same ALQ was administered in both IU1 and IU2 with two minor differences: the Promotion Points scale, representing Soldiers' self-reported awards that contribute to their enlisted promotion packet score, was only scored in the IU2 sample due to irregularities in the response patterns in the IU1 sample, whereas Number of Disciplinary Incidents was only collected from IU1 sample. All of the scales achieved a reasonable level of internal consistency reliability across all the data collection points (ranging from .69 to .95).

The majority of ALQ items are rated on a Likert-type scale ranging from 1 to 5, with the exception of the following items (scale response values for each item are reported in parentheses): (a) Number of disciplinary incidents in training (0-7), (b) Last APFT Score (free response), (c) Number of IMT Achievements (0-2), (d) Number of IMT Failures (0-3), (d) Self-rated AIT/OSUT performance (1-4; 1 = *Below Average [Bottom 30%]* to 4 = *Truly Exceptional [Top 5%]*), (e) Self-ranked AIT/OSUT performance (1-4, where 1 = *Strongest Area of Performance* and 4 = *Weakest Area of Performance*), (f) In-Unit Disciplinary Action (0-1), (g) Last Weapon Qualification Score (1-4), (h) Qualifications and Awards (0-3), (i) Deployment Tempo (free response), and (j) Promotion Points (0-100). Reliability estimates were unavailable for these scales.

Performance Rating Scales (PRS)

The PRS measures Soldiers' performance on both MOS-specific and Army-wide performance dimensions. The PRS were designed to be completed by both the supervisors and peers (when feasible). The content of the MOS-specific PRS was based on performance requirements identified through job analysis and other job-relevant information. The Army-wide PRS varied at different phases of the data collection and adaptations were made to fit the particular circumstance of the Soldier at the time of rating. A detailed comparison of the scales administered is presented in Table 2.5.

Table 2.4. Summary of Army Life Questionnaire (ALQ) across Four Data Collections

	CV	LV		
Composite/Scale		EOT	In-Unit 1	In-Unit 2
Attitudinal				
Satisfaction with Army	√			
Satisfaction with MOS	√		√	√
Perceived MOS Fit	√	√	√	√
Perceived Army Fit	√	√	√	√
Perceived Competence	√			
MOS Exceeds Expectations	√			
Attrition Cognitions	√	√	√	√
Career Intentions	√	√	√	√
Normative Commitment		√		
Affective Commitment		√	√	√
Reenlistment Intentions			√	√
Performance				
Adjustment to Army Life		√		
Number of Disciplinary Incidents		√	√	
Last APFT Score		√	√	√
Number of IET Achievements		√		
Number of IET Failures		√		
Self-Rated AIT/OSUT Performance		√		
Self-Ranked AIT/OSUT Performance		√		
Qualifications and Awards			√	√
Last Weapon Qualification Score			√	√
Promotion Points				√
Deployment				
Deployment Tempo			√	√
Deployment Adjustment			√	√

The majority of the PRS were similarly structured, consisting of a definition of the selected performance dimension and a series of behavioral examples (or anchors) representing differing levels of Soldier performance (e.g., “Neglects own assigned tasks, creating more work for others;” as a low anchor for Exhibiting Effort). Raters were instructed to rate the Soldier on the basis of the definition and the behavioral examples (or anchors) using a 1 to 7 scale (divided into high [scale points 6 and 7], moderate [scale points 3, 4, and 5], and low [scale points 1 and 2]). Raters also had the option of selecting “cannot rate/not applicable” when they had not observed the Soldier on the targeted behaviors. The exception to this structure was the Army-wide LV-EOT PRS, where each response scale had one behavioral statement on the low end (rating of 1) and one on the high end (rating of 5). A single overall score was created for each Army-wide performance dimension and a composite of the MOS-specific scales. The EOT PRS were completed by both the supervisors and peers of the Solder being rated, while the in-unit (CV and LV) PRS were completed by supervisors only.

Table 2.5. Summary of Performance Rating Scales (PRS) across Four Data Collections

Composite/Scale	CV	LV		
		EOT	In-Unit 1	In-Unit 2
MOS-Specific PRS	√	√	√	√
Army-Wide PRS				
Exhibits Effort and Professionalism/Effort/Exhibiting Effort	√	√	√	√
Works Effectively with Others/Support for Peers/Communicating with Others	√	√	√	√
Demonstrates Physical Fitness/Physical Fitness and Bearing	√	√	√	√
Personal Discipline		√	√	√
Commitment and Adjustment to the Army		√		
Peer Leadership/Leadership Potential		√	√	√
Common Warrior Tasks Knowledge and Skill/Performing Core Warrior Tasks		√	√	√
MOS Qualification Knowledge and Skill/Performing MOS-Specific Tasks		√	√	√
Processing Information			√	√
Solving Problems			√	√
Contributing to the Team			√	√
Interactions with Indigenous People and Soldiers from other Countries			√	√
Following Safety Procedures			√	√
Developing Own Skills			√	√
Managing Personal Matters			√	√

Note. "/" means there was a minor change of scale names across different data collections.

All Army-wide PRS scales exhibited high levels of internal consistency reliability across multiple data collections (ranging from .79 to .91).[3] However, the interrater reliabilities (i.e., ICC[A,*k*]) for many of the LV-EOT PRS scales were lower than desired, especially for MOS-specific ratings. Interrater reliability cannot be estimated for IU1 and IU2 data collections as each Soldier was typically rated by only one supervisor.

Anticipating that Soldiers in the IU2 data collection would generally have experience working under deployment conditions, the Combat/Deployment Performance Rating Scales (CDPRS) were developed as a supplemental set of rating scales for rater-ratee pairs who had been jointly deployed. The CDPRS used the same format as the in-unit AW PRS, and included five scales (i.e., Field/Combat Judgment, Field Readiness, Physical Endurance, Physical Courage, and Awareness/Vigilance). Ratings on the CDPRS scales were combined into a single unit-weighted composite score.

[3] Reliability information was not provided in Army Class CV report (Ingerick et al., 2009). Thus, these numbers reflect only the Army Class LV results.

Job Knowledge Tests (JKTs)

The JKTs measure Soldiers' knowledge of the basic facts, principles, and procedures (i.e., declarative and procedural knowledge) required of first-term Soldiers (e.g., the major steps in loading a tank main gun, the main components of an engine). In contrast to other performance measures (e.g., PRS), JKTs generally reflect "can do" knowledge-based components of Soldier job performance (i.e., what a Soldier *knows*). MOS-specific JKTs were included at all criterion data collection points for CV and LV research. In addition, Warrior Tasks and Battle Drills (WTBD) JKTs, suitable for all Soldiers regardless of MOS were also administered in the IU1 and IU2 data collections.

Most of the JKT items were in a multiple-choice format with two to four response options. However, other formats, such as multiple response (i.e., check all that apply), rank ordering, and matching were also used. The items also use visual images to make them more realistic and to reduce reading burden. A single, overall raw score was created for each JKT by summing the total number of points Soldiers earned across the set of items within each JKT. All of the multiple-choice items were worth one point. Depending on the format of the non-traditional items, they were worth one or more points. A percent correct score was also computed by dividing the number of points the Soldier received by the total number of points Soldiers could earn across all of the items within a JKT.

For the Army Class CV research, the internal consistency reliability scores ranged between .64 and .65 for four out of the five MOS, with the exception of 91B (α = .86). For the Army Class LV EOT sample, reliability estimates were generally acceptable, ranging from .70 to .83, with 19K JKT relatively low (α = .66). Most of the IU1 and IU2 JKTs exhibited good internal consistency reliability (.76 to .87), with relatively low reliability estimates associated with the WTBD JKT (α = .65 for IU1 and α = .68 for IU2) and the 68W JKT (α = .61 for IU1).

Administrative Criteria

Administrative data were collected from the Army records as part of the LV research.

Attrition. Information about Soldier attrition was obtained from the original LV predictor sample on a quarterly basis throughout the course of the research, with a final data capture in September 2011. Attrition information was extracted for participating Soldiers from the TTAS database maintained by the U.S. Army Accessions Command. The attrition analyses were limited to Regular Army Soldiers due to difficulties in obtaining accurate separation data on Soldiers in the Reserve Components. Attrition was computed at 3 months (attrition near or after the completion of Basic Combat Training), 4 months (attrition during AIT/OSUT), 6 months (attrition near or after completion of AIT/OSUT), and at regular 3-month intervals thereafter. For the purposes of this research, attrition is a broad category that includes separations because of underage enlistment, conduct, family concerns, sexual orientation, drugs/alcohol, performance, physical standards/weight, mental disorder, or violations of the Uniformed Code of Military Justice. Once all of this information had been considered, a single attrition variable was computed with no additional preparation or cleaning required.

Initial Military Training (IMT) Performance and Completion. IMT performance and completion data were obtained from two administrative personnel databases: (a) Army Training Requirements and Resources Systems (ATRRS) and (b) Resident Individual Training Management System (RITMS). Soldier data on three IMT-related criteria were constructed from data extracted from these databases: (a) graduation from AIT/OSUT, (b) number of times restarted through AIT/OSUT, and (c) average AIT/OSUT exam grade.

Re-Enlistment. For the present research, the Army Class LV sample had reached a level of maturity to assess whether they had re-enlisted at the end of their first term of service (see analyses in Chapter 7). We constructed a re-enlistment variable using the Total Army Personnel Database – Active Enlisted (TAPDB-AE). Any individual that had re-enlisted at least once was treated as a re-enlistment, while those that had reached the end of their first term of service and separated were treated as a separation. Individuals that separated before the end of their first term of service were considered "attrited," and thus treated as missing for the purpose of the re-enlistment variable.

Summary

The purpose of this chapter was to describe the methodology of the Army Class CV and LV efforts, with particular emphasis on the predictor and criterion instruments administered to the two populations. These instruments were used to examine the underlying factor structure of the predictor (Chapter 3) and criterion (Chapter 4) space in more detail. Readers interested in more details about these instruments should consult previous reports in the Army Class and Select21 streams of research.

CHAPTER 3: EXPERIMENTAL PREDICTORS: PSYCHOMETRIC PROPERTIES AND LATENT STRUCTURE

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The purpose of this chapter is to describe the process used to identify the underlying latent structure of the Army Class predictors. These analyses are important for several reasons. First, they reduce the predictor set for subsequent analyses by combining scales that measure similar constructs. In doing so, we place less emphasis on the method of measurement (e.g., Likert-scaled [RBI] versus forced-choice [TAPAS]) in favor of the underlying constructs being measured. Second, this approach examines the common underlying traits of the current experimental predictors and the predictive efficacy of those common traits. Instead of discarding measures (e.g. RBI, TAPAS, AIM) because they do not measure a specific trait, those that show strong validity could be developed and added to current measures.

We identified the latent structure of the predictor space with the following activities. First, we developed an initial framework based on previous research. Second, we mapped the observed scales with the latent predictor framework and submitted that framework to confirmatory factor analysis (CFA) for the Army Class LV and CV samples. Finally, we computed factor scores based on the results of the CFA analyses. These factor scores provided the basis for the validity analyses described in Chapters 5 through 8.

Background

Success in military careers is complex and multidimensional, and involves many factors. To assist the Army in identifying the best Soldiers—those that are likely to be committed and successful in their jobs—Army personnel research has progressed to consider more than just cognitive ability-based measures in selection. Non-cognitive variables are a subset of person-level characteristics commonly referred to as *individual differences.* These attributes are defined as the generally stable and enduring basic tendencies, traits, fundamental capacities, and dispositions of individuals contributing to the variance in observable behavior (Motowidlo, Borman, & Schmitt, 1997). It is widely accepted that cognitive ability is the single best predictor of task performance; however, non-cognitive factors (e.g., personality) have been found to be better predictors of other aspects of performance in both civilian (Motowidlo et al., 1997) and military (Campbell & Knapp, 2001) contexts.

In the early 1990s, Project A researchers found that personality variables were predictive of certain work-related criteria, such as job involvement, job proficiency, and delinquency (Hough, Eaton, Dunnette, Kamp, & McCloy, 1990). Researchers also found that personality was generally most predictive of discretionary “will do” performance dimensions when compared to more cognitively-based assessments (McHenry, Hough, Toquam, Hanson, & Ashworth, 1990). Since then, extensive research has reported significant relationships between personality and performance in military and other high-risk settings (Barrick & Mount, 2005; Biersner & Hogan, 1984; Manning & Fullerton, 1988; McDonald, Norton, & Hodgdon, 1988; Steel, Suedfeld, Peri, & Palinkas, 1997). Overall, the introduction of non-cognitive measurement has increased the potential for selection batteries to identify recruits with lower turnover propensities and higher

performance potential, particularly for motivational "will do" performance criteria (McHenry et al., 1990).

A number of non-cognitive measures have been investigated experimentally by the Army over the last decade, including the TAPAS, RBI and AIM. Each of these measures taps temperament-related constructs using different assessment methods. As described in Chapter 2, the TAPAS is a forced choice measure requiring Soldiers to choose one of two options that best describes them. The RBI uses Likert-type items, where respondents endorse a point on a scale that indicates their level of agreement to a statement about past experiences. For each AIM item, respondents select from four statements (a tetrad) one that is *most* like them and one that is *least* like them. Each format intends to reduce the effects of faking, coaching, and socially desirable responding. Decisions on which non-cognitive measure (i.e. TAPAS, RBI, or AIM) to use operationally are often based on maximizing predictive validity while reducing faking. For example, the TAPAS is used operationally because the forced choice format is designed to reduce the impact of socially desirable responding. Since there are several measures comprising multiple constructs, we take an approach in the current research that focuses on latent factors, rather than specific measures, in predicting Soldier outcomes.

Approach

Non-cognitive predictors of work outcomes have received much attention in recent years. The predictors included in the Army Class project span a number of non-cognitive domains (e.g., interests, values, personality, dispositions, motivational orientations) and used a number of different methods (e.g., multiple choice, forced choice, ranking). To account for the potentially confounding influence of method effects (e.g., Kanfer, Wolf, Kantrowitz, & Ackerman, 2010), we used a combined theoretical and empirical approach to examine the latent structure of the Army Class predictor space. First, we conducted a literature review to investigate pre-established theories of non-cognitive predictors to define a framework for the current predictor set. Next, we conducted CFA to test the appropriateness of the predictor framework in light of the Army Class CV and LV data collected. Finally, we constructed factor scores, representative of the latent constructs, to use in the analyses described in Chapters 5 through 8.

Theoretical Framework Development

We sought to develop a taxonomy of non-cognitive constructs that would integrate personality, biodata, and interest constructs. We envisioned a non-cognitive taxonomy that could be used to represent all of the non-cognitive instruments contained in the Army Class research. We believed that the interest and other measures could be categorized according to the personality constructs. Previous research has demonstrated significant relationships between interest variables and personality (Goh & Leong, 1993; Gottfredson, Jones, & Holland, 1993). Additionally, earlier work investigating non-cognitive aspects has successfully incorporated constructs across domains into coherent dimensions reflecting human performance predictors (e.g., Ackerman & Heggestad, 1997; Kanfer et al., 2010).

To identify such a taxonomy, we consulted relevant literature. This review targeted journal articles and book chapters, with particular emphasis on works published in fields related to

vocational interests, personality, work values, and personnel selection. We identified six frameworks, including the Five Factor Model, the Hogan Framework, Assessment of Background and Life Experiences (ABLE), the Occupational Personality Questionnaire (OPQ), the Guion Framework, and the O*NET model. Table 3.1 lists the factors associated with each framework.

Table 3.1. Source Material Considered for Predictor Space Model Development

Model Name	Key Reference(s)	Model Description	Traits/Factors
Five Factor Model (FFM)	Costa & McCrae, 1992; Goldberg, 1993; Tupes & Christal, 1961	General personality-based framework claiming to explain human personality, wholly, through five distinct dimensions. *In contrast to subsequent models, this framework was not developed specifically for work contexts, but for life in general.*	• Openness to experience[a] • Conscientiousness • Extraversion • Agreeableness[a] • Neuroticism[a]
Hogan Framework	Hogan, 1982	Comprising six dimensions, this framework is aimed at the prediction of job performance. The Hogan Personality Inventory (HPI; Hogan & Hogan, 1992) is based on this framework.	• Adjustment • Likability • Self-Control • Intellectance • Ascendance • Sociability
Assessment of Background and Life Experiences (ABLE)	Hough, 1997	The ABLE was developed as part of the Army's Project A (J. P. Campbell & Knapp, 2001). This seven-dimension taxonomy focused on job performance in the Army context.	• Surgency[a] • Achievement • Adjustment • Agreeableness • Dependability • Locus of Control • Physical Condition[a]
Occupational Personality Questionnaire (OPQ)	Saville & Holdsworth, 1990	The OPQ is a broad conceptualization of work relevant-features. These concepts are not based on the Big 5, rather they were proposed to "operationalize constructs directly relevant to the working population" (Borman et al., 1999).	• Relationships with People • Feelings/Emotions • Thinking Style

Table continues on next page

Table 3.1. (continued)

Model Name	Key Reference(s)	Model Description	Traits/Factors
Guion Framework	Guion, 1992; Raymark, Schmit, & Guion, 1997	A model developed by Guion and associates to identify the dimensions that differentiate person-level characteristics (e.g. personality, traits, orientations) across jobs.	• General Leadership • Achievement Striving • Sensitivity to Interests of Others • Cooperative or Collaborative Work Tendency • General Trustworthiness • Adherence to a Work Ethic • Emotional Stability • Tendency to Think Things Through • Interest in Negotiation • Friendly Disposition • Desire to Generate Ideas • Thoroughness and Attentiveness to Detail
O*NET	Borman et al., 1999	This framework was developed by evaluating several empirically-supported personality taxonomies (e.g. ABLE, FFM). It was intended to present a comprehensive set of person-level qualities that reflect job characteristics of positions in the U.S. workforce (e.g. interpersonal and work style preferences)	• Achievement Orientation[a] • Social Influence • Interpersonal Orientation • Adjustment • Conscientiousness[a] • Independence • Practical Intelligence[a]

Note. Much of this information in this table was adapted from Borman et al. (1999).
[a] Indicates that this factor was incorporated into the proposed predictor framework.

Proposed Predictor Framework

We used the O*NET model as an initial framework for the predictor factor structure, due to its extensive scope, and because it has taken into account features of most jobs in the U.S. Additionally, a cursory review of the predictor measures included in the Army Class projects suggests possible correspondence between them and the O*NET model factors. Though this model is robust, it did not comprehensively represent all of the factors underlying the Army Class predictors. Given the unique elements inherent to Army service, we identified the following dimensions from the remaining five frameworks discussed above to ensure comprehensive coverage of the predictor space.

Achievement Orientation. Those high in Achievement Orientation focus on establishing and maintaining personally challenging goals and exerting effort toward task mastery. They exhibit persistence in the face of obstacles on the job, and are willing to take on additional job responsibilities and challenges. These individuals may perform well in jobs requiring personal goal setting, where they attempt to succeed at those goals and strive to be competent. We adapted this description of Achievement Orientation from the Borman et al. (1999) conceptualization.

Affect Management. This dimension reflects a proclivity to convey maturity, poise, and restraint of emotionality, even in the face of pressures, stressors, criticism, setbacks, and personal and work-related problems. Research demonstrates that those high on this construct tend to do better in jobs that require the maintenance of composure, keeping emotions in check even in very difficult situations, controlling anger, and avoiding aggressive behaviors than those who are lower on this construct. In general, individuals high in this construct tend to be more emotionally stable and less reactive to stress than individuals lower on this construct. Affect Management and the corresponding definition were adapted from Goldberg's (1993) Big 5 Neuroticism dimension.

Agreeableness. Individuals high in Agreeableness are likable, pleasant, cooperative, sensitive to others, tolerant, helpful, non-defensive, and are generally easy to get along with. A person high in Agreeableness adds cohesiveness rather than friction. A disagreeable person is unlikable, critical, fault-finding, touchy, defensive, alienating, and generally contrary. The Agreeableness factor, as defined here, is rooted in the conceptualization offered by Goldberg (1993).

Conscientiousness. Individuals high in Conscientiousness tend to prefer jobs that require dependability, commitment to doing the job correctly and carefully, accountability, and attention to detail. These people are seen as reliable, responsible, and dependable, and committed to fulfilling obligations. After considering multiple views of the Conscientiousness factor, we opted to tailor the perspective of Borman et al. (1999) to describe Soldiers in the U.S. Army.

Surgency. The Surgency construct is comprised primarily of two characteristics—dominance and energy. Dominance has been defined as the tendency to seek and enjoy positions of leadership and influence over others. A highly dominant individual is forceful and persuasive when adopting such behavior is appropriate. The relatively non-dominant person is less inclined to seek leadership positions and is timid about offering opinions, advice, or direction. Energy can be viewed as a person's vigor and enthusiasm. A person high in energy is enthusiastic, active, vital, optimistic, cheerful, and has the energy to get things done. People who are low in energy are lethargic, pessimistic, and tired. This factor was adapted from the definition of Surgency offered by Hough (1997).

Practical Intelligence. Individuals high in Practical Intelligence generate useful ideas, enjoy thinking things through logically, and prefer jobs that require creativity and alternative thinking to come up with new ideas and answers to work-related problems. Additionally, they approach tasks with techniques that require analyzing information and using logic to address work-related issues. Practical Intelligence and its definition were adapted from the Borman et al. (1999) model.

Openness. Openness reflects the degree to which people are open to change (positive and negative) and to workplace variations in tasks, settings, and coworkers. They typically approach new cultures, tasks, and responsibility with eagerness and do not rely on preconceived ideas or past experiences. People high in Openness tend to be curious, have broad interests, love novelty, and are open-minded. Our description of Openness was derived from the perspective offered by McCrae and Costa (1987).

Fitness Orientation. Fitness Orientation captures the degree to which individuals are motivated and enjoy behaviors and actions that involve physical exertion. Those high in this dimension set goals toward achieving higher levels of physical performance and work toward those outcomes. Additionally, these individuals seek out activities fostering fitness goals including exercise routines, and engagement in team or individual sporting activities. This description of Fitness Orientation was derived from Hough (1997).

Linkage Task

We used both theoretical and empirical methods to link the observed predictor scales to the theoretical framework. We started by mapping the LV predictor scales onto the theoretical framework using the scale definition, the theoretical definition, and the correlations among the predictor scales. The lead researcher loosely mapped the scales and noted scales that potentially mapped onto more than one factor. Table 3.2 lists the initial linkage between the LV predictors and the eight factors. Next, we conducted initial CFAs. The CFAs were used to determine which scales fit into the 8-factor model, but also to determine whether any of the 8 factors needed modification (e.g., be combined).

Next, three subject matter experts (SMEs) with military research experience examined the alignment between the individual predictor scales and the dimensions of the proposed taxonomy. We presented SMEs with the predictor framework (including all dimensions, dimension definitions, and examples of the dimensions), the predictor scales from the CV research and the LV scales that loaded onto the initial 8-factor model. SMEs made ratings using a 3-point scale, ranging from 0 (no relationship) to 2 (strong fit between items and dimensions). We instructed the SMEs to select the rating that best indicated the relationship between the observed scale and non-cognitive dimension. Scales with ratings of 1 or 2 and consensus among the SMEs were initially included as a part of the dimension. For 60% of the scales, the raters reached exact agreement and an additional 26% of the scales were within one point of agreement. Fourteen of the CV WVI scales failed to meet the requirements for inclusion and were dropped from further examination. Table 3.3 lists the results of the linkage task for the CV predictors. Additionally, two of the LV scales did not meet the requirements for inclusion and were dropped from further consideration. We used the results of the linkage task as the initial factor structure for the analyses.

Table 3.2 Sorting of Army Class LV Predictor Scales into Latent Factors

Predictor Factor	RBI	TAPAS	AIM	WPA	AKA
Achievement Orientation	Achievement Self-Efficacy	Achievement	Work Orientation	Prestige High Profile	
Affect Management	Stress Tolerance Gratitude Hostility to Authority	Even Temper Optimism	Adjustment		
Agreeableness	Interpersonal Skills: Diplomacy	Cooperation/Trust	Agreeableness	Help Others Work with Others	Social
Conscientiousness	Respect for Authority	Non-Delinquency Order	Dependability	Detail Orientation Clear Procedures	
Openness	Cultural Tolerance Cognitive Flexibility	Curiosity Tolerance		Artistic Activities Creativity	Artistic
Fitness Orientation	Fitness Motivation	Physical Conditioning	Physical Conditioning	Physical	
Practical Intelligence		Intellectual Efficiency		Critical Thinking Conduct Research	Investigative Conventional Realistic
Surgency	Peer Leadership	Dominance Attention Seeking	Leadership	Lead Others	Enterprising

Note. The AKA Conventional scale was originally linked to Conscientiousness, but was later moved into Practical Intelligence. The WPA Information Management scale was tested in both Conscientiousness and Practical Intelligence. The RBI Narcissism scale was tested in both Surgency and Affect Management. The WPA Mechanical scale was not linked to any latent factor.

Table 3.3. Sorting of Army Class CV Predictor Scales into Latent Factors

Predictor Factor	RBI	WSI	WVI	WPA
Achievement Orientation		Achievement/ Effort Initiative Persistence	Achievement Ability Utilization Esteem	Prestige High Profile
Affect Management	Stress Tolerance	Self-Control Stress Tolerance	Emotional Development	
Agreeableness	Peer Support Skills: Diplomacy Team Orientation	Concern for Others Cooperation Social Orientation	Co-Workers Team Orientation	Help Others Work with Others
Conscientiousness		Attention to Detail Dependability	Fixed Role	Clear Procedures Detail Orientation
Openness	Cultural Tolerance Cognitive Flexibility	Adaptability/ Flexibility Cultural Tolerance	Flexible Schedule Variety	
Fitness Orientation	Fitness Motivation		Physical Development	
Practical Intelligence		Innovation		Critical Thinking Conduct Research
Surgency		Leadership Orientation	Leadership Opportunities Influence Energy	Lead Others

Note. Scales that were not sorted into any of the above latent factors were not included in the CFA analyses.

Confirmatory Factor Analysis

CFA is a factor analytic approach where observed indicators are clustered based on common variance. The method is confirmatory in nature because the clusters are pre-determined based on theory. The variance shared among a set of observed indicators thought to measure a certain construct, is considered the "true" variance associated with the trait construct. One advantage of this approach is that the measurement error is explicitly modeled and the amount of bias in the estimated parameters is reduced (Kline, 2005).

The CFA models were estimated using Mplus Full Information Maximum Likelihood (FIML) with missing data estimation (Muthén & Muthén, 1998-2007). Research has shown that using FIML produces parameter estimates that are less biased than relying on listwise or pairwise deletion (Enders, 2001a). FIML uses all of the available data to estimate the likelihood value of the parameter estimates for each individual. Specifically, when there are missing observations, matrices are produced that incorporate both observed and missing parameter information. The information associated with the complete portion of the vector is used to estimate the likelihood value of the variables with missing data (Enders, 2001b). Note that unlike other missing data estimation methods, data are *not* imputed into the database. The missing data are accounted for by including additional information to estimate the parameters in the analysis. Overall model fit was assessed using the χ^2 statistic, Bentler's (1990) Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI) (Tucker & Lewis, 1973), Steiger's (1990) Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Squared Residual (SRMR). CFI and TLI values $\geq .95$ and SRMR and RMSEA values $\leq .08$ indicate good fit (Hu & Bentler, 1998, 1999).

Using the longitudinal validation sample, we created two randomly assigned samples of equal size. One sample was use to test the theoretically derived model, while the holdout sample served to cross-validate the original findings. The concurrent validation sample was used as an independent sample to test the factor structure.

Results

Confirmatory Factor Analysis

In accordance with the non-cognitive taxonomy we constructed, we began by testing a CFA model that included all eight factors. The eight factor model specifies each factor as a unique construct but also accounts for variance associated between latent factors and individual scales. Because there may be some general driver of non-cognitive performance, similar to "*g*" in the cognitive domain, including all constructs in one model best accounts for overlap between factors. However, the initial CFA analyses yielded poor fit. To investigate the misfit, single factor models were tested for each individual factor. We examined intercorrelations between scales and model residuals to determine scales that were not representative of the target construct and removed scales with low intercorrelations or high residuals (i.e., where the model did not replicate the data well for specific scales/relationships). We identified scales for each of the eight factors that fit the data well; however, we dropped a number of scales from the initial framework to improve fit. Table 3.4 lists the model fit indices and scales that were included in each single-

factor model. Across factors, the holdout sample showed similar fit, suggesting the results were not due to chance.

Table 3.4. Longitudinal Validation Latent Predictor Space Factor Structure

Factor	Sample	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Achievement Orientation	Analysis	13.55	2	1.00	0.99	0.03	0.01
RBI: Achievement RBI: Self-Efficacy AIM: Work Orientation WPA: Prestige	Holdout	33.67	2	0.99	0.97	0.05	0.02
Affect Management	Analysis	2.99	2	1.00	1.00	0.01	0.01
RBI: Stress Tolerance TAPAS: Optimism TAPAS: Even Temper AIM: Adjustment	Holdout	1.99	2	1.00	1.00	0.01	0.01
Agreeableness	Analysis	12.48	2	1.00	0.99	0.03	0.01
RBI: Interpersonal Skills: Diplomacy AKA: Social WPA: Work With Others WPA: Help Others	Holdout	13.75	2	1.00	0.99	0.03	0.01
Conscientiousness	Analysis	7.16	2	1.00	1.00	0.02	0.02
TAPAS: Order AIM: Dependability WPA: Clear Procedures WPA: Detail Orientation	Holdout	8.84	2	1.00	1.00	0.03	0.02
Openness	Analysis	23.96	2	0.99	0.97	0.05	0.02
RBI: Cultural Tolerance RBI: Cognitive Flexibility TAPAS: Curiosity WPA: Creativity	Holdout	4.31	2	1.00	1.00	0.01	0.01
Physical Fitness Orientation	Analysis	Just identified. Average r = .62					
RBI: Fitness Motivation TAPAS: Physical Condition AIM: Physical Conditioning	Holdout						
Practical Intelligence	Analysis	Just identified. Average: *r = .29*					
WPA: Critical Thinking WPA: Conduct Research AKA: Conventional Scale	Holdout						
Surgency	Analysis	5.14	2	1.00	1.00	0.02	0.01
TAPAS: Dominance RBI: Peer Leadership AIM: Leadership WPA: Lead Others	Holdout	8.16	2	1.00	0.99	0.02	0.01

Note. CFI and TLI values greater or equal to .95 and RMSEA and SRMR values less than or equal to .08 are considered strong fit. Model fit for factors with three or fewer scales are inestimable because there are not enough degrees of freedom to fit the model. Just identified = there are as many known (e.g., variances) as unknown (e.g., latent variables) parameters. n = 5,125.

Next, we examined the full model using the factors that emerged in the single factor analyses. Two models were examined, one including all eight factors and a 7-factor model excluding Fitness Orientation. The 7-factor model was examined because Fitness Orientation was not included in the theoretical frameworks of non-cognitive predictors, and we wanted to evaluate whether the non-cognitive model would fit better without it. Each observed scale loaded on a method factor (e.g., RBI, TAPAS, AIM, AKA, or WPA), a trait factor, and a second-order trait factor. The method factors represent the variance associated with the method of measurement. By specifying the method factor, the trait factor represents the variance associated with the true construct of interest. The second-order factor accounts for any shared variance among the traits. Both models showed adequate fit for the analysis and holdout samples (see Table 3.5). The RMSEA and SRMR were within the range of acceptable fit; however, the CFI and TLI were below the .95 mark suggested by Hu and Bentler (1998) but near the .90 mark that is typically considered adequate. Overall, the current results show moderate empirical support for the proposed predictor framework but provide a good foundation for future research.

Table 3.5. Full Factor Army Class Longitudinal Validation (LV) Model

	χ^2	*df*	CFI	TLI	RMSEA	SRMR
8-Factor Model						
Analysis	5173.04	353	0.90	0.88	0.05	0.05
Holdout	5124.57	353	0.90	0.88	0.05	0.05
7-Factor Model [a]						
Analysis	4299.40	276	0.91	0.89	0.05	0.05
Holdout	4256.50	276	0.91	0.89	0.05	0.05

[a]The seven-factor model excludes Fitness Orientation. Models include method factors for the RBI, TAPAS, AIM, AKA, and WPA and a second-order trait factor.

Finally, we examined the scales of the concurrent validation sample using the same 8-factor model. Similar procedures were used to identify single-factor models that fit well. Table 3.6 lists the model fit indices and the scales associated with each factor. Overall, the same 8-factor model was able to characterize the CV predictor scales. However, attempts to fit a full model including all eight factors were unsuccessful. Model diagnostics showed strong method effects with the WVI and WSI, which resulted in high cross-factor correlations. As a result, the full model did not converge. The results suggested that the scales associated with each single factor represent a common construct, but, because of the method effects, the factors are not distinct enough to fit well together suggesting the method variance is more dominant than the trait variance.

Table 3.6. Concurrent Validation Latent Predictor Space Factor Structure

Factor	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Achievement Orientation	6.54	2	0.98	0.93	0.08	0.3
WVI: Achievement						
WVI: Ability Utilization						
WVI: Esteem						
WPA: Prestige						
Affect Management	0.43	2	1.00	1.00	0.00	0.01
RBI: Stress Tolerance						
WSI: Self Control						
WSI: Stress Tolerance						
WVI: Emotional Development						
Agreeableness	5.70	5	0.99	0.98	0.02	0.03
RBI: Peer Support Skills – Diplomacy						
WPA: Work With Others						
WPA: Help Others						
WSI: Cooperation						
WSI: Social Orientation						
Conscientiousness	2.93	2	0.99	0.98	0.04	0.02
WSI: Attention To Detail						
WSI: Dependability						
WPA: Detail Orientation						
WPA: Clear Procedures						
Openness	2.91	2	0.99	0.97	0.04	0.02
WSI: Adaptability/Flexibility						
WPA: Creativity						
RBI: Cognitive Flexibility						
RBI: Cultural Tolerance						
Physical Fitness Orientation	Under identified. *r = .27*					
WVI: Physical Development						
RBI: Fitness Motivation						
Practical Intelligence	Just identified. Average *r = .23*					
WPA: Critical Thinking						
WPA: Conduct Research						
WSI: Innovation						
Surgency	1.61	2	1.00	1.00	0.00	0.02
WSI: Leadership Orientation						
WVI: Energy						
WPA: Lead Others						
WVI: Influence						

Note. CFI and TLI values greater or equal to .95 and RMSEA and SRMR values less than or equal to .08 are considered strong fit. Model fit for factors with three or fewer scales are inestimable because there are not enough degrees of freedom to fit the model. Just identified = there are as many known (e.g., variances) as unknown (e.g., latent variables) parameters; under identified = there are fewer known than unknown parameters.

Factor Scores

We proceeded with validity analyses using the LV data. The LV database has a wide range of criterion variables at multiple time points, measures the predictor constructs well, and results provide a solid framework for understanding the relationship between criteria and latent predictor factors. We investigated a number of options for constructing LV factor scores to use in the subsequent analyses. There were several challenges in deciding how to proceed. First, there were a number of individuals with missing data on one or more scales. Specifically, the AIM and TAPAS was administered to only one-third of the predictor sample as part of the EEEM research (see Chapters 1 and 2). Relying on an aggregation approach would result in significant loss of data. As an alternative, we estimated factor scores using Mplus. Mplus factor scores comprise the shared variance associated with each trait. The method effect and the common variance accounted for by the second-order factor is removed from the trait-specific factor scores. The advantage of using the Mplus factor score is that FIML estimation yields factor scores for every individual, even if they are missing data on a particular component measures. Table 3.7 lists the intercorrelations among the Mplus factor scores. Table 3.8 lists the correlations between the Mplus factor scores and raw factor scores computed by averaging across scales. Several of the correlations between the factor scores and raw scores were lower than expected, with Achievement showing the most aberrant results (r = .17). Additionally, initial validity analysis using the Mplus factor scores yielded unexpected results.

Table 3.7. Descriptives and Intercorrelations for LV FIML Latent Predictor Factor Scores

Factor Scores	M	SD	Avg. SE	1	2	3	4	5	6	7
1. Achievement	.00	.12	.13							
2. Affect Management	.00	.16	.18	**.20**						
3. Agreeableness	.00	.07	.07	**.54**	**.07**					
4. Conscientiousness	.00	.10	.05	**.29**	**.07**	**.05**				
5. Practical Intelligence	.00	.33	.28	**.99**	**.23**	**.57**	**.30**			
6. Openness	.00	.36	.28	**.98**	**.23**	**.56**	**.28**	**.99**		
7. Fitness Orientation	.00	.37	.28	**-.15**	-.01	**-.20**	**-.06**	**-.14**	**-.14**	
8. Surgency	.00	.29	.32	**.57**	**-.02**	**.37**	-.01	**.59**	**.57**	**-.19**

Note. Avg. SE = Average Standard Error for individual factor scores. Correlations in bold are statistically significant, $p < .05$. FIML = Full Information Maximum Likelihood. n = 10,724

In response to the latent factor score results, we computed raw factor scores excluding the TAPAS and AIM scales as a potential alternative. Factor scores were computed by standardizing each variable and averaging across variables. Table 3.9 lists the correlations between the raw factor scores using all scales and the factor scores excluding TAPAS and AIM. The correlation between the two computations ranged from .71 to 1.00. The high correlations suggest that excluding the TAPAS and AIM does not have a large impact on the factor scores. By excluding the TAPAS and AIM, we were able to increase our sample size by two-thirds (on average from 365 to 1,163) and still examine trait specific constructs. We further examined the scales that remained in the factor score to determine if the scale changed meaning by excluding the TAPAS and AIM variables. Three of the four Affect Management scales were dropped. We felt that using only one scale as an indicator of the Factor did not adequately reflect the trait. Therefore, we proceeded with raw factor scores excluding TAPAS and AIM for all factors except for Affect Management.

Table 3.8. Correlations between the LV Raw and FIML Latent Predictor Factor Scores

Raw Factor Scores	Correlations with Latent Predictor Factor Scores							
	1	2	3	4	5	6	7	8
1. Achievement	**.17**	.01	.01	**.04**	**.08**	**.07**	**.11**	**.08**
2. Affect Management	**.06**	**.92**	-.03	**.05**	**.08**	**.09**	**.06**	**-.10**
3. Agreeableness	**.09**	.00	**.54**	.01	**.09**	**.08**	**-.08**	**.12**
4. Conscientiousness	**.07**	**.08**	**.04**	**.60**	**.05**	.03	**-.05**	**-.08**
5. Practical Intelligence	**.62**	**.17**	**.36**	**.24**	**.61**	**.56**	.00	**.34**
6. Openness	**.68**	**.26**	**.38**	**.19**	**.67**	**.73**	-.03	**.36**
7. Fitness Orientation	**-.19**	.01	**-.23**	**-.11**	**-.22**	**-.20**	**.93**	**-.22**
8. Surgency	**.13**	**-.06**	**.12**	**-.07**	**.11**	**.09**	**-.04**	**.68**

Note. Correlations in bold are statistically significant, $p < .05$. Boxed correlations reflect the same latent factor constructed using the raw and factor score methods. FIML = Full Information Maximum Likelihood.

Table 3.9. Correlations between the LV Subset and Raw Factor Scores

Subset Factor Score	Correlations with Raw Factor Scores							
	1	2	3	4	5	6	7	8
1. Achievement	.96	.24	.57	.47	.51	.55	.41	.69
2. Affect Management	.21	.71	.18	.13	.20	.29	.20	.12
3. Agreeableness	.57	.12	1.00	.46	.54	.48	.14	.58
4. Conscientiousness	.49	.16	.44	.86	.46	.29	.11	.34
5. Practical Intelligence	.51	.13	.54	.50	1.00	.55	.12	.47
6. Openness	.53	.23	.45	.30	.59	.94	.15	.48
7. Fitness Orientation	.33	.24	.15	.11	.11	.12	.87	.25
8. Surgency	.63	.16	.54	.29	.41	.46	.25	.89

Note. The subset excludes TAPAS and AIM. All correlations are statistically significant, $p < .05$. Boxed correlations reflect the same latent factor constructed using the subset and raw scoring methods.

In addition to the factor scores described above, we examined several additional predictors in the subsequent analyses. Internal Locus of Control and Army Affective Commitment were important predictor scales that did not map onto the Factor structure, but measured unique non-cognitive attributes. Further, Locus of Control and Army Affective Commitment have shown favorable results in the prediction of Soldier performance and commitment (Knapp & Heffner, 2009; Knapp et al., 2011). Additionally, we examined Cognitive Aptitude using Soldiers' AFQT scores. AFQT is the primary selection measure for the Army and any non-cognitive measures included in selection decisions would be in addition to AFQT. As a result, it is important to examine the efficiency of the non-cognitive measures taking into account cognitive aptitude. In total we examined eleven predictors: Achievement Orientation, Affect Management, Agreeableness, Army Affective Commitment, Cognitive Aptitude, Conscientiousness, Internal Locus of Control, Practical Intelligence, Openness, Fitness Orientation, and Surgency. Table 3.10 lists the descriptive statistics and intercorrelations among the final predictors.

Table 3.10. Descriptive Statistics and Intercorrelations for LV Final Predictor Factor Scores

						Correlations									
	n	Min	Max	Mean	*SD*	1	2	3	4	5	6	7	8	9	10
1. Achievement Orientation	8,113	-4.08	1.93	0.00	0.78										
2. Affect Management	3,084	-2.70	2.01	0.02	0.70	**.21**									
3. Agreeableness	7,920	-2.90	1.83	0.00	0.68	**.58**	**.18**								
4. Army Affective Commitment	8,626	1.00	5.00	3.73	0.69	**.40**	**.29**	**.27**							
5. Cognitive Aptitude	10,736	1.00	99.00	56.13	19.31	**.06**	**.21**	**-.06**	.02						
6. Conscientiousness	9,926	-3.76	1.44	0.00	0.97	**.47**	**.13**	**.46**	**.23**	**-.11**					
7. Internal Locus of Control	8,625	1.38	5.00	3.55	0.57	**.43**	**.43**	**.31**	**.34**	**.17**	**.21**				
8. Practical Intelligence	9,594	-3.10	2.03	0.00	0.73	**.51**	**.20**	**.54**	**.17**	**.12**	**.51**	**.24**			
9. Openness	8,112	-2.78	1.91	0.00	0.75	**.53**	**.29**	**.48**	**.23**	**.17**	**.28**	**.33**	**.55**		
10. Fitness Orientation	8,626	-3.39	2.50	0.00	1.00	**.35**	**.20**	**.14**	**.30**	.02	**.13**	**.21**	**.12**	**.15**	
11. Surgency	8,112	-3.74	2.05	0.00	0.83	**.68**	**.12**	**.58**	**.33**	**.04**	**.35**	**.28**	**.47**	**.51**	**.30**

Note. Correlations in bold are statistically significant, $p < .05$.

Conclusions

This chapter shows both theoretical and empirical support for an 8-factor non-cognitive predictor model. The model was derived from a number of theoretical non-cognitive models, and two independent sets of measures were reliably classified into the eight factors. Additionally, CFA analyses showed acceptable fit for the eight factors. Army research has typically focused on the predictive efficacy of specific sets of measures that share a common method of measurement. However, these results suggest a core set of underlying traits explains the variance in many of the component scales.

The results also highlight measures that do not include the core predictor factors. For example, Practical Intelligence was not measured by the AIM or RBI, and Openness was not measured by the AIM. We recommend using this framework to determine if the current measures could be strengthened by identifying if any of the eight traits are not included, especially any measures that are being used for future selection decisions. Adding traits may yield even stronger validity results to the "best bet" measures identified in previous Army Class reports (e.g., Knapp & Heffner, 2010).

The results of this chapter also reveal the strong method effect associated with each measure, particularly with measures with high amounts of ipsativity (typically characterized by the rank-order predictor instruments [see Chapter 2]; e.g., WSI, WVI). This was particularly evident in the full model CFAs, where method factors were necessary to account for the shared variance among the scales with common methods but different traits. The method effect may represent the use of different response formats among the measures or may represent a source of variance that is characteristic of the scale but not trait-specific. Specifically, the difference between interest-focused scales and personality-based scales may be manifesting as method effects. Given the strong method effect, future research should examine the driving cause of the method effect and the influence of the method effects on validity analyses.

In summary, we developed eight predictor factor scores that we used in the analyses described in Chapters 5 through 8. The factor scores are intended to measure the latent non-cognitive traits. Combining scales across measures helped to control for method effects and determine the predictive efficacy of the latent traits.

CHAPTER 4: CRITERION MEASURES: PSYCHOMETRIC PROPERTIES AND DATA REDUCTION

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In this chapter we focus on the analyses of the criterion data collected as part of the Army Class LV examination of enlisted Army Soldiers, with the purpose of better defining the latent structure of the criterion space. As described in Chapter 2, the criterion measures were collected at three time periods: End of Training (EOT), In-Unit 1 (IU1), and In-Unit 2 (IU2). We begin with an overview of previous research defining the criterion space in an Army context. Next, we describe the foundational framework used in this effort—John Campbell's job performance taxonomy (J. P. Campbell, McCloy & Oppler, 1993; J. P. Campbell & Sager, 2012). Building on J. P. Campbell's (2012) taxonomy, we describe the task of linking the Army Class LV criteria to latent criterion space factors. We then test this structure using a combination of descriptive analysis, rational judgment, and confirmatory factor analysis. We conclude with a final model of the criterion space describing outcomes of importance to the U.S. Army.

Approach

Initial Criterion Space Model

To define the criterion space, we reviewed journal articles, book chapters, and technical reports (with an emphasis on ARI-sponsored research) describing how job performance is conceptualized in the Army and in the civilian sector. Subsequently, we focused our initial model-building activities on the work of Campbell (2012)—a recent and comprehensive summary of the job performance literature. The Campbell job performance model draws on work conducted as part of Project A (J. P. Campbell, 1990; J. P. Campbell & Knapp, 2001), and more recent research describing the job performance domain. Campbell's model proposes eight dimensions of job performance: (a) job-specific technical task proficiency, (b) non-job-specific technical task proficiency, (c) written and oral communication task proficiency, (d) demonstrating effort, (e) counterproductive work behavior (CWB), (f) facilitating peer and team performance, (g) supervision/leadership, and (h) management/administration.

Though a useful starting point, J. P. Campbell's (2012) model is only concerned with job performance—defined as the *actions* taken on the job—and not with other outcomes that may be of interest to the Army, such as Soldier commitment and continuance. In the present analysis, we are interested in defining the "criterion space" more holistically than "job performance" alone. Thus, our definition focuses on a range of outcomes valued by military leadership, including job performance, attitudes, interaction style, and motivation. Additionally, the Campbell taxonomy is domain invariant—it is written to be applicable to all jobs. However, there are aspects of job performance that are only critically important in a military context and are not included in Campbell's taxonomy. With this in mind, we revised Campbell's model to include nine dimensions (see Table 4.1).

Table 4.1. Initial Latent Criteria Taxonomy

Dimension	Dimension Description
Technical Performance and Achievement	Requirements vary by substantive area (e.g., MOS) and by level of complexity or difficulty within an area. This dimension does not include interpersonal influence in relation to other members of the Army (e.g. subordinates, superiors, or coworkers), but may involve persuasion of customers/clients in making choices/selections beneficial to the Army (e.g., recruiters "selling the Army" to potential recruits). Consequently, externally directed persuasion and negotiation qualify as technical content for some MOS. The subfactors for this dimension are obviously numerous, and the domain could be parsed into large or narrow slices. A few examples of technical performance are driving a vehicle, analyzing data, firing a weapon, operating a communications device, translating speech, and administering first aid.
Communication	This dimension refers to the proficiency with which one conveys information that is clear, understandable, and well organized. It is independent of subject matter expertise. The two major subfactors are oral and written communication.
Initiative, Persistence, and Effort	This dimension is defined by observable behaviors such as working extra hours, voluntarily taking on additional tasks, and working under extreme or adverse conditions.
Counterproductive Work Behavior (CWB)	CWB refers to a category of actions having negative implications for achieving Army goals. Examples of CWB include: alcohol and substance abuse on duty, law or rules infractions, excessive absenteeism, theft on the job, and freeloading. Deviant behaviors could be directed at the Army (e.g., theft, sabotage, falsifying information, malingering) or directed at individuals, including oneself (e.g., physical attacks, verbal abuse, sexual harassment, drug and alcohol abuse).
Peer/Team Member Leadership Performance	This dimension refers to behaviors aimed at influencing peer/team members through interpersonal interaction and influence. It includes behaviors such as consideration and support, guiding, directing, goal emphasis, empowerment, facilitation, training, coaching, and serving as a model.
Peer/Team Member Management Performance	Distinct from direct leadership behaviors, this dimension relates to the direction and alignment of peer/team member activities to the goals of the unit or Army. Such management functions include planning and problem solving, team coordination, monitoring team performance, external representation, and compliance.
Physical Fitness	This dimension relates to behaviors and actions that involve physical exertion with the intention of promoting physical well-being and ability. Activities fostering fitness goals may include exercise routines and engagement in team or individual sporting activities.
Satisfaction and Commitment	This component captures cognitions, attitudes, and views toward perceived fit with the Army as an organization, with the norms of Army life and subsequent appraisals of experiences with the Army. This includes satisfaction with all aspects of the Army experience, and being committed to orders, directives, and the Army in general.
Separation, Career Intention Cognitions, and Attrition	The final dimension captures separation from the Army. This includes cognitions toward both separating from and remaining with the Army, as well as actual separation from the Army and Army retention.

Note. Definitions are adapted from J. P. Campbell (2012).

In the revised model, the "job-specific technical task proficiency," "demonstrating effort," "CWB," and "written and oral communication task proficiency" factors remained largely intact. We also retained the "supervision/leadership" and "management/administration" dimensions; however, given that first-term enlisted Soldiers rarely have direct reports, the dimensions were re-conceptualized to emphasize teamwork and team leadership. Specifically, the dimension "facilitating peer and team performance" was eliminated, and the remaining leadership dimensions were renamed "peer/team member leadership" and "peer/team member supervision." Consistent with previous Army research (J. P. Campbell, 1990), we also added a "physical fitness" performance dimension**.** Finally, we combined J. P. Campbell's (2012) "non-job-specific technical task proficiency" and "job-specific technical task proficiency" dimensions into one dimension that we refer to as "technical performance and achievement."

Moving beyond the narrower "job performance" domain, we also added a dimension reflecting Army "satisfaction and commitment." We added this because previous research has demonstrated the important role of job attitudes as antecedents to job performance and continuance (e.g., Riketta, 2008; Schleicher, Hansen, & Fox, 2011). We also added a "separation, career intention cognitions, and attrition" dimension, drawing on previous research showing the link between cognitions and separation behavior. Separation itself is also a critical variable to examine because it has been found to negatively impact the Army from financial, morale, and performance perspectives.

Linkage Task

We used the linkage task to leverage the collective knowledge of several SMEs to examine the relationship between the administered criteria (described in Chapter 2) and the dimensions presented in Table 4.1. To accomplish this, we (a) recruited SMEs, (b) identified items to include in the linkage task, and (c) developed the linkage worksheets.

We asked five SMEs with prior military research experience and at least a Master's degree in industrial and organizational psychology to link the item-level criterion variables with the dimensions of the proposed taxonomy. All five raters were familiar with the Army Class instruments and the criterion space literature upon which the taxonomy described in Table 4.1 was based. Combined, these raters have more than 50 years of experience in examining performance-related issues in the Army.

We identified 137 items for presentation to SMEs. These came from the Army Class criterion measures (i.e., the Army Life Questionnaire [ALQ], Performance Rating Scales [PRS], Job Knowledge Tests [JKT], and Administrative Records; see Chapter 2 for more details). In general, item level information was presented to the SMEs. The exception was for the JKTs, in which items were all written to tap the same underlying construct—Army-wide or MOS-specific technical job knowledge. We began with 91 individual items administered at the EOT data collection, and added only unique items from the IU1 (38 items) and IU2 (8 items) data collections. Items administered that were redundant items across time-points were only presented to the SMEs once.

We asked SMEs to evaluate each item's relationship to each dimension using the following 3-point rating scale: 0 (no relationship), 1 (somewhat related), and 2 (completely related). The raters selected the number from the rating scale that best corresponded to the degree of relationship between the presented items and the target dimensions. Open comments fields were also included in the rating sheet, allowing raters to provide additional feedback beyond the ratings.

We combined the individual SME ratings into a single workbook. This resulted in two 137 x 9 (item by construct) matrices containing (a) the sum of ratings for each item by dimension comparison and (b) the standard deviation of the ratings for each item by dimension comparison. Items "linked" to a dimension with an average dimension rating of nearly 2 were considered to clearly reflect the corresponding dimension specified in the taxonomy. Items linked to more than one dimension were further evaluated to determine which dimension was most appropriate. For example, the ALQ item *I like the amount of physical training I have to do as a Soldier* was linked to both the Physical Fitness (average rating = 1.6), and Satisfaction/Commitment (average rating = 1.4) dimensions. We evaluated such items along with any associated comments made by SMEs, and either (a) dropped variables that did not align with a single dimension or (b) chose one dimension that was most appropriate.

Interrater agreement was assessed using an inter-class correlation coefficient (ICC[A,5]; McGraw & Wong, 1996). Results are presented in Table 4.2. Overall, the interrater agreement was quite high, with the exception of one dimension – Factor 6: Peer/Team Member Management Performance. As described earlier, this factor was intended to capture managerial and administrative activities related to leadership. Because this dimension was generally not the focus of the Army Class criterion instruments, some raters would assign ratings of 1 (somewhat related), while others would provide no rating (unrelated). This led to the low interrater agreement coefficient for this dimension.

Items that were not originally linked to any factor using the rules above were re-examined. In some cases, raters suggested a new factor for the item. In these instances, we created categories for the new dimensions and presented them to the SMEs along with the corresponding linked items for feedback. In the majority of these instances, the SMEs agreed with the alternative linkage. Of the original set of 137 items included in the linkage task, 115 were retained for further analysis.

Upon completion of the linkage task, revisions to the initial model were made (see Figure 4.4). First, the *communication* dimension was eliminated. Across all three time points, only one (In-Unit) criterion variable was linked to this factor (i.e., the *Communicating with Others* PRS). The researchers decided that this one linkage was not enough to retain the entire factor for further analysis.

Second, the *peer/team member management performance* dimension was also eliminated. The few items that raters felt represented this factor were more strongly linked to other factors, usually "Peer/Team Member Leadership Performance."

Table 4.2. Interrater Agreement Coefficients for Linkage Activity

Factor	ICC(A,5)	Notes
Factor 1: Technical Performance/Achievement	.92	
Factor 2: Communication	.81	-Only one criterion linked to this factor -Dropped as a stand-alone factor
Factor 3: Initiative, Persistence, and Effort	.85	
Factor 4: Counterproductive Work Behavior	.95	
Factor 5: Peer/Team Member Leadership Performance	.92	-Renamed the "Peer Support" factor to better subsume dimensions of teamwork
Factor 6: Peer/Team Member Management Performance	.33	-No criteria directly linked to this factor, so dropped from consideration as a stand-alone factor
Factor 7: Physical Fitness	.95	
Factor 8: Satisfaction	.96	-Multiple raters recommended testing MOS Fit/Satisfaction and Army Fit/Satisfaction models separately
Factor 9: Separation/Career Intention Cognitions and Attrition	.92	-Multiple raters recommended testing attrition cognitions and career intention cognitions models separately

Third, we renamed the "Peer/Team Member Leadership Performance" dimension "Peer Support Performance." This was done so that other interpersonally-related items (e.g., *Interacting with Indigenous People and Soldiers from Other Countries* PRS) could be linked to a dimension. Four SME raters suggested that this factor be created to subsume more items than what would be subsumed under the narrower "Peer/Team Member Leadership Performance" dimension.

Finally, revisions were made to both the *Satisfaction/Commitment* and *Continuance Cognitions* dimensions. In their comments, three of the five raters suggested testing two sub-dimensions for each of these factors. With regard to the *Satisfaction/Commitment* dimension, raters felt that MOS-specific and general Army satisfaction/commitment sub-dimensions should be evaluated separately. With regard to the *Continuance Cognitions* dimension, raters suggested separating it into *Attrition Cognitions* and *Career Intention Cognitions*. Finally, we reviewed the items that were not linked to any of dimensions to see if there were any patterns. We noticed that many of the EOT ALQ "Adjustment to Army Life" scale items were generally not linked to any dimension. After some discussion with the SMEs, the researchers added another dimension called "Adjustment" and put most of the EOT ALQ "Adjustment to Army Life" into that dimension. These sub-dimensions were tested empirically using Confirmatory Factor Analysis in the next section. The full model submitted to CFA is described in Figure 4.1.

1. *Technical Performance/Achievement*
2. *Initiative, Persistence, and Effort*
3. *Counterproductive Work Behavior*
4. *Interpersonal*
5. *Fitness*
6. *Satisfaction/Commitment*
    a. *MOS Satisfaction/Commitment*
    b. *Army Satisfaction/Commitment*
7. *Continuance Cognitions*
    a. *Attrition Cognitions*
    b. *Career Intention Cognitions*
8. *Adjustment (EOT Only)*

Figure 4.1. Post linkage task criterion taxonomy.

Confirmatory Factor Analysis

The goal of this activity was to test the latent structure of the criterion space through CFA analysis of the items linked by the SMEs to the performance model described in Figure 4.1. Before submitting the linked items to CFA, researchers examined the intercorrelations and descriptives among the items linked to each dimension at each criterion data collection timepoint (i.e., EOT, IU1, and IU2). Items with very low base rates were eliminated from further analysis. Items that were weakly related to other linked items were also excluded. Typically, we eliminated items with average bivariate intercorrelations of .20 or less. Items that passed this review were included in the CFA analysis.

For each Army Class LV criterion data collection timepoint (i.e., EOT, IU1, and IU2), we tested the fit of models at the dimension level to determine the underlying structure of the criterion space. We used these analyses to determine (a) whether it is appropriate to treat each linked item as a part of the underlying factor and (b) whether there is further structure to each dimension by testing competing models. Similar to the predictor analyses (see Chapter 3), the CFA models were estimated using Mplus (Muthén & Muthén, 1998-2012). Additionally, we applied the same recommendations for evaluations of fit. Overall model fit was assessed using the χ^2 statistic, Bentler's (1990) Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI) (Tucker & Lewis, 1973), Steiger's (1990) Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Squared Residual (SRMR). CFI and TLI values $\geq .95$ and SRMR and RMSEA values $\leq .08$ indicate good fit (Hu & Bentler,1998; 1999). We also used Full Information Maximum Likelihood (FIML) to account for missing data.

Results

End of Training (EOT) CFA Results

Table 4.3 depicts the final EOT models after all of the analysis steps described above were completed.

Adjustment. Four ALQ items were linked to the Adjustment factor. As Table 4.3 shows, the fit indices for this dimension were acceptable using some indices (e.g., SRMR), but unacceptable for others (e.g., TLI, RMSEA). Further examination of the intercorrelations suggests that there may be two underlying sub-factors, one emphasizing adjustment-specific items and one emphasizing their feelings about joining the Army. The correlation of the two *Adjustment to Army Life* items was .53 and the two *Feelings about Joining the Army* items was .51. These factors could not be tested with CFA because there were only two items per factor (i.e., the model was under identified).

Satisfaction and Commitment. For this dimension, we tested both a 1-factor model (i.e., overall Army Fit[4] and Commitment) and a 2-factor model (i.e., separating out Army Fit/Commitment and MOS Fit/Commitment) in the CFA. The 1-factor solution resulted in poor fit among the 22 items. The 2-factor solution, the results of which are presented in Table 4.3, represented a dramatic improvement, with acceptable fit indices for both factors. The average correlations among items within each dimension were .46, and .60, for Army Fit/Commitment and MOS Fit, respectively. These dimensions remained separate for subsequent analysis.

Continuance Cognitions. We submitted 13 items to CFA in the Continuance Cognitions dimension. Two competing models were tested—a 1-factor Continuance Cognitions model and a 2-factor model that distinguishes between Attrition Cognitions and Career Intention Cognitions. The fit indices for the 1-factor model were poor when evaluating the fit indices (i.e. CFI, TLI, RMSEA, SRMR, and $\chi 2$), suggesting this model was inappropriate. For the 2-factor model, fit was acceptable for the Attrition Cognitions dimension, but remained unacceptably low for the Career Continuance Cognitions dimension. Further examination of the intercorrelations and residuals suggested that the Career Continuance Cognitions dimension might reflect two sub-dimensions: (a) Short-Term Continuance and (b) Long-Term Continuance. This could not be tested directly using CFA due because the models were under identified. However, the average intercorrelations of the items within each new dimension were high, ranging from .73 to .82.

Counterproductive Work Behavior (CWB). The base rate for one item linked to this dimension (asking whether the Soldier had ever received an Article 15) was too low to be included in subsequent CFA models. This left three items, which is not sufficient to compute fit indices (i.e., the model is *just identified*). The average sample correlation for these variables was .34.

[4] We begin using the term "fit" rather than "satisfaction" at this point because it more consistent with the item content. The distinction between fit and satisfaction will become more apparent in the discussion of the IU1 and IU2 results.

Table 4.3. End of Training (EOT) Latent Criterion Space Factor Structure

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
ADJUSTMENT	120.78	2	.95	.84	.16	.04
ALQ - I have found it difficult to make the transition from civilian to Army life[a].						
ALQ - I have seriously questioned the wisdom of my decision to join the Army[b].						
ALQ - I have had trouble getting used to the highly disciplined lifestyle[a]. (r)						
ALQ - Life in the Army is worse than I expected before I joined the service[b]. (r)						
ARMY FIT AND COMMITMENT	763.63	65	.96	.95	.07	.03
ALQ - I am able to maintain my values as a member of the Army.						
ALQ - The Army is a good match for me.						
ALQ - The values of the Army reflect my own values.						
ALQ - I like the disciplined lifestyle that the Army offers.						
ALQ - The Army fulfills my needs.						
ALQ - I feel like I am part of the Army family.						
ALQ - The Army has a great deal of personal meaning for me.						
ALQ - I feel a strong sense of belonging to the Army.						
ALQ - I am proud to tell others I am in the Army.						
ALQ - I doubt I could become as attached to another organization.						
ALQ - I feel personally attached to the Army.						
ALQ - I do not fit very well in the Army. (r)						
ALQ - I feel that the problems faced by the Army are also my own problems.						
MOS FIT	262.95	24	.98	.98	.07	.02
ALQ - Given my skills and abilities, I think I am in the right MOS.						
ALQ - My MOS will allow me to perform the kind of work I want to do.						
ALQ - If I could easily switch my MOS, I would. (r)						
ALQ - Working in my MOS will help me achieve my long-term career goals.						
ALQ - I think my skills make me better suited for another MOS.						
ALQ - My MOS is a good match for me.						
ALQ - Given my interests, I would be better off in another MOS. (r)						
ALQ - I like the work I have been trained to do in my MOS.						
ALQ - I am the right person for the type of work my MOS requires.						

Table 4.3. (continued)

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
ATTRITION COGNITIONS	23.19	2	.99	.98	.07	.01
ALQ - I would leave the Army before my term of service ends, if I could find a way.						
ALQ - I am confident that I will complete my current term of service.						
ALQ - How important is it to you that you complete your current term of service?						
ALQ - How likely is it that you will complete your current term of service?						
SHORT TERM CONTINUANCE COGNITIONS	Under Identified		FIML sample correlation between items = .73			
ALQ - I intend to leave the Army after completing my current term of service.						
ALQ - How likely is it that you will leave the Army after completing your current term of service?						
LONG TERM CONTINUANCE COGNITIONS	Under Identified		FIML sample correlation between items = .82			
ALQ - I plan to spend the rest of my career in the Army.						
ALQ - How likely is it that you will make the Army a career?						
COUNTERPRODUCTIVE WORK BEHAVIOR	Just identified		Average FIML sample correlation between items = .34			
ALQ - Ever placed on restriction for disobeying a direct order?						
ALQ - Ever placed on restriction for not adhering to standards of conduct?						
ALQ - Ever placed on restriction for disrespecting peers or supervisors?						
PHYSICAL FITNESS	32.88	5	.98	.97	.05	.02
ALQ - Ever have to retake the Army physical fitness test (APFT)? (r)						
ALQ - Last Army Physical Fitness Test (APFT) Score						
ALQ - I have had trouble handling the physical demands of training.						
AW PRS - Physical Fitness And Bearing Composite (Peer)						
AW PRS - Physical Fitness And Bearing Composite (Supervisor)						
INITIATIVE, PERSISTENCE, AND EFFORT (PEER)	Under identified		FIML sample correlation between items = .76			
AW PRS - Effort Composite (Peer)						
AW PRS - Personal Discipline Composite (Peer)						
INITIATIVE, PERSISTENCE, AND EFFORT (SUPERVISOR)	Under identified		FIML sample correlation between items = .78			
AW PRS - Effort Composite (Supervisor)						
AW PRS - Personal Discipline Composite (Supervisor)						

Table 4.3. (continued)

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
PEER SUPPORT (PEER)	Under identified		FIML sample correlation between items = .70			
AW PRS - Support For Peers Composite (Peer)						
AW PRS - Peer Leadership Composite (Peer)						
PEER SUPPORT (SUPERVISOR)	Just identified		FIML sample correlation between items = .68			
AW PRS - Support For Peers Composite (Supervisor)						
AW PRS - Peer Leadership Composite (Supervisor)						
TECHNICAL PERFORMANCE AND ACHIEVEMENT (PEER)	Just identified		Average FIML sample correlation between items = .69			
AW PRS - Common Tasks/Warrior Tasks Knowledge And Skill Scale (Peer)						
AW PRS - MOS Qualification Knowledge And Skill Scale (Peer)						
PRS - MOS-specific performance ratings composite (Peer)						
TECHNICAL PERFORMANCE AND ACHIEVEMENT (SUPERVISOR)	Just identified		Average FIML sample correlation between items = .68			
AW PRS - Common Tasks/Warrior Tasks Knowledge And Skill Scale						
AW PRS - MOS Qualification Knowledge And Skill Scale (Supervisor)						
PRS - MOS-Specific Performance Ratings Composite (Supervisor)						

Note. (r) = reverse-coded. *Adjustment* was subsequently split into two sub-dimensions (two-items each) reflecting Adjustment to Army Life and Feelings about Joining the Army. [a] items associated with Adjustment to Army Life sub-dimension. [b] items associated with Feelings about Joining the Army sub-dimension. Analyses of factor fit across both Peer and Supervisor data sources were conducted for *Initiative, Persistence, and Effort, Peer Support Performance*, and *Technical Performance/Achievement.* The data determined factors associated with each source of ratings to be distinct. Just identified = fit statistics cannot be computed because there are as many known (e.g., variances) as unknown (e.g., latent variables) parameters. Under identified = fit statistics cannot be computed because there are fewer known than unknown parameters.

Physical Fitness. After examining the items found by SMEs to reflect the Physical Fitness dimension, one ALQ item was excluded from CFA analyses (*Physical Fitness - rated performance*) due to small intercorrelations with the other items. The remaining items were submitted to CFA, and found to have acceptable fit across indices.

Effort, Peer Support, and Technical Performance/Achievement. Not surprisingly given previous Army Class analyses (e.g., Knapp & Heffner, 2011), the item-level intercorrelations suggested a strong method effect for the performance rating scales, such that supervisor ratings relate more with one another, regardless of dimension, than with the peer ratings of the same dimension and vice versa. We conducted CFA analyses to determine whether it was appropriate, despite the method effect, to combine the different sources of ratings of the same dimension, or to model them separately in later chapters. Results of this activity suggested that the models with only a single method factor explained the data well, suggesting that the peer and supervisor versions of each dimension should be treated separately. The results of this analysis affected mainly three dimensions (*initiative, persistence, and effort; peer support*; and *technical performance/achievement*).

With regard to the Peer Support dimension, examination of the descriptive statistics for each linked item suggested one item (asking Soldiers whether they were ever placed on restriction for disrespecting peers or supervisors) had a very low base rate. This variable was dropped from the CFA analysis. The remaining items, all from the PRS (see Table 4.3) were retained for CFA analysis. High correlations were found for items in both Supervisor and Peer variants of this dimension (.70 and .68, respectively).

Three items were linked to the Initiative, Persistence, and Effort dimension, one of which had an extremely low base-rate (a question asking whether the Soldier was ever counseled about lack of effort). This item was dropped from the CFA analysis. However, we did retain peer (r = .76) and supervisory (r = .78) variants of two PRS.

Finally, 11 items were linked to the Technical Performance/Achievement dimension, four of which were excluded from analysis due to low base rates or low intercorrelations. The excluded items include: (a) *refire more than once to qualify in basic rifle marksmanship (ALQ),* (b) *field exercises - rated performance (ALQ),* (c) *ever counseled about unsatisfactory performance (ALQ),* and (d) *comprehensive AIT/OSUT failure (administrative).* The remaining items (the PRS and the *MOS-Specific JKT total score*) were submitted to CFA analysis. The inclusion of the PRS and the MOS-Specific JKT in the same model resulted in poor fit. Therefore, we modeled two dimensions reflecting supervisor and peer ratings of technical performance, and left the MOS-Specific JKT. We believe that the PRS reflect a measure of "typical" Soldier technical performance, while the MOS-Specific JKT is a "maximal" performance measure. Since both are important aspects of Soldier technical performance, we retained both separately for subsequent analyses. We found average sample correlations of .69 and .68 for the peer and supervisory variants of Technical Performance/Achievement, respectively.

In-Unit 1 CFA Results

Table 4.4 provides the CFA results for the In-Unit 1 data.

Continuance Cognitions. Similar to EOT effort, CFA testing suggested that the Continuance Cognitions factor should be divided into three sub-dimensions: (a) Short Term Continuance Cognitions, (b) Long Term Continuance Cognitions, and (c) Attrition Cognitions. We could not complete CFA modeling for the continuance cognitions dimensions, because these dimensions were under-identified or just-identified. However, the average intercorrelations for the two were .79 and .83, respectively. For Attrition Cognitions, the average intercorrelation was .48, and the CFA model demonstrated excellent fit.

Counterproductive Work Behaviors (CWB). All five items identified by the SMEs to represent CWB were found to show moderate to strong relationships with one another and acceptable descriptive statistics. The CFA of these items verified this initial observation through acceptable fit statistics associated with this factor.

Technical Performance/Achievement. All four items identified by SMEs as reflecting technical job criteria were retained for inclusion in CFA models after examination of intercorrelations and descriptives. All fit indices for this dimension surpassed the recommended standards.

Initiative, Persistence, and Effort. Upon inspecting the descriptive statistics of the three items shown to reflect Initiative, Persistence, and Effort, a low base-rate was found for the dichotomous ALQ variable "have you even been formally counseled about lack of effort?" Less than 6% of the sample answered "yes" to this question. Model fit indices could not be tested because there were only two manifest indicators, with a sample correlation of .64 between items.

Physical Fitness. With regard to the Physical Fitness dimension, weak relationships were observed between *I like the amount of physical activity I have to do as a Soldier* and the other two items. Thus, the variable was excluded from the CFA. We observed a correlation of .39 for the two retained items.

Peer Support. When inspecting the intercorrelations and descriptives for the three variables linked with the Peer Support dimension, weaker relationships were observed between *have you ever been placed on restriction for disrespecting your peers or superiors* with the other two variables. Additionally, this variable demonstrated a very low base-rate, with around 2% of sample positively endorsing the item. Thus, we excluded this item from subsequent analysis. The sample correlation between the two remaining items was .61.

Satisfaction/Commitment. Similar to the EOT analyses, SMEs suggested that models for Army Fit/Commitment and MOS Fit/Satisfaction be tested separately. However, the initial MOS Fit/Satisfaction CFA did not fit the data well. Further examination revealed a separated sub-dimension within the items linked to this dimension centered on satisfaction with the overall job undertaken in the Army, which we labeled *Job Satisfaction* (note the items in this scale were labeled MOS Satisfaction in previous Army Class analyses). The Army Fit/Commitment dimension was comprised of 12 items, Job Satisfaction 6 items, and MOS Fit contained 9. The average correlations among items within each dimension were .51, .71 and .61, respectively, and all three exhibited acceptable fit.

Table 4.4. In-Unit 1 Latent Criterion Space Factor Structure

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
SHORT TERM CONTINUANCE COGNITIONS	Under identified	FIML sample correlation between items =.79				
ALQ - I intend to leave the Army after completing my current term of service						
ALQ - How likely is it that you will leave the Army after completing your current term of service?						
LONG TERM CONTINUANCE COGNITIONS	Just identified	Average FIML sample correlation between items = .82				
ALQ - I plan to spend the rest of my career in the Army						
ALQ - How likely is it that you will make the Army a career?						
ALQ - How confident are you that you will stay in the Army until you retire?						
ATTRITION COGNITIONS	1.55	1	1.00	1.00	.02	.00
ALQ - How important is it to you that you complete your current term of						
ALQ - How frequently have you thought about trying to leave the Army before your current term of service expires?						
ALQ - How likely is it that you will complete your current term of service?						
ALQ - I am confident that I will complete my current term of service.						
COUNTERPRODUCTIVE WORK BEHAVIOR	41.19	5	.97	.94	.07	.03
ALQ - Received an Article 15?						
ALQ - Restriction for -- Disobeying a Direct Order?						
ALQ - Restriction For -- Not Adhering To Standards of Conduct?						
ALQ - Been Formally Counseled About Your Behavior or Discipline?						
ALQ - Restriction for -- Disrespecting Your Peers or Superiors?						
MOS FIT	395.03	24	.97	.95	.10	.03
ALQ - I like the work I do in my MOS						
ALQ - Given my skills and abilities, I think I am in the right MOS						
ALQ - If I could easily switch my MOS, I would (r)						
ALQ - I think my skills make me better suited for another MOS (r)						
ALQ - My MOS is a good match for me						
ALQ - Given my interests, I would be better off in another MOS (r)						
ALQ - I am the right person for the type of work my MOS requires						
ALQ - My MOS allows me to perform the kind of work I want to do						
ALQ - Working in my MOS helps me achieve my long-term career goals						

Table 4.4. (Continued)

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
JOB SATISFACTION	179.29	9	.98	.96	.11	.02
ALQ - How satisfied are you with your opportunity to perform work you find						
ALQ - How satisfied are you with your opportunity to learn new skills on the job?						
ALQ - How satisfied are you with the amount of challenge in your work?						
ALQ - How satisfied are you with the amount of variety in your work?						
ALQ - How satisfied are you with your opportunity to use your aptitudes, experience, and training?						
ALQ - How satisfied are you with the day-to-day tasks on your job?						
ARMY FIT/COMMITMENT	697.06	54	.94	.93	.09	.04
ALQ - I am able to maintain my values as a member of the Army						
ALQ - Life in the Army is worse than I expected before I joined the service (r)						
ALQ - The Army is a good match for me						
ALQ - The values of the Army reflect my own values						
ALQ - I feel like I am part of the Army family						
ALQ - I feel that the problems faced by the Army are also my own problems						
ALQ - The Army has a great deal of personal meaning for me						
ALQ - I feel a strong sense of belonging to the Army						
ALQ - I am proud to tell others I am in the Army						
ALQ - I doubt I could become as attached to another organization as I am to the						
ALQ - I have found my deployment to be an enriching experience						
ALQ - I feel personally attached to the Army						
TECHNICAL_PERFORMANCE/ACHIEVEMENT	1.21	1	1.00	1.00	.01	.01
ALQ - What was the last weapon qualification you received on your individual						
JKT AW- Army Class IU Total Score						
AW PRS - Scale 1-Performing Core Warrior Tasks						
AW PRS - Scale 2-Performing MOS-Specific Tasks						
PHYSICAL FITNESS	Under Identified	FIML sample correlation between items = .39				
ALQ - Last Army Physical Fitness Test (APFT) Score						
AW PRS - Scale 9-Exhibiting Fitness And Bearing (Overall)						

Table 4.4. (Continued)

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
INITIATIVE, PERSISTENCE, AND EFFORT	Under Identified	FIML sample correlation between items = .64				
AW PRS - Scale 6-Exhibiting Effort (Overall)						
AW PRS - Scale 12-Developing Own Skills (Overall)						
PEER SUPPORT	Under Identified	FIML sample correlation between items = .61				
AW PRS - Scale 10-Interacting With Indigenous People and Soldiers From Other Countries						
AW PRS - Scale 8-Contributing to the Team						

Note. (r) = reverse-coded. For consistency with EOT, only select criteria were used in certain analysis. For example, only APFT scores were used to represent physical fitness. In the Attrition Cognitions dimension, two of the ALQ items were allowed to correlate (*How important is it to you that you complete your current term of service?* with *How frequently have you thought about trying to leave the Army before your current term of service expires?).* Reverse coded items in the *MOS Fit* dimension were also allowed to correlate. In the Technical Performance Achievement dimension, two of the performance rating scale items were allowed to correlate (*Scale 1-Performing Core Warrior Tasks* with *Scale 2-Performing MOS-Specific Tasks).* Just identified = fit statistics cannot be computed because there are as many known (e.g., variances) as unknown (e.g., latent variables) parameters. Under identified = fit statistics cannot be computed because there are fewer known than unknown parameters.

In-Unit 2 CFA Results

The In-Unit 2 CFA results appear in Table 4.5.

Continuance Cognitions. As with the EOT and IU1 results, the Continuance Cognitions items were broken into three factors: (a) Short-Term Continuance Cognitions, (b) Long Term Continuance Cognitions, and (c) Attrition Cognitions. The average intercorrelations among these dimensions in the IU2 sample were high, ranging from .48 to .83. The Attrition Cognitions dimension was subjected to CFA, and found to fit the data well.

Initiative, Persistence, and Effort. Initially, three items were linked to this dimension. However, when subjected to CFA, one item, measuring "awareness and vigilance" was found to be incompatible with the other two items. We opted for a two-item composite of this dimension, which were correlated .73 with one another.

Physical Fitness. Four items linked to the IU2 Physical Fitness dimension were retained for CFA after inspecting the descriptives and intercorrelations. The resulting fit indices associated with this 4-item model were high.

Peer Support. The Peer Support dimension at IU2 consisted of the same variables as in IU1. Only two items comprised the factor, thus CFA analysis was not possible. The observed FIML sample correlation between items was .63.

Satisfaction/Commitment. As with the IU1 linkages, the items linked to this dimension were divided into three factors: Army Fit/Commitment, MOS Fit, and Job Satisfaction. All three dimensions exhibited acceptable fit when subjected to CFA analysis.

Technical Performance/Achievement. Upon inspecting the intercorrelations and descriptive statistics of the items identified as reflective of technical performance we retained all five items for CFA analysis. The fit indices for the technical performance CFA model were acceptable.

Table 4.5. In-Unit 2 Latent Criterion Space Factor Structure

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
SHORT TERM CONTINUANCE COGNITIONS	Under Identified	FIML sample correlation between items = .83				
ALQ - I intend to leave the Army after completing my current term of						
ALQ - How likely is it that you will leave the Army after completing your current term of service?						
LONG TERM CONTINUANCE COGNITIONS	Just identified	FIML sample correlation between items = .82				
ALQ - I plan to spend the rest of my career in the Army						
ALQ - How likely is it that you will make the Army a career?						
ALQ - How confident are you that you will stay in the Army until you						
ATTRITION COGNITIONS	31.42	2	.98	.93	.12	.03
ALQ - How important is it to you that you complete your current term						
ALQ - How frequently have you thought about trying to leave the Army before your current term of service expires?						
ALQ - How likely is it that you will complete your current term of						
ALQ - I am confident that I will complete my current term of service						
MOS FIT	173.56	17	.97	.96	.10	.03
ALQ - Given my skills and abilities, I think I am in the right MOS						
ALQ - If I could easily switch my MOS, I would (r)						
ALQ - I think my skills make me better suited for another MOS (r)						
ALQ - My MOS is a good match for me						
ALQ - Given my interests, I would be better off in another MOS (r)						
ALQ - I am the right person for the type of work my MOS requires						
ALQ - Working in my MOS helps me achieve my long-term career						
ALQ - I like the work I do in my MOS						
JOB SATISFACTION	126.86	9	.97	.95	.12	.02
ALQ - How satisfied are you with your opportunity to perform work you find interesting?						
ALQ - How satisfied are you with your opportunity to learn new skills						
ALQ - How satisfied are you with the amount of challenge in your						
ALQ - How satisfied are you with the amount of variety in your work?						
ALQ - How satisfied are you with your opportunity to use your aptitudes, experience, and training?						
ALQ - How satisfied are you with the day-to-day tasks on your job?						

Table 4.5. (continued)

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
ARMY FIT/COMMITMENT	617.71	65	.93	.91	.10	.04
ALQ - I am able to maintain my values as a member of the Army						
ALQ - Life in the Army is worse than I expected before I joined the						
ALQ - The Army is a good match for me						
ALQ - The values of the Army reflect my own values						
ALQ - I feel personally attached to the Army						
ALQ - I feel like I am part of the Army family						
ALQ - I feel that the problems faced by the Army are also my own						
ALQ - The Army has a great deal of personal meaning for me						
ALQ - I feel a strong sense of belonging to the Army						
ALQ - I am proud to tell others I am in the Army						
ALQ - I doubt I could become as attached to another organization as I am to the Army						
TECHNICAL PERFORMANCE/ACHIEVEMENT	2.49	2	1.00	1.00	.02	.01
AW PRS - Scale 1-Performing Core Warrior Tasks						
AW PRS - Scale 2-Performing MOS-Specific Tasks						
Combat PRS - Field/Combat Judgment						
ALQ - What was the last weapon qualification you received on your individual weapon?						
JKT AW - Army Class Total Score						
PHYSICAL FITNESS	0.13	1	1.000	1.000	.000	.004
ALQ - Last Army Physical Fitness Test (APFT) Score						
AW PRS - Scale 9-Exhibiting Fitness and Bearing						
Combat PRS - Physical Endurance						
ALQ - I like the amount of physical activity I have to do as a Soldier						
INITIATIVE, PERSISTENCE, AND EFFORT	Under Identified	FIML sample correlation between items = .73				
AW PRS - Scale 6-Exhibiting Effort						
AW PRS - Scale 12-Developing Own Skills						

Table 4.5. (Continued)

Factor	χ^2	*df*	*CFI*	*TLI*	*RMSEA*	*SRMR*
PEER SUPPORT	Under Identified	FIML sample correlation between items = .63				
AW PRS - Scale 10-Interacting With Indigenous People and Soldiers From Other Countries						
AW PRS - Scale 8-Contributing to the Team						

Note. (r) = reverse-coded. For consistency with EOT, only select criteria were used in certain analysis. For example, only APFT scores were used to represent physical fitness. In the Attrition Cognitions dimension, two of the ALQ items were allowed to correlate (*How important is it to you that you complete your current term of service?* with *How frequently have you thought about trying to leave the Army before your current term of service expires?).* Reverse coded items in the *MOS Fit* dimension were also allowed to correlate. In the Technical Performance/Achievement dimension, two of the performance rating scale items were allowed to correlate (*Scale 1-Performing Core Warrior Tasks* with *Scale 2-Performing MOS-Specific Tasks).* Just identified = fit statistics cannot be computed because there are as many known (e.g., variances) as unknown (e.g., latent variables) parameters. Under identified = fit statistics cannot be computed because there are fewer known than unknown parameters.

CFA Results Summary

A number of similarities were identified in the evaluation of the factor structures across the three Army Class criterion data collections. The items linked to Short-Term Continuance Cognitions were identical across the EOT, IU1, and IU2 data collections. The items contributing to the final composite scores for MOS Fit, Army Fit/Commitment, Long-Term Continuance Cognitions, Attrition Cognitions, and Physical Fitness were very similar across data collections such that the substantive meaning does not change. The Initiative/Persistence/Effort, Technical Performance/Achievement (maximal and typical), and Peer Support performance dimensions were conceptually similar across data collection points. However, with these dimensions, it is important to note that the sources of appraisal tapped during the EOT time points included both peers and supervisors of target Soldiers. The Job Satisfaction dimensions were similar across IU1 and IU2 data collections but not included in EOT data, while the Adjustment to Army Life and Feelings about Joining the Army dimensions were only included in the EOT data collection. Finally, the CWB dimension in the EOT and IU1 periods reflected the same items; however, these variables were not available at IU2. The models capturing the criterion space of the three time points of the Army Class project represent an integrated conceptualization for the given measures. These conceptualizations of outcomes of importance will be essential to the analyses illustrated in subsequent chapters.

Final Criterion Model and Scores

The primary purpose of this chapter was to define the latent structure of the Army Class LV criterion space for use in subsequent analysis. These latent constructs will be the criteria used in determining the predictive validity of the predictor constructs. The final set of criteria used in this research can be found in Table 4.6.

Once all of the criterion dimensions and items contributing to the criterion dimensions were identified, the final step was to construct the final criterion scores. In accomplishing this task, we considered the longitudinal nature of many analyses planned for subsequent chapters. In longitudinal analysis, in order for the means from one time point to the other to be meaningful, the same items should contribute to the scores at each time point. This will make direct comparisons across the EOT, IU1, and IU2 time points most meaningful. Thus, in constructing the final composites, we also took into account which items were *common* across time points, not just what was linked within each time point after the CFA analyses (displayed in Tables 4.3 through 4.5). In cases where dimensions included items from multiple assessment methods (e.g., PRS and ALQ items), we standardized those items before creating the overall score. The descriptive statistics for the final set of criteria are presented in Table 4.7.

Table 4.6. Final EOT, IU1, and IU2 Criterion Factor Descriptions

Factor	Description
1. Technical Performance and Achievement	Captures the performance of technical components of the job, such as Core Warrior Knowledge and Skill, such as weaponry, and MOS-Specific Knowledge and Skill. It is divided into maximal and typical dimensions. Measures of maximal and typical performance were administered at all three time points (EOT, IU1, and IU2).
a. Maximal	Characterized by performance on maximal measures of technical performance, in this case, Army-wide and MOS-Specific JKTs. Correspond to measure of "can do" performance in Project A.
b. Typical	Characterized by performance on typical measures of technical performance, in this case, Army-wide and MOS-Specific PRS scores.
2. Initiative, Persistence, and Effort (or simply "Effort")	Captures demonstration of effort, particularly under adverse conditions. Aspects of maintaining personal discipline, taking initiative, and developing one's own skills are also included in this dimension. It is assessed primarily with peer and supervisory ratings, and was collected at all three time points (EOT, IU1, and IU2).
3. Counterproductive Work Behavior (CWB)	Captures Soldier disobedience, lack of discipline and failure in complying with Army standards. It is assessed with self-report items of disciplinary action. This dimension was not assessed at the IU2 time point.
4. Peer Support	Captures Soldier facilitation capabilities through demonstrating support, providing leadership, and being open to interacting with people from different national backgrounds. It is assessed primarily with peer and supervisory ratings, and was collected at all three time points (EOT, IU1, and IU2).
5. Physical Fitness	Captures performance and outcomes related fitness and physical ability. It was measured at all three time points (EOT, IU1, and IU2) and reflects scores of physical fitness (i.e., APFT) and peer and supervisory appraisals of physical fitness.
6. Satisfaction and Commitment	Captures Soldier satisfaction, commitment, and fit with the Army overall, their MOS, and their specific job duties. These three aspects of satisfaction and commitment are measured separately.
a. Army Fit/ Commitment (or simply "Army Fit")	Individuals high on this dimension feel a sense of belonging to and identifying with the Army, focusing on the congruence between Soldiers' values and needs compared with those of the Army and perceived attachment to the Army. This factor captures the sense of pride Soldiers experience in relation to the decision of having joined the Army. This dimension was assessed with items from the ALQ at all three time points (EOT, IU1, and IU2).
b. MOS Fit	MOS Fit is similar to the Army Fit/Commitment factor in that both capture person-fit aspects of work. However, MOS Fit focuses specifically on the nature of the Soldier's MOS. Items are characterized by the perceived match between Soldier interests and characteristics and ability develop over the course of the career. This dimension was assessed with items from the ALQ at all three time points (EOT, IU1, and IU2).

Table 4.6. (continued)

Factor	Description
c. Job Satisfaction	Where the MOS Fit and Army Fit Commitment factors focus on the perceived match between person and job/environment, the focus of this dimension is on determination of Soldiers' feelings about various job-specific characteristics (e.g. skills, variety, and challenge). Note that this is not "MOS" Satisfaction because the items focus on Soldier duties, which may or may not be MOS-Specific. This dimension was assessed with items from the ALQ and was captured at time points IU1 and IU2.
7. Continuance Cognitions	
a. Short Term Continuance Cognitions	Captures Soldiers' thoughts on remaining with the Army for the short-term future (i.e. through the completion of the current term of service). This dimension was assessed with items from the ALQ at all three time points (EOT, IU1, and IU2).
b. Long Term Continuance Cognitions	This factor captures Soldiers' thoughts on remaining with the Army until retirement and making the Army a lifelong career. This dimension was assessed with items from the ALQ at all three time points (EOT, IU1, and IU2).
c. Attrition Cognitions	This factor is similar to the continuance cognitions dimensions. However, items comprising this factor concern immediate thoughts on leaving the Army (i.e. before the end of their current term of service). In other words, these items capture the likelihood of the Soldier attriting and how important completing their current term of service is to them. This dimension was assessed with items from the ALQ at all three time points (EOT, IU1, and IU2).
8. Adjustment	Captures the degree of comfort new Soldiers have experienced when transitioning from a civilian life to the Army. It is assessed along two dimensions: (a) Adjustment to Army Life and (b) Feelings about Joining the Army. Both dimensions were assessed with items from the ALQ at one time point (EOT).
a. Adjustment to Army Life	Items linked to this factor focus on difficulties in transitioning from civilian life to the Army.
b. Feelings about Joining the Army	Items linked to this factor emphasize the difference between expectations of life in the Army and the experience of life in the Army after accessing

Table 4.7. Descriptive Statistics for Analysis Criteria

	n	Minimum	Maximum	*M*	*SD*
End of Training					
Technical Performance/Achievement					
Maximal Performance (Job Knowledge Test) [a]	2,093	-3.70	2.62	0.00	1.00
Supervisor Ratings of Technical Performance [a]	1,552	-3.14	1.52	-0.01	0.87
Peer Ratings of Technical Performance [a]	2,171	-3.97	1.53	-0.01	0.90
Initiative, Persistence, and Effort					
Peer Ratings of Effort [a]	2,248	-3.54	1.79	0.00	1.00
Supervisor Ratings of Effort [a]	1,764	-3.24	1.50	0.00	1.00
Counterproductive Work Behavior	2,259	0.00	1.00	0.13	0.34
Peer Support					
Peer Ratings of Peer Support [a]	2,239	-3.48	1.88	0.00	1.00
Supervisor Ratings of Peer Support [a]	1,641	-3.18	1.61	0.00	1.00
Physical Fitness	2,204	-3.24	1.12	0.00	0.75
Satisfaction/Commitment					
MOS Fit	2,198	1.00	5.00	3.68	0.88
Army Fit	2,016	1.00	5.00	3.91	0.64
Continuance Cognitions					
Attrition Cognitions	2,206	1.00	5.00	1.69	0.73
Short Term Continuance Cognitions	2,209	1.00	5.00	3.09	1.07
Long Term Continuance Cognitions	2,212	1.00	5.00	3.15	1.10
Adjustment					
Adjustment to Army Life	2,258	1.00	5.00	2.30	0.90
Feelings about Joining Army	2,240	1.00	5.00	2.49	0.99
In-Unit 1					
Technical Performance/Achievement					
Technical Performance (Typical) [a]	1,363	-2.32	1.72	0.01	0.76
Technical Performance (Maximal)	1,587	0.00	1.00	0.64	0.24
Effort [a]	897	-3.04	1.56	0.00	1.00
Counterproductive Work Behaviors	1,494	0.00	1.00	0.23	0.42
Peer Support [a]	871	-3.83	1.21	0.00	1.00
Physical Fitness [a]	1,314	-4.73	2.78	0.00	1.00
Satisfaction/Commitment					
Job Satisfaction	1,449	1.00	5.00	3.47	0.98
MOS Fit	1,449	1.00	5.00	3.28	0.98
Army Fit	1,433	1.00	5.00	3.71	0.80
Continuance Cognitions					
Attrition Cognitions	1,471	1.00	5.00	4.24	0.83
Short Term Continuance Cognitions	1,466	1.00	5.00	3.09	1.27
Long Term Continuance Cognitions	1,461	1.00	5.00	2.67	1.25
In-Unit 2					
Technical Performance/Achievement					
Technical Performance (Typical) [a]	926	-2.67	1.51	0.00	0.75
Technical Performance (Maximal)	977	0.00	1.00	0.68	0.19
Effort [a]	724	-3.15	1.41	0.00	1.00
Peer Support [a]	713	-4.13	1.11	0.00	1.00
Physical Fitness [a]	926	-6.62	9.75	0.00	1.00
Satisfaction/Commitment					
Job Satisfaction	936	1.00	5.00	3.36	0.94
MOS Fit	940	1.00	5.00	3.22	0.96
Army Fit	921	1.00	5.00	3.42	0.82
Continuance Cognitions					
Attrition Cognitions	950	1.00	5.00	4.07	0.88
Short Term Continuance Cognitions	949	1.00	5.00	3.43	1.31
Long Term Continuance Cognitions	948	1.00	5.00	2.41	1.24

[a] Component variables for factor score were standardized to a mean of 0 and a standard deviation of 1. The remaining factor scores retained their original scaling. See Chapter 2 for more detailed scaling information.

Conclusions

The purpose of this chapter was to define the latent structure of the criterion space. Previous Army Class reports have relied on analyzing individual scales within a measurement method (Knapp & Heffner, 2011; Knapp et al., 2012). However, the scale intercorrelations were often high, suggesting that some of them could potentially be representing the same underlying construct. As with the predictor analyses described in Chapter 3, we wanted to capture latent factors of the criterion space rather than individual scales for each measurement method. CFA analyses conducted in this chapter suggest that having multiple scales, even when those scales represent similar constructs, was often appropriate. For example, we tested models where MOS Fit and Job Satisfaction items were treated together, but the results of our analysis found that the fit of the model was significantly better when treated separately. The list of criteria described in Table 4.7, along with outcomes such as attrition and re-enlistment (see Chapter 2), will be used in analyses in subsequent chapters. The choice of what criteria to use will depend on the nature of the analysis and the target question being answered.

CHAPTER 5. MODELING SOLDIER ATTITUDINAL AND CONTINUANCE COGNITIONS THROUGH 36 MONTHS OF SERVICE

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Overview

This chapter concerns the modeling and prediction of Soldier attitudes, attrition cognitions, and career intentions through their first 36 months of service. Over the course of the Army Class LV effort, researchers administered a number of attitudinal variables, such as perceptions of fit with the Army, job satisfaction, and thoughts about leaving the Army, at multiple points in time (Knapp et al., 2011). As described in Chapter 4, we conducted a number of analyses to formulate latent factors of these constructs that have similar meaning at each time point. This chapter describes (a) how these attitudinal criterion variables change over time, (b) the utility of the latent predictor variables (outlined in Chapter 3) in predicting these attitudinal criteria at each time point, and (c) the relationship between the latent predictor variables and the change trajectory of the attitudinal variables.

Background

Theory and empirical evidence suggest that attitudes are among the strongest predictors of job performance and separation behaviors (e.g., Azjen, 1991; Hom & Griffith, 1995). For example, within the Army context, researchers have found attitudinal antecedents such as self-reported Army affective commitment and thoughts about leaving to be strong predictors of post-Initial Military Training (IMT) separation behavior (Lytell & Drasgow, 2009; Strickland, 2005). Thus, as part of this research, it was important to determine whether the latent predictors (e.g., Agreeableness, Conscientiousness) are meaningfully related to the key self-reported attitudinal antecedents of performance, attrition, and continuance over time.

Previously published Army Class findings have demonstrated that the experimental predictor measures generally predict key self-reported attitudinal criteria (e.g., affective commitment, attrition cognitions) extremely well in both concurrent (Ingerick et al., 2009) and longitudinal (Knapp & Heffner, 2009; Knapp et al., 2011) examinations. In general, measures of Soldier temperament (i.e., RBI, TAPAS, AIM, and WSI) emerged most consistently as the strongest predictors of attitudinal criteria across projects. The WPA, WVI and AKA also exhibited strong predictive validity for attitudinal criteria, albeit at a generally lower magnitude than the temperament measures. In the present research, we build on this previous Army Class research by examining the pattern of relationships between the latent predictors established in this investigation and these criteria longitudinally.

Generally speaking, the variability associated with any construct at a single point in time can be quite different from the variability associated with this construct over time (Ployhart & Vandenberg, 2010). As such, cross-sectional research provides little insight into how individual variables as well as the relationships between variables may change over time, which can lead to inaccurate conclusions (Maxwell & Cole, 2007). Therefore, we used latent growth modeling to (a) examine how Soldiers' self-reported attitudes change over time and (b) determine the

relationships among the predictors and Soldiers' self-reported change in attitudes through 36 months of service.

Approach

Predictors and Attitudinal Criteria

The following analyses rely on the latent predictor factors described in Chapter 3 and the latent criterion factors described in Chapter 4. Latent factors rely less heavily on individual measures of temperament and attitudes such that the validity results in this chapter allow us to understand whether each predictor construct relates to each attitudinal variable. This approach places less emphasis on the specific measures used to collect information on the predictor space and has the potential to control for any method effects that may emerge. We divide these self-report attitudinal factors into two categories to assist in interpretation.

Attitudinal Self-Report Factors

- Army Fit
- MOS Fit
- Adjustment to Army Life
- Feelings about Joining the Army
- Job Satisfaction

Self-Report Continuance Cognitions

- Attrition Cognitions
- Short-Term Continuance Cognitions
- Long-Term Continuance Cognitions

Change in Attitudes over Time

As described in Chapter 4, a number of attitudinal and continuance constructs were assessed at each time point, including Attrition Cognitions, Short-Term Continuance Cognitions, Long-Term Continuance Cognitions, Army Fit, and MOS Fit. To examine how these variables change over time, we used Latent Growth Modeling (LGM), an application of confirmatory factor analysis. Two latent variables were specified for each LGM – initial status and change – and the observed criterion variable for each measurement occasion was included as a manifest indicator of those two latent variables. Initial status represents the mean starting value of the variable of interest across all individuals. Change represents the mean change in the variable across all individuals. In order to model the latent growth, the factor loadings for each of the three measurement occasions were constrained to be one for the initial status latent construct (see Figure 5.1). For the change latent construct, the time one (End of Training; EOT) factor loading was constrained to zero, the time two (In-Unit 1; IU1) factor loading was constrained to one, and the time three (In-Unit 2; IU2) factor loading was constrained to two.

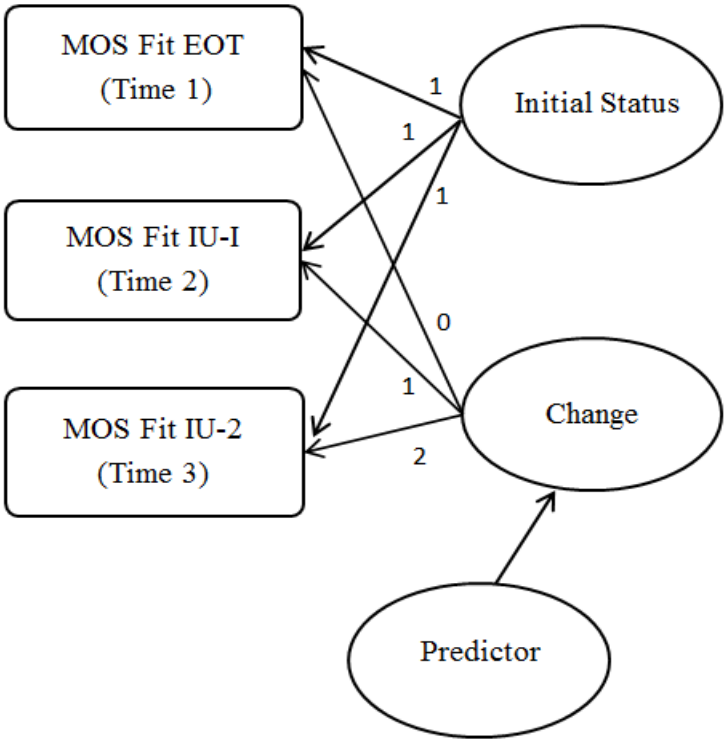

Figure 5.1. Latent Growth Model of change with predictors.

Initial status represents the mean MOS Fit at the EOT across all Soldiers and change represents the mean change in MOS Fit across all Soldiers. The arrow between predictor and change denotes change regressed on to the predictor of interest.

The model produces goodness-of-fit estimates that assess overall model fit and mean and variance estimates of the initial status and change constructs. Overall model fit was assessed using the χ^2 statistic, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). CFI and TLI values $\geq .95$ and SRMR and RMSEA values $\leq .08$ indicate acceptable fit. A significant mean change estimate suggests a non-zero change in the variable of interest, on average, for the whole sample. Significant variance estimates suggest that there are individual differences within the sample in how each individual changes over time. The critical *z*-scores were used to test significance of the mean and variance parameters.

We used Mplus LGM analyses with Full Information Maximum Likelihood (FIML) missing data analysis (Muthén & Muthén, 1998-2012). See Chapter 3 for a full description of FIML estimation. Our sample for the LGM analyses was restricted to Soldiers in each of the six target MOS (i.e., 11B, 19K, 31B, 68W, 88M, and 91B) who had participated in at least two of the three data collections (EOT, IU1, IU2). These six MOS were targeted for the EOT data collection (see Chapter 2). Additionally, we limited the sample to those with data from at least two time points to increase the amount of information available for the FIML analyses. Of the 10,814 Soldiers in the full Army Class LV sample, 5,146 Soldiers were in the six target MOS, of which 746 had completed at least two data collections.

Predicting Soldier Attitudes

We conducted a number of analyses to examine the predictive efficacy of the latent predictor factors. First, we examined the bivariate correlations between the latent attitudinal variables and the latent predictors. Next, we used Johnson's (2000; see also Johnson & LeBreton, 2004) procedure to compute relative weights (*RW*). Specifically, we re-scaled estimates to a proportion metric ranging from 0% to 100%, which allowed us to interpret them as the percentage of criterion variance accounted for (R^2) by each predictor. Finally, we examined the Ordinary Least Squares (OLS) regression weights for each latent predictor by including all predictors in the model for each criterion. As noted in Chapter 3, most of the predictor factor composites were constructed excluding TAPAS and AIM to enhance the sample size; however, Affect Management was constructed using the TAPAS and AIM. As a result, the overall sample size is much smaller in the analyses in this chapter than it would have been otherwise. With the exception of Affect Management, the larger sample sizes were used in the assessment of the bivariate correlation and relative weights, but the smaller sample size was used for the OLS regression evaluating all predictors together. The smaller sample size impacts the ability to detect statistically significant results. In interpreting the results, we placed more emphasis on the bivariate correlations and relative weights.

We also examined whether the predictors explained variance in the mean change estimate. To examine predictors of change, there must be significant variance in the mean change factor. No variance in the change factor indicates that all of the Soldiers in the sample are changing along similar trajectories. If there was non-significant amount of variance in the change factor then no additional analyses were conducted. To test key predictors of change, the predictor variables were added to the model by regressing the change factor onto the predictor variables of interest (see Figure 5.1, Change regressed on Predictor).

Results

Change in Attitudes over Time

The following describes the results of the Latent Growth Models (LGMs) assessing change in attitudes. Note that mean change, listed in the results, represents the average change across the time points. Table 5.1 lists the full results for each variable including the goodness-of-fit measures for each model.

Continuance Cognitions. There was a significant increase in Attrition Cognitions over time (*mean change* = .43), while there was a significant decrease in Short-Term Continuance Cognitions over time (*mean change* = -.92). Between EOT and IU2, Attrition Cognitions, or Soldiers' expectations that they will leave the Army prior to the end of their current term of service, increased by 28%. Between EOT and IU2, Short-Term Continuance Cognitions, or Soldiers' perceptions that they will re-enlist after their current term of service, decreased by 29%. Long-Term Continuance Cognitions also decreased over time (*mean change* = -.98), but the model fit poorly. Examination of the results showed that the mean estimates at each time point were not adequately modeled, leading to uncertainty in the change estimate.

These results suggest that Soldiers' expectations that they will leave prior to the end of their current term of service increased over time and Soldiers' expectations that they will stay beyond their current term of service decreased over time. Figure 5.2 depicts the change over time for Attrition Cognitions and Short-Term Continuance Cognitions. It is worth noting the Attrition Cognitions mean at each time point is below the midpoint of the scale, suggesting that while endorsement of attrition statements increased, overall Soldiers tend to disagree with such statements.

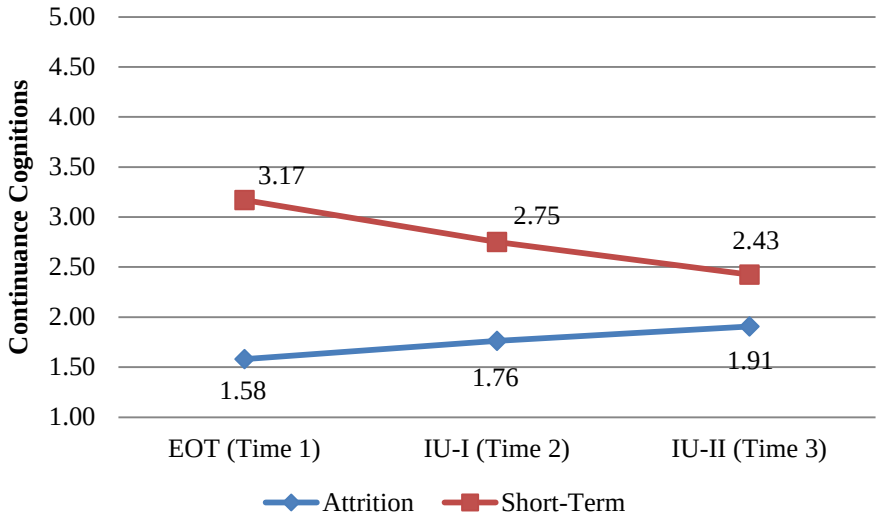

Figure 5.2. Latent Growth Model of continuance cognitions.

Army and MOS Fit. There was a significant decrease in both Army Fit (*Mean change* = -.34), and MOS Fit (*Mean change* = -.26), over time. Between EOT and the IU2, Soldiers' perceptions of how well they fit in the Army and how well they fit in their assigned MOS decreased (Figure 5.3). While Army and MOS Fit decreased over time the mean at each time point is above the midpoint of the scale suggesting that, on average, Soldiers agree with more statements about Fit than disagree.

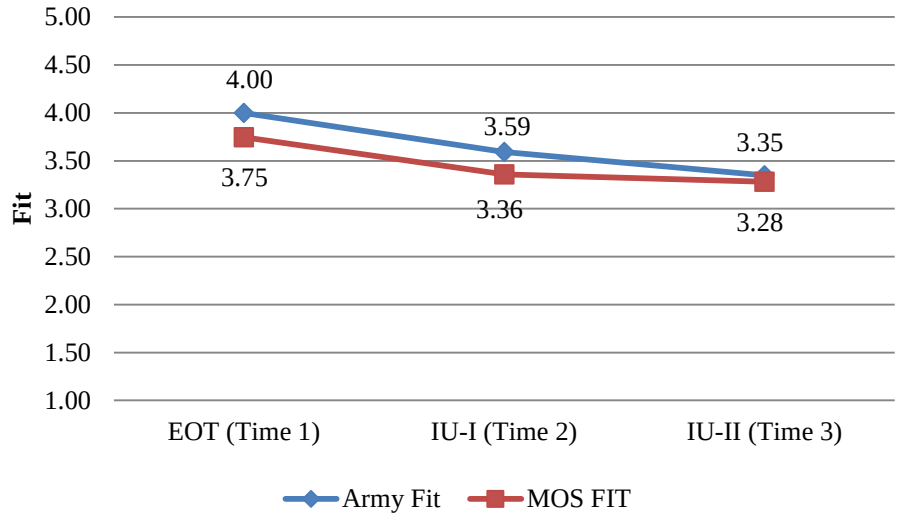

Figure 5.3. Latent Growth Models of Army and MOS Fit.

Table 5.1. Latent Growth Modeling Results of Soldier Attitudes and Continuance Cognitions

	N	χ^2	*df*	CFI	TLI	RMSEA	SRMR	IS	CH	Variance CH
Attrition Cognitions	743	0.18	1	1.00	1.00	.00	.01	3.76	**0.43**	Yes
Short-Term Continuance Cognitions	745	0.54	1	1.00	1.00	.00	.01	4.73	**-0.92**	No
Long-Term Continuance Cognitions	745	18.73	1	0.87	0.60	.15	.05	3.68	**-0.98**	Yes
Army Fit	738	4.03	1	0.97	0.90	.06	.03	3.99	**-0.34**	Yes
MOS Fit	745	11.85	1	0.92	0.76	.12	.04	3.73	**-0.26**	Yes

Note. Bolded results indicate significance at $p < .05$. CFI = Comparative Fit Index; TLI = Tucker Lewis Fit Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; CFI and TLI values ≥ .95 and SRMR and RMSEA values ≤ .08 indicate acceptable fit. Initial Status (IS) represents the mean starting value of the variable of interest across all individuals. Change (CH) represents the mean change at each point of measurement in the variable of across all individuals. Results are based on FIML analyses and include individuals with data at least two time points for the target attitudinal variable.

Predicting Soldier Attitudes

The following describes the validity analyses examining the relationship between the predictors and the attitudinal criteria at each time point. Significant results will be discussed. The full results can be found in the associated tables.

End of Training

Continuance Cognitions Criteria. Table 5.2 lists the results for the EOT criteria. The following results were noted.

- All of the predictors were significantly and negatively correlated with Attrition Cognitions. Correlations ranged from -.05 to -.28, with Army Affective Commitment showing the strongest relationship.
- With the exception of Cognitive Aptitude, all of the predictors were significantly correlated with Short-Term Continuance Cognitions. Correlations ranged from .06 to .26. Army Affective Commitment and Affect Management were the strongest predictors of Short-Term Continuance Cognitions.
- All of the predictors, except Internal Locus of Control, were significantly related to Long-Term Continuance with correlations ranging from -.08 to .28. The strongest predictors included Army Affective Commitment, Affect Management, Surgency, and Cognitive Aptitude. Cognitive Aptitude was negatively related to Long-Term Continuance (r = -.08), suggesting Soldiers with higher cognitive ability may believe they have other opportunities outside of the Army and therefore do not plan on making the Army a career (this interpretation is further supported by the re-enlistment results reported in Chapter 7).

Overall, the predictors accounted for between 9% and 11% of the variance in the continuance cognitions criteria.

Table 5.2. Correlations and Relative Importance Indices of Latent Factors in Predicting End of Training Attitudinal Criteria

	Army Fit (n = 479 – 2,010)			Adjustment to Army Life (n = 495 – 2,251)			Feelings about Joining the Army (n = 489 – 2,233)			MOS Fit (n = 479 – 2,191)		
	R^2 = ***.19***			R^2 = ***.10***			R^2 = ***.12***			R^2 = ***.08***		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	**.28**	.06	9.5%	**-.15**	.02	3.4%	**-.14**	.06	2.9%	**.13**	-.01	4.7%
Affect Management	**.16**	.05	4.4%	**-.22**	**-.14**	27.9%	**-.23**	**-.15**	25.9%	**.13**	.09	12.5%
Agreeableness	**.21**	.01	4.5%	**-.11**	-.01	2.5%	**-.10**	.05	1.3%	**.15**	**.14**	16.0%
Army Affective Commitment	**.41**	**.33**	54.1%	**-.25**	**-.17**	35.0%	**-.27**	**-.19**	38.3%	**.20**	**.13**	29.7%
Cognitive Aptitude	-.03	-.05	1.2%	**-.07**	-.05	3.3%	-.02	.03	0.4%	-.01	.00	0.5%
Conscientiousness	**.18**	.02	3.4%	**-.12**	-.07	5.7%	**-.09**	-.01	1.5%	**.09**	.02	3.5%
Fitness Orientation	**.15**	-.01	2.8%	**-.14**	-.04	7.1%	**-.13**	-.02	4.8%	**.14**	.07	12.4%
Internal Locus of Control	**.20**	.02	5.0%	**-.17**	-.02	8.0%	**-.20**	-.09	14.2%	**.12**	.01	4.8%
Openness	**.14**	-.06	1.5%	**-.12**	-.01	2.3%	**-.10**	.03	1.3%	.01	**-.13**	6.3%
Practical Intelligence	**.15**	.02	2.2%	**-.08**	.04	0.9%	**-.09**	-.02	1.3%	.04	-.06	2.3%
Surgency	**.27**	**.12**	11.5%	**-.13**	-.04	3.9%	**-.16**	-.12	8.1%	**.13**	.06	7.3%

	Attrition Cognitions (n = 481 – 2,199)			Short-Term Continuance (n = 482 – 2,202)			Long-Term Continuance (n = 482 – 2,204)		
	R^2 = ***.10***			R^2 = ***.10***			R^2 = ***.12***		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	**-.20**	-.02	7.3%	**.12**	-.02	3.7%	**.14**	-.01	4.3%
Affect Management	**-.18**	-.09	13.8%	**.18**	**.17**	23.9%	**.12**	**.11**	9.2%
Agreeableness	**-.17**	-.05	6.1%	**.09**	-.04	1.6%	**.10**	-.08	1.7%
Army Affective Commitment	**-.28**	**-.21**	45.2%	**.26**	**.22**	47.9%	**.28**	**.27**	51.6%
Cognitive Aptitude	**-.05**	-.03	1.4%	-.02	-.04	1.2%	**-.08**	**-.10**	6.9%
Conscientiousness	**-.13**	-.04	4.4%	**.10**	.02	2.7%	**.14**	.03	4.8%
Fitness Orientation	**-.12**	-.01	3.5%	**.08**	-.03	1.7%	**.06**	-.05	1.1%
Internal Locus of Control	**-.18**	-.03	7.6%	**.06**	-.09	2.6%	.04	-.09	2.8%
Openness	**-.12**	.03	1.8%	**.06**	-.06	1.4%	**.08**	-.04	1.3%
Practical Intelligence	**-.12**	.01	1.8%	**.09**	.03	1.9%	**.13**	.10	6.8%
Surgency	**-.18**	-.05	7.2%	**.15**	.14	11.5%	**.16**	**.12**	9.6%

Note. Bolded values indicate significance at $p < .05$. *r* = bivariate correlations; β = Standardized Beta weights with all predictors included in the regression model; RW = Johnson's relative weights. Results are based on OLS regression.

Attitudinal Criteria. All of the predictors were significantly related to Adjustment to Army Life and, with the exception of cognitive aptitude, all of the predictors were significantly related to Army Fit and Feelings about Joining the Army. For both of these criteria, Army Affective Commitment was the strongest predictor. Affect Management was also a strong predictor for Adjustment to Army Life and Feelings about Joining the Army. Notably, Achievement Orientation, Surgency, Agreeableness, and Internal Locus of Control showed strong relationships with Army Fit.

With the exception of Cognitive Aptitude, Openness, and Practical Intelligence, all of the predictors were significantly correlated with MOS Fit. Army Affective Commitment and Agreeableness emerged as the strongest predictors. Overall, the latent predictors accounted for 8% to 19% of the variance in these attitudinal criteria, with Army Affective Commitment and Affect Management accounting for the most variance across the individual criteria, though Cognitive Aptitude, Surgency, Agreeableness, and Openness also contributed substantially to the prediction of certain criteria.

In-Unit 1

Continuance Cognitions Criteria. Table 5.3 lists the predictive results for the IU1 criteria.

- With the exception of Affect Management and Agreeableness, all of the predictors were significantly related to Attrition Cognitions, with correlations ranging from -.08 to -.17. Internal Locus of Control and Achievement Orientation showed the strongest correlations.

- A number of predictors were significantly related to Short-Term Continuance Cognitions, including Army Affective Commitment, Achievement Orientation, Conscientiousness, Practical Intelligence, Internal Locus of Control, and Agreeableness.

- All of the predictors except Affect Management and Fitness Orientation were significantly correlated with Long-Term Continuance with Practical Intelligence, Army Affective Commitment and Achievement Orientation emerging as the strongest predictors.

Overall, the predictors showed less utility in predicting IU1Continuance Cognitions than in EOT; however, Practical Intelligence emerged as a significant predictor of IU1 Long-Term Continuance and was not significant for EOT.

Attitudinal Criteria. The following results were noted.

- Army Affective Commitment continued to be a strong predictor of IU1 Army Fit. With the exception of Affect Management and Fitness Orientation, all other predictors showed significant relationships with Army Fit.

- A number of predictors were no longer significantly related to MOS Fit; however Affect Management, Army Affective Commitment, Conscientiousness, Internal Locus of Control, and Practical Intelligence continued to be significantly related to IU1 MOS Fit.

Table 5.3. Correlations and Relative Importance Indices of Latent Factors in Predicting In-Unit 1 Attitudinal Criteria

	Army Fit (n = 358 – 1,423)			MOS Fit (n = 366 – 1,439)			Job Satisfaction (n = 368 – 1,439)		
	R^2 = ***.07***			R^2 = *.03*			R^2= ***.07***		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	**.20**	.10	16.6%	.05	.01	2.8%	**.12**	.13	11.3%
Affect Management	.05	-.05	1.1%	**.13**	**.13**	42.7%	.07	.08	7.0%
Agreeableness	**.15**	.00	6.5%	.06	.00	3.0%	**.13**	.07	10.8%
Army Affective Commitment	**.17**	**.12**	22.8%	**.07**	.03	6.9%	**.08**	.03	3.9%
Cognitive Aptitude	.00	-.02	0.5%	.00	-.02	1.0%	**-.17**	**-.18**	44.4%
Conscientiousness	**.17**	.05	13.2%	**.09**	.05	13.8%	**.13**	.02	7.3%
Fitness Orientation	.04	-.04	1.0%	.00	-.04	1.8%	.01	-.05	1.2%
Internal Locus of Control	**.14**	.06	9.9%	**.06**	.01	4.8%	**.07**	.01	2.8%
Openness	**.13**	.01	5.4%	.00	-.11	10.5%	.02	-.09	3.5%
Practical Intelligence	**.19**	.11	18.8%	**.08**	.07	11.1%	**.09**	.06	5.4%
Surgency	**.13**	-.04	4.4%	.04	.02	1.7%	.05	-.07	2.5%
	Attrition Cognitions (n = 372 – 1,461)			Short-Term Continuance (n = 372 – 1,456)			Long-Term Continuance (n = 370 – 1,451)		
	R^2 = *.05*			R^2 = *.04*			R^2 = ***.06***		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	**-.15**	-.09	16.1%	**.11**	.07	12.3%	**.15**	.11	14.7%
Affect Management	-.06	.05	1.8%	.00	-.07	4.4%	.02	-.04	1.2%
Agreeableness	-.06	.06	2.3%	**.07**	-.01	3.2%	**.09**	-.04	3.2%
Army Affective Commitment	**-.11**	-.04	9.0%	**.13**	.11	29.0%	**.14**	**.12**	22.4%
Cognitive Aptitude	**-.08**	-.06	9.6%	.01	.01	0.3%	**-.05**	-.07	6.1%
Conscientiousness	**-.08**	-.04	5.4%	**.11**	.05	13.1%	**.15**	.06	15.9%
Fitness Orientation	**-.09**	-.04	8.0%	.01	-.04	2.2%	.03	-.03	0.8%
Internal Locus of Control	**-.17**	-.12	32.4%	**.10**	.07	13.7%	**.09**	.04	6.0%
Openness	**-.11**	-.05	8.2%	.06	-.01	2.3%	**.07**	-.03	2.6%
Practical Intelligence	**-.09**	-.02	4.4%	**.11**	.09	15.4%	**.16**	**.14**	23.5%
Surgency	**-.08**	.05	2.7%	.04	-.09	4.0%	**.06**	-.10	3.7%

Note. Bolded values indicate significance at $p < .05$. *r* = bivariate correlations; β = Standardized Beta weights with all predictors included in the regression model; RW = Johnson's relative weights. Results are based on OLS regression.

- Job Satisfaction was assessed at IU1 and a number of predictors were significant. Cognitive Aptitude showed the strongest relationship, however the correlation was negative (r = -.17), suggesting those with higher cognitive ability were less satisfied with their jobs.

From these results, we can conclude that (a) the predictors are less predictive of IU1 attitudinal criteria than EOT attitudinal criteria overall; (b) the predictive efficacy of Army Affective Commitment and Affect Management is greatly diminished for Soldiers in units, while other predictors (e.g., Cognitive Aptitude, Practical Intelligence, Internal Locus of Control) take on a larger role; and (c) a number of predictors remain statistically significant in predicting attitudinal outcomes when examining the bivariate correlations.

In-Unit 2

Continuance Cognitions Criteria. Table 5.4 lists the full results for the IU2 criteria. There were a number of significant correlations between the predictors and the continuance criteria. Locus of Control was the strongest predictor of IU2 Attrition Cognitions (r = -.17). In contrast to IU1, Conscientiousness and Surgency were no longer significantly related to IU2 Attrition Cognitions. As was the case in EOT, Affect Management emerged as a relative strong predictor of Attrition Cognitions while it was not significant in IU1.

Short-Term Continuance Cognitions showed similar patterns of correlations as in IU1. However, Surgency emerged as a significant predictor in IU2 and Conscientiousness was the strongest predictor of Short-Term Continuance. Finally, the relationships between the predictors and Long-Term Continuance Cognitions were similar at IU2; however, Army Affective Commitment and Internal Locus of Control were no longer significant. Achievement Orientation and Conscientiousness showed the strongest relationships with Long-Term Continuance Cognitions. Overall, there was again a drop in the utility of the predictors to predict continuance variables with Army Affective Commitment further diminished in predicting the IU2 Continuance Cognitions.

Attitudinal Criteria. Agreeableness was the only predictor significantly correlated with MOS Fit at IU2. Further, the R^2 decreased from .07 at IU1 to .02 at IU2, suggesting external factors may play a stronger role in Soldiers' attitudes towards their MOS at later points in time. The pattern of correlations between the predictors and IU2 Army Fit was very similar to IU1. However, the predictive effectiveness of Army Affective Commitment was substantially reduced. In contrast, Practical Intelligence emerged as the strongest predictor of IU2 Army Fit. Cognitive Aptitude continued to be the strongest, but negative predictor of IU2 Job Satisfaction and similar patterns of correlations emerged with the exception of Agreeableness. Agreeableness was no longer significantly related to IU2 Job Satisfaction. Similar to the continuance cognitions criteria, the predictors did not show as strong of utility for predicting the attitudinal variables and, notably, Army Affective Commitment was no longer a strong predictor.

Table 5.4. Correlations and Relative Importance Indices of Latent Factors in Predicting In-Unit 2 Attitudinal Criteria

	MOS Fit (n = 294 – 933)			Army Fit (n = 293 – 914)			Job Satisfaction (n = 292 – 929)		
	R^2 = .02			R^2 = .06			R^2 = .05		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	.03	-.07	4.2%	**.17**	.03	10.7%	**.10**	.07	8.7%
Affect Management	-.02	-.08	13.6%	.01	-.07	3.3%	.03	.02	1.6%
Agreeableness	**.08**	.10	28.7%	**.19**	.07	16.7%	**.13**	.08	16.6%
Army Affective Commitment	.06	.05	12.4%	**.10**	.04	5.7%	.04	-.01	0.7%
Cognitive Aptitude	.03	.05	8.4%	-.03	-.04	3.0%	**-.13**	**-.14**	37.4%
Conscientiousness	.04	.02	4.2%	**.15**	.03	10.8%	**.11**	.01	8.4%
Internal Locus of Control	.05	.05	10.3%	**.13**	.09	13.3%	**.08**	.06	8.2%
Openness	.02	-.02	2.3%	**.12**	-.01	5.2%	.02	-.07	3.4%
Fitness Orientation	.04	.04	7.3%	.03	-.03	0.7%	.01	-.02	0.4%
Practical Intelligence	.05	.02	5.3%	**.19**	.12	23.9%	**.10**	.08	11.8%
Surgency	.04	-.01	3.3%	**.15**	.00	6.8%	.05	-.06	2.8%
	Attrition Cognitions (n = 298 – 943)			Short-Term Continuance (n = 298 – 942)			Long-Term Continuance (n = 298 – 941)		
	R^2 = .06			R^2 = .03			R^2 = .04		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	**-.10**	-.03	5.0%	**.13**	.05	14.9%	**.15**	.12	23.0%
Affect Management	**-.13**	-.03	11.3%	-.02	-.08	8.4%	.05	.04	2.9%
Agreeableness	-.02	.08	3.4%	**.12**	.05	15.2%	**.13**	.01	9.0%
Army Affective Commitment	**-.10**	-.04	6.9%	**.07**	.03	6.5%	.06	.00	2.2%
Cognitive Aptitude	**-.10**	-.04	8.8%	-.02	-.01	1.1%	**-.07**	-.09	15.5%
Conscientiousness	-.02	.05	2.0%	**.12**	.05	18.5%	**.14**	.04	16.2%
Internal Locus of Control	**-.18**	**-.14**	34.6%	**.09**	.06	13.2%	.07	.01	3.3%
Openness	**-.09**	.00	3.9%	.07	-.01	3.1%	**.08**	-.02	3.4%
Fitness Orientation	**-.09**	-.05	6.9%	.03	-.01	0.7%	.01	-.06	3.0%
Practical Intelligence	**-.11**	-.13	14.9%	**.11**	.03	10.7%	**.13**	.06	13.4%
Surgency	-.03	.06	2.2%	**.10**	.00	7.7%	**.11**	.01	7.9%

Note. Bolded values indicate significance at $p < .05$. *r* = bivariate correlations; β = Standardized Beta weights with all predictors included in the regression model; RW = Johnson's relative weights. Results are based on OLS regression.

Predictors of Change in Attitudes

In addition to examining the predictors of each individual time point, we also examined the utility of the predictors to predict change in attitudes. Earlier in this chapter, we reported that several variables showed significant change over time. In addition, several of these variables showed significant variance in the change function. That is, there was variation in the way an individual Soldier's attitudes changed over time that can potentially be accounted for by the predictors. Attrition Cognitions, Long-Term Continuance Cognitions, Army Fit, and MOS Fit each had significant variance in the change estimate. However, the model of Long-Term Continuance Cognitions did not fit the data well, so further analyses were not performed. We examined the relationship between the latent predictor factors to determine if a Soldier's propensity to change could be predicted. We also examined Soldiers' attitudes at EOT as predictors of the change function. Table 5.5 presents a full list of the results. All of the predictors were included in the model together. Significance was evaluated based on the significance of the path coefficient (β), and is interpreted as the extent to which a variable predicts change after controlling for the other predictors.

Change in Army Fit

Achievement Orientation (β = .22), Agreeableness (β = .23), Army Affective Commitment (β = -.24), and Surgency (β = -.22) were significant predictors of change in Army Fit. Soldiers with higher levels of Achievement Orientation and Agreeableness showed less negative change in perceptions of Army Fit over time. In contrast, Soldiers with higher levels of Army Affective Commitment and Surgency showed more negative change in perceptions of Army Fit over time. Additionally, Feelings about Joining the Army at EOT (β = .26) and perceptions of MOS Fit at EOT (β = -.20) significantly predicted change in Army Fit. That is, Soldiers with more positive Feelings about Joining the Army at EOT showed less negative change in their perceptions of Army Fit over time. Soldiers with more positive perceptions of MOS Fit at EOT had more negative change in perceptions of Army Fit over time.

The negative findings associated with Army Affective Commitment and MOS Fit are surprising. However, additional analyses show that Soldiers with higher Army Affective Commitment and higher EOT perceptions of MOS Fit tended to start with higher perceptions of Army Fit (β = .48), suggesting that the more rapid decrease may be a result of those individuals starting with higher expectations.

Change in MOS Fit

None of the predictors significantly predicted change in MOS Fit; however, EOT perceptions of Army Fit significantly predicted change in MOS Fit (β = -.43). Soldiers with higher levels of self-reported Army Fit at EOT had greater decreases in perceptions of MOS Fit over time. Additional analyses show that those with higher initial perceptions of Army Fit also had higher initial perceptions of MOS Fit. Those with lower expectations associated with fitting with the Army also had lower initial expectations of fitting in their MOS. With little to no expectations of MOS Fit, these individuals did not decline nearly as rapidly in their perceptions of fit.

Table 5.5. Predictors of Longitudinal Change

Change in Army Fit	β	R^2	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Predictors Model		**.15**	9.62	13	1.00	1.00	.00	.01
Achievement Orientation	**.22**							
Affect Management	-.09							
Agreeableness	**.23**							
Army Affective Commitment	**-.24**							
Cognitive Aptitude	.13							
Conscientiousness	-.11							
Fitness Orientation	-.10							
Internal Locus of Control	-.05							
Openness	.06							
Practical Intelligence	-.03							
Surgency	**-.22**							
EOT Attitudes Model								
Adjustment to Army Life	.07	**.17**	8.54	5	0.99	0.98	.03	.03
Feelings about Joining the Army	**.26**							
MOS Fit	**-.20**							
Change in MOS Fit	β	R^2	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Predictors Model		.29	30.05	13	0.91	0.74	.04	.03
Achievement Orientation	.11							
Affect Management	-.48							
Agreeableness	-.02							
Army Affective Commitment	-.01							
Cognitive Aptitude	.07							
Conscientiousness	-.19							
Fitness Orientation	-.04							
Internal Locus of Control	.25							
Openness	-.02							
Practical Intelligence	.09							
Surgency	-.29							
EOT Attitudes Model		**.20**	26.63	5	0.93	0.82	.08	.05
Adjustment to Army Life	-.04							
Feelings about Joining the Army	.04							
Army Fit	**-.43**							
Change in Attrition Cognitions	β	R^2	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Predictors Model		.15	8.73	13	1.00	1.00	.00	.02
Achievement Orientation	-.18							
Affect Management	.23							
Agreeableness	.04							
Army Affective Commitment	.11							
Cognitive Aptitude	-.06							
Conscientiousness	**.19**							
Fitness Orientation	-.01							
Internal Locus of Control	-.18							
Openness	-.01							
Practical Intelligence	-.09							
Surgency	**.28**							
EOT Attitudes Model		**.22**	3.96	9	1.00	1.00	.00	.02
Army Fit	**.29**							
MOS Fit	**.18**							
Adjustment to Army Life	**-.15**							
Feelings about Joining the Army	.03							

Note. Bolded values indicate significance at $p < .05$. EOT = End of Training. CFI = Comparative Fit Index; TLI = Tucker Lewis Fit Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation. Results are based on Full Information Maximum Likelihood Latent Growth Modeling. $N = 746$ for all models.

Change in Attrition Cognitions

Conscientiousness (β = .19) and Surgency (β = .28) were significant predictors of change in attrition cognitions. Additionally, EOT perceptions of Army Fit (β = .29), MOS Fit (β = .18), and Adjustment to Army Life (β = -.15) also predicted change in Attrition Cognitions. Attrition Cognitions is scaled such that a higher value indicates an increase in thoughts of attriting. Change in Attrition Cognitions was positive, suggesting that over time Soldiers thoughts of leaving increased. As Conscientiousness, Surgency, EOT perceptions of Army Fit, and EOT perceptions of MOS Fit increased, change in attrition cognitions also increased. That is, these Soldiers had more thoughts of attriting over time than their counterparts lower on these measures.

Additional analyses show that individuals with higher Conscientiousness tend to have lower initial thoughts of attrition. Similarly, those with higher initial perceptions of Army Fit and MOS fit, tend to have lower initial Attrition Cognitions. It is likely that these Soldiers' rate of change is larger because they start with higher perceptions but tend to have similar perceptions as their peers later in time.

Conclusions

This chapter focused on attitudes and the influencing factors of predictors on attitudes at three time points during a Soldiers initial 36 months of service. A number of interesting findings emerged. First, attitudes about staying in the Army and perceptions of Army and MOS Fit changed over time. While cognitions about leaving do not necessarily equate to actual separations, these attitudes are critical antecedents of actual separation behaviors in a Soldier's first term (see Chapter 7, also Strickland, 2005). These findings differ from recent findings in an Army Officer population that career intentions, on average, remain stable over time (Allen & Young, 2012). However, this difference could be due to the difference in age and maturity of the samples. The findings show that Soldiers' changes in attitudes generally occur between the end of their MOS-specific technical training and when they join their first unit of assignment. These changes may be a result of differences in Soldiers' perceptions of unit life and the reality encountered once there. Additionally, during IU1 and IU2, Soldiers likely experience their first deployment which may have an impact on perceptions of Army Fit and career intentions. The decrease in attitudes over time may not translate to later time points and it is likely that the longer Soldiers are in the Army, the more stable their attitudes become over time. Research should continue to assess this trend over time and at later stages in Soldiers' first term of service.

The utility of the predictors was stronger at EOT than at IU1 and IU2. Overall, multiple latent predictors were non-trivial predictors of attitudes and continuance cognitions at the EOT, with Army Affective Commitment and Affect Management being the most prominent. However, the reduced utility of the predictors at IU1 and IU2 suggests that other influences contribute to Soldiers' attitudes and continuance cognitions once they are in their first unit of assignment, such as deployments and leadership. The individual difference factors that tend to predict Soldier continuance cognitions and attitudes in their unit of assignment tend to be more focused on capabilities (e.g., Locus of Control, Cognitive Aptitude, Practical Intelligence) than the best predictors at EOT. These results highlight the importance of collecting criteria at multiple points

in time. The relationships between predictors and attitudes at early points in a Soldier's career may not reflect the same relationships at later points. This difference may also be a result of a Soldier's MOS. When Soldiers are in a unit, they are fully entrenched in their MOS. Attitudes may differ by MOS, resulting in differences in predictor-criterion relationships. Chapter 8 attempts to answer this question by examining the differential validity by MOS.

By examining predictors of change in attitudes, we were able to identify whether any of the temperament measures could predict the propensity for a Soldier to change his or her continuance cognitions or attitudes over time. Several interesting findings emerged. First, results showed that those higher in Army Affective Commitment, initial Army Fit, and initial MOS Fit, had larger decreases in Army Fit, MOS Fit, and Attrition Cognitions over time. These results suggest that there may be a disconnect between expectations and reality for some Soldiers before they reach their first unit of assignment. Therefore, the ability for the Army to manage Soldiers' expectations may be important and, on the flip side, a Soldier's propensity to manage expectations may also be an important attribute to staying satisfied and committed to the Army.

In addition to these relationships, a number of attributes predicted change in attitude and continuance cognition in the expected direction. Soldiers with high Achievement Orientation and high Agreeableness had more stable perceptions of how well they fit with the Army. In contrast, Soldiers with high Surgency tended to have larger decreases in perceptions of Army Fit and higher increases in Attrition Cognitions. These Soldiers have similar initial perceptions of Army Fit and Attrition Cognitions as their peers, suggesting that these temperaments directly contribute to how they change over time.

CHAPTER 6: PREDICTING SOLDIER PERFORMANCE IN TRAINING AND IN-UNIT

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Overview

This chapter concerns the modeling and prediction of Soldier performance at the end of training (EOT) and at two in-unit time points (IU1 and IU2). We describe (a) how Soldier performance changes through their first term of service, (b) the utility of the latent predictor variables in predicting the performance at each time point, (c) the relationship between the latent predictor variables and change trajectories of performance, and (d) the mediating influence of Soldier's self-reported attitudes on the relationship between predictors and performance.

Background

Work performance is a dynamic construct that can change over time (e.g., Alvares & Hulin, 1972; Deadrick & Madigan, 1990). As such, examining performance using longitudinal research designs provides a more methodologically rigorous and realistic depiction of the construct (Maxwell & Cole, 2007). In addition, it is important to examine the relationship between performance and other variables longitudinally as these relationships also have the potential to be dynamic over time. Previous research efforts have demonstrated temporal changes in predictive validity coefficients for a variety of objective and subjective predictors of performance (Deadrick & Madigan, 1990). An important objective of this chapter is to examine how performance changes over time and how the validity of predictors of performance changes at different points in time.

An additional consideration is the process behind *how* the relationships between the predictors and performance criteria unfold, especially at later points in time. In this chapter, we attempt to address this question by examining whether the self-report attitudinal variables (described in Chapters 4 and examined in depth in Chapter 5) mediate the relationship between the latent predictors and job performance. Previous Army Class research suggests that the experimental predictors better differentiate attitudinal criteria than performance criteria (e.g., Ingerick et al., 2009). This suggests that the attitudinal variables examined in Chapter 5 may serve as important mediating mechanisms in predictor/performance criterion relationships. Previous research has modeled relationships between the experimental predictors and attitudinal and performance criteria separately, but the relationship between the attitudinal and performance criteria has been less frequently studied.

Approach

Change in Performance over Time

We used the same approach described in Chapter 5 to examine change over time in Soldier performance measures. A number of performance measures were assessed at each time point, including Physical Fitness, Peer Support, and Effort. At EOT, Effort, Peer Support, and

Technical Performance were rated by supervisors and peers. However, the Effort, Peer Support and Technical Performance constructs for IU1 and IU2 were based only on supervisor ratings. Therefore, for the assessment of the Latent Growth Models (LGMs), EOT supervisor ratings of these variables were used to assess change over time. We also examined MOS-Specific Job Knowledge (JKT) – described as Technical Performance and Achievement Maximal Performance in Chapter 4 – longitudinally because it was administered at all three time points.

Prediction of Soldier Performance

To examine the efficacy of the latent predictors in predicting key performance criteria, we examined bivariate correlations (*r*), Johnson's relative weights (*RW*), and the beta-weights associated with the Ordinary Least Squares (OLS) regression between the predictors and criteria. In addition to Technical Performance, Physical Fitness, Peer Support, Effort, and MOS-Specific JKT, we examined a number of other key criteria representing the job performance space described in Chapter 4.

We also examined predictors of the latent growth change function using the same approach described in Chapter 5. In addition to examining static predictors of change, we also explored the relationship between attitudinal change (presented in Chapter 5) and change in performance. Specifically, we regressed performance change on attitudinal change to determine if performance increase/decrease differs based on the trajectory of attitudinal change. For example, individuals with increased perceptions of Army Fit over time may put forth more effort later in their term of service.

Mediation of Predictors and Performance

We examined mediation using the approach described by Baron and Kenny (1986). They described three prerequisites to testing mediation. First, the predictor must be significantly correlated with the outcome variable. Second, the predictor must be significantly correlated with the mediator and, third, the mediator must be significantly correlated with the outcome. To test mediation, a two-step regression analyses were conducted. In the first step, only the predictor was included in the model. If the first prerequisite was met, then the regression coefficient was significant. Next, the mediator was included in the regression model simultaneously with the predictor. For the model to be fully mediated, the regression coefficient for the predictor must become non-significant while the regression coefficient of the mediator must be significant.

Results

Change in Performance over Time

The Latent Growth Models (LGMs) assessing change in Soldier performance over time are shown in Table 6.1. The table includes the full results for each variable, including the goodness-of-fit statistics for each model. Physical Fitness emerged as the only performance measure that significantly changed over time (*Mean change* = .07). Physical Fitness increased over time with the most dramatic increase occurring between EOT and IU1. Figure 6.1 depicts the change over time.

Table 6.1. Latent Growth Modeling Results of Performance Criteria

	N	χ^2	df	CFI	TLI	RMSEA	SRMR	IS	CH	Variance CH
Effort	685	0.73	1	1.00	1.00	.00	.16	0.14	-0.05	Yes
Physical Fitness	743	1.30	1	1.00	0.99	.02	.02	0.01	**0.07**	Yes
Peer Support	670	0.61	1	1.00	1.00	.00	.02	0.07	0.01	No
Technical Performance (JKT)	728	2.52	1	0.99	0.97	.05	.02	0.06	0.00	No

Note. Bolded results indicate significance at $p < .05$. CFI = Comparative Fit Index; TLI = Tucker Lewis Fit Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; IS = Initial Status; CH = Change. CFI and TLI values ≥ .95 and SRMR and RMSEA values ≤ .08 indicate acceptable fit. Initial status represents the mean starting value of the variable of interest across all individuals. Change represents the mean change in the variable of across all time points and all individuals. Results are based on FIML analyses and include individuals with data on at least two time points.

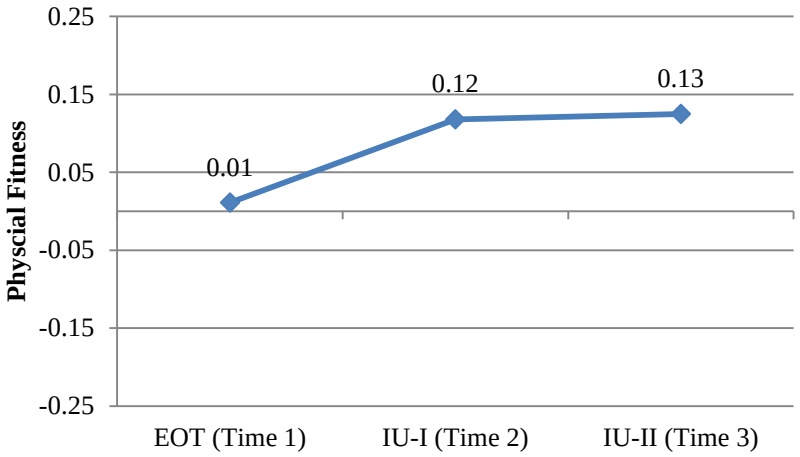

Figure 6.1. Change in Physical Fitness over time.

Predicting Soldier Performance

Below we describe the validity analyses examining the relationship between the predictors and performance criteria at each time point and discuss significant results.

End of Training

Table 6.2 lists the results for the EOT performance criteria. Many predictors were significantly correlated with Physical Fitness. Correlations ranged from .05 to .42, with Fitness Orientation being the most dominate predictor. However, Achievement Orientation, Surgency, Internal Locus of Control and Affect Management were all significantly correlated with Physical Fitness and, taken together, accounted for an additional 11.5% of the predictive variance. Practical Intelligence and Cognitive Aptitude were the only two predictors not significantly correlated with Physical Fitness. Counterproductive Work Behaviors (CWB) was not predicted well by the factors; Internal Locus of Control was the only predictor significantly correlated with CWB.

Table 6.2. Correlations and Relative Importance Indices of Latent Factors in Predicting End of Training Performance Criteria

	Counterproductive Work Behaviors (n = 494 – 2,252)			Physical Fitness (n = 483 – 2,197)			Peer Ratings of Technical Performance (n = 479 – 2,166)			Supervisor Ratings of Technical Performance (n = 284 – 1,546)			Overall MOS JKT Score (n = 462 – 2,088)		
	R^2 = *.01*			R^2 = ***.18***			R^2 = ***.12***			R^2 = *.03*			R^2 = ***.22***		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	-.02	-.02	4.3%	**.16**	.02	4.1%	.03	-.05	1.5%	.01	-.02	2.2%	-.01	-.03	0.7%
Affect Management	-.06	-.03	13.9%	**.10**	.03	2.1%	**.09**	.02	4.8%	.03	.00	1.2%	**.20**	**.10**	9.3%
Agreeableness	.04	.08	23.7%	**.07**	.01	0.5%	.01	.04	0.5%	-.06	-.09	14.3%	**-.08**	-.06	2.4%
Army Affective Commitment	-.04	-.02	7.5%	**.09**	-.07	1.5%	.03	-.04	1.1%	.00	-.03	1.0%	**.09**	.09	3.1%
Cognitive Aptitude	-.04	-.02	6.3%	.03	.03	0.4%	**.15**	**.15**	33.7%	**.10**	.11	34.6%	**.44**	**.42**	78.0%
Conscientiousness	.00	-.02	1.5%	**.07**	.04	0.9%	.01	.03	0.6%	.04	.11	13.0%	-.04	.04	0.6%
Fitness Orientation	-.03	-.01	2.9%	**.42**	**.42**	84.5%	**.17**	**.19**	47.1%	**.08**	.08	19.0%	.02	.00	0.2%
Internal Locus of Control	**-.06**	-.04	16.0%	**.11**	.02	1.7%	**.09**	.06	7.4%	.03	.02	2.1%	**.12**	.03	2.8%
Openness	-.04	-.06	14.5%	**.05**	-.03	0.4%	.00	-.05	1.5%	-.01	.00	1.5%	.03	-.03	0.8%
Practical Intelligence	.01	.02	4.2%	.04	-.05	0.4%	.00	-.04	0.9%	-.03	-.08	7.4%	.03	.01	0.7%
Surgency	.01	.03	5.3%	**.14**	.04	3.6%	.01	-.02	0.9%	.02	.06	3.6%	**-.05**	**-.06**	1.4%

	Peer Ratings of Effort (n = 495 – 2,241)			Supervisor Ratings of Effort (n = 344 – 1,758)			Peer Ratings of Peer Support (n = 495 – 2,233)			Supervisor Ratings of Peer Support (n = 309 – 1,636)			Exam Grade (n = 391 – 1,460)		
	R^2 = ***.06***			R^2 = *.04*			R^2 = ***.05***			R^2 = *.04*			R^2 = ***.12***		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	-.02	-.06	2.9%	.00	-.04	1.3%	.01	-.09	2.9%	.04	-.01	1.3%	.06	-.02	0.5%
Affect Management	**.13**	.08	17.8%	**.11**	.08	16.7%	**.10**	.05	9.8%	.10	.07	16.0%	**.18**	.11	14.2%
Agreeableness	-.02	.04	0.8%	-.04	-.05	4.3%	.03	.07	2.6%	-.01	-.03	2.3%	.04	.02	0.7%
Army Affective Commitment	.02	-.01	0.8%	.02	-.02	0.5%	.01	-.04	1.4%	.03	-.01	0.7%	.02	-.04	0.6%
Cognitive Aptitude	**.18**	**.18**	48.4%	**.16**	**.16**	53.2%	**.14**	**.14**	35.9%	**.14**	**.14**	50.4%	**.33**	**.30**	72.7%
Conscientiousness	.00	.05	0.9%	.04	.10	8.4%	.01	.05	1.1%	.03	.08	5.6%	.01	.02	0.5%
Fitness Orientation	**.10**	**.11**	16.1%	**.06**	.05	5.7%	**.14**	**.16**	36.5%	**.07**	.05	8.6%	.02	-.01	0.2%
Internal Locus of Control	**.08**	.03	5.0%	**.06**	.03	4.7%	**.08**	.03	4.8%	**.08**	.03	7.3%	**.14**	.04	5.6%
Openness	.02	.01	1.0%	-.01	-.04	2.2%	.04	.03	1.8%	.01	-.03	1.4%	**.12**	.02	2.9%
Practical Intelligence	-.01	-.04	1.2%	-.01	-.05	2.1%	.00	-.07	2.0%	.00	-.07	3.4%	**.09**	-.01	1.3%
Surgency	**-.05**	**-.08**	5.3%	.00	.04	0.8%	.01	-.02	1.2%	.04	.05	3.0%	**.06**	.03	0.9%

Note. Bolded values indicate significance at $p < .05$. $\bar{N}$= mean sample size across predictor-criterion relationships; *r* = bivariate correlations; β = Standardized Beta weights with all predictors included in the regression model; RW = Johnson's relative weights. Results are based on OLS regression. The sample size associated with the R^2 and the β are smaller than the overall average sample size. The Average *n* for the Affect Management results was 365, resulting in a lower sample size for the overall regression model. The lower sample size, lead to lower power to detect significant results. More weight should be placed on the bivariate correlations and the Johnson's relative weights when interpreting predictive utility.

Cognitive Aptitude and Affect Management were the strongest predictors of the MOS JKT score. Army Affective Commitment and Internal Locus of Control were also positively correlated with JKT, while Agreeableness and Surgency were negatively correlated. Cognitive Aptitude was also the strongest predictor of Exam Grade. Several additional predictors were significantly correlated with Exam Grade, including Affect Management, Internal Locus of Control, Openness, Practical Intelligence, and Surgency.

Peer Ratings of Technical Performance, Effort, and Peer Support were each significantly correlated with Cognitive Aptitude, Fitness Orientation, Affect Management, and Internal Locus of Control. Fitness Orientation and Cognitive Aptitude were the strongest predictors. Surgency was also negatively related to Peer Ratings of Effort.

Supervisor Ratings of Technical Performance, Effort, and Peer Support were also significantly correlated with Cognitive Aptitude and Fitness Orientation. Locus of Control was significantly related to Supervisor Ratings of Effort and Peer Support. Affect Management was significantly related to Supervisor Ratings of Effort. The strong congruency in predictors-criterion relationships among the Peer and Supervisor Ratings suggest that there may be a general perception of temperament that is driving ratings, leading to the same factors predicting the performance ratings.

In-Unit 1

Table 6.3 lists the full results for the IU1 performance criteria. Overall, there were fewer significant relationships between the predictors and IU1 performance criteria. Similar to EOT, Cognitive Aptitude, Army Affective Commitment, and Internal Locus of Control were significantly related to the JKT. Cognitive Aptitude remained a strong predictor of Technical Performance. After controlling for the other predictors in the regression analyses, Surgency was also a significant predictor of Technical Performance. A number of other variables were significantly related to Technical Performance, including Affect Management, Army Affective Commitment, Internal Locus of Control, and Fitness Orientation.

Fitness Orientation continued to be a strong predictor of IU1 Physical Fitness. Additionally, Achievement Orientation, Agreeableness, Army Affective Commitment, and Internal Locus of Control were significantly related to Physical Fitness. Internal Locus of Control was no longer related to CWB, but Fitness Orientation and Practical Intelligence showed moderate correlations with IU1 CWB.

Finally, a number of variables no longer showed significant correlations with Effort and Peer Support. For IU1 Effort, Cognitive Aptitude was the only predictor with a significant correlation. Openness and Surgency were the only predictors with significant relationships with Peer Support.

Table 6.3. Correlations and Relative Importance Indices of Latent Factors in Predicting In-Unit 1 Performance Criteria

	Counterproductive Work Behaviors (n = 379 – 1,484)			Effort (n = 245 – 892)			Peer Support (n = 244 – 867)		
	R^2 = *.02*			R^2 = *.02*			R^2 = *.03*		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	-.01	.02	2.7%	.04	-.02	1.9%	.06	-.03	2.5%
Affect Management	.01	.04	4.5%	-.01	-.07	6.8%	-.07	-.13	35.4%
Agreeableness	-.03	-.01	4.2%	.00	-.04	2.5%	.05	.00	2.3%
Army Affective Commitment	.01	.00	1.0%	.03	.02	2.3%	.04	.03	4.0%
Cognitive Aptitude	-.05	-.04	11.9%	**.11**	.11	51.9%	.06	.07	14.9%
Conscientiousness	-.03	-.01	4.1%	.01	-.01	1.2%	.03	.00	0.8%
Fitness Orientation	**.06**	.06	23.5%	.06	.05	10.6%	.05	.05	8.4%
Internal Locus of Control	-.04	-.06	13.0%	.04	.03	4.3%	.02	.02	2.4%
Openness	-.03	.00	3.1%	.03	-.02	1.5%	**.08**	.07	15.5%
Practical Intelligence	**-.08**	-.09	28.2%	.06	.07	12.2%	.06	.03	5.9%
Surgency	.00	.04	3.8%	.05	.04	4.8%	**.08**	.03	7.9%
	Technical Performance (n = 343 – 1,354)			Physical Fitness (n = 335 – 1,305)			Overall MOS JKT Score (n = 153 – 626)		
	R^2 = ***.19***			R^2=***.13***			R^2 = ***.15***		
Latent Factors	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	.05	-.09	1.2%	**.09**	-.06	2.2%	.07	.05	1.6%
Affect Management	**.17**	.06	6.3%	.08	.00	1.7%	.08	-.04	1.2%
Agreeableness	-.05	-.09	3.0%	**.07**	.08	2.1%	-.04	-.07	2.2%
Army Affective Commitment	**.18**	.15	11.1%	**.08**	-.04	1.6%	**.13**	.13	8.5%
Cognitive Aptitude	**.36**	**.34**	59.3%	.03	.04	0.8%	**.36**	**.36**	78.5%
Conscientiousness	-.04	.01	0.9%	.04	.02	0.5%	-.02	-.01	0.9%
Fitness Orientation	**.17**	.12	10.2%	**.35**	**.36**	84.1%	.03	-.01	0.2%
Internal Locus of Control	**.14**	.04	3.6%	**.11**	.05	3.3%	**.12**	.05	4.3%
Openness	.03	-.06	0.9%	.05	.01	0.4%	.03	-.07	1.0%
Practical Intelligence	.01	-.03	0.7%	.01	-.08	1.3%	.05	.04	1.1%
Surgency	**.08**	**.12**	2.9%	.09	.00	2.1%	.03	-.01	0.5%

Note. Bolded values indicate significance at $p < .05$. $\bar{N}$= mean sample size across predictor-criterion relationships; *r* = bivariate correlations; β = Standardized Beta weights with all predictors included in the regression model; RW = Johnson's relative weights. Results are based on OLS regression. The sample size associated with the R^2 and the β are smaller than the overall average sample size. The Average *n* for the Affect Management results was 365, resulting in a lower sample size for the overall regression model. The lower sample size, lead to lower power to detect significant results. More weight should be placed on the bivariate correlations and the Johnson's relative weights when interpreting predictive utility.

In-Unit 2

Table 6.4 lists the full results for the IU2 performance criteria. Cognitive Aptitude remained the strongest predictor of the JKT and Technical Performance. Fitness Orientation was also a significant predictor of Technical Performance, suggesting supervisors' general impressions of what they could observe most easily in their subordinates (i.e., intelligence and physical fitness) contributed to their ratings. Army Affective Commitment and Agreeableness were also significant predictors of Technical Performance, while Affect Management, Army Affective Commitment and Openness were significant predictors of the JKT.

Cognitive Aptitude was the only predictor significantly related to Effort. Fitness Orientation continued to be a strong predictor of Physical Fitness. Surgency, Achievement Orientation (r = .11), and Cognitive Aptitude also emerged as a significant predictor of Physical Fitness, albeit in a negative direction for Cognitive Aptitude.

Predictors of Change in Performance

Physical Fitness and Effort showed significant variation in change over time. That is, while average change in Effort was non-significant, the change trajectory for Physical Fitness and Effort differed across Soldiers. Examining the predictors of change in Effort may help to better explain how individuals are changing over time (i.e., who increases, decreases, and stays the same). To accomplish this, we examined the relationship between the latent predictor factors and several attitudes at EOT to determine if the change estimate could be predicted. We also examined the relationship between change in attitude and change in performance. Table 6.5 presents the results when all of the predictors were included in the model. Significance was evaluated based on the significance of the path coefficient (β) and indicated the extent to which a predictor predicts change after controlling for the other predictor variables.

Change in Effort

Agreeableness was a significant predictor of change in effort (β = .34). Because the average change in effort was zero, the results suggest that Soldiers with higher levels of Agreeableness tend to have more positive change in Effort over time. By contrast, Soldiers with lower levels of Agreeableness tend to have more negative change in Effort over time.

Change in Army Fit (β = .42) and change in Attrition Cognitions (β = -.51) were also significant predictors of change in Effort. As change in Army Fit increased, change in Effort also increased. Because average Army Fit is negative, as Army Fit increases the slope becomes less negative or flatter. The results suggest that as perception of Army Fit becomes more stable over time, Effort increased over time. The same is true for Attrition Cognitions. Average Attrition Cognitions is positive—as Attrition Cognitions decrease, the slope becomes less positive or flatter. As Attrition Cognitions become more stable, Effort increases.

Table 6.4. Correlations and Relative Importance Indices of Latent Factors in Predicting In-Unit 2 Performance Criteria

	Effort (n = 222 – 719)			Peer Support (n = 218 – 708)			Technical Performance (n = 295 – 919)			Physical Fitness (n = 291 – 919)			Overall MOS JKT Score (n = 149 – 429)		
	R^2 = .03			R^2 = .03			R^2=**.15**			R^2=**.12**			R^2 = **.15**		
	r	β	RW	*r*	β	RW	*r*	β	RW	*r*	β	RW	*r*	β	RW
Achievement Orientation	-.01	-.03	2.4%	-.03	-.06	6.7%	.01	-.04	1.0%	**.11**	.04	5.0%	.01	-.10	1.7%
Affect Management	-.02	-.02	2.1%	.08	.10	27.3%	.06	-.02	1.0%	.05	.04	1.8%	**.17**	.09	10.0%
Agreeableness	.00	.07	4.2%	.05	.15	25.4%	**-.10**	-.11	6.1%	.01	-.09	2.2%	.02	.06	0.9%
Army Affective Commitment	.00	-.01	0.6%	.02	.02	2.0%	**.10**	.11	6.2%	.04	-.08	1.8%	**.14**	.15	11.6%
Cognitive Aptitude	**.08**	.13	37.5%	.04	.05	7.2%	**.33**	**.34**	67.7%	**-.10**	**-.12**	10.2%	**.32**	**.32**	62.8%
Conscientiousness	.00	.05	2.9%	-.02	-.03	3.0%	-.06	.01	1.1%	.04	-.01	0.5%	-.02	.02	0.6%
Fitness Orientation	.07	.08	18.4%	.02	.03	2.1%	**.15**	**.14**	13.0%	**.29**	**.28**	66.0%	.07	.05	2.0%
Internal Locus of Control	-.03	-.05	5.4%	-.02	-.06	6.6%	.03	-.04	0.7%	.05	.02	1.1%	.03	-.11	2.3%
Openness	-.06	-.08	15.5%	-.04	-.09	12.7%	.01	-.02	0.8%	-.01	-.07	2.1%	**.12**	.11	6.4%
Practical Intelligence	-.04	-.07	8.5%	-.02	-.03	3.8%	-.02	-.03	1.0%	.02	.02	0.7%	.04	-.05	0.8%
Surgency	.01	.03	2.6%	-.01	.00	3.1%	.03	.06	1.4%	**.12**	**.12**	8.6%	.01	-.06	1.0%

Note. Bolded values indicate significance at $p < .05$. $\bar{N}$= mean sample size across predictor-criterion relationships; *r* = bivariate correlations; β = Standardized Beta weights with all predictors included in the regression model; RW = Johnson's relative weights. Results are based on OLS regression. The sample size associated with the R^2 and the β are smaller than the overall average sample size. The Average *n* for the Affect Management results was 365, resulting in a lower sample size for the overall regression model. The lower sample size, lead to lower power to detect significant results. More weight should be placed on the bivariate correlations and the Johnson's relative weights when interpreting predictive utility.

Table 6.5. Predictors of Longitudinal Change

Change in Effort	β	R^2	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Predictors		.14	7.14	13	1.00	1.00	.00	.02
Achievement Orientation	.07							
Affect Management	-.05							
Agreeableness	**.34**							
Army Affective Commitment	-.19							
Cognitive Aptitude	.08							
Conscientiousness	.14							
Fitness Orientation	.11							
Internal Locus of Control	.05							
Practical Intelligence	-.08							
Openness	-.01							
Surgency	-.23							
Mediators		.08	5.38	6	1.00	1.00	.00	.02
EOT Army Fit	-.05							
EOT MOS Fit	-.08							
EOT Adjustment to Army Life	.03							
EOT Feelings about Joining the Army	.18							
Change								
Change in Army Fit	**.42**	.17	15.66	9	0.95	0.91	.03	.06
Change in MOS Fit	.26	.07	23.29	9	0.91	0.85	.05	.05
Change in Attrition Cognitions	**-.51**	.26	9.54	9	0.99	0.99	.01	.04
Change in Physical Fitness	.18	.03	6.85	9	1.00	1.00	.00	.04
Change in Physical Fitness	β	R^2	χ^2	*df*	CFI	TLI	RMSEA	SRMR
Predictors		.11	11.42	13	1.00	1.00	.00	.02
Achievement Orientation	-.01							
Affect Management	-.25							
Agreeableness	-.03							
Army Affective Commitment	-.06							
Cognitive Aptitude	-.06							
Conscientiousness	-.20							
Fitness Orientation	-.03							
Internal Locus of Control	.21							
Openness	-.01							
Practical Intelligence	-.01							
Surgency	.00							
Mediators		.13	6.86	6	0.99	0.99	.01	.02
EOT Army Fit	**.39**							
EOT MOS Fit	-.02							
EOT Adjustment to Army Life	-.05							
EOT Feelings about Joining the Army	.10							
Change								
Change in Army Fit	.22	.05	12.37	9	0.99	0.98	.02	.03
Change in MOS Fit	.28	.08	8.28	9	1.00	1.00	.00	.04
Change in Attrition Cognitions	-.16	.02	15.98	9	0.97	0.95	.03	.04
Change in Effort	-.11	.01	20.02	9	0.96	0.94	.04	.04

Note. Bolded values indicate significance at $p < .05$. EOT = End of Training; IU1 =In-Unit 1; IU2 = In-Unit 2. CFI = Comparative Fit Index; TLI = Tucker Lewis Fit Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; CFI and TLI values ≥ .95 and SRMR and RMSEA values ≤ .08 indicate acceptable fit. Results are based on Full Information Maximum Likelihood Latent Growth Modeling.

Change in Physical Fitness

None of the latent factors significantly predicted change in Physical Fitness over time. Fitness Orientation predicted Physical Fitness at each time point, but did not predict change in Physical Fitness. This suggests that having an orientation for fitness does not lead to an increase in physical fitness over time, but Soldiers with an orientation for fitness tend to maintain high levels of physical fitness. EOT perceptions of Army Fit predicted change in Physical Fitness over time (β =.39), indicating that Soldiers with higher initial perceptions of Army Fit tended to increase their Physical Fitness. This was the only significant predictor of change in Physical Fitness.

Mediators of Soldier Performance

Mediation analyses were conducted to examine the effect of attitudes on the predictor/performance relationship. For the purpose of these analyses, the mediator was specified as the attitude that was measured at the same point in time as the performance criterion. For example, EOT Army Fit was used to examine the mediating influence of Army Fit on the predictors and EOT Physical Fitness. Recall that to assess mediation, three relationships must be true. Chapter 5 describes the relationship between predictors and attitudes, while the previous sections in this chapter describe the relationship between the predictor and performance outcomes. Tables 6.6 and 6.7 describe the relationship between attitudes and performance outcomes. A number of relationships meet the three requirements. Given the potential pervasive effects, only full mediation was examined. That is, results are presented when the predictor and criterion relationship was no longer significant when the mediator was considered.

Table 6.8 lists the mediating relationships that were significant. Several patterns of results emerged.

- *EOT Counterproductive Work Behaviors.* The relationship between Internal Locus of Control and EOT Counterproductive Work Behaviors was fully mediated by Adjustment to Army Life, Feelings about Joining the Army, Army Fit, and Attrition Cognitions.

- *EOT Physical Fitness.* The relationship between Affect Management, Agreeableness, and EOT Physical Fitness was fully mediated by Adjustment to Army Life, Army Fit, MOS Fit, Feelings about Joining the Army, and Attrition Cognitions. The relationships between Army Affective Commitment and EOT Physical Fitness were fully mediated by Adjustment to Army Life, Army Fit, Feelings about Joining the Army, and Attrition Cognitions. Finally, the relationship between Conscientiousness and EOT Physical Fitness was fully mediated by Adjustment to Army Life and Army Fit.

Table 6.6. Correlations between Attitudinal Mediators and Performance Criteria

	EOT Army Fit	EOT Adjustment to Army Life[a]	EOT Feeling about Joining the Army[a]	EOT MOS Fit	IU1 MOS Fit	IU1 Army Fit	IU1 Job Satis.	IU2 MOS Fit	IU2 Army Fit	IU2 Job Satis.
EOT CWB	**-.10**	**.15**	**.12**	**-.06**						
EOT Physical Fitness	**.16**	**-.28**	**-.22**	**.14**						
EOT Peer Effort	**.11**	**-.18**	**-.14**	**.07**						
EOT Sup Effort	**.11**	**-.14**	**-.13**	**.09**						
EOT Peer Peer Support	**.09**	**-.13**	**-.10**	**.08**						
EOT Sup Peer Support	**.07**	**-.12**	**-.11**	**.08**						
EOT Peer Technical	**.13**	**-.18**	**-.15**	**.13**						
EOT Sup Technical	**.07**	**-.13**	**-.13**	**.12**						
EOT JKT	**.09**	**-.15**	**-.08**	**.07**						
IU1 CWB					**-.12**	**-.20**	**-.17**			
IU1 Effort					**.14**	**.21**	**.17**			
IU1 Peer Support					**.11**	**.20**	**.13**			
IU1 Technical					**.10**	.05	-.05			
IU1 Physical Fitness					-.02	.02	-.02			
IU1 JKT					**.12**	**.09**	.01			
IU2 Effort								.07	**.20**	**.15**
IU2 Peer Support								.09	**.15**	**.13**
IU2 Technical								.01	.00	**-.09**
IU2 Physical Fitness								-.03	**.12**	.07
IU2 JKT								.04	-.01	.04

Note. Bolded values indicate significance at $p < .05$. EOT = End of Training; IU1 =In-Unit 1; IU2 = In-Unit 2; CWB = Counterproductive Work Behavior. EOT $\bar{N} = 1{,}931$; IU1 $\bar{N} = 1{,}049$; IU2 $\bar{N} = 698$. [a] Adjustment to Army Life and Feelings about Joining the Army are scaled such that higher scores mean lower adjustment and more negative feelings about joining the Army, respectively.

Table 6.7. Correlations between Continuance Mediators and Performance Criteria

	EOT Attrition	EOT Short-Term	EOT Long-Term	IU1 Attrition	IU1 Short-Term	IU1 Long-Term	IU2 Attrition	IU2 Short-Term	IU2 Long-Term
EOT CWB	**.11**	-.04	-.04						
EOT Physical Fitness	**-.18**	**.10**	**.09**						
EOT Peer Effort	**-.17**	**.05**	.03						
EOT Sup Effort	**-.13**	**.06**	**.05**						
EOT Peer Peer Support	**-.14**	**.05**	.03						
EOT Sup Peer Support	**-.07**	**.05**	.04						
EOT Peer Technical	**-.19**	**.08**	**.07**						
EOT Sup Technical	**-.09**	**.06**	.02						
EOT JKT	**-.13**	**.04**	.02						
IU1 CWB				**.22**	**-.11**	**-.14**			
IU1 Effort				**-.28**	**.17**	**.18**			
IU1 Peer Support				**-.25**	**.12**	**.13**			
IU1 Technical				**-.15**	-.01	-.02			
IU1 Physical Fitness				**-.12**	.01	.00			
IU1 JKT				**-.14**	.10	.06			
IU2 Effort							**-.17**	**.13**	**.13**
IU2 Peer Support							**-.14**	.05	.03
IU2 Technical							**-.11**	-.04	-.06
IU2 Physical Fitness							-.06	**.08**	**.09**
IU2 JKT							**-.14**	.06	.02

Note. Bolded values indicate significance at $p < .05$. EOT = End of Training; IU1 =In-Unit 1; IU2 = In-Unit 2; CWB = Counterproductive Work Behavior; JKT = MOS-Specific Job Knowledge Test. EOT $\bar{N} = 1{,}960$; IU1 $\bar{N} = 1{,}068$; IU2 $\bar{N} = 711$.

- *EOT Supervisor Ratings of Effort.* The relationship between Fitness Orientation and EOT Supervisor Ratings of Effort were fully mediated by Adjustment to Army Life, Army Fit, MOS Fit, Feelings about Joining the Army, and Attrition Cognitions. The relationship between Internal Locus of Control and EOT Supervisor Ratings of Effort was fully mediated by Adjustment to Army Life, Army Fit, Feelings about Joining the Army, and Attrition Cognitions. Finally, the relationship between Affect Management and EOT Supervisor Ratings of Effort was fully mediated by Adjustment to Army Life, Feelings about Joining the Army, and Attrition Cognitions.

- *EOT Supervisor Ratings of Technical Performance.* The relationship between Internal Locus of Control and EOT Supervisor Ratings of Technical Performance was fully mediated by Adjustment to Army Life, Army Fit, Feelings about Joining the Army, and MOS Fit.

- *EOT Peer Ratings of Peer Support.* The relationship between Affect Management and EOT Peer Ratings of Peer Support was fully mediated by Adjustment to Army Life and Attrition Cognitions.

Fewer IU1 and IU2 relationships were fully mediated.

- *Peer Support.* The relationship between Openness and IU1 Peer Support was fully mediated by Attrition Cognitions and Army Fit, while the relationship between Openness and IU2 Peer Support was fully mediated by Attrition Cognitions. The relationship between Surgency and IU1 Peer Support was fully mediated by Army Fit.

- *Effort.* The relationship between Affective Commitment and IU1 Effort was fully mediated by Job Satisfaction. The relationship between Cognitive Aptitude and IU2 Effort was fully mediated by Attrition Cognitions.

- *IU1 Counterproductive Work Behaviors.* Finally, the relationship between Practical Intelligence and IU1 Counterproductive Work Behaviors was fully mediated by Army Fit.

Table 6.8. Standardized Regression Coefficient for Fully Mediated Relationships

Predictor	Criterion	Mediator	β	
			X	*X + M*
Internal Locus of Control	EOT Counterproductive Work Behaviors	Adjustment to Army Life	**.06**	.03
		Feelings about Joining the Army	**.06**	.03
		Army Fit	**.06**	.04
		Attrition Cognitions	**.06**	.04
Affect Management	EOT Physical Fitness	Adjustment to Army Life	**.10**	.04
		Army Fit	**.10**	.08
		Feelings about Joining the Army	**.10**	.05
		Attrition Cognitions	**.10**	.07
		MOS Fit	**.10**	.09
Army Affective Commitment	EOT Physical Fitness	Adjustment to Army Life	**.09**	.02
		Attrition Cognitions	**.09**	.04
		Army Fit	**.09**	.03
		Feelings about Joining the Army	**.09**	.03
Agreeableness	EOT Physical Fitness	Adjustment to Army Life	**.07**	.03
		Army Fit	**.07**	.03
		Feelings about Joining the Army	**.07**	.04
		Attrition Cognitions	**.07**	.04
		MOS Fit	**.07**	.05
Conscientiousness	EOT Physical Fitness	Adjustment to Army Life	**.07**	.04
		Army Fit	**.07**	.04
Affect Management	EOT Peer Ratings of Peer Support	Adjustment to Army Life	**.10**	.08
		Attrition Cognitions	**.10**	.08
Internal Locus of Control	EOT Supervisor Ratings of Technical Performance	Adjustment to Army Life	**.03**	.01
		Army Fit	**.03**	.01
		Feelings about Joining the Army	**.03**	.00
Affect Management	EOT Supervisors Ratings of Effort	Adjustment to Army Life	**.11**	.08
		Feelings about Joining the Army	**.11**	.08
		Attrition Cognitions	**.11**	.09
Fitness Orientation	EOT Supervisors Ratings of Effort	Adjustment to Army Life	**.06**	.04
		Army Fit	**.06**	.04
		Feelings about Joining the Army	**.06**	.04
		MOS Fit	**.06**	.05
		Attrition Cognitions	**.06**	.04
Internal Locus of Control	EOT Supervisors Ratings of Effort	Adjustment to Army Life	**.07**	.04
		Army Fit	**.07**	.04
		Feelings about Joining the Army	**.07**	.04
		Attrition Cognitions	**.07**	.04
Practical Intelligence	IU1 Counterproductive Work Behaviors	Army Fit	**.06**	.05
Openness	IU1 Peer Support	Army Fit	**.08**	.06
		Attrition Cognitions	**.08**	.06
Surgency	IU1 Peer Support	Army Fit	**.08**	.05
Openness	IU2 Peer Support	Attrition Cognitions	**.08**	.07
Affective Commitment	IU1Effort	Job Satisfaction	**.03**	.02
Cognitive Aptitude	IU2 Effort	Attrition Cognitions	**.09**	.07

Note. Bolded values indicate significance at $p < .05$. X represents the standardized regression coefficient of the predictor when the criteria are regressed on the predictor; X+ M represents the standardized regression coefficient of the predictor when the criteria are regressed on the predictor and the mediator.

While a number of relationships were mediated by attitudinal variables, there were distinct patterns in the relationships that were not mediated. Specifically, many of the capability-based performance criteria were not mediated, including EOT, IU1, and IU2 JKT scores, and IU1 and IU2 Physical Fitness and Technical Performance. Additionally, there were far fewer relationships mediated at IU1 and IU2 than at EOT. These results suggest that Commitment to the Army and perceptions of Army Fit more highly influence performance behaviors at the end of training than in-unit. This may be in part because those with low commitment and low Army Fit likely separated from the Army before the IU data collections (a proposition partially supported by the relationships found between separation and EOT attitudes in Chapter 7, Table 7.11). The relationships that were mediated at IU1 and IU2 were Peer Support and Effort, which are more "will-do" performance criteria. A number of capability-based criteria were also mediated at the EOT, specifically Physical Fitness and supervisor ratings of Technical Performance. This suggests that attitudinal variables such as Adjustment, Commitment, and Fit, impact whether one can perform during training. This is especially true of individuals high in Affect Management, Army Affective Commitment, and Agreeableness.

Conclusions

This chapter focused on predicting Soldier performance and examining the mediating influence of attitudes. Attitudes have traditionally been used as proxies for separation and career intentions and this chapter highlights the complex relationships between predictors, performance, and career intentions. Our results suggest that predicting Soldier commitment can also help to predict later Soldier performance.

For most performance criteria, average change in performance stayed relatively stable over time. Physical Fitness was the one exception, increasing substantially between EOT and IU1. These findings are not particularly surprising. After completing Initial Military Training, Soldiers continue training and become more physically fit once they are in units. This is particularly true of Soldiers in Combat Arms MOS such as 11B, who make up a large proportion of our sample (and the overall Army population). There was variability in how much Soldiers increased their physical fitness but there were no significant predictors of this change in our analysis. Interestingly, Fitness Orientation predicted level of physical fitness at each time point, but change was not predicted by Fitness Orientation. Change in Physical Fitness may be a product of training and maturity versus any specific individual differences in propensity to change.

Effort, CWB, and Peer Support were not particularly well predicted by our individual difference scales. At the EOT, peer ratings and supervisor ratings of Effort and Peer Support performance showed strong relationships with a number of variables, but the same predictors predicted ratings of both Effort and Peer Support, despite these being distinct constructs. These results could indicate that peers and supervisor tend to use general impressions when making ratings, leading to similar ratings across performance categories. These variables were not latent constructs of the traits, so it is unclear how well ratings measure the constructs of interest. This is especially apparent examining peer ratings of Technical Performance. The strongest predictor of peer ratings of Technical Performance was Fitness Orientation which is in opposition to the strong relationship between Cognitive Aptitude and all other measures of Technical Performance. Peers may rely on the most observable characteristic, Fitness Orientation, and are perhaps less

qualified to judge Technical Performance. This discrepancy highlights the importance of using latent criterion factors.

IU1 and IU2 Effort and Peer Support were not well predicted by our individual difference scales, and many of those relationships were mediated by attitudinal variables. For IU1, there were strong relationships between CWB, Effort, Peer Support and MOS Fit, Army Fit/Commitment, Job Satisfaction, and Continuance Cognitions. The mediation results further shed light on the impact that attitudes can have on predictor-performance relationships and suggest that attitudes play a strong role in whether a Soldier is a strong performer. Results show that early in a Soldier's term of service, attitudes play a role in both whether he or she *can* and *will* perform well, while later in a Soldier's term of service, attitudes mainly play a role in whether he or she *will* perform well. These results demonstrate the importance of selecting Soldiers with higher propensities toward commitment and Army Fit, and that the relationships between predictors and attitudes can be as important as the direct relationship between predictors and performance. We encourage research to continue to examining the role of mediators on predictors and performance criteria.

Technical Performance, Physical Fitness, and JKT were well predicted at each time point. While there were slight changes in the correlations between these performance criteria and the predictors, overall the relationships remained fairly stable over time. As expected, Fitness Orientation was the strongest predictor of Physical Fitness across the time points, and Cognitive Aptitude was the strongest predictor of both Technical Performance and JKT across the time points. Indeed, these results continue to buttress the validity of the ASVAB for predicting technical job performance.

CHAPTER 7: PREDICTING SOLDIER ATTRITION AND RE-ENLISTMENT

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Overview

This chapter focuses on the description and prediction of Soldier attrition and re-enlistment. It begins with a summary of previous efforts to model and predict Soldier attrition followed by a description of the specific approach used in the present effort. Next, we discuss several types of results, including (a) descriptive statistics and models of Soldier attrition, (b) prediction of attrition over time, (c) mediators of attrition, (d) prediction of re-enlistment, and (e) mediators of re-enlistment. The chapter concludes with a general summary of findings.

Background

Soldier retention has been a priority of the Army for many years (e.g., Laurence, Naughton, & Harris, 1996; McCloy, & DiFazio, 1994; Strickland, 2005). This is due to the high cost associated with failure of enlisted Soldiers to complete their obligated term of service (i.e., attrition). For example, based on a federal report (GAO, 1998), Strickland (2005) estimated that the costs of attrition for a yearly cohort of accessions exceed 700 million dollars. Other estimates have been even higher (e.g., $60,000 per recruit; McCloskey, 1999). Further, such estimates typically fail to include costs associated with lost time, energy, administrative, and legal costs (Strickland, 2005). In our sample, about 17% of Regular Army Soldiers attrited from the Army before 12 months in service. Although some attrition is unavoidable or even functional (e.g., when low performers leave) (Campion, 1991; Dalton, Todor, & Krackhardt, 1982), reduction of avoidable, dysfunctional attrition could translate into considerable savings to the Army. Toward this goal, research has been conducted to better understand and predict Soldier attrition and re-enlistment.

Strickland (2005) reported the results of Project First Term, a six-year, longitudinal investigation of Soldier attrition and re-enlistment among first-term enlisted Soldiers. Strickland distinguished attrition from re-enlistment by permitting no overlap between Soldiers who attrited and those who did not re-enlist in the analysis of each criterion. Specifically, attrits left before the end of their term of service for pejorative reasons (e.g., misconduct) whereas Soldiers who did not re-enlist decided to allow their term of service to expire. We make the same distinction between attrition and re-enlistment here. Strickland examined predictors of attrition and focused on the first 48 months of service overall, several components of training, and the first operational unit of assignment. Early attrition was found to be due primarily to performance and medical/physical factors, which accounted for approximately 80% of all attrition in the first 6 months of service. After 6 months, performance and medical/physical attrition rapidly decreased. Beyond 6 months, moral character attrition became more prevalent (approximately 60% of all attrition occurring between 2 and 3 years of service and nearly 50% of attrition thereafter). Attrition later on in the unit stemmed primarily from deviance-related issues. These findings indicate that the most effective predictors of attrition vary over time.

Strickland (2005) also examined the predictors of re-enlistment after the first term. For all time points, three factors were consistently found to predict re-enlistment: (a) career commitment change, (b) continuance commitment, and (c) continuance intention. Additionally, these factors mediated the effects of other attitudinal and organizational factors such as job satisfaction and affective commitment on re-enlistment. As a part of Army Class research efforts conducted prior to this report, Knapp and Heffner (2009) found that many non-cognitive predictors (e.g., interests, values, temperament) significantly incremented the Armed Forces Qualification Test (AFQT) in predicting Soldier retention during training. Additionally, Knapp, Owens, and Allen (2012) found that many of the same predictors incremented the ability to predict in-unit retention-related attitudes and behavior over Education Tier, one of the strongest predictors of early Soldier separation (Knapik et al., 2004).

In sum, recent research has revealed the importance of non-cognitive predictors and attitudes in explaining Soldier attrition and re-enlistment. The present research makes use of the full Army Class data set to examine the descriptive features of attrition over 48 months, and to determine the best predictors of attrition and re-enlistment over time. The following sections describe the approach taken to analyze these data, the results from these analyses, and a general summary including recommendations for practice and future research.

Approach

Data

As described in Chapter 2, non-cognitive predictor data were collected from new Soldiers as they entered the Army, and attitudinal variables and criterion data were collected at three subsequent time points: (a) End of Training (EOT), (b) In-Unit 1 (IU1), and (c) In-Unit 2 (IU2). Attrition data were obtained from Soldiers' administrative records in three month intervals from 3 to 48 months (16 time points).[5] These data were binary such that a "1" indicated that the Soldier had separated from the Army during that 3-month period (e.g., between 0 and 3 months) and a "0" indicated that the Soldier had not separated during that 3-month period. As will be described in more detail later, some analyses required the attrition variable to remain a "1" in every month following the period in which attrition was observed (e.g., 0 0 1 1 1), while other analyses required the data to be treated as missing in every month following the period in which attrition was observed (e.g., 0 0 1 . .). Separation was not considered attrition if it was beyond the Soldier's control (e.g., injury). Re-enlistment was a single dichotomous variable, with "1" signifying that the Soldier re-enlisted at least once and "0" signifying that the Soldier did not re-enlist. Soldiers who attrited were excluded from all re-enlistment analyses. Similarly, Soldiers who reached the end of their first term of service but did not re-enlist were excluded from attrition analyses. Thus, there was no overlap between Soldiers who attrited and those who did not re-enlist in the analysis of each variable.

[5] As described in Chapter 2, we also computed attrition at 4 months. However, this time point was not used in the present analyses, and therefore is not discussed further.

Analysis

Modeling Soldier Attrition and Re-Enlistment

We computed descriptive statistics (e.g., frequency counts) for the attrition and re-enlistment variables. We also plotted attrition over time for the overall sample and for three subgroups of Soldiers with different reasons for attriting: (a) character and performance attrition includes conduct (e.g., AWOL, desertion, serious offense), dropped from rolls (e.g., prisoner with bad conduct), performance, and Uniformed Code of Military Justice (UCMJ; e.g., court martial); (b) medical standards attrition includes medical (e.g., failed physical, drug rehab failure), physical (e.g., not meeting standards), and weight reasons; and (c) other attrition includes administrative (e.g., fraudulent entry), disability (e.g., pre-existing condition aggravation), family (e.g., parenthood, hardship), sexual orientation, mental (e.g., personality disorder), and "other".

We then used discrete time-survival mixture analysis (DTSMA) to examine the latent structure of Soldier attrition over the 48-month time period. We selected DTSMA over other methods for three reasons: (a) the focus of the analysis in on the individual and on individual differences; (b) the timing of attrition is taken into account, making full use of the information provided by time; and (c) the possibility of some Soldiers having a higher or lower baseline risk of attriting than others is addressed (Voelkle & Sander, 2008). DTSMA is a relatively new statistical procedure, described by Muthén and Masyn (2005), which to date has only been used in a handful of published studies in the social sciences (e.g., Alarcon & Edwards, 2013; Huang, Murphy, & Hser, 2011; Islam & Meade, 2011). DTSMA is an extension of event history analysis (EHA).[6] Muthén and Masyn (2005) demonstrated how EHA, also called discrete-time survival analysis, can be extended into a general latent variable modeling framework. DTSMA is superior to other methods of analyzing attrition, such as logistic regression, because the timing of attrition is modeled, allowing for detection of potential changes in the risk of attrition over time. In addition, it seems reasonable to expect that different groups of Soldiers may have different baseline hazard rates of attriting due to unmeasured individual differences. It would not be practical for the Army to measure every possible covariate of attrition. Thus, any unmeasured individual differences related to attrition risk would produce unobserved heterogeneity in Soldier attrition. Most analytic procedures, including logistic regression and EHA, are based on the assumption of a homogeneous sample. However, if this assumption is false, failure to account for this heterogeneity could severely bias parameter estimates and lead to false conclusions (Voelkle & Sander, 2008). DTSMA can account for unobserved heterogeneity by specifying multiple latent classes of individuals with different survival functions.

In the present context, this means that DTSMA allows for simultaneous modeling of different attrition hazards across meaningfully different subpopulations of Soldiers, without having to specify these subpopulations a priori. Data such as separation reason, even if reported with great care, may not be accurate 100% of the time. By using a latent variable approach and allowing subpopulations to emerge empirically from the data, misclassification of subpopulations can be minimized and error can be incorporated into models. Due to these advantages, we used DTSMA to uncover latent classes of Soldiers in the attrition data. Unlike static analyses (e.g., correlation

[6] For more detailed descriptions and examples of EHA, see, for example, Allison, 1984; Knapp et al., 2011, 2012; Morita, Lee, & Mowday, 1989; and Singer & Willett, 1993. EHA is also discussed in some detail in Chapter 8.

and logistic regression), DTSMA requires that all data following the period in which attrition is observed be treated as missing. We estimated all DTSMA models using Mplus (Muthén & Muthén, 1998-2012). Once a DTSMA model is specified, the probability of belonging to a specific group can then be regressed on potential predictors.

Once we established the final DTSMA model, we exported class membership status and probability of class membership from Mplus into the original database containing all predictor data. In addition to predictive analyses described below, we also examined the relationship between latent class (LC) membership and separation reason. Note that we excluded Education Tier from the predictive models. This was purposeful, given our construct-oriented focus in this report. Nevertheless, given that Education Tier has a strong relationship with Soldier attrition we examined this relationship separately from the predictive models.

Predicting Soldier Attrition and Re-Enlistment

Similar to previous Army research, we correlated cognitive and non-cognitive predictors and attitudes with Soldier attrition and re-enlistment (Knapp & Heffner, 2009; Knapp et al., 2012). We examined these static bivariate relationships between predictors and Soldier attrition and re-enlistment with point-biserial correlations.

A major difference from previous research is that we examined the antecedents of attrition LC membership—specifically class membership probabilities—as an alternative to examining direct antecedents of attrition. This was done for two reasons: (a) the purpose of the DTSMA was to impose a simpler, empirically driven structure on a large, complex longitudinal database (i.e., all 3-48 month attrition); and (b) the DTSMA results revealed that attrition was best described with three classes or types (i.e., stayers, early leavers, and late leavers). Thus, the dependent variable (DV) for all multivariate models examining the antecedents of attrition were LC membership probabilities for all three classes (stayers, early leavers, late leavers). We created multivariate regression models in which all three class membership probabilities were simultaneously regressed on a block of predictors. Multivariate regression allows multiple DVs to be regressed simultaneously on predictors, and tests the equivalence of the effect of the explanatory variable(s) on the DVs (Judge, LePine, & Rich, 2006). This provided a clear advantage over traditional ordinary least squares (OLS) regression because the three DVs were not separate constructs but instead different manifestations of the same construct (attrition).

The re-enlistment analyses were more in line with analyses conducted in previous research, consisting of an examination of point-biserial correlations between predictors and re-enlistment and logistic regressions of re-enlistment on predictor blocks.

Results

Modeling and Predicting Soldier Attrition

This section presents attrition descriptive statistics, plots over time, the results of DTSMA modeling of attrition, and the results of analyses examining predictors and mediators of attrition.

Modeling Soldier Attrition

Table 7.1 presents attrition rates from 0 to 48 months of service. Figure 7.1 plots the probability of attrition at each interval (i.e., total in service / attrition). Taken together, Table 7.1 and Figure 7.1 show that attrition rates, and thus attrition probability, spike early in service and then sharply decrease between six and nine months in service. After Soldiers have served nine months, attrition gradually decreases from about three to about two percent. A potential explanation for the rapid drop off after six months may reflect procedural issues. Specifically, it is much easier to separate from the Army during training than after a Soldier is in unit for two reasons: (a) the procedure to discharge (or "chapter out") someone can take up to a year once they are in unit, and (b) many Soldiers deploy right away and it is very difficult to attrit when in theatre.

Next, we examined the latent structure of attrition with DTSMA. By testing models with different numbers of latent classes and examining model fit and other parameters, researchers can empirically determine the appropriate number of latent classes to describe the data. The DTSMA models considered were univariate, consisting of attrition and retention data from over 5,000 Soldiers (coded as 1 and 0, respectively). If the attrition base rates were so low as to only occur by chance, then one LC would best fit the data. If a stayer class and a leaver class are present then two latent classes would best fit the data. However, if unobserved subpopulations of Soldiers attrit at different times throughout the 48 month period, there could be any number of latent classes. We found that two- and three-class models fit the data considerably better than a one-class model (i.e., two- and three-class models had considerably lower scores on model evaluation indices – such as the Akaike Information Criterion [AIC], Bayesian Information Criterion [BIC], and chi-square – than a one-class model).

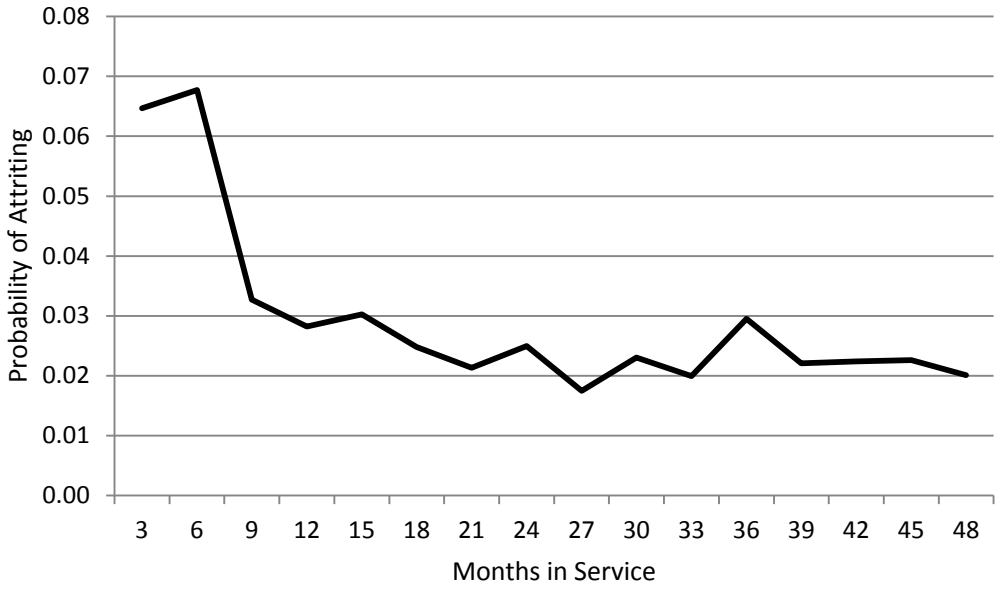

Figure 7.1. Probability of attriting at each month in service.

Table 7.1. Rates of Attrition at 3-Month Time Intervals

Month Intervals	Total in Service	Attrition	Percent Attrition	Cumulative Percent Attrition	Percent of All Attrition	Cumulative Percent of all Attrition
0-3	4,823	312	6.5	6.5	16.8	16.8
3-6	4,517	306	6.8	13.2	16.5	33.2
6-9	4,374	143	3.3	16.5	7.7	40.9
9-12	4,254	120	2.8	19.3	6.5	47.4
12-15	4,128	125	3.0	22.4	6.7	54.1
15-18	4,028	100	2.5	24.8	5.4	59.5
18-21	3,937	84	2.1	27.0	4.5	64.0
21-24	3,841	96	2.5	29.5	5.2	69.2
24-27	3,771	66	1.8	31.2	3.6	72.7
27-30	3,649	84	2.3	33.5	4.5	77.2
30-33	3,558	71	2.0	35.5	3.8	81.1
33-36	3,455	102	3.0	38.5	5.5	86.6
36-39	3,353	74	2.2	40.7	4.0	90.5
39-42	3,039	68	2.2	42.9	3.7	94.2
42-45	2,651	60	2.3	45.2	3.2	97.4
45-48	2,390	48	2.0	47.2	2.6	100.0

Note. Intervals are inclusive at the top of the interval, but not the bottom. The "Total in Service" column includes those present during the time interval in the "Months Intervals" column. "Percent attrition" is the percent attrition that occurred in a given interval. "Cumulative Percent Attrition" is the cumulative sum of attrition percentages through that interval. "Percent of all Attrition" is the percentage of overall attrition that occurs in a given interval. Finally, "Cumulative Percent of All Attrition" represents the cumulative percent of all attritions through that interval.

Table 7.2 presents fit statistics for the final model, which had three latent classes. The two- and three-class models had similar fit statistics, with those of the three-class model being slightly lower (indicating slightly better fit) than the two-class model. A four-class model placed close to zero individuals in the fourth LC, indicating no real gain over the three-class model. We based the choice between the two-class and the three-class model upon an examination of other parameters besides overall model fit. For example, Table 7.3 shows proportions of Soldiers predicted to belong to each LC in the three-class model. The third LC contains over 450 of the Soldiers in the dataset (9%), a non-trivial number. Additionally, Entropy for the model with three latent classes was .97, which indicates very high classification accuracy. Entropy is an overall index of classification accuracy across all latent classes, ranging from 0 to 1. Another, more specific index of classification accuracy is expressed as one percentage for each LC. These three percentages were also high (i.e., 98% for class 1, 99% for class 2, and 94% for class 3). Based upon these findings and because the three latent classes were interpretable and theoretically sound (see below), we determined the three-class model to be the best.

Table 7.2. Discrete Time-Survival Mixture Analysis (DTSMA) Tests of Model Fit

	Value
Log Likelihood	
H_0 Value	-8,162.57
H_0 Scaling Correction Factor for MLR	0.80
Number of Free Parameters	20
Akaike Information Criterion (AIC)	16,365.15
Bayesian Information Criterion (BIC)	16,496.09
Sample-Size Adjusted BIC	16,432.54
Pearson Chi-Square	4,335.00
Degrees of Freedom	65,520
p	1.00
Likelihood Ratio Chi-Square	3,308.13
Degrees of Freedom	65,520
p	1.00

Note. n = 5,152. Modeling attrition from 3-48 months. Three latent classes. MLR = Maximum Likelihood estimation with Robust Standard Errors, a less biased estimate of log-likelihood when non-normality and non-independence are an issue.

Table 7.3. DTSMA Final Class Counts and Proportions for the Latent Classes

	Estimated Model		Classification based on Most Likely Class	
Latent Classes	Counts	Proportions	Counts	Proportions
1	1339.42	26%	1360	26%
2	3336.36	65%	3333	65%
3	476.22	9%	459	9%

Note. n = 5,152. Counts of the Estimated Model differ from Classification based on Most Likely Class because the former is the abstract statistical model and the latter uses the model to place actual Soldiers into classes based on their probability of class membership.

Table 7.4. DTSMA Results in Probability Scale for Latent Classes

		Latent Class								
		1: Early Leavers			2: Stayers			3: Late Leavers		
Attrition Interval	Cat	Estimate	Standard Error	*p*	Estimate	Standard Error	*p*	Estimate	Standard Error	*p*
0-3	1	0.77	0.01	0.00	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.23	0.01	0.00	0.00	0.00	1.00	0.00	0.00	1.00
3-6	1	0.70	0.02	0.00	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.30	0.02	0.00	0.00	0.00	1.00	0.00	0.00	1.00
6-9	1	0.80	0.02	0.00	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.20	0.02	0.00	0.00	0.00	1.00	0.00	0.00	1.00
9-12	1	0.79	0.02	0.00	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.21	0.02	0.00	0.00	0.00	1.00	0.00	0.00	1.00
12-15	1	0.72	0.03	0.00	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.28	0.03	0.00	0.00	0.00	1.00	0.00	0.00	1.00
15-18	1	0.70	0.04	0.00	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.31	0.04	0.00	0.00	0.00	1.00	0.00	0.00	1.00
18-21	1	0.63	0.06	0.00	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.37	0.06	0.00	0.00	0.00	1.00	0.00	0.00	1.00
21-24	1	0.33	0.15	0.03	1.00	0.00	1.00	1.00	0.00	1.00
	2	0.67	0.15	0.00	0.00	0.00	1.00	0.00	0.00	1.00
24-27	1	0.00	0.00	1.00	1.00	0.00	1.00	0.96	0.07	0.00
	2	1.00	0.00	1.00	0.00	0.00	1.00	0.04	0.07	0.55
27-30	1	0.00	0.00	1.00	1.00	0.00	1.00	0.81	0.02	0.00
	2	1.00	0.00	1.00	0.00	0.00	1.00	0.19	0.02	0.00
30-33	1	0.00	0.00	1.00	1.00	0.00	1.00	0.81	0.03	0.00
	2	1.00	0.00	1.00	0.00	0.00	1.00	0.20	0.03	0.00
33-36	1	0.00	0.00	1.00	1.00	0.00	1.00	0.65	0.05	0.00
	2	1.00	0.00	1.00	0.00	0.00	1.00	0.35	0.05	0.00
36-39	1	0.00	0.00	1.00	1.00	0.00	1.00	0.61	0.08	0.00
	2	1.00	0.00	1.00	0.00	0.00	1.00	0.39	0.08	0.00
39-42	1	0.00	0.00	1.00	1.00	0.00	1.00	0.36	0.19	0.06
	2	1.00	0.00	1.00	0.00	0.00	1.00	0.64	0.19	0.00
42-45	1	0.00	0.00	1.00	0.99	0.01	0.00	0.00	0.00	1.00
	2	1.00	0.00	1.00	0.01	0.01	0.35	1.00	0.00	1.00
45-48	1	0.00	0.00	1.00	0.98	0.00	0.00	0.00	0.00	1.00
	2	1.00	0.00	1.00	0.02	0.00	0.00	1.00	0.00	1.00

Note. n = 5,152. Cat = Category (1 = retention, 2 = attrition). Estimates are probabilities of staying (1) versus attriting (2). All p-values are two-tailed.

Table 7.4 reports attrition probabilities from the three-class DTSMA model for each time interval. A lower probability in category 1 (staying) and a higher probability in category 2 (attriting) indicates a higher attrition hazard for members of that LC during that time period. These attrition probabilities are also plotted in Figure 7.2. Taken together, Table 7.4 and Figure 7.2 show that members of LC 1 are at risk of attriting very early, and this risk steadily increases and then dramatically increases after about 21 months. By their 27th month in service, all Soldiers in LC 1 have attrited. Thus, we labeled this class "early leavers." Members of LC 2 experience zero risk of attrition until about 45 months, at which time the probability of attrition is still very low (.01 to .02). Thus, we labeled this group of Soldiers "stayers." Finally, members of LC 3 experience essentially zero risk of attrition until about 27 months, at which time the probability of attrition gradually increases, and then more sharply increases after 39 months. By 45 months all of these Soldiers have attrited. We labeled this group of Soldiers "late leavers."

Remember that no Soldiers belonged to a fourth LC. Therefore, these three groups adequately described attrition in this sample. Therefore, subsequent analyses examining the prediction of attrition focused on the probability of each Soldier belonging to one of the three latent classes as the DV.

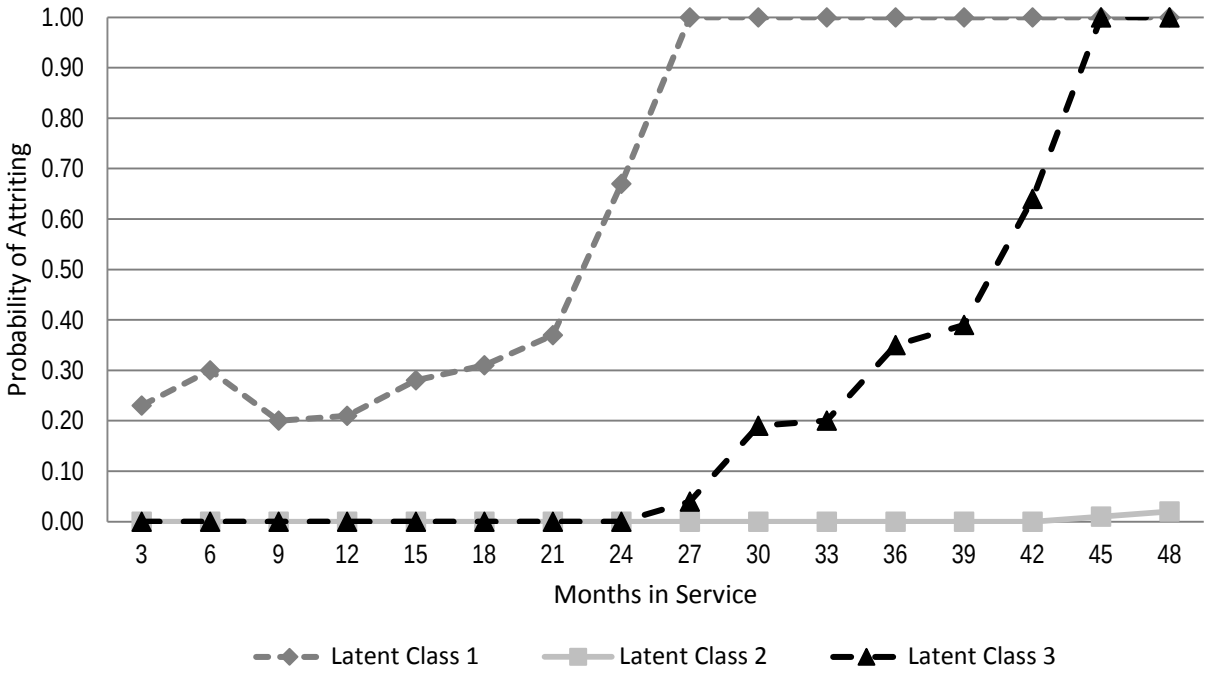

Figure 7.2. Plot of attrition probability over time by latent class membership.

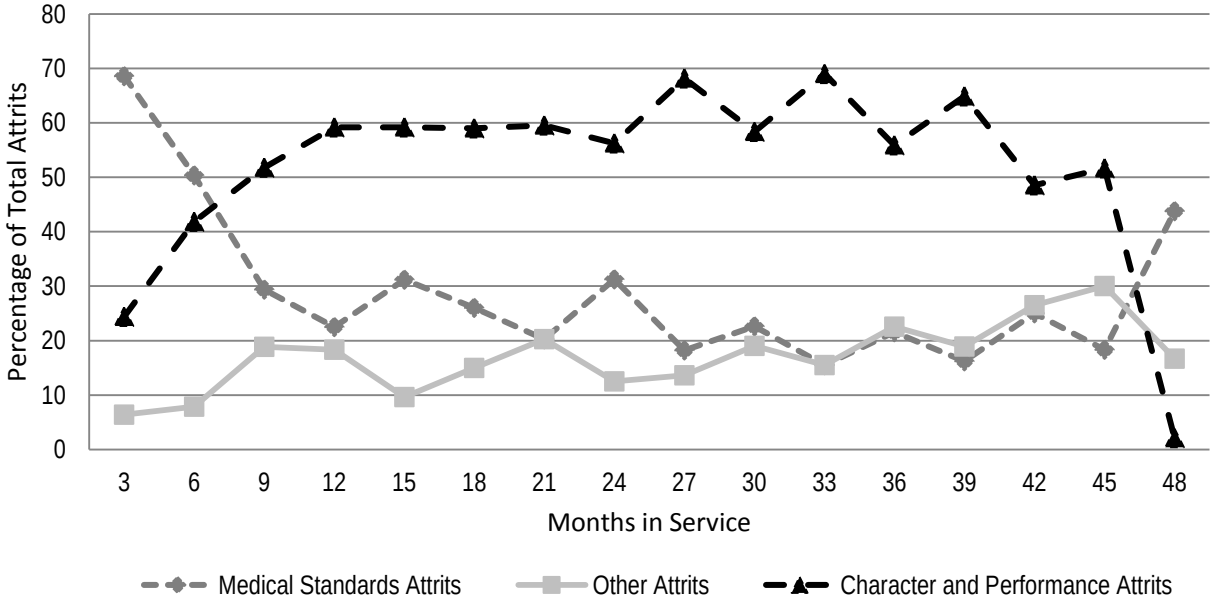

Figure 7.3. Type of attrition at multiple time intervals.

Figure 7.3 presents the ratios of attrition attributable to three groups of separation reasons (character and performance attrits, attrits due to medical standards, and other attrits) during each time interval. These percentages typically sum to 100, with month 48 being a notable exception. Separation reason data for that month were incomplete, which may account for the observed sharp shifts in trends during this final time period. However, an examination of the months prior to the final data point reveals some correspondence with the DTSMA results. For example, attrition rates are higher earlier for LC 1 due to medical standards. Note that at 27 months all members of LC 1 have attrited and that attrition due to medical standards is low from 27 to 45 months relative to character and performance reasons. Character and performance attrits are at their highest relative to medical and other reasons from months 27 to 39, which corresponds to some extent with the high probability of attrition late in the series for Soldiers belonging to LC 3.

Follow-up analyses directly examining the correspondence between LC membership and separation reason are presented in Table 7.5. Specifically, we crosstabulated separation reasons with the two latent classes representing attrition. Results demonstrate that Soldiers leaving for character, performance, and "other" reasons (e.g., administrative, disability, family) were more likely to be late leavers, while Soldiers attriting for medical reasons were much more likely to be early leavers. Dichotomizing each of the separation reason variables as 0 for non-membership and 1 for membership, and dichotomizing early leavers and late leavers as 0 and 1, respectively, allowed for another test of the magnitude and significance of these relationships. Tetrachoric correlations between separation reason and attrition class are presented in Table 7.5. These correlations were moderate and significant (e.g., -.35 to .17), showing that separation reason is indeed related to LC membership, although one certainly does not fully explain the other.

Table 7.5. Separation Reason by Latent Class Crosstabulation

Separation Reason	r_{tc}	Early Leavers		Late Leavers		% Difference
		n	%	*n*	%	
Character and Performance	**.17**	636	46.9	267	58.2	**11.3**
Medical Standards	**-.35**	564	41.6	92	20.0	**-21.6**
Other	**.25**	157	11.6	100	21.8	**10.2**
Total		1,357	100.0	459	100.0	

Note. r_{tc} is the Tetrachoric correlation between dummy-coded variables for each separation reason and early versus late leaver status (Early = 0, Late = 1). Statistics in bold are statistically significant, $p < .05$. Differences in percentages were tested with the chi-square statistic.

Table 7.6 presents a crosstab of Education Tier by the three latent classes representing attrition and retention. High school graduates were significantly more likely to be stayers and non-high school graduates were significantly more likely to be either early or late leavers. However, there was no significant difference in high school graduation rate between early (60.3%) and late (65.1%) leavers.

Table 7.6. Education Tier by Latent Class Crosstabulation

	Early Leavers		Stayers		Late Leavers	
	n	%	*n*	%	*n*	%
HS Grad	820	60.3	2,560	**76.8**	299	65.1
Non-HS Grad	540	39.7	773	**23.2**	160	34.9
Total	1,360	100.0	3,333	100.0	459	100.0

Note. Percentages in bold are significantly different from percentages in both adjacent columns, $p < .05$. Differences in percentages were tested with the Chi-square statistic.

Predicting Soldier Attrition

The purpose of this section is to identify predictors that are the primary antecedents of attrition. Previous research has typically presented point-biserial correlations between predictor measures and attrition as bivariate evidence of validity for each predictor. However, a challenge in interpreting such results is that one would have to examine the validity of a single predictor at 16 points in time (i.e., 3-48 months). However, the DTSMA model fit to these data revealed a simpler structure of three latent classes (i.e., stayers, early leavers, and late leavers). Therefore, point-biserial correlations for interested readers are provided in the Appendix (Tables B.1 – B.4). The discussion here will focus on the results of a series of multivariate regressions, discussed previously, in which three DVs (LC membership probabilities for each of the three latent classes) were simultaneously regressed on a block of predictors. We then repeated this analysis for several different predictor sets.[7]

Table 7.7 presents descriptive statistics and model-level information for a multivariate regression of the three attrition LC probabilities on a single block of cognitive and non-cognitive predictors. As a whole, the predictors explained 3% of the variance in probability of belonging to the early leaver class and an additional 3% of the variance in probability of belonging to the stayer class. While the predictors taken together predicted the early leaver and stayer classes, they did not significantly predict the late leaver class.

Results presented in Table 7.8 indicate that Cognitive Aptitude (measured by AFQT) and Fitness Orientation both differentially predict retention and attrition class membership probability, and that Cognitive Aptitude explains 2% of the variance in the DVs, and Fitness Orientation explains 1% of the variance in the DVs, even after removing variance explained by all other latent predictor factors.[8] The *RW*s of these predictors are 33% and 26%, respectively. This means that although no other predictor reached significance, the block of predictors excluding Cognitive Aptitude and Fitness Orientation explained the remaining 41% of the shared variance between predictors and the attrition classes (100–33–26=41).

Table 7.7. Multivariate Regression Between-Subjects Effects for Latent Predictor Factors

DV	*n*	*Mean*	*SD*	*F*	*p*	Partial η^2	*R*	Adjusted R^2
LC1: Early Leavers	1,421	0.29	0.45	4.53	0.00	0.03	0.18	0.03
LC2: Stayers	1,421	0.61	0.48	4.52	0.00	0.03	0.18	0.03
LC3: Late Leavers	1,421	0.10	0.28	1.41	0.16	0.01	0.10	0.00

Note. DV = Latent Class Membership Probability. Model = Intercept + Block of Predictors.

[7] Parallel multinomial logistic regression analyses predicting class membership rather than probability of class membership were also run but are not reported. Results of these analyses were very similar to the multivariate regression analyses reported here.

[8] Table 7.8 presents two types of information: (a) Wilks' Lambda, the *F*-statistic and *p*-values provide evidence regarding the equivalence of prediction across the three DVs, i.e., significant *p*-values provide evidence against equivalence; (b) Partial η^2 and Relative Weight (*RW*; LeBreton & Tonidandel, 2008) provide information regarding the relative magnitude of variance explained by each predictor in all three DVs.

Table 7.8. Variance Accounted for in Latent Class Membership Probabilities by Latent Predictor Factors

Predictor	Wilks' Lambda	*F*	*p*	Partial η^2	Relative Weight
Achievement Orientation	1.00	0.63	0.59	0.00	0.04
Affect Management	1.00	0.76	0.52	0.00	0.07
Agreeableness	1.00	0.37	0.77	0.00	0.01
Army Affective Commitment	1.00	1.95	0.12	0.00	0.12
Cognitive Aptitude	0.98	8.82	0.00	0.02	0.33
Conscientiousness	1.00	1.02	0.38	0.00	0.04
Fitness Orientation	0.99	5.99	0.00	0.01	0.26
Internal Locus of Control	1.00	1.38	0.25	0.00	0.03
Openness	1.00	0.63	0.60	0.00	0.03
Practical Intelligence	1.00	1.12	0.34	0.00	0.04
Surgency	1.00	1.29	0.28	0.00	0.03

Note. n = 1,421. Wilks' Lambda, the *F*-statistic and *p*-values provide evidence regarding the equivalence of prediction across the three DVs (i.e., significant *p*-values provide evidence against equivalence); Partial η^2 and Relative Weight provide information regarding the relative magnitude of variance explained by each predictor in all three DVs.

Table 7.9 illustrates the differential prediction findings of Cognitive Aptitude and Fitness Orientation. While Cognitive Aptitude best predicted stayers, it significantly predicted all three latent classes. Specifically, lower Cognitive Aptitude coincided with higher probability of attrition. This finding is consistent with Strickland (2005) and the results reported in Chapter 8. Fitness Orientation significantly predicted early leavers and stayers but not late leavers. Lower Physical Fitness Orientation also contributed to higher probability of attrition.

Table 7.9. Multivariate Regression Parameter Estimates for Latent Predictor Factors

DV	LC1: Early Leavers				LC2: Stayers				LC3: Late Leavers			
Parameter	*β*	*t*	*p*	Partial η^2	*β*	*t*	*p*	Partial η^2	*β*	*t*	*p*	Partial η^2
Achievement Orientation	-0.02	-0.79	0.43	0.00	0.00	0.18	0.85	0.00	0.02	0.95	0.34	0.00
Affect Management	-0.02	-1.03	0.30	0.00	0.01	0.36	0.72	0.00	0.01	1.03	0.30	0.00
Agreeableness	-0.01	-0.57	0.57	0.00	0.02	0.81	0.42	0.00	-0.01	-0.47	0.64	0.00
Army Affective Commitment	-0.05	-2.35	0.02	0.00	0.04	1.80	0.07	0.00	0.01	0.69	0.49	0.00
Cognitive Aptitude	0.00	-3.44	0.00	0.01	0.00	5.01	0.00	0.02	0.00	-3.00	0.00	0.01
Conscientiousness	-0.01	-0.63	0.53	0.00	0.02	1.26	0.21	0.00	-0.01	-1.14	0.25	0.00
Fitness Orientation	-0.05	-4.01	0.00	0.01	0.05	3.85	0.00	0.01	0.00	-0.13	0.90	0.00
Internal Locus of Control	0.02	0.80	0.42	0.00	-0.03	-1.24	0.22	0.00	0.01	0.82	0.41	0.00
Openness	0.03	1.26	0.21	0.00	-0.02	-0.76	0.45	0.00	-0.01	-0.73	0.47	0.00
Practical Intelligence	0.00	-0.12	0.91	0.00	-0.02	-0.90	0.37	0.00	0.03	1.72	0.09	0.00
Surgency	0.04	1.79	0.07	0.00	-0.03	-1.17	0.24	0.00	-0.01	-0.87	0.39	0.00

Note. n = 1,421.

Mediators of Soldier Attrition

Chapters 5 and 6 demonstrated significant and meaningful relationships between cognitive and non-cognitive predictors and attitudinal and performance-based criteria. This chapter has examined direct relationships between distal predictors and attrition. The next set of analyses examines relationships between potential mediators of distal individual difference-attrition relationships. Specifically, multivariate regressions examine the validity of self-reported mediators collected at three time points (EOT, IU1, IU2) in predicting the three DVs comprising LC membership probability.

EOT. Table 7.10 presents model-level information for a multivariate regression of the three attrition LC probabilities on a block of EOT variables. As a whole, these variables explained 2%, 3%, and 2% of the variance in probability of belonging to the early leaver, the stayer, and the late leaver class, respectively. Table 7.11 presents information regarding the equivalence of prediction across the three DVs and the relative magnitude of variance explained by each predictor in all three DVs. Results indicate that Attrition Cognitions, Long-Term Continuance Cognitions, and Counterproductive Work Behavior (CWB) all differentially predict attrition class membership probability. Attrition Cognitions explain 1% of the variance in the DVs, Long-Term Continuance Cognitions explain 1% of the variance in the DVs, and CWB explains 2% of the variance in the DVs. The *RW*s of these predictors are 17%, 10% and 26%, respectively. Table 7.12 illustrates the differential prediction findings. Attrition Cognitions only significantly predicted early leavers. Long-Term Continuance Cognitions only significantly predicted stayers. Finally, CWB predicted stayers and late, but not early, leavers.

Table 7.10. Multivariate Regression Between-Subjects Effects for End of Training Self-Report Variables

DV	*n*	*Mean*	*SD*	*F*	*p*	Partial η^2	*R*	Adjusted R^2
LC1: Early Leavers	1,052	0.14	0.34	3.24	0.00	0.03	0.16	0.02
LC2: Stayers	1,052	0.76	0.42	3.99	0.00	0.03	0.18	0.03
LC3: Late Leavers	1,052	0.10	0.27	2.96	0.00	0.02	0.16	0.02

Note. DV = Latent Class Membership Probability. Model = Intercept + Block of Predictors.

Table 7.11. Variance Accounted for in Latent Class Membership Probabilities by End of Training Self-Report Variables

Predictor	Wilks' Lambda	*F*	*p*	Partial η^2	Relative Weight
Adjustment to Army Life	1.00	1.36	0.25	0.00	0.11
Army Fit	1.00	1.01	0.39	0.00	0.09
Attrition Cognitions	0.99	3.02	0.03	0.01	0.17
CWB	0.98	5.90	0.00	0.02	0.26
Feelings about Joining Army	1.00	0.81	0.49	0.00	0.09
Fitness	1.00	1.59	0.19	0.00	0.09
Long-Term Continuance	0.99	2.96	0.03	0.01	0.10
MOS Fit	1.00	1.08	0.36	0.00	0.05
Short-Term Continuance	1.00	0.59	0.62	0.00	0.05

Note. n = 1,052. Wilks' Lambda, the *F*-statistic and *p*-values provide evidence regarding the equivalence of prediction across the three DVs (i.e., significant *p*-values provide evidence against equivalence); (2) Partial η^2 and Relative Weight provide information regarding the relative magnitude of variance explained by each predictor in all three DVs.

Table 7.12. Multivariate Regression Parameter Estimates for End of Training Self-Report Variables

DV	LC1: Early Leavers				LC2: Stayers				LC3: Late Leavers			
Parameter	*β*	*t*	*p*	Partial η^2	*β*	*t*	*p*	Partial η^2	*β*	*t*	*p*	Partial η^2
Adjustment to Army Life	0.02	1.19	0.24	0.00	-0.03	-1.94	0.05	0.00	0.02	1.44	0.15	0.00
Army Fit-Commitment	0.04	1.31	0.19	0.00	-0.01	-0.23	0.82	0.00	-0.03	-1.28	0.20	0.00
Attrition Cognitions	0.06	2.95	0.00	0.01	-0.05	-1.85	0.07	0.00	-0.02	-0.89	0.37	0.00
CWB	0.04	1.11	0.27	0.00	-0.14	-3.45	0.00	0.01	0.10	3.83	0.00	0.01
Feelings about Joining Army	0.02	1.12	0.27	0.00	-0.01	-0.59	0.55	0.00	-0.01	-0.49	0.62	0.00
Fitness	-0.02	-1.60	0.11	0.00	0.00	0.25	0.81	0.00	0.02	1.62	0.11	0.00
Long-Term Continuance	0.03	1.42	0.16	0.00	-0.06	-2.58	0.01	0.01	0.03	2.12	0.03	0.00
MOS Fit	0.00	-0.30	0.77	0.00	-0.01	-0.34	0.73	0.00	0.01	0.88	0.38	0.00
Short-Term Continuance	0.00	0.03	0.97	0.00	0.02	0.84	0.40	0.00	-0.02	-1.32	0.19	0.00

Note. n = 1,052.

IU1. Table 7.13 presents model-level information for a multivariate regression of the three attrition LC probabilities on a block of IU1 variables. As a whole, these variables explained 6%, 13%, and 8% of the variance in probability of belonging to the early leaver, the stayer, and the late leaver class, respectively. Table 7.14 presents information regarding the equivalence of prediction across the three DVs and the relative magnitude of variance explained by each predictor in all three DVs. Results indicate that Attrition Cognitions, Long-Term Continuance Cognitions, and CWB all differentially predict attrition class membership probability. Attrition Cognitions explain 5% of the variance in the DVs, while Long-Term Continuance Cognitions explains 1%, and CWB explains 3%. The *RW*s of these predictors are 41%, 11% and 26%, respectively. Table 7.15 illustrates the differential prediction findings. Attrition Cognitions best predicted stayers and early leavers, but also significantly predicted late leavers. Long-Term Continuance Cognitions only significantly predicted early leavers. Finally, CWB best predicted stayers and late leavers, but also significantly predicted early leavers. No individual variable accounted for more than 4% of the variance in predicting group membership probability.

Table 7.13. Multivariate Regression Between-Subjects Effects for In-Unit 1 Self-Report Variables

DV	*n*	*Mean*	*SD*	*F*	*p*	Partial η^2	*R*	Adjusted R^2
LC1: Early Leavers	855	0.05	0.20	8.30	0.00	0.07	0.27	0.06
LC2: Stayers	855	0.84	0.35	17.20	0.00	0.14	0.37	0.13
LC3: Late Leavers	855	0.11	0.29	9.63	0.00	0.08	0.29	0.08

Note. DV = Latent Class Membership Probability. Model = Intercept + Block of Predictors.

Table 7.14. Variance Accounted for in Latent Class Membership Probabilities by In-Unit 1 Self-Report Variables

Predictor	Wilks' Lambda	*F*	*p*	Partial η^2	Relative Weight
Army Fit	0.99	2.38	0.09	0.01	0.07
Attrition Cognitions	0.95	21.81	0.00	0.05	0.41
CWB	0.97	14.69	0.00	0.03	0.26
Fitness	0.99	2.81	0.06	0.01	0.05
Job Satisfaction	1.00	0.30	0.74	0.00	0.02
Long-Term Continuance	0.99	3.98	0.02	0.01	0.11
MOS Fit	1.00	0.67	0.51	0.00	0.04
Short-Term Continuance	1.00	1.73	0.18	0.00	0.06

Note. n = 855. Wilks' Lambda, the *F*-statistic and *p*-values provide evidence regarding the equivalence of prediction across the three DVs (i.e., significant *p*-values provide evidence against equivalence); Partial η^2 and Relative Weight provide information regarding the relative magnitude of variance explained by each predictor in all three DVs.

Table 7.15. Multivariate Regression Parameter Estimates for In-Unit 1 Self-Report Variables

DV	LC1: Early Leavers				LC2: Stayers				LC3: Late Leavers			
Parameter	*β*	*t*	*p*	Partial η^2	*β*	*t*	*p*	Partial η^2	*β*	*t*	*p*	Partial η^2
Army Fit	0.03	2.16	0.03	0.01	-0.02	-0.83	0.41	0.00	-0.01	-0.51	0.61	0.00
Attrition Cognitions	0.05	5.46	0.00	0.03	-0.10	-6.00	0.00	0.04	0.05	3.24	0.00	0.01
CWB	0.04	2.74	0.01	0.01	-0.14	-5.42	0.00	0.03	0.10	4.43	0.00	0.02
Fitness	0.00	0.20	0.84	0.00	0.00	1.92	0.05	0.00	0.00	-2.37	0.02	0.01
Job Satisfaction	0.00	0.05	0.96	0.00	-0.01	-0.69	0.49	0.00	0.01	0.77	0.44	0.00
Long-Term Continuance	-0.03	-2.74	0.01	0.01	0.04	2.00	0.05	0.00	-0.01	-0.46	0.65	0.00
MOS Fit	0.00	0.24	0.81	0.00	0.01	0.85	0.40	0.00	-0.01	-1.15	0.25	0.00
Short-Term Continuance	0.02	1.81	0.07	0.00	-0.01	-0.55	0.59	0.00	-0.01	-0.60	0.55	0.00

Note. $n = 855$.

IU2. Table 7.16 presents model-level information for a multivariate regression of two of the three attrition LC probabilities on a block of IU2 variables. We excluded early leavers because their timeframe of attrition did not overlap with the IU2 data collection. Additionally, CWB data were not collected at IU2. As a whole, these variables explained 8% of the variance in probability of belonging to the stayer class and an additional 8% of the variance in probability of belonging to the late leaver class. Table 7.17 presents information regarding the equivalence of prediction across the two DVs and the relative magnitude of variance explained by each predictor in both DVs. Results indicate that Attrition Cognitions and Long-Term Continuance Cognitions both differentially predict attrition class membership probability. Attrition Cognitions explain 6% of the variance in the DVs and Long-Term Continuance Cognitions explain 1% of the variance in the DVs. The *RW*s of these predictors are 65% and 15%, respectively. Table 7.18 illustrates the differential prediction findings. Because there are only two latent classes (stayers and leavers) the only real difference in prediction is a change in sign (direction). Thus, Attrition Cognitions and Long-Term Continuance Cognitions both predicted stayers and late leavers.

Table 7.16. Multivariate Regression Between-Subjects Effects for In-Unit 2 Self-Report Variables

DV	*n*	*Mean*	*SD*	*F*	*p*	Partial η^2	*R*	Adjusted R^2
LC2: Stayers	705	0.94	0.22	10.04	0.00	0.09	0.30	0.08
LC3: Late Leavers	705	0.06	0.22	9.73	0.00	0.09	0.30	0.08

Note. DV = Latent Class Membership Probability. Model = Intercept + Block of Predictors.

Table 7.17. Variance Accounted for in Latent Class Membership Probabilities by In-Unit 2 Self-Report Variables

Predictor	Wilks' Lambda	*F*	*p*	Partial η^2	Relative Weight
Army Fit	0.99	1.19	0.31	0.01	0.06
Attrition Cognitions	0.94	14.46	0.00	0.06	0.65
Fitness	0.99	1.17	0.32	0.01	0.04
Job Satisfaction	1.00	0.31	0.82	0.00	0.02
Long-Term Continuance	0.99	3.13	0.03	0.01	0.15
MOS Fit	1.00	0.21	0.88	0.00	0.02
Short-Term Continuance	0.99	1.39	0.24	0.01	0.06

Note. *n* = 705. Wilks' Lambda, the *F*-statistic and *p*-values provide evidence regarding the equivalence of prediction across the three DVs (i.e., significant *p*-values provide evidence against equivalence); Partial η^2 and Relative Weight provide information regarding the relative magnitude of variance explained by each predictor in all three DVs.

Table 7.18. Multivariate Regression Parameter Estimates for In-Unit 2 Self-Report Variables

DV	LC2: Stayers				LC3: Late Leavers			
Parameter	*β*	*t*	*p*	Partial η^2	*β*	*t*	*p*	Partial η^2
Army Fit	-0.03	-1.79	0.07	0.00	0.03	1.84	0.07	0.00
Attrition Cognitions	-0.07	-6.60	0.00	0.06	0.07	6.40	0.00	0.06
Fitness	0.00	1.44	0.15	0.00	0.00	-1.48	0.14	0.00
Job Satisfaction	-0.01	-0.49	0.62	0.00	0.00	0.38	0.70	0.00
Long-Term Continuance	0.04	2.74	0.01	0.01	-0.04	-2.92	0.00	0.01
MOS Fit	0.01	0.72	0.47	0.00	-0.01	-0.79	0.43	0.00
Short-Term Continuance	-0.02	-1.67	0.10	0.00	0.02	1.91	0.06	0.01

Note. *n* = 705.

Modeling and Predicting Soldier Re-Enlistment

This section presents a description of the re-enlistment criterion variable and the results of analyses examining predictors and mediators of re-enlistment. We computed re-enlistment by first filtering out all Soldiers who attrited during the 48 month time period, so as not to contaminate the re-enlistment variable with variance due to attrition, which is substantively different from re-enlistment. Re-enlistment represents a Soldier's choice to stay with or separate from the Army after the completion of their obligated term of service, whereas attrition represents a break from the Army before the completion of an obligated term of service for pejorative reasons. A total of 1,707 cases were filtered out due to attrition. Another 1,400 cases were filtered out due to other reasons (e.g., Soldier had not reached end of first term of service due to a non-attrition reason beyond their control, such as an injury sustained in combat). Of the remaining cases eligible for analysis, 694 Soldiers did not re-enlist and 1,680 Soldiers re-enlisted at least once. These were coded as 0 and 1, respectively.

Predicting Soldier Re-Enlistment

Unlike attrition, we operationalized re-enlistment as a static variable occurring at one point in time. Thus, we used more traditional analyses (i.e., correlation, logistic regression) to examine the predictors of re-enlistment. Table 7.19 presents bivariate validity estimates for the prediction of re-enlistment by cognitive and non-cognitive traits. Several non-cognitive variables were significantly and positively related to re-enlistment (Conscientiousness, Internal Locus of Control, Agreeableness, Achievement Orientation, and Affective Commitment). Cognitive Aptitude was negatively related to re-enlistment. This finding is consistent with prior research (Strickland, 2005).

Table 7.19. Point-Biserial Correlations between Latent Predictor Factors and Re-Enlistment

Predictor	*n*	r_{pb}
Achievement Orientation	1,625	**.05**
Affect Management	642	.04
Agreeableness	1,584	**.06**
Army Affective Commitment	1,736	**.04**
Cognitive Aptitude	2,250	**-.13**
Conscientiousness	2,072	**.07**
Fitness Orientation	1,736	.01
Internal Locus of Control	1,736	**.07**
Openness	1,625	.02
Practical Intelligence	1,998	.00
Surgency	1,624	.03

We also examined the multivariate predictive validity of the full block of predictors.[9] The full model explained significant variance in re-enlistment (χ^2 = 53.56, *df* = 10, *n* = 1,568, *p* = 0.00, -2 Log likelihood = 1874.82, Nagelkerke R^2 = .05, McFadden R^2 = .03). However, only three of the

[9]Affect Management was not entered into the logistic regression including the other predictors. Including Affect Management would have reduced sample size substantially (i.e., the sample could be reduced from 1,584 to 642 or less depending upon patterns of missing data). Further, unlike the results for attrition, in which Affect Management was a significant bivariate predictor of all 48 months of attrition (r_{pb} = -.06 to -.10 in Table A.7.1), Affect Management was not a significant predictor of re-enlistment.

predictors were statistically significant: Cognitive Aptitude, Conscientiousness, and Internal Locus of Control (Table 7.20). Of the variance accounted for in re-enlistment by all of the predictors, Cognitive Aptitude explained 63% of this variance (note that it was negatively related to re-enlistment), Conscientiousness explained 16%, and Locus of Control explained 12%.

Table 7.20. Logistic Regression Parameter Estimates for Latent Predictor Factors

DV = Re-Enlistment	β	Wald	p	Exp(β)	Relative Weight
Achievement Orientation	0.02	0.03	0.87	1.02	0.02
Agreeableness	-0.04	0.09	0.76	0.96	0.02
Army Affective Commitment	0.02	0.03	0.87	1.02	0.02
Cognitive Aptitude	-0.02	32.48	0.00	0.98	0.63
Conscientiousness	0.17	5.60	0.02	1.18	0.16
Fitness Orientation	-0.03	0.22	0.64	0.97	0.00
Internal Locus of Control	0.31	6.89	0.01	1.36	0.12
Surgency	-0.03	0.08	0.77	0.97	0.01
Openness	0.06	0.32	0.57	1.06	0.01
Practical Intelligence	-0.04	0.13	0.71	0.96	0.01

Note. n = 1,568.

Mediators of Soldier Re-Enlistment

In this section, we use point-biserial correlations and logistic regressions to examine the validity of self-reported mediators collected at three time points in predicting re-enlistment.

Table 7.21 presents bivariate validity estimates of the prediction of re-enlistment by self-reported variables collected at EOT, IU1, and IU2. Many of these estimates were moderate to strong and all significant relationships were in the expected direction. Note that Adjustment to Army Life and Feelings about Joining Army are scored such that they actually reflect poor adjustment and negative feelings. The strongest predictors of re-enlistment were Short-Term and Long-Term Continuance Cognitions. These findings are consistent with previous research (Strickland, 2005). Next, we report the results of three logistic regressions in which all available self-report variables from each of the three data collections were entered as predictor blocks with re-enlistment as the DV.

Table 7.21. Point-Biserial Correlations Between Self-Report Variables and Re-Enlistment

	Re-Enlistment					
	EOT		IU1		IU2	
Predictor	n	r_{pb}	n	r_{pb}	n	r_{pb}
Army Fit-Commitment	589	**.09**	597	**.23**	453	**.25**
Attrition Cognitions	688	**-.07**	616	**-.14**	470	-.03
Fitness	689	**.08**	567	**.10**	460	**.14**
Long-Term Continuance	687	**.20**	611	**.35**	468	**.33**
MOS Fit	687	.04	605	.04	467	**.08**
Short-Term Continuance	688	**.15**	613	**.38**	470	**.40**
CWB	704	.02	616	.00	--	--
Adjustment to Army Life	703	**-.10**	--	--	--	--
Feelings about Joining Army	697	**-.08**	--	--	--	--
Job Satisfaction	--	--	607	**.09**	463	**.16**

Note. Statistics in bold are statistically significant, $p < .05$.

EOT. The EOT logistic regression model explained significant variance in re-enlistment (χ^2 = 31.89, *df* = 9, *n* = 564, *p* = 0.00, -2 Log likelihood = 684.70, Nagelkerke R^2 = .08, McFadden R^2 = .05). However, only one of the predictors, Long-Term Continuance Cognitions, was statistically significant (see Table 7.22), which explained 47% of the relative variance accounted for in re-enlistment by all of the predictors.

Table 7.22. Logistic Regression Parameter Estimates for End of Training Self-Report Variables

DV = Re-Enlistment	*β*	Wald	*p*	Exp(*β*)	Relative Weight
Adjustment to Army Life	-0.17	1.81	0.18	0.84	0.08
Army Fit-Commitment	-0.15	0.36	0.55	0.86	0.04
Attrition Cognitions	0.20	1.14	0.29	1.23	0.03
CWB	0.36	1.15	0.28	1.44	0.05
Feelings about Joining Army	0.07	0.30	0.59	1.08	0.02
Fitness	0.23	3.10	0.08	1.25	0.10
Long-Term Continuance	0.51	10.44	0.00	1.66	0.47
MOS Fit	-0.06	0.22	0.64	0.94	0.01
Short-Term Continuance	-0.01	0.00	0.97	0.99	0.21

Note. *n* = 564.

IU1. The IU1 logistic regression model also explained significant variance in re-enlistment (χ^2 = 93.90, *df* = 8, *n* = 529, *p* = 0.00, -2 Log likelihood = 579.07, Nagelkerke R^2 = .23, McFadden R^2 = .14). However, only two of the predictors were statistically significant: Short-Term Continuance Cognitions and Fitness (see Table 7.23). Of the variance accounted for in re-enlistment by all of the predictors, Short-Term Continuance Cognitions explained 44% of this variance and Fitness explained 5%. Note that with the exception of Short-Term Continuance Cognitions, beta weights and relative weights do not match *p*-values to a great extent, although the Wald statistic is in sync with the significance tests. Taken as a whole, the results presented in Table 7.23 show strong support for Short-Term Continuance Cognitions, tentative support for Long-Term Continuance Cognitions (although *p* = .06, *RW* = 36%), and tentative support for Fitness as a predictor of re-enlistment in this sample. Thus, cross-validation of these results in a new sample of similar Soldiers (e.g., early in-unit) is recommended.

Table 7.23. Logistic Regression Parameter Estimates for In-Unit 1 Self-Report Variables

DV = Re-Enlistment	*β*	Wald	*p*	Exp(*β*)	Relative Weight
Army Fit	0.06	0.10	0.76	1.06	0.10
Attrition Cognitions	0.17	1.05	0.31	1.19	0.02
CWB	0.05	0.05	0.82	1.06	0.00
Fitness	0.01	5.16	0.02	1.01	0.05
Job Satisfaction	0.02	0.01	0.91	1.02	0.02
Long-Term Continuance	0.34	3.53	0.06	1.40	0.36
MOS Fit	-0.09	0.55	0.46	0.91	0.01
Short-Term Continuance	0.52	11.47	0.00	1.69	0.44

Note. *n* = 529.

IU2. Finally, the IU2 logistic regression model explained significant variance in re-enlistment (χ^2 = 97.24, *df* = 7, *n* = 432, *p* = 0.00, -2 Log likelihood = 422.52, Nagelkerke R^2 = .29, McFadden R^2 = .19). In this sample, four of seven predictors were statistically significant: Short-Term

Continuance Cognitions, Attrition Cognitions, Army Fit, and Fitness (see Table 7.24). Of the variance accounted for in re-enlistment by all of the predictors, Short-Term Continuance Cognitions explained 43% of this variance, Attrition Cognitions explained 3%, Army Fit explained 15%, and Fitness explained 8%. Once again, *RW* values did not correspond to a high degree with *p*-values for some variables (e.g., Long-Term Continuance Cognitions). Thus, cross-validation using new data from a similar sample is recommended.

Table 7.24. Logistic Regression Parameter Estimates for In-Unit 2 Self-Report Variables

DV = Re-Enlistment	β	Wald	p	Exp(β)	Relative Weight
Army Fit	0.51	4.61	0.03	1.66	0.15
Attrition Cognitions	0.55	9.47	0.00	1.73	0.03
Fitness	0.01	4.64	0.03	1.01	0.08
Job Satisfaction	-0.10	0.32	0.57	0.90	0.03
Long-Term Continuance	0.03	0.01	0.90	1.03	0.25
MOS Fit	0.26	2.88	0.09	1.29	0.03
Short-Term Continuance	0.78	16.60	0.00	2.18	0.43

Note. n = 432.

Conclusions

This chapter examined the structure, antecedents, and mediators of Soldier attrition and re-enlistment. We used discrete time-survival mixture analysis (DTSMA) to model attrition through 48 months of service. DTSMA results uncovered three classes describing the latent structure of attrition: an early leaver class, a late leaver class, and a stayer class. Soldiers in the early leaver class are at risk early, and this risk dramatically increases after 21 months; by 27 months all have attrited. Soldiers in the late leaver class experience essentially zero risk of attrition until about 27 months; attrition risk sharply increases after 39 months, and by 45 months all of these Soldiers have left. Soldiers in the stayer class remain at essentially zero risk of attrition during their first 48 months of service. Probability of latent class membership served as the dependent variable in all subsequent analyses.

Analyses examining the correspondence between attrition class membership and separation reason revealed that Soldiers attriting for medical reasons were much more likely to be early leavers. Similarly, Strickland (2005) found early attrition to be due primarily to medical/physical and performance factors. Attrition occurring later in the unit stemmed primarily from moral character/deviance-related issues. Results here show that Soldiers attriting for character, performance, and other reasons were more likely to be late leavers. Further, self-reported counterproductive work behavior collected at the end of training and in-unit consistently predicted Soldier probability of belonging to the late leaver class. Positive relationships between Education Tier and attrition are well documented in Army research (Knapp et al., 2012; Strickland, 2005). Our results support this conclusion. Non-high school graduates were significantly more likely to attrit than high school graduates. Together, these results are consistent with several of the findings reported in previous research.

Strickland (2005) reported that the most effective predictors of attrition vary over time. Accordingly, the results of this research show that Cognitive Aptitude predicted long-term stayers better than early and late leavers, although it did also significantly predict these latter two

classes. The research reported by Strickland and the present research indicate that Soldiers with higher Cognitive Aptitude are less likely to attrit before the end of their term of service. Physical Fitness Orientation also significantly predicted early attrition and stayers but not later attrition, such that higher Fitness Orientation was related to lower probability of early attrition.

Re-enlistment was also best predicted by Cognitive Aptitude, such that higher scores were related to lower probability of re-enlistment. Strickland (2005) reported that Soldiers who were classified as "High quality recruits" (including high AFQT scores) tended not to re-enlist after their first-term of service. It is possible that many of these Soldiers enlisted for Army College Fund benefits expecting that they would leave to pursue college after one term of service. Conscientiousness and Locus of Control also explained unique variance in re-enlistment, such that higher standings on these variables coincided with higher probability of re-enlistment.

Potential mediators of distal predictor/attrition relationships include Attrition Cognitions, Long-Term Continuance Cognitions, and CWB. Early (EOT) Attrition Cognitions only significantly predicted early leavers, later (IU1) Attrition Cognitions best predicted stayers and early leavers, but also significantly predicted late leavers, and IU2 Attrition Cognitions predicted stayers and late leavers. EOT Long-Term Continuance Cognitions only significantly predicted stayers, IU1 Long-Term Continuance Cognitions only significantly predicted early leavers, and IU2 Long-Term Continuance Cognitions predicted stayers and late leavers. Finally, CWB reported at EOT and IU1 best predicted stayers and late leavers.

Similar to findings reported by Strickland (2005), the best proximal predictors of re-enlistment were Continuance Cognitions. Specifically, Long-Term Continuance Cognitions collected at EOT and Short-Term Continuance Cognitions collected in-unit (IU1 and IU2) best predicted re-enlistment. Other variables explaining less, but unique variance in re-enlistment included Fitness, Army Fit, and Attrition Cognitions.

Considering all of the results presented here, we recommend further refinement of the latent factors for predicting attrition and re-enlistment. Although several of these constructs significantly predicted attrition (e.g., Fitness Orientation) and re-enlistment (e.g., Conscientiousness, Internal Locus of Control), much of the variance in attrition and re-enlistment decisions were not explained by pre-screening measures. Not surprisingly, more proximal attitudes, cognitions, and behaviors explained more variance in actual attrition and re-enlistment decisions than distal predictor measures. Despite this, as demonstrated in previous chapters and in this chapter, the pre-screening measures examined here are related to more proximal antecedents of and actual attrition and re-enlistment. Therefore, even without further refinement several of these measures could provide savings to the Army as screening measures to reduce attrition and increase re-enlistment.

CHAPTER 8: EXAMINING THE ROLE OF MOS IN PREDICTING SOLDIER PERFORMANCE AND ATTRITION

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Overview

In this chapter, we evaluate the extent to which relations between predictors and targeted criteria vary across Military Occupational Specialty (MOS). We present results of two analyses examining differential validity of predictors with regard to select criterion measures—one involving criteria assessing job performance and Soldier attitudes, and one involving attrition.

Background

According to Differential Assignment Theory (DAT; Zeidner & Johnson, 1994; Zeidner, Johnson, & Scholarios, 1997), differential validity is a primary determinant of the extent to which gains in performance can be realized through classification. Thus, the greater the variability in relations between predictors and criteria across MOS, the greater the classification potential the predictors provide. In an earlier analysis, Trippe, Ingerick, and Diaz (2012) found that the experimental predictors administered as part of the Army Class Concurrent Validation study exhibited non-trivial classification gains over the ASVAB using classification statistics such as Horst's *d*. These analyses were conducted on six target MOS, and gains were even greater when including an expanded set of MOS. These results were obtained when the criteria included performance measures (e.g., job knowledge tests, ratings of technical performance) and antecedents of retention (e.g., self-reported MOS fit, MOS satisfaction).

In the present analyses, we examine the degree to which the experimental predictors manifest different relations with performance criteria and with attrition. Those variables exhibiting such variability would be candidates for use in classification and assignment of personnel to military occupations.

Approach

The current analytic approach differs from those taken in previous efforts. Here, we examine the variability in regression coefficients obtained for each predictor across the MOS in question. Hierarchical Linear Models (HLM; Raudenbush & Bryk, 2002; also termed multilevel regression) were used to determine (a) the regression coefficients for each predictor, (b) whether there is a significant relation between the predictors and the criterion, and (c) the amount of variability in regression coefficients for each predictor across MOS. Our approach appropriately accounts for the nested structure of the data, where Soldiers are nested within MOS, thus providing appropriate standard errors for the predictors. Failure to account for the nested structure of the data would lead to artificially small standard errors and thus an increased chance of making Type I errors with regard to the significance of the predictors. All analyses in this chapter were conducted with HLM software, version 6.02a (Raudenbush, Bryk, & Congdon, 2005).

Table 8.1 presents the MOS that contributed data to the differential validity analyses for the performance and attitudinal criteria. A complete list of MOS included in our analyses can be found in Appendix C. We excluded from analysis any MOS containing fewer than 15 useable cases. The table shows that all MOS included during the End of Training phase also appeared in the two in-unit phases, aside from 11X, whose Soldiers typically were assigned to 11B. Therefore, our analyses treated all 11X Soldiers as members of 11B.

Table 8.2 presents similar information for the attrition criterion. MOS selection for the attrition analyses tried to maximize two goals: retain (a) as many MOS as possible (level-two observations—occupations), and (b) only those MOS with sufficient numbers of Soldiers to permit MOS-specific modeling (level-one observations—Soldiers). We chose a minimum MOS sample size of 30 Soldiers for our analyses.[10] This led to us retaining the 23 MOS (comprising 4,454 Soldiers) presented in the table, 13 of which comprised more than 100 Soldiers. Table 8.2 also shows that the attrition analysis sample represents 83% of the total sample having attrition data.

Table 8.1. MOS Included in Differential Validity Analyses: Performance Criteria

End of Training			In-Unit 1			In-Unit 2		
MOS	Frequency	% in Analysis	MOS	Frequency	% in Analysis	MOS	Frequency	% in Analysis
11B/X	669	29.3	11B	311	24.2	11B	203	27.5
19K	471	20.6	13B	19	1.5	11C	17	2.3
31B	716	31.4	19D	61	4.8	19D	37	5.0
68W	136	6.0	19K	95	7.4	19K	69	9.3
88M	72	3.2	21B	45	3.5	21B	18	2.4
91B	219	9.6	21E	17	1.3	25U	51	6.9
			25U	53	4.1	31B	120	16.3
			31B	212	16.5	42A	39	5.3
			35F	29	2.3	68W	22	3.0
			42A	60	4.7	88M	25	3.4
			68W	39	3.0	91B	31	4.2
			74D	16	1.2	92A	24	3.3
			88M	61	4.8	92F	22	3.0
			91B	65	5.1	92G	22	3.0
			92A	54	4.2	92Y	38	5.1
			92F	44	3.4			
			92G	30	2.3			
			92Y	72	5.6			

Note. Maximum sample sizes are N = 2,283 for the End of Training sample, N = 1,283 for the In-Unit 1 sample, and N = 738 for the In-Unit 2 sample. Sample sizes for each analysis varied depending on the availability of the specific criterion measure used in each model.

[10] Sample sizes and number of MOS included in the analysis vary depending on (a) the type of criterion and (b) the data collection time. Sample sizes and number of MOS are lowest for MOS-specific criteria and higher for Army-wide criteria. Sample sizes and number of MOS are also larger for administrative criteria (i.e., attrition). Sample sizes within MOS tend to be larger at the End of Training, but data were only collected for six MOS at that time point. Data were collected on both the MOS-specific sample and the Army-wide sample in the two in-unit data collections. See Chapter 2 for more details.

Table 8.2. MOS Included in Differential Validity Analyses: Attrition

MOS	Frequency	Percent	*p*(*n*)	*n*(MOS)
11B	1,236	23.02		
31B	616	11.47		
19K	447	8.32		
25U	209	3.89		
92Y	202	3.76		
91B	186	3.46		
21B	175	3.26		
92F	174	3.24		
88M	162	3.02		
92A	134	2.50		
19D	121	2.25		
42A	119	2.22		
68W	114	2.12	.725	13
25B	87	1.62		
92G	83	1.55		
35F	68	1.27		
09S	57	1.06		
94F	53	0.99		
13B	52	0.97		
15T	47	0.88		
92R	40	0.74		
13D	39	0.73		
35N	33	0.61	.829	23

Note. MOS above line have $n > 100$; MOS below the line have $n < 100$. *p*(*n*) = Proportion of the total sample ($N = 5{,}370$) represented by the group of MOS with more than 100 Soldiers in the analysis sample. *n*(MOS) = Number of MOS above the table line.

Table 8.3 presents attrition rates through 48 months for the analysis and total samples, respectively. The attrition rates in the two samples are nearly identical, thus indicating that the attrition rates for those MOS not included in the analysis sample did not differ in any meaningful way from those that were included.

Table 8.3. MOS Included in Differential Validity Analyses: Attrition

	n	Separations	Rate
Analysis Sample	4,454	1,559	.350
Total Sample	5,370	1,859	.346

Note. Data span 48 months.

Results for Differential Validity on Performance and Attitudes Across MOS

The first set of analyses investigated the degree to which the predictive relations of nine experimental predictors and one measure of cognitive aptitude varied across MOS for select criterion measures collected at three in-service time points. Three criteria were entered in the analyses at all three time points: MOS Fit, Maximal Technical Performance/Achievement (i.e., MOS-Specific Job Knowledge Test [JKT]), and Physical Fitness. One additional criterion, Job Satisfaction, was included as part of the two in-unit analyses.

Results of the analyses appear in Tables 8.4 through 8.9. Tables 8.4 and 8.5 contain EOT results, Tables 8.6 and 8.7 IU1 results, and Tables 8.8 and 8.9 IU2 results. Tables 8.4, 8.6, and 8.8 contain the estimates of the fixed and random effects for each predictor with the various criteria. These estimates reveal whether the predictor is significantly related to the criterion on average across MOS (fixed effects) and whether there is significant variation in the magnitude of the coefficients for that predictor across MOS (random effects). Thus, the random effects give us a look at potential differential validity in the predictors. Tables 8.5, 8.7, and 8.9 contain standardized coefficients for the various predictors by MOS.

EOT Criteria

Tables 8.4 and 8.5 contain the results for the EOT criteria. We present the results by criterion.

MOS Fit. Consistent with the findings in Chapter 5, the fixed effects columns of Table 8.4 show that two predictors had significant relations with MOS Fit (Agreeableness, Army Affective Commitment), with a third approaching significance (Fitness Orientation). The random effects columns show that only Conscientiousness had regression coefficients that varied significantly across MOS. Achievement Orientation and Army Affective Commitment approached significance. Together, these results indicate the following:

- Agreeableness is a significant predictor of MOS Fit, and the degree of relation does not vary significantly across the six MOS included in the analysis.

- Army Affective Commitment is a significant predictor of MOS Fit, and the variability of its degree of relation does approach significance across the six MOS.

- The variability in the coefficients for Achievement Orientation also approach statistical significance across the six MOS.

- Conscientiousness exhibits non-significant relations with MOS Fit *on average*, but it still exhibits significant variability across the six MOS. (Think of a distribution of coefficients centered at 0.0 but exhibiting a wide range.) This means that this measure has the potential to offer significant differential validity to the prediction of MOS Fit.

Table 8.5 contains the standardized regression coefficients for the predictors by MOS. Those predictors demonstrating variability that either approached or attained statistical significance are highlighted in the table with gray shading. Further examination of Table 8.5 suggests that Army Affective Commitment is a strong predictor of MOS Fit in 11B (Infantryman) and 68W (Health Care Specialist) but a weak or non-significant predictor in other MOS. Conscientiousness is a significant positive predictor of MOS Fit in 11B and 91B (Wheeled Vehicle Mechanic) but a weak or negative predictor in other MOS.

MOS-Specific JKT. Table 8.4 shows that Cognitive Aptitude and Army Affective Commitment are significant predictors of MOS-Specific JKT scores. Practical Intelligence approaches significance as a predictor. In terms of variability of effects across MOS, Agreeableness and Practical Intelligence show significant variability; Achievement Orientation exhibits variability

that approaches significance. Examination of the standardized regression coefficients in Table 8.5 reveals that Agreeableness and Practical Intelligence are significant negative and positive (respectively) predictors of MOS-Specific job knowledge in certain MOS (88M Motor Transport Operator and 91B) but non-significant in other MOS.

Table 8.4. Hierarchical Linear Model for Targeted EOT Criteria

	Fixed Effects			Random Effects		
	Coefficient	*SE*	*t*-ratio	*SD*	VarComp	$\chi^2_{(5)}$
MOS Fit (*n* = 1,606)						
Intercept	2.59	0.23	11.08	0.33	0.11	2.17
Achievement Orientation	-0.03	0.08	-0.36	0.15	0.02	***10.19***
Agreeableness	**0.15**	0.05	**2.68**	0.07	0.00	2.46
Army Affective Commitment	**0.20**	0.07	**3.09**	0.13	0.02	***10.78***
Cognitive Aptitude	0.00	0.00	-0.68	0.00	0.00	4.70
Conscientiousness	0.00	0.06	-0.02	0.11	0.01	**15.67**
Fitness Orientation	***0.08***	0.03	***2.21***	0.06	0.00	6.02
Internal Locus of Control	0.08	0.06	1.30	0.09	0.01	5.78
Openness	-0.11	0.07	-1.75	0.13	0.02	7.80
Practical Intelligence	-0.01	0.06	-0.10	0.11	0.01	5.77
Surgency	-0.02	0.06	-0.31	0.11	0.01	6.66
MOS-Specific JKT (*n* = 1,538)						
Intercept	-2.29	0.25	-9.17	0.30	0.09	3.25
Achievement Orientation	-0.02	0.09	-0.18	0.16	0.02	***10.41***
Agreeableness	-0.22	0.12	-1.79	0.26	0.07	**19.61**
Army Affective Commitment	**0.18**	0.05	**3.56**	0.06	0.00	2.20
Cognitive Aptitude	**0.02**	0.00	**11.65**	0.00	0.00	6.93
Conscientiousness	0.00	0.04	-0.03	0.07	0.00	3.66
Fitness Orientation	0.04	0.04	1.12	0.06	0.00	5.75
Internal Locus of Control	0.08	0.05	1.47	0.06	0.00	1.63
Openness	-0.05	0.06	-0.88	0.09	0.01	5.72
Practical Intelligence	***0.22***	0.09	***2.46***	0.18	0.03	**13.86**
Surgency	-0.11	0.07	-1.63	0.13	0.02	8.16
Physical Fitness (*n* = 1,611)						
Intercept	244.82	11.31	21.65	21.91	480.00	8.03
Achievement Orientation	-2.44	1.77	-1.38	1.99	3.96	2.34
Agreeableness	0.80	1.66	0.49	0.84	0.71	3.55
Army Affective Commitment	-2.05	2.36	-0.87	4.69	21.97	***10.30***
Cognitive Aptitude	0.08	0.06	1.41	0.09	0.01	3.13
Conscientiousness	0.09	1.38	0.07	2.30	5.28	4.44
Fitness Orientation	**12.46**	1.22	**10.21**	2.08	4.31	6.36
Internal Locus of Control	0.89	1.91	0.47	2.74	7.51	4.43
Openness	-1.67	2.07	-0.81	3.73	13.93	6.48
Practical Intelligence	0.04	2.38	0.02	4.36	18.98	6.01
Surgency	1.68	1.48	1.14	1.53	2.34	1.94

Note. *SE* = Standard Error. VarComp = Variance Component. ICC = Intraclass Correlation Coefficient. Coefficients in bold are statistically significant, $p < .05$. Coefficients in bold and italics approach statistical significance, $p < .10$.

Table 8.5. Standardized Regression Coefficients for EOT Criteria by MOS

	MOS					
	11B	19K	31B	68W	88M	91B
MOS Fit (*n* = 1,606)						
Achievement Orientation	-0.09	***0.18***	0.06	-0.21	-0.24	-0.08
Agreeableness	**0.13**	0.02	**0.16**	0.15	0.28	0.06
Army Affective Commitment	**0.24**	0.06	***0.09***	**0.35**	0.03	0.12
Cognitive Aptitude	-0.02	***-0.12***	-0.07	0.09	-0.01	-0.02
Conscientiousness	**0.12**	-0.06	***-0.12***	-0.13	-0.05	**0.21**
Fitness Orientation	0.04	0.05	0.05	**0.23**	0.23	0.00
Internal Locus of Control	-0.01	0.07	**0.15**	0.04	0.13	-0.01
Openness	-0.05	**-0.16**	**-0.20**	0.11	-0.16	-0.10
Practical Intelligence	**-0.11**	0.02	0.02	0.08	0.15	-0.12
Surgency	0.07	0.00	0.11	-0.04	-0.15	-0.15
MOS-Specific JKT (*n* = 1,538)						
Achievement Orientation	0.09	0.08	**-0.17**	0.07	-0.27	0.05
Agreeableness	0.03	-0.03	-0.06	-0.05	**-0.62**	**-0.41**
Army Affective Commitment	***0.09***	**0.13**	**0.14**	0.03	0.19	0.09
Cognitive Aptitude	**0.46**	**0.44**	**0.46**	**0.34**	**0.43**	**0.29**
Conscientiousness	-0.04	0.00	0.00	-0.11	-0.11	0.12
Internal Locus of Control	0.00	0.06	0.05	0.02	0.10	0.09
Fitness Orientation	-0.01	-0.03	-0.02	0.09	0.21	0.06
Openness	0.02	**-0.15**	0.02	0.01	-0.11	-0.07
Practical Intelligence	0.03	0.04	0.09	***0.24***	**0.64**	**0.28**
Surgency	**-0.16**	-0.05	0.04	***-0.25***	0.03	-0.13
Physical Fitness (*n* = 1,611)						
Achievement Orientation	-0.06	-0.09	-0.08	-0.09	0.37	-0.12
Agreeableness	-0.01	0.04	0.10	0.08	-0.07	0.09
Army Affective Commitment	0.04	**0.13**	0.01	0.08	-0.25	-0.13
Cognitive Aptitude	0.00	**-0.19**	-0.02	0.15	-0.09	-0.07
Conscientiousness	0.00	-0.02	0.07	-0.12	-0.09	0.17
Fitness Orientation	-0.05	-0.03	0.07	0.02	0.05	0.08
Internal Locus of Control	0.01	0.01	**0.09**	0.01	-0.05	0.01
Openness	**0.42**	**0.48**	**0.41**	**0.39**	0.21	**0.27**
Practical Intelligence	0.00	-0.11	-0.03	-0.04	0.17	0.10
Surgency	-0.04	0.05	-0.11	-0.06	-0.01	-0.10

Note. Coefficients in bold are statistically significant, $p < .05$. Coefficients in bold and italics approach statistical significance, $p < .10$. Shaded rows had significant or nearly significant slope variability across MOS (see Table 8.4).

Physical Fitness. Table 8.4 shows that just one predictor exhibits a significant predictive effect across MOS for Physical Fitness: Fitness Orientation. Only Army Affective Commitment approaches significance in terms of variability of coefficients across the six MOS.

In-Unit 1 Criteria

Table 8.6 presents the differential validity results for the four IU1 criteria. Again, we present the results by criterion measure.

Table 8.6. Hierarchical Linear Model for Targeted In-Unit 1 Criteria

	Fixed Effects			Random Effects		
	Coefficient	*SE*	*t*-ratio	*SD*	VarComp	χ^2
MOS Fit (*n* = 895)						
Intercept	2.93	0.34	8.65	0.72	0.52	9.67
Achievement Orientation	0.01	0.07	0.19	0.10	0.01	10.99
Agreeableness	-0.04	0.11	-0.36	0.33	0.11	**30.48**
Army Affective Commitment	**0.14**	0.06	**2.38**	0.06	0.00	6.28
Cognitive Aptitude	**0.00**	0.00	**-2.26**	0.00	0.00	11.38
Conscientiousness	***0.11***	0.06	***1.77***	0.17	0.03	**30.14**
Internal Locus of Control	0.00	0.08	0.05	0.18	0.03	18.71
Fitness Orientation	-0.03	0.04	-0.79	0.10	0.01	11.42
Openness	-0.06	0.07	-0.86	0.12	0.02	17.34
Practical Intelligence	0.09	0.08	1.13	0.21	0.04	**24.95**
Surgency	-0.02	0.07	-0.24	0.11	0.01	***21.68***
Job Satisfaction (*n* = 894)						
Intercept	3.24	0.42	7.64	1.17	1.37	23.74
Achievement Orientation	0.03	0.09	0.39	0.18	0.03	20.79
Agreeableness	0.08	0.08	1.02	0.17	0.03	11.29
Army Affective Commitment	**0.15**	0.07	**2.29**	0.14	0.02	14.44
Cognitive Aptitude	**-0.01**	0.00	**-4.62**	0.00	0.00	12.91
Conscientiousness	0.08	0.05	1.52	0.12	0.02	9.75
Fitness Orientation	-0.02	0.04	-0.46	0.05	0.00	7.28
Internal Locus of Control	0.04	0.09	0.44	0.24	0.06	**24.62**
Openness	-0.04	0.08	-0.46	0.20	0.04	18.26
Practical Intelligence	0.08	0.08	1.00	0.19	0.04	18.22
Surgency	-0.09	0.07	-1.23	0.13	0.02	13.52
MOS-Specific JKT (*n* = 491)						
Intercept	-1.65	0.53	-3.12	0.89	0.79	5.19
Achievement Orientation	0.05	0.16	0.29	0.30	0.09	**11.34**
Agreeableness	-0.12	0.14	-0.89	0.26	0.07	4.67
Army Affective Commitment	0.08	0.12	0.64	0.23	0.05	**15.35**
Cognitive Aptitude	**0.02**	0.00	**5.16**	0.01	0.00	7.03
Conscientiousness	-0.03	0.11	-0.29	0.22	0.05	***10.00***
Fitness Orientation	-0.01	0.05	-0.24	0.06	0.00	0.93
Internal Locus of Control	0.11	0.13	0.82	0.22	0.05	9.21
Openness	-0.08	0.14	-0.58	0.27	0.07	5.07
Practical Intelligence	0.12	0.16	0.75	0.32	0.10	***10.67***
Surgency	0.02	0.18	0.11	0.38	0.15	**12.84**
Physical Fitness (*n* = 814)						
Intercept	220.85	17.82	12.39	52.91	2799.85	37.63
Achievement Orientation	-4.10	3.00	-1.36	5.77	33.33	17.98
Agreeableness	6.29	4.04	1.56	11.78	138.75	21.44
Army Affective Commitment	-2.37	2.76	-0.86	6.61	43.69	18.10
Cognitive Aptitude	-0.03	0.12	-0.22	0.39	0.15	**45.08**
Conscientiousness	2.80	1.90	1.47	4.33	18.78	***23.25***
Fitness Orientation	**12.16**	1.62	**7.50**	3.35	11.25	17.78
Internal Locus of Control	**8.44**	3.70	**2.28**	10.45	109.18	**28.89**
Openness	-0.29	3.06	-0.09	7.81	60.96	***24.21***
Practical Intelligence	***-4.99***	2.81	***-1.77***	6.92	47.90	22.20
Surgency	-0.09	2.98	-0.03	7.64	58.40	**28.88**

Note. *SE* = Standard Error. VarComp = Variance Component. Degrees of freedom for the chi-square statistic across the four criteria are 14, 13, 5, and 15, respectively. Coefficients in bold are statistically significant, $p < .05$. Coefficients in bold and italics approach statistical significance, $p < .10$.

MOS Fit. Both Cognitive Aptitude and Army Affective Commitment significantly predicted MOS Fit at the IU1 time point. Conscientiousness approached statistical significance. In terms of variability of effects across the 15 MOS included in this analysis, four predictors demonstrated significant variation: Surgency, Agreeableness, Conscientiousness, and Practical Intelligence. None of these, however, was a significant predictor in its own right (although Conscientiousness approached significance, as mentioned). According to the results presented in Table 8.7:

- Surgency negatively predicted MOS Fit in 19K (Armor Crewman) and positively predicted MOS Fit in other MOS (91B and 92A Automated Logistical Specialist), although the positive relations were non-significant.

- Agreeableness positively predicted MOS Fit in 11B and 42A (Human Resource Specialist) and negatively predicted MOS Fit in 91B.

- Conscientiousness negatively predicted MOS Fit in 13B (Cannon Crewmember) and positively predicted MOS Fit in 92F (Petroleum Supply Specialist), 31B, and 19D (Cavalry Scout).

- Practical Intelligence predicted MOS fit in 25U (Signal Support Specialist), 68W (Health Care Specialist) and 21B (Combat Engineer) but was non-significant in other MOS.

Table 8.7 contains the standardized regression coefficients for the predictors by MOS. As in Table 8.5, predictors demonstrating variability that either approached or attained statistical significance are highlighted with gray shading. For this criterion, the table shows the wide range of variation in coefficients across MOS, especially for Agreeableness, which has values ranging from -1.02 (MOS 91B) to 0.92 (MOS 42A).

Job Satisfaction. Table 8.6 shows that two variables have significant predictive relations with Job Satisfaction (not examined in the EOT analyses): Cognitive Aptitude and Army Affective Commitment. Internal Locus of Control exhibits significant variability in the magnitude of its effect across the 14 MOS included in the analysis, with negative coefficients for 19K and 42A, and positive coefficients for 31B and 88M (Table 8.7).

MOS-Specific JKT. Only Cognitive Aptitude proves a significant predictor across MOS of this criterion at IU1. Several predictors evidence variability of coefficients across the MOS, however, Achievement Orientation, Surgency, and Army Affective Commitment all displayed significant variability across the six MOS represented in the analysis, and Conscientiousness and Practical Intelligence both approached significance with the variability of their coefficients. Examination of Table 8.7 suggests that most of the variability occurs in the 11B and 68W MOS.

Physical Fitness. For the Physical Fitness criterion, Fitness Orientation again exhibits significant prediction (as expected), but for IU1 it is joined by Internal Locus of Control. Practical Intelligence approaches significance with its main effect. Three predictors (Surgency, Cognitive Ability, and Internal Locus of Control) exhibit significant variability in their MOS-specific regression coefficients (across 16 MOS). Openness and Conscientiousness also display notable variability, approaching statistical significance.

Table 8.7. Standardized Regression Coefficients for In-Unit 1 Criteria by MOS

	MOS															
	11B	13B	19D	19K	21B	21E	25U	31B	42A	68W	88M	91B	92A	92F	92G	92Y
MOS Fit (*n* = 895)																
Achievement Orientation	0.07	1.51	-0.11	0.10	-0.15	.	**-0.67**	0.03	-0.30	0.04	0.29	-0.25	0.24	0.03	-0.20	-0.24
Agreeableness	**0.24**	-0.86	-0.04	0.01	-0.42	.	-0.07	0.10	**0.92**	-0.31	-0.35	**-1.02**	0.22	-0.28	0.43	0.04
Army Affective Commit	0.11	-0.22	0.21	0.13	0.23	.	0.20	0.07	-0.16	0.14	0.11	0.03	-0.08	-0.01	-0.02	-0.13
Cognitive Aptitude	-0.09	-0.26	0.04	***-0.25***	-0.22	.	***-0.28***	0.04	-0.01	-0.13	-0.27	**-0.55**	-0.22	-0.04	0.05	0.03
Conscientiousness	-0.07	***-1.00***	***0.37***	0.19	-0.14	.	-0.10	***0.18***	0.37	-0.30	-0.17	-0.05	-0.42	**0.69**	0.51	0.08
Fitness Orientation	0.09	0.25	-0.09	0.02	0.15	.	-0.05	-0.11	-0.24	0.17	0.11	-0.02	***-0.53***	-0.06	-0.25	-0.17
Internal Locus of Ctrl	0.03	0.32	***-0.32***	-0.16	-0.15	.	-0.07	0.09	-0.17	-0.18	0.31	**0.55**	0.10	0.17	0.29	0.32
Openness	**-0.18**	0.34	0.13	0.18	-0.36	.	0.22	-0.21	0.12	-0.26	-0.19	0.37	-0.40	-0.21	0.00	0.27
Practical Intelligence	-0.07	-0.54	-0.08	0.06	***0.59***	.	**0.61**	0.04	-0.05	**0.70**	0.23	-0.16	-0.01	-0.18	-0.35	-0.35
Surgency	-0.06	0.53	0.14	**-0.40**	0.40	.	0.38	0.03	-0.24	-0.06	-0.14	0.70	0.49	0.16	-0.21	0.29
Job Satisfaction (*n* = 894)																
Achievement Orientation	***0.19***	.	-0.37	0.25	0.23	.	***-0.53***	0.10	-0.40	-0.30	0.24	-0.23	0.24	0.50	-0.73	-0.39
Agreeableness	***0.14***	.	0.01	0.15	0.07	.	0.19	0.06	**0.93**	-0.06	-0.11	***-0.61***	0.11	0.11	0.08	0.24
Army Affective Commit	0.00	.	0.27	-0.06	0.14	.	**0.54**	0.02	0.21	0.27	-0.02	0.24	-0.06	0.08	0.25	-0.23
Cognitive Aptitude	**-0.31**	.	-0.15	***-0.24***	-0.16	.	-0.17	-0.06	-0.11	**-0.41**	-0.09	***-0.51***	-0.43	-0.30	-0.16	-0.06
Conscientiousness	0.04	.	**0.43**	0.03	-0.13	.	0.01	-0.05	0.24	0.09	-0.14	-0.04	0.08	0.33	0.40	0.16
Fitness Orientation	0.08	.	-0.09	0.01	0.12	.	0.02	-0.07	-0.17	0.06	0.09	-0.19	-0.35	0.12	-0.25	0.05
Internal Locus of Ctrl	0.08	.	-0.13	***-0.27***	-0.10	.	-0.36	***0.18***	***-0.34***	-0.14	***0.40***	0.44	-0.05	0.04	0.55	0.17
Openness	0.00	.	0.32	0.10	-0.36	.	0.14	**-0.29**	***0.46***	0.11	-0.12	0.11	-0.36	0.08	0.50	0.26
Practical Intelligence	-0.08	.	-0.11	0.20	0.10	.	0.32	0.18	0.11	-0.12	0.36	0.32	-0.22	-0.39	-0.28	-0.39
Surgency	***-0.16***	.	0.03	**-0.41**	0.20	.	-0.02	-0.07	***-0.50***	0.22	-0.21	0.26	0.28	-0.31	0.19	0.36
MOS-Specific JKT (*n* =491)																
Achievement Orientation	**0.28**	.	.	0.11	.	.	.	-0.07	.	-0.35	0.51	-0.13	.	.	.	.
Agreeableness	-0.04	.	.	-0.16	.	.	.	-0.05	.	-0.33	0.36	-0.31	.	.	.	.
Army Affective Commit	**0.25**	.	.	0.03	.	.	.	0.10	.	-0.09	-0.57	-0.13	.	.	.	.
Cognitive Aptitude	**0.41**	.	.	0.19	.	.	.	**0.35**	.	0.03	0.74	0.39	.	.	.	.
Conscientiousness	***-0.14***	.	.	0.10	.	.	.	0.06	.	-0.37	-0.26	**0.54**	.	.	.	.
Fitness Orientation	0.01	.	.	-0.03	.	.	.	0.03	.	0.01	-0.06	-0.23	.	.	.	.
Internal Locus of Ctrl	***-0.12***	.	.	0.03	.	.	.	0.11	.	-0.07	0.22	0.46	.	.	.	.
Openness	-0.08	.	.	-0.01	.	.	.	0.05	.	-0.30	0.34	-0.39	.	.	.	.
Practical Intelligence	0.14	.	.	0.21	.	.	.	-0.06	.	**0.77**	-0.27	-0.27	.	.	.	.
Surgency	**-0.20**	.	.	-0.05	.	.	.	0.06	.	**0.47**	-0.45	0.59	.	.	.	.

Table 8.7. (continued)

	MOS															
	11B	13B	19D	19K	21B	21E	25U	31B	42A	68W	88M	91B	92A	92F	92G	92Y
Physical Fitness (n = 814)																
Achievement Orientation	0.00	-1.42	-0.09	0.19	1.06	0.20	-0.34	-0.02	0.37	-0.36	-0.24	0.20	-0.25	-0.15	-0.92	-0.16
Agreeableness	0.01	***1.43***	0.24	0.20	0.39	0.29	***0.58***	0.05	0.23	0.21	-0.28	-0.06	-0.38	0.15	0.63	-0.27
Army Affective Commit	-0.07	0.80	-0.17	-0.23	-0.31	-0.27	0.12	-0.11	-0.19	0.26	-0.04	0.09	0.36	-0.28	-0.45	-0.03
Cognitive Aptitude	0.11	0.69	**0.53**	0.16	-0.17	0.12	-0.33	-0.18	**-0.50**	**0.35**	-0.17	-0.46	-0.19	***0.43***	-0.02	-0.20
Conscientiousness	0.04	0.02	0.02	0.23	-0.47	-0.66	***-0.40***	0.15	-0.39	0.23	0.31	0.13	0.46	***0.46***	0.53	***0.33***
Fitness Orientation	**0.32**	0.69	**0.44**	**0.37**	**0.47**	-0.40	0.13	**0.34**	0.07	**0.56**	0.34	0.28	**0.68**	-0.24	0.22	***0.44***
Internal Locus of Ctrl	0.01	-0.80	0.04	-0.17	-0.22	0.83	0.08	-0.01	***0.42***	**0.45**	0.33	0.40	-0.15	0.18	0.13	-0.21
Openness	-0.11	-0.83	0.01	-0.18	0.08	-0.55	-0.25	-0.08	-0.10	-0.25	0.05	0.27	**0.81**	-0.03	**1.08**	0.09
Practical Intelligence	0.08	0.51	**-0.63**	-0.05	0.05	0.65	-0.05	-0.09	-0.11	-0.19	-0.08	0.14	-0.39	**-0.83**	0.01	-0.32
Surgency	-0.10	0.48	0.28	***-0.31***	**-1.17**	0.18	0.11	-0.12	0.04	0.05	0.19	-0.48	-0.25	***0.61***	-0.62	**0.65**

Note. Coefficients in bold are statistically significant, $p < .05$. Coefficients in bold and italics approach statistical significance, $p < .10$. Shaded rows had significant or nearly significant slope variability across MOS (see Table 6).

In-Unit 2 Criteria

Tables 8.8 and 8.9 contain the results for the IU2 criteria. Again, we discuss the observed relations and variability by criterion measure.

MOS Fit. Table 8.8 shows that for the IU2 time point, none of the 10 predictors exhibited a significant predictive relation with MOS Fit. Two predictors (Conscientiousness, Practical Intelligence) did exhibit significant variability across the eight MOS represented in the analysis. Table 8.9 contains the standardized regression coefficients for the predictors by MOS. As in Tables 8.5 and 8.7, predictors demonstrating variability that either approached or attained statistical significance are highlighted with gray shading. For this criterion, the table shows the wide range of variation in coefficients across MOS, especially for Conscientiousness, which has values ranging from -0.89 to 1.06.

Job Satisfaction. Table 8.8 shows that just one predictor exhibited significant predictive relations with Job Satisfaction: Cognitive Aptitude. Note that this relation is *negative,* indicating that Soldiers having higher cognitive aptitude have lower levels of Job Satisfaction at IU2. Just one predictor (Achievement Orientation) exhibited significant variability in its coefficients across the 15 MOS represented in this analysis. Table 8.9 shows that this variability was driven mainly by a strong negative regression coefficient for 92Y (Unit Supply Specialist) Soldiers.

MOS-Specific JKT. Two predictors (Cognitive Aptitude, Army Affective Commitment) relate significantly to scores on the MOS-specific JKTs. Fitness Orientation approaches significance, as well. Achievement Orientation, Surgency, Conscientiousness, and Fitness Orientation all demonstrate significant variability in predictive relations across the MOS contributing to this analysis. Note, however, that there were but four MOS with sufficient sample sizes for inclusion in the analysis involving this criterion, so some caution is warranted.

Physical Fitness. The Physical Fitness criterion was again predicted by Fitness Orientation at the IU2 time period. Cognitive Aptitude also evidenced significant prediction of Fitness, albeit in a negative direction. Army Affective Commitment approached a statistically significant relation (again in the negative direction). In terms of variability of predictive relations across the nine MOS represented in this analysis, only one (Fitness Orientation) demonstrated significant variability, such that the magnitude of the positive regression was strong in some MOS and non-significant in others (see Table 8.9).

Table 8.8. Hierarchical Linear Model for Targeted In-Unit 2 Criteria

	Fixed Effects (Intercepts)			Random Effects (Slopes)		
	Coefficient	*SE*	*t*-ratio	*SD*	VarComp	χ^2
MOS Fit (*n* = 522)						
Intercept	2.77	0.56	4.96	1.44	2.06	2.96
Achievement Orientation	-0.20	0.17	-1.20	0.50	0.25	**18.75**
Agreeableness	0.16	0.10	1.60	0.21	0.04	5.62
Army Affective Commit	0.15	0.11	1.28	0.32	0.10	7.82
Cognitive Aptitude	0.00	0.00	-0.09	0.00	0.00	12.90
Conscientiousness	0.10	0.09	1.03	0.29	0.08	**17.50**
Fitness Orientation	0.09	0.05	1.66	0.11	0.01	6.60
Internal Locus of Control	-0.06	0.11	-0.53	0.27	0.08	13.02
Openness	0.04	0.11	0.40	0.26	0.07	7.37
Practical Intelligence	-0.16	0.15	-1.08	0.44	0.19	**21.44**
Surgency	-0.01	0.12	-0.11	0.31	0.09	10.56
Job Satisfaction (*n* = 894)						
Intercept	3.01	0.43	6.95	0.82	0.66	5.18
Achievement Orientation	-0.04	0.14	-0.31	0.37	0.14	**21.14**
Agreeableness	0.09	0.11	0.83	0.23	0.06	5.87
Army Affective Commit	0.14	0.10	1.43	0.22	0.05	8.46
Cognitive Aptitude	**-0.01**	0.00	**-3.13**	0.00	0.00	6.04
Conscientiousness	0.08	0.07	1.24	0.15	0.02	7.39
Fitness Orientation	0.04	0.06	0.61	0.14	0.02	11.35
Internal Locus of Control	0.06	0.08	0.74	0.11	0.01	7.99
Openness	0.06	0.10	0.63	0.24	0.06	7.05
Practical Intelligence	-0.06	0.09	-0.64	0.15	0.02	4.43
Surgency	-0.04	0.09	-0.49	0.15	0.02	5.47
MOS-Specific JKT (*n* = 491)						
Intercept	-1.64	0.58	-2.82	0.76	0.57	2.73
Achievement Orientation	-0.11	0.20	-0.58	0.31	0.10	***6.68***
Agreeableness	0.10	0.11	0.93	0.04	0.00	1.78
Army Affective Commit	**0.30**	0.11	**2.69**	0.13	0.02	2.24
Cognitive Aptitude	**0.02**	0.00	**5.57**	0.00	0.00	1.35
Conscientiousness	0.13	0.13	0.94	0.25	0.06	**13.25**
Fitness Orientation	***0.22***	0.12	***1.90***	0.22	0.05	**15.52**
Internal Locus of Control	-0.17	0.10	-1.65	0.03	0.00	0.13
Openness	0.15	0.10	1.47	0.07	0.00	2.99
Practical Intelligence	-0.14	0.13	-1.08	0.14	0.02	1.91
Surgency	-0.17	0.14	-1.22	0.22	0.05	**9.31**
Physical Fitness (*n* = 516)						
Intercept	271.52	20.20	13.44	47.60	2,266.23	9.41
Achievement Orientation	-0.51	5.10	-0.10	11.85	140.44	9.73
Agreeableness	-5.28	3.51	-1.50	2.53	6.43	6.33
Army Affective Commit	***-6.83***	3.55	***-1.92***	6.78	45.91	7.34
Cognitive Aptitude	**-0.28**	0.10	**-2.75**	0.17	0.03	11.45
Conscientiousness	1.93	2.25	0.86	2.85	8.11	2.31
Fitness Orientation	**12.96**	2.85	**4.55**	7.92	62.72	**20.41**
Internal Locus of Control	6.19	3.78	1.64	6.38	40.67	6.36
Openness	-5.31	3.58	-1.48	5.59	31.30	4.61
Practical Intelligence	0.48	3.64	0.13	4.24	17.96	4.89
Surgency	6.03	3.83	1.57	8.28	68.59	8.38

Note. *SE* = Standard Error. VarComp = Variance Component. Degrees of freedom for the chi-square statistic across the four criteria are 7, 8, 3, and 8, respectively. Coefficients in bold are statistically significant, $p < .05$. Coefficients in bold and italics approach statistical significance, $p < .10$.

Table 8.9. Standardized Regression Coefficients for In-Unit 2 Criteria by MOS

	MOS								
	11B	11C	19K	25U	31B	42A	91B	92F	92Y
MOS Fit									
Achievement Orientation	0.13	0.26	-0.23	**-0.69**	0.03	.	0.78	0.13	-0.87
Agreeableness	0.03	0.92	0.19	0.29	-0.06	.	-0.10	0.70	0.33
Army Affective Commit	0.11	-0.53	0.01	0.27	0.07	.	-0.22	0.17	0.31
Cognitive Aptitude	-0.05	-0.74	***0.31***	0.15	-0.21	.	0.37	-0.24	0.09
Conscientiousness	0.05	0.23	0.25	0.03	***-0.27***	.	**-0.89**	0.06	**1.06**
Fitness Orientation	-0.02	0.60	0.19	0.22	-0.03	.	0.08	0.72	0.20
Internal Locus of Control	0.06	0.46	-0.11	-0.08	**0.33**	.	-0.04	-0.25	-0.05
Openness	0.01	-0.48	-0.18	-0.12	-0.15	.	-0.36	-0.24	0.46
Practical Intelligence	-0.09	-0.76	-0.24	**0.69**	0.17	.	0.46	-0.90	-0.52
Surgency	-0.13	-1.16	0.23	-0.24	0.25	.	-0.60	0.13	***-0.69***
MOS Satisfaction									
Achievement Orientation	0.29	0.95	0.18	-0.19	0.02	0.26	0.97	0.51	**-1.38**
Agreeableness	0.06	1.25	0.24	-0.08	0.13	0.23	-1.70	-0.08	0.26
Army Affective Commit	-0.01	-0.28	0.07	0.31	-0.03	-0.35	0.44	0.34	***0.33***
Cognitive Aptitude	-0.03	-0.50	0.04	-0.12	***-0.24***	-0.21	-0.24	-0.60	-0.24
Conscientiousness	0.01	-0.42	-0.12	0.12	0.09	-0.39	0.08	0.17	**1.00**
Fitness Orientation	-0.03	-0.38	0.05	-0.10	0.12	**0.51**	-0.50	1.00	0.12
Internal Locus of Control	0.00	0.48	-0.18	0.01	**0.33**	-0.08	0.13	-0.13	0.06
Openness	-0.02	-0.15	-0.29	-0.15	-0.11	0.30	0.08	0.04	0.42
Practical Intelligence	-0.09	0.09	0.08	0.13	-0.07	0.07	0.98	-0.33	-0.49
Surgency	***-0.20***	-1.67	0.12	0.15	-0.04	-0.22	-0.05	0.22	0.01
MOS-Specific JKT									
Achievement Orientation	***-0.24***	.	0.44	.	-0.27	.	-0.08	.	.
Agreeableness	0.11	.	0.01	.	0.05	.	-1.44	.	.
Army Affective Commit	**0.19**	.	0.06	.	**0.33**	.	-0.02	.	.
Cognitive Aptitude	**0.33**	.	0.17	.	**0.37**	.	0.37	.	.
Conscientiousness	-0.05	.	-0.36	.	**0.36**	.	0.66	.	.
Fitness Orientation	-0.11	.	0.01	.	**0.38**	.	0.36	.	.
Internal Locus of Control	-0.13	.	-0.07	.	-0.07	.	-0.11	.	.
Openness	0.05	.	0.11	.	0.02	.	1.00	.	.
Practical Intelligence	0.02	.	0.04	.	-0.10	.	-0.55	.	.
Surgency	0.16	.	-0.17	.	-0.06	.	0.38	.	.
Physical Fitness (APFT)									
Achievement Orientation	0.13	-0.23	0.14	0.43	-0.11	0.31	0-.91	-0.83	***-0.60***
Agreeableness	-0.09	0.45	-0.05	0.11	-0.07	-0.24	1.21	1.75	***-0.62***
Army Affective Commit	-0.14	-0.24	-0.17	-0.15	-0.04	-0.12	0.29	-0.83	0.29
Cognitive Aptitude	-0.06	-0.43	-0.20	-0.13	-0.05	**-0.76**	0.00	-0.05	-0.34
Conscientiousness	0.03	0.18	-0.01	-0.08	0.15	0.18	0.28	-0.19	0.47
Fitness Orientation	**0.27**	0.35	**0.43**	0.32	**0.34**	-0.09	-0.13	-0.09	-0.10
Internal Locus of Control	-0.06	0.61	0.01	-0.15	0.02	-0.12	0.36	0.43	0.14
Openness	-0.04	-0.09	-0.10	-0.18	0.11	0.12	-0.42	-0.55	-0.44
Practical Intelligence	-0.02	0.00	0.07	-0.33	-0.22	0.14	-0.63	-0.15	0.23
Surgency	-0.05	-0.22	-0.08	-0.04	0.07	0.08	0.42	-0.29	***0.79***

Note. Coefficients in bold are statistically significant, $p < .05$. Coefficients in bold and italics approach statistical significance, $p < .10$. Shaded rows had significant or nearly significant slope variability across MOS (see Table 8).

Summary

Table 8.10 presents a summary of the results of the differential validity analyses by time of criterion measurement, criterion measure, and effect (fixed and random). With regard to predictive relations between the predictors and the criteria (main effects), the table suggests the following:

- Cognitive Aptitude, Army Affective Commitment, and Fitness Orientation proved the strongest predictors of the set. Cognitive Aptitude was a significant predictor of MOS-Specific JKT scores at all three time periods, and Fitness Orientation was a significant predictor of Physical Fitness scores at all three time periods—results that are expected and in line with the findings in Chapters 5 and 6.

- Army Affective Commitment was a significant predictor of MOS Fit at EOT and IU1, of Job Satisfaction at IU1, and of MOS-Specific JKT at EOT and IU2. It also approached significance as a predictor of Physical Fitness at IU2.

- Job Satisfaction proved relatively difficult to predict, with only Cognitive Aptitude and Army Affective Commitment demonstrating significant relations.

- Three predictors failed to demonstrate predictive relations with any criteria: Achievement Orientation, Surgency, and Openness.

With regard to variability of the predictors across MOS (random effects), the table suggests the following:

- MOS-Specific JKT was the criterion with the most predictors exhibiting significant or nearly significant variability across MOS. Job Satisfaction was the criterion with the fewest.

- Conscientiousness had statistically significant variability for its coefficients related to MOS Fit for all three time periods. Achievement Orientation had one significantly varying set and two nearly significant sets across the three time periods for its coefficients related to MOS-Specific JKT.

- All predictors but one (Openness) had at least one significantly varying set of coefficients.

These findings suggest that there could well be a reasonable amount of differential validity provided by these predictors for these criteria, with certain pairings being especially promising in this regard (e.g., Conscientiousness with MOS Fit). Predictors failing to show a significant fixed effect but demonstrating significant variability across MOS should be retained in hopes of obtaining differential validity and thus classification efficiency through their use.

Table 8.10. Summary of Significant Main (Prediction) and Random (Variability) Effects for the Differential Validity Analyses of Performance and Attitude Criteria

		Criteria							
		MOS Fit		Job Satisfaction		MOS-Specific JKT		Physical Fitness	
Predictors	Time	β	σ^2	β	σ^2	β	σ^2	β	σ^2
Achievement Orientation	EOT		•	na	na		•		
	IU1						x		
	IU2		x		x		•		
Agreeableness	EOT	x		na	na		x		
	IU1		x						
	IU2								
Army Affective Commit	EOT	x	•	na	na	x			•
	IU1	x		x			x		
	IU2					x		•	
Cognitive Aptitude	EOT			na	na	x			
	IU1	x		x		x			x
	IU2			x		x		x	
Conscientiousness	EOT		x	na	na				
	IU1	•	x				•		•
	IU2		x				x		
Fitness Orientation	EOT	•		na	na			x	
	IU1							x	
	IU2					•	x	x	x
Internal Locus of Control	EOT			na	na				
	IU1				x			x	x
	IU2								
Openness	EOT			na	na				
	IU1								•
	IU2								
Practical Intelligence	EOT			na	na	•	x		
	IU1		x				•	•	
	IU2		x						
Surgency	EOT			na	na				
	IU1		•				x		x
	IU2						x		

Note. β = main effect testing statistical significance of the predictor; σ^2 = random effect testing statistical significance of the variability of the predictor's coefficients across MOS; x = effect significant at $p < .05$; • = effect significant at $p < .10$; na = not applicable.

Results for Differential Validity on Attrition Across MOS

The second set of analyses investigated the degree to which the predictive relations of nine experimental predictors and one cognitive aptitude variable varied across MOS for predicting attrition through 48 months. The analyses involved a discrete time logistic regression model (Singer & Willett, 2003) estimated with the HLM software package (Raudenbush et al., 2005). This model provides an event history analysis for attrition, allowing attrition to occur at various points over time and to appropriately treat censored cases (i.e., individuals who drop out of the research for reasons other than the event of interest—here, attrition). Censored cases in the present analysis would include those individuals who left the enlisted ranks for reasons not coded as pejorative attrition (e.g., entry to Officer Candidate School, injury). Because we are also

considering the nested nature of these data (Soldiers nested within MOS) as we did in the previous analysis, the analysis reported here is a multilevel event history analysis (MLEHA).

The analyses involved fitting three primary models. The first fits a baseline hazard model to the data. This model contains no predictor variables—only dummy variables for each discrete time point evaluated in the analysis. The second model adds the nine experimental predictors, and the third model adds the measure of cognitive aptitude to the second model.

With regard to the interpretation of the results below, we stress that although the functional form of the underlying regression model differs from that of the previous analysis (i.e., a logistic function that allows appropriate statistical treatment of the dichotomous attrition variable), the parameters of interest remain the same: the fixed and random effects for the predictors in each model. Again, statistically significant fixed effects indicate that the predictor has a statistically reliable predictive relation with attrition, and statistically significant random effects indicate that the predictive relation of the predictor varies systematically across MOS.

Model 1: Baseline Hazard Model

The bedrock of any event history model is the *hazard function*. In a discrete time event history model with non-repeating events, the hazard function represents the probability of the event of interest (here, attrition) occurring during the time interval in question, conditional on that event having not occurred previously. Each dummy variable's regression coefficient was allowed to vary across MOS (the 23 MOS listed in Table 2). The results of this baseline hazard model are presented in Table 8.11. The resulting hazard function is plotted in Figure 8.1.

Table 8.11 shows the coefficients for each discrete time point used in this analysis. There are 17 time points in all, representing intervals of 3, 4, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, and 48 months. Also presented in the table are the odds ratio (the exponentiated value of the regression coefficient) and the probability represented by that odds ratio. Mathematically, we have the following:

$$Odds\ Ratio = e^{\beta}$$

and

$$p = \frac{e^{\beta}}{1 + e^{\beta}}$$

Plotting the probabilities yields the hazard function in Figure 8.1.

Table 8.11 and Figure 8.1 demonstrate the following:

- The hazard rate looks similar to what we would expect it to in light of previous research (e.g., McCloy & Putka, 2005b; Putka, 2005). The one discrepancy involves the 33-month time period. Here, the hazard rate is much higher than anticipated (we would typically expect the 3-month period to be highest in this analysis). Further investigation revealed

that this result is driven almost entirely by the high attrition rate at this time period in MOS 13D (Field Artillery Automated Tactical Data Systems Specialist).

Table 8.11. Baseline Hazard Model

	Fixed Effects					Random Effects		
Months	Coeff.	*SE*	*t*-ratio	*OR*	*P*	*SD*	VarComp	χ^2
3	-2.56	0.05	**-47.61**	0.08	.07	0.40	0.16	**108.45**
4	-3.48	0.04	**-83.71**	0.03	.03	0.32	0.10	21.26
6	-3.05	0.05	**-67.14**	0.05	.05	0.29	0.08	29.54
9	-3.37	0.05	**-64.55**	0.03	.03	0.23	0.05	24.41
12	-3.12	0.04	**-73.45**	0.04	.04	0.38	0.14	29.95
15	-3.10	0.04	**-72.01**	0.05	.04	0.36	0.13	26.09
18	-3.14	0.04	**-88.16**	0.04	.04	0.40	0.16	23.57
21	-3.38	0.05	**-73.89**	0.03	.03	0.35	0.12	27.29
24	-2.85	0.04	**-76.21**	0.06	.05	0.48	0.23	30.28
27	-3.60	0.04	**-91.51**	0.03	.03	0.35	0.13	21.53
30	-3.21	0.04	**-83.98**	0.04	.04	0.40	0.16	20.36
33	-2.21	0.03	**-75.18**	0.11	.10	0.75	0.56	**48.50**
36	-2.78	0.04	**-73.86**	0.06	.06	0.48	0.23	26.97
39	-3.55	0.04	**-80.77**	0.03	.03	0.29	0.09	18.14
42	-3.10	0.04	**-77.70**	0.05	.04	0.39	0.15	22.55
45	-3.31	0.04	**-74.63**	0.04	.04	0.41	0.17	23.21
48	-3.04	0.03	**-98.00**	0.05	.05	0.47	0.23	17.15

Note. *SE* = Standard Error. *OR* = Odds Ratio. VarComp = Variance Component. Coefficients in bold are statistically significant, $p < .05$.

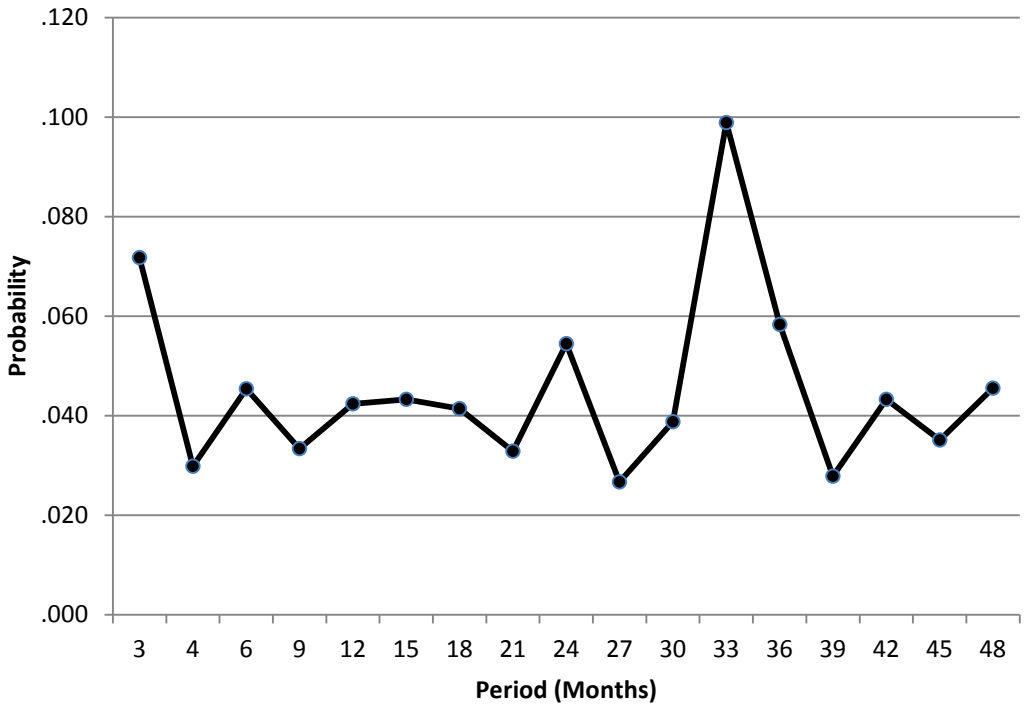

Figure 8.1. Baseline hazard function for the differential validity analysis of 48-month attrition.

- Only two time points evidence significant variability across the 23 MOS: the 3-month time period (as we might expect in terms of differential attrition rates in general across MOS) and the 33-month period just described. The rest of the hazard function, however, does not vary across MOS.

Due to the low amount of variability for the majority of time points across MOS, we entered the time dummies as fixed effects in all subsequent analyses (i.e., they were not allowed to vary across MOS).

Model 2: Experimental Predictors

The second model represents our first attempt to predict attrition. The predictor set of interest comprises the nine experimental predictors used in the first differential validity analysis. The measures are Internal Locus of Control, Army Affective Commitment, Achievement Orientation, Surgency, Agreeableness, Conscientiousness, Practical Intelligence, Openness, and Fitness Orientation. Results for this first predictive model appear in Table 8.12.

With regard to the fixed effects for the experimental predictors, two of them exhibit significant predictive relations with attrition: Army Affective Commitment and Fitness Orientation. Both are negative relations, indicating that Soldiers who have higher levels of affective commitment and physical fitness attrit at lower rates than do Soldiers who have lower standing on these variables.

With regard to the random effects, only Fitness Orientation exhibits statistically significant variability in its coefficients across the 23 MOS, with values ranging from -0.04 for MOS 13D to .01 for MOS 88M. The absolute value of the coefficients was < .03 for all but the following MOS, all of which showed negative relations with attrition (i.e., greater Fitness Orientation leads to lower attrition rates): 13D, 68W, 92F, and 92G. This differential validity could possibly aid classification decisions.

Model 3: Experimental Predictors and Cognitive Aptitude

The final model we examined added a measure of cognitive aptitude to the predictor set. The results for this model are presented in Table 8.13.

With regard to the fixed effects for the predictors in this second model, three exhibit significant predictive relations with attrition: Army Affective Commitment and Fitness Orientation (as in Model 2) and Cognitive Aptitude. Thus, the addition of Cognitive Aptitude did not greatly attenuate the predictive strength of the two experimental predictors exhibiting significant predictive relations in Model 2. Again, the experimental predictors relate negatively to attrition, indicating higher standing on Affective Commitment and Fitness Orientation relate to lower levels of attrition. Cognitive aptitude has a regression coefficient that is small in magnitude but nevertheless statistically significant. It is signed negatively, indicating that Soldiers scoring higher on cognitive aptitude attrit at a lower rate than do those who score lower.

Table 8.12. Results for an Attrition Model Containing Nine Experimental Predictors

	Fixed Effects					Random Effects		
Month/Predictor	Coeff	*SE*	*t*-ratio	*OR*	*p*	*SD*	VarComp	χ^2
3	**-2.70**	0.07	**-38.80**	0.07	.06			
4	**-3.72**	0.11	**-33.33**	0.02	.02			
6	**-3.12**	0.09	**-35.85**	0.04	.04			
9	**-3.49**	0.10	**-33.29**	0.03	.03			
12	**-3.57**	0.11	**-32.27**	0.03	.03			
15	**-3.50**	0.11	**-32.19**	0.03	.03			
18	**-3.54**	0.11	**-31.49**	0.03	.03			
21	**-3.77**	0.13	**-29.78**	0.02	.02			
24	**-3.51**	0.11	**-30.77**	0.03	.03			
27	**-3.89**	0.14	**-28.26**	0.02	.02			
30	**-3.66**	0.13	**-29.04**	0.03	.03			
33	**-3.87**	0.14	**-27.45**	0.02	.02			
36	**-3.48**	0.12	**-29.12**	0.03	.03			
39	**-3.81**	0.14	**-26.96**	0.02	.02			
42	**-3.67**	0.14	**-26.10**	0.03	.02			
45	**-3.72**	0.16	**-23.95**	0.02	.02			
48	**-3.92**	0.18	**-21.66**	0.02	.02			
Achievement Orientation	0.11	0.06	1.76	1.11	.53	0.07	0.00	17.14
Agreeableness	0.02	0.06	0.39	1.02	.51	0.02	0.00	19.21
Army Affective Commit	**-0.20**	0.05	**-3.64**	0.82	.45	0.11	0.01	23.53
Conscientiousness	-0.03	0.04	-0.91	0.97	.49	0.05	0.00	19.99
Fitness Orientation	**-0.30**	0.05	**-6.21**	0.74	.43	0.16	0.02	**44.64**
Internal Locus of Control	0.10	0.06	1.60	1.10	.52	0.10	0.01	19.04
Openness	0.00	0.06	-0.01	1.00	.50	0.13	0.02	18.72
Practical Intelligence	-0.06	0.06	-1.07	0.94	.48	0.08	0.01	20.53
Surgency	0.07	0.05	1.33	1.07	.52	0.01	0.00	17.53

Note. *SE* = Standard Error. *OR* = Odds Ratio. VarComp = Variance Component. Coefficients in bold are statistically significant, $p < .05$. Approximate degrees of freedom = 39,246 (time dummies) and 22 (predictors). All continuous predictors centered at their group mean.

With regard to the random effects, the results mirror those of Model 2: Only Fitness Orientation exhibits statistically significant variability in its coefficients across the 23 MOS, with values ranging from -0.04 for MOS 13D to .01 for MOS 88M. The absolute value of the coefficients was < .03 for all but the following MOS, all of which showed negative relations with attrition (i.e., greater Fitness Orientation leads to lower attrition rates): 13D, 35N, 68W, 92F, and 92G.

Conclusions

Consistent with Chapter 7, The MLEHA models identified three primary predictors of attrition: Army Affective Commitment, Fitness Orientation, and Cognitive Aptitude. Of these, Fitness Orientation is the one that exhibited a reasonable amount of variability in its predictive power across MOS and thus seems like a candidate for classification purposes.

An important caveat regarding this set of attrition analyses regards the exclusion of Education Tier from the models. This was done purposely, given our construct-oriented focus in this report. Nevertheless, given that education status has been the strongest predictor of military attrition for decades, we placed some additional models containing this predictor in Appendix C for reference purposes.

Table 8.13. Results for an Attrition Model Containing Nine Experimental Predictors and Cognitive Aptitude

	Fixed Effects					Random Effects		
Month/Predictor	Coeff	*SE*	*t*-ratio	*OR*	*p*	*SD*	VarComp	χ^2
3	**-2.69**	0.07	**-39.81**	0.07	.06			
4	**-3.69**	0.11	**-34.72**	0.02	.02			
6	**-3.10**	0.08	**-37.00**	0.04	.04			
9	**-3.47**	0.10	**-34.55**	0.03	.03			
12	**-3.55**	0.11	**-33.54**	0.03	.03			
15	**-3.49**	0.10	**-33.34**	0.03	.03			
18	**-3.51**	0.11	**-32.70**	0.03	.03			
21	**-3.74**	0.12	**-31.03**	0.02	.02			
24	**-3.49**	0.11	**-31.93**	0.03	.03			
27	**-3.88**	0.13	**-29.38**	0.02	.02			
30	**-3.63**	0.12	**-30.22**	0.03	.03			
33	**-3.86**	0.14	**-28.54**	0.02	.02			
36	**-3.49**	0.12	**-30.07**	0.03	.03			
39	**-3.78**	0.13	**-28.12**	0.02	.02			
42	**-3.64**	0.13	**-27.17**	0.03	.03			
45	**-3.69**	0.15	**-24.94**	0.03	.02			
48	**-3.88**	0.17	**-22.61**	0.02	.02			
Achievement Orientation	0.10	0.06	1.71	1.11	.53	0.08	0.01	17.81
Agreeableness	0.01	0.07	0.11	1.01	.50	0.16	0.03	22.95
Army Affective Commit	**-0.20**	0.05	**-3.83**	0.82	.45	0.11	0.01	23.80
Cognitive Aptitude	**-0.00**	0.00	**-2.28**	1.00	.50	0.01	0.00	27.28
Conscientiousness	-0.06	0.04	-1.64	0.94	.49	0.04	0.00	15.95
Fitness Orientation	**-0.31**	0.05	**-6.29**	0.74	.42	0.16	0.03	**45.93**
Internal Locus of Control	***0.12***	0.06	***1.96***	1.13	.53	0.11	0.01	19.75
Openness	0.02	0.06	0.31	1.02	.50	0.14	0.02	17.78
Practical Intelligence	-0.03	0.06	-0.59	0.97	.49	0.10	0.01	22.24
Surgency	0.06	0.05	1.16	1.06	.52	0.09	0.01	19.32

Note. *SE* = Standard Error. *OR* = Odds Ratio. VarComp = Variance Component. Coefficients in bold are statistically significant, $p < .05$. Approximate degrees of freedom = 39,118 (time dummies) and 22 (predictors). All continuous predictors centered at their group mean.

Considered together, these differential validity analyses identified some experimental predictors that hold some promise for consideration in future classification work. With regard to the performance and attitudinal criteria in the first set of analyses, Conscientiousness (for MOS Fit) and Achievement Orientation (for MOS-Specific JKT) seem to hold some classification potential. With regard to attrition, Fitness Orientation is the variable that yielded differential relations across MOS and thus provides the greatest hope for classification gains through its use.

CHAPTER 9: A LOOK BACK AND THE WAY FORWARD

Matthew T. Allen (HumRRO)

Overview

The purpose of this chapter is to (a) summarize the analyses and results presented in previous chapters, (b) discuss the implications of these results, and (c) describe some limitations and potential directions for future research. We begin with a brief summary of the research objectives.

Research Objectives

As described in Chapter 1, most of the previous reports in the Army Class program of research examined the predictive efficacy and classification potential of individual Army Class instruments (see Knapp & Heffner, 2009; Knapp et al., 2012). The emphasis on instruments was driven by the need to identify measures for use in an Initial Operational Test and Evaluation (IOT&E). While these analyses served the purpose of identifying "best bet" instruments for operational testing (see Knapp & Heffner, 2010; Knapp et al., 2011), it left a number of more fundamental research questions about the prediction of Soldier performance, attitudes, and continuance unanswered. To build on the work conducted in these earlier reports, we took a construct-oriented, rather than instrument-oriented, approach to examining the relationship between individual differences and key Soldier outcomes. The emphasis on constructs rather than instruments reduces redundancy in the predictor set; giving us more degrees of freedom to conduct analyses that otherwise would be prohibitive if all of the scales for each predictor and criterion instrument were examined independently. It also reduces potentially confounding method effects in our analyses.

The specific objectives of this research were as follows:

1. Model the latent structure of the predictor and criterion space to better emphasize the constructs underlying the Army Class instruments rather than the measurement methods.
2. Examine Soldier performance, attitudes, and continuance over time.
3. Examine the individual differences that best predict Soldier performance, attitudes, and continuance over time.
4. Examine mediators and moderators of this predictive evidence, with particular emphasis on the mediating role of Soldier attitudes and the moderating role of MOS.

We accomplished these objectives by analyzing data collected during the Army Class CV and LV efforts (with particular emphasis on the LV effort) using innovative statistical approaches. The use of these new approaches is driven both by the desire to shed new light on the phenomena being examined and by vagaries in collecting data in an applied setting (e.g., accounting for missing data). More details about the design of the Army Class CV and LV studies and the instruments used in our analysis are reported in Chapter 2.

Summary of Results

Latent Structure of Predictor and Criterion Space

Examining the latent structure of the predictor and criterion space was a necessary first step in executing the other research objectives set forth above. We accomplished this objective in Chapter 3 (predictor space) and Chapter 4 (criterion space). While similar methods were used for each chapter (i.e., a linkage task combined with Confirmatory Factor Analysis [CFA]), the specific approach used in each chapter differed in key ways. For example, we modeled the predictor space at the scale level in Chapter 3, but the criterion space at the item level in Chapter 4. Differences in the development of the instruments that contributed to the two domains drove the methodological approaches used in the two chapters. On one hand, the predictors were not developed with any overarching theoretical framework in mind. For this reason, the authors in Chapter 3 began their analysis by examining integrative individual difference frameworks (e.g., the Five Factor Model, O*NET), and categorizing the scales according to those frameworks. CFA was used to resolve ambiguities in the placement of various scales into each category. On the other hand, the criterion measures were developed with previous military criterion taxonomies in mind (e.g., J. P. Campbell, Hanson, & Oppler, 2001), which were precursors of the J. P. Campbell (2012) taxonomy described in depth in Chapter 4. For this reason, the authors in Chapter 4 relied much more heavily on the linkage task to confirm the factor structure, using CFA to examine the appropriate level of specificity in the model.

From the analyses conducted in Chapters 3 and 4, we can conclude the following:

1. *Method effects had a strong influence on both the predictor and criterion CFA models.* For many of the models in Chapters 3 and 4, method factors were modeled explicitly in order to obtain acceptable fit indices. In some cases, such as the overall Army Class CV model in Chapter 3 and the peer versus supervisory rating model in Chapter 4, the models never achieved acceptable levels of fit. Method effects were particularly strong for the Performance Rating Scales (PRS), the Job Knowledge Tests (JKTs), and the predictor measures with the highest levels of ipsativity (e.g., the WVI and WSI).

2. *Despite strong method effects, the predictors could be classified reliably into eight factors.* These eight factors were Achievement Orientation, Affect Management, Agreeableness, Conscientiousness, Practical Intelligence, Openness, Fitness Orientation, and Surgency. Other scales (Internal Locus of Control, Army Affective Commitment) were treated separately in subsequent analyses.

3. *In general, confirmatory analyses supported a more granular criterion factor structure than the original higher-order factor structure proposed.* In Chapter 4, higher-order factors (e.g., overall fit) were often evaluated against lower order factors (e.g., Army and MOS-specific fit). In nearly every case, confirmatory analyses supported the lower-order factor structure, suggesting that there are a number of meaningful differences among the criteria administered, despite high intercorrelations observed in previous Army Class reports (Knapp et al., 2012).

Soldier Outcomes Over Time

As described in Chapter 2, criterion data in the Army Class LV effort were collected at three points in time: (a) near the end of their MOS-specific technical training, or End of Training (EOT); (b) 12 to 24 months after accessing, when they are in their first unit of assignment (In-Unit 1 [IU1]); and (c) approximately 36 months after accessing into the Army (In-Unit 2 [IU2]). We also extracted attrition information from Soldiers' administrative records every three months after the start of the data collections. These data collection efforts allowed us to examine Soldier attitudes (Chapter 5), performance (Chapter 6), and attrition (Chapter 7) over time. Modeling these outcomes longitudinally is critical to better understanding their dynamic nature, which translates into a higher probability that we will be able to predict these outcomes at key points in a Soldier's first term. It also introduces the possibility of examining whether the latent factors can predict *change* in these outcomes over time. This is a critical extension of previous research because the best predictors of change in key outcomes are not always the same as the best predictors at a particular point in time, as illustrated in a recent examination of change in Army officer attitudes over time (Bynum & Ardison, 2012).

From the analyses conducted in Chapters 5, 6, and 7 modeling Soldier outcomes throughout their first term of service, we can conclude the following:

1. *Soldier attitudes and continuance intentions tended to decrease through their first term of service, but generally stayed above the mid-point of the scale*. The exception to this was Short-Term Continuance Cognitions, which did fall below the mid-point of the scale from EOT to IU1.

2. *Soldier performance was generally stable over their first term; however, Physical Fitness did increase significantly from EOT to IU1*.

3. *Attrition over Soldiers' first term of service can be modeled by three latent classes representing "early leavers," "late leavers," and "stayers."* Soldiers separating for reasons related to medical standards tended to be early leavers, while Soldiers separating for character, performance, and other reasons tended to be late leavers. Consistent with previous research (e.g., Strickland, 2005), rates of attrition were highest in the early months before leveling off after about one year.

Predicting Soldier Outcomes

The present effort extends previous criterion-related validity analyses in the Army Class program of research in a few key ways. First, by reducing the number of predictors, we were able to examine the individual differences that best predicted Soldier outcomes *relative* to the other predictors included in the model. Second, in previous analyses, criterion-related validity was examined *incrementally* over the AFQT. In the present effort, we examined AFQT as one among many predictors in our model, putting it on equal footing with the non-cognitive factors (Hough, 2011). Third, as mentioned above, modeling the criteria over time allowed us to examine whether the latent individual difference factors could predict *change* in outcomes over time in addition to static levels of these outcomes. Finally, we examined the criterion-related validity of

these predictor factors with a new outcome not examined in previous Army Class reports—Soldier re-enlistment.

Based on the analyses conducted in Chapters 5 through 8, we conclude the following:

1. *The latent predictor factors were strongly related to attitudinal and continuance intentions outcomes at multiple points in time*. The relationship was strongest at EOT, and decreased at IU1 and IU2. The strongest predictors of Soldier attitudes at EOT were the Army Affective Commitment and Affect Management factors. However, at IU1 and IU2, the strongest predictors were related to more capability-oriented constructs, such as Internal Locus of Control, Cognitive Aptitude, and Practical Intelligence.

2. *Multiple latent factors predicted change in attitudes over Soldiers' first term of service*. Army Affective Commitment and Surgency were associated with more negative Soldier attitudes over time, while Achievement Orientation and Agreeableness were associated with more positive Soldier attitudes over time. The negative relationship between Army Affective Commitment and change in Soldier attitudes suggests that individuals starting with high expectations are more likely to be let down if their expectations are not met.

3. *Prediction of Soldier performance and attrition was dominated by two factors: Cognitive Aptitude and Fitness Orientation*. In addition to those two factors, Affect Management, Army Affective Commitment, and Internal Locus of Control also predicted key outcomes. Agreeableness was also associated with a positive change in Soldier Effort over their first term of service. Overall however, many outcomes, such as Soldier Effort, Peer Support, and Counterproductive Work Behaviors, were not well predicted by the individual difference factors.

4. *Soldier re-enlistment after the first term of service was predicted by Cognitive Aptitude, Internal Locus of Control, and Conscientiousness*. Higher Cognitive Aptitude was associated with a lower propensity to re-enlist, consistent with previous research (Strickland, 2005). Internal Locus of Control and Conscientiousness were both associated with a higher propensity to re-enlist.

Mediators and Moderators

The true impact of the latent predictors examined in this effort may be underestimated by the presence of key mediators and moderators in the predictor/criterion relationship. Understanding these mediators and moderators also helps to explain variance in the criteria of interest, which can lead to more precision in predicting key outcomes. Additionally, as described in Chapter 8, failure to account for nested structure and non-independence in our data may lead to biased criterion-related validity estimates (Raudenbush & Bryk, 2002).

From the analyses conducted in Chapters 5 through 8, we can conclude the following:

1. *The relationship between the latent predictor factors and key outcomes (i.e., performance and attrition) are either partially or fully mediated by Soldier attitudes and continuance*

intentions. As noted above, the latent factors, particularly the non-cognitive latent factors, tend to predict Soldier attitudes and continuance intentions better than performance and attrition outcomes. There is a tendency to disregard these findings as unimportant to the real outcomes of interest. The results reported in Chapters 6 and 7 suggest that these attitudes at certain points in time may be reasonable proxies for the performance and continuance outcomes of ultimate interest.

2. *Multiple latent factors exhibited significant variability in predictive efficacy across MOS throughout a Soldier's first term*. Many of the predictors exhibiting this variability in Chapter 8 were found to be unrelated to key outcomes in earlier Chapters, suggesting that these factors may have high classification potential. For example, Conscientiousness was weakly related to MOS Fit in Chapter 5, but was found to be positively predictive of self-reported fit in some MOS, and negatively predictive in others in Chapter 8. Factors such as these could potentially be used for classification purposes, perhaps as part of a line score for a job series.

Implications

We believe the analyses presented here represent a significant extension of previous Army research regarding enlisted Soldier performance and attrition. First, the present effort demonstrates which individual difference constructs hold the most promise for improving Soldier selection and classification. This construct-oriented approach could inform future predictor measure development activities. For example, our research found that the RBI scale Internal Locus of Control was a significant predictor of multiple outcomes of interest. This construct was not measured as part of the two instruments that are currently being tested in an IOT&E (i.e., the WPA and TAPAS; Knapp et al., 2011), but could potentially be developed as part of one or both of those measures for subsequent evaluations. Second, the analyses presented here use a number of innovative statistical approaches to address problems that commonly occur when doing applied research (e.g., missing data). These methods could be used in future ARI research and can also be applied to previously-completed projects to shed new light on the data and answer new questions. Third, the results presented here answer basic research questions about the nature of Soldier attitudes, performance, and continuance. For example, the present analyses examine how Soldier attitudes change over time, predictors of those attitudes, and the effect those attitudes have on key outcomes. While these questions have been addressed in other studies, we believe the results presented here are among the most comprehensive and integrative ever conducted on these topics in an Army sample.

In spite of all that is presented above, the results reported here only scratch the surface of the full complexity of the Army Class data. There is ample opportunity for researchers to use the Army Class CV and LV datasets to answer additional questions.

Limitations and Directions for Future Research

Previous reports have outlined the limitations and potential confounding factors in the Army Class LV methodology (Allen, Knapp, & Owens, 2012). These include (a) history and maturation effects, (b) sample size issues, (c) unreliability in the Performance Rating Scales (PRS), and (d) generalizability of the results to an operational setting. Because these issues have been described in detail in previous reports, we will focus our discussion on the limitations and potential extensions of the analyses conducted as part of the current effort.

First, while every attempt was made to leverage the full complexity of the Army Class CV and LV datasets, in the end we only used data from three instruments—the RBI, WPA, and AKA—in our predictive analysis. A number of other instruments were also administered as predictors, such as the PSJT, WVI, WSI, TAPAS, and AIM. However, as described in Chapter 3, these instruments were excluded from further analysis due to missing data and problems with the generation of factor scores using Full Information Maximum Likelihood (FIML). While limiting our analyses to the three measures allowed us to maximize the power of our analyses, we may have lost key pieces of information by excluding the other instruments. There are two ways in which future research can build on these analyses: (a) by exploring alternative ways to compute factor scores using missing data estimation that results in better estimates than the ones constructed in Chapter 3, and (b) by exploring alternative frameworks for modeling the predictor space. To the latter point, the predictor space could be modeled in a number of alternative ways, using other integrative individual difference frameworks as a guide. For example, personality and person-environment fit instruments could be modeled separately rather than in the same framework. Future research should explore alternative conceptualizations of the predictor space and their effects on predicting key outcomes of interest.

Second, in modeling key Soldier outcomes such as attrition, we examined multiple predictors, mediators, and one moderator. However, extant literature on similar topics, such as turnover (most similar to re-enlistment; Hom & Griffeth, 1995), demonstrates the complexity in the nomological networks for explaining these outcomes. Furthermore, other factors, such as deployments (Ingerick, Allen, Weaver, Caramagno, & Hooper, 2008), may also explain variance in these outcomes. Future research can expand on these analyses by examining additional mediator and moderator variables, and examining the interrelationships among them in a more comprehensive manner.

Finally, while the analyses used in the present report helped answer key research questions described above, their complexity tended to skew the generalizability of the results away from practical application. For example, the differential validity results reported in Chapter 8 illustrated the constructs with promising classification potential, but did not address practical constraints in the Army's classification system, such as applicant flow, differences in MOS density, and current force requirements. Future research should use more application focused statistical methods developed as part of previous research (e.g., Allen, Cheng, Putka, Hunter, & White, 2010; Trippe et al., 2012) and apply them to latent constructs, such as those developed as part of the present effort.

Conclusion

The U.S. Army's personnel selection and classification system must quickly and accurately identify the best candidates out of an eligible population of applicants, and classify them into an MOS that will best maximize their performance. To accomplish this for a large volume of applicants, standardized assessments that measure a broad range of individual differences must be deployed to get a complete picture of an individual's cognitive ability, temperament, skills, and interests. To determine what specific individual differences these standardized assessments should measure, it is critical to first gain a solid understanding of the nature of Soldier performance and continuance, and the factors that drive them. In the present effort, we sought to contribute to the extant body of knowledge on this topic, using data collected over a 7-year period as part of Army Class. We believe the methods and findings in the present effort represent a significant contribution to this literature, and an important step in developing assessments that best meet the Army's personnel selection and assessment needs.

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APPENDIX A: DESCRIPTIONS OF PREDICTOR MEASURES

Table A.1. Description of AIM Dimensions

Scale	Description
Work Orientation	Measures the tendency to strive for excellence in the completion of work-related tasks. Persons high on this construct seek challenging work activities and set high standards for themselves. They consistently work hard to meet these high standards.
Adjustment	Measures the tendency to have a uniformly positive affect. Persons high on this construct maintain a positive outlook on life, are free of excessive fears and worries, and have a feeling of self-control. They maintain their positive affect and self-control even faced with stressful situations.
Agreeableness	Measures the tendency to interact with others in a pleasant manner. Persons high on this construct get along and work well with others. They show kindness, while avoiding arguments and negative emotional outbursts directed at others.
Dependability	Measures the tendency to respect and obey rules, regulations, and authority figures. Persons high on this construct are more likely to stay out of trouble in the workplace and avoid getting into difficulties with law enforcement officials.
Leadership	Measures the tendency to seek out and enjoy being in leadership positions. Persons high on this scale are confident of their abilities and gravitate towards leadership roles in groups. They feel comfortable directing the activities of other people and are looked to for direction when group decisions have to be made.
Physical Conditioning	Measures the tendency to seek out and participate in physically demanding activities. Persons high on this construct routinely participate in vigorous sports of exercise, and enjoy hard physical work.

Table A.2. Description of TAPAS-95s Facets

Facet	Description	Big Five Domain
Achievement	Individuals scoring high might be described as hard working, ambitious, confident, or resourceful.	Conscientiousness
Curiosity	Individuals scoring high might be characterized as inquisitive and perceptive; they read popular science/mechanics magazines and are interested in experimenting.	Openness to Experience
Non-Delinquency	Persons scoring high on this facet tend to comply with current rules, customs, norms, and expectations; they dislike change and do not challenge authority.	Conscientiousness
Dominance	High scoring individuals are domineering, take charge, and are often referred to by their peers as "natural leaders."	Extraversion
Even-Temper	Persons scoring low tend to experience a range of negative emotions including irritability, anger, hostility, and even aggression. On the other hand, persons scoring high tend to be calm, level headed, and stable.	Emotional Stability
Attention-Seeking	Individuals scoring high are constantly in search of social stimulation; they are loud, loquacious, entertaining, and even boastful.	Extraversion
Intellectual Efficiency	High scoring individuals seem to process information quickly and might be referred to by others as quick thinking, knowledgeable, astute, or intellectual.	Openness to Experience
Order	Order refers here to the ability to plan and organize tasks and activities. Persons scoring low might be referred to as disorganized, unstructured, or sloppy.	Conscientiousness
Physical Conditioning	High scoring individuals routinely participate in vigorous sports or exercise and enjoy hard physical work. On the other hand, persons scoring low are less active, and, in the extreme, might be referred to as “couch potatoes.”	Non-Big Five
Tolerance	Individuals scoring high generally enjoy cultural events and meeting and befriending people with different views. They also tend to adapt more easily to novel situations than persons scoring low.	Openness to Experience
Cooperation/Trust	High scoring individuals are trusting, cordial, cooperative, uncritical, and easy to live with, whereas those scoring low may be described as difficult, suspicious, or uncooperative.	Agreeableness
Optimism	Persons scoring high have a general emotional tone reflecting joy or happiness, whereas those scoring low have an emotional tone suggesting sadness or despair.	Emotional Stability

Table A.3. Description of RBI Scales

Scale	Description
Peer Leadership	Individuals scoring high generally seek positions of authority and influence, are comfortable with being in charge of a group, and willing to make tough decisions and accept responsibility for the group's performance.
Cognitive Flexibility	Individuals scoring high are willing to entertain new approaches to solving problems, enjoy creating new plans and ideas, and initiate and accept change and innovation.
Achievement Orientation	Individuals scoring high are willing to give one's best effort and to work hard towards achieving difficulty objectives.
Fitness Motivation	Measures degree of enjoyment from participating in physical exercise. Individuals scoring high are willing to put in the time and effort to maintain good physical conditioning.
Interpersonal Skills – Diplomacy	Individuals scoring high are extroverted and outgoing, able to make friends easily and establish rapport with strangers, and good at meeting/greeting people.
Stress Tolerance	Measures the ability to maintain one's composure under pressure. Individuals scoring high remains calm and in control of his/her emotions instead of feeling anxious and worried.
Hostility to Authority	Individuals scoring high are suspicious of the motives and actions of legitimate authority figures, and they view rules, regulations, and directives from higher authority as punitive and illegitimate.
Self-Esteem	Individuals scoring high generally have the feeling that he/she has successfully overcome work obstacles in the past and that will continue to do so in the future.
Cultural Tolerance	Individuals scoring high are willing to work with people of different cultures, and they are able to establish supportive work relationships with people with a variety of racial and ethnic backgrounds.
Internal Locus of Control	Measure the belief that one can exert influence over important events in order to control one's destiny.
Army Identification	Measures the degree of personal identification with, and intrinsic interest in becoming, a U.S. Army Soldier.
Respect for Authority	Individuals scoring high generally perceive authority figures as having a positive influence on his/her knowledge and skill development.
Narcissism	Individuals scoring high are excessively preoccupied with satisfying one's own needs and desires.
Gratitude	Individual scoring high are appreciative of the help that one has received from others.
Lie Scale	This scale is not a predictor scale. Its purpose is to detect and adjust for socially desirable responding.

Table A.4. Description of WSI Dimensions

Scale	Description
Achievement/Effort	Work that requires setting challenging goals and working continuously to attain them.
Adaptability/Flexibility	Work that requires being open to change (positive or negative) and a lot of variety.
Attention to Detail	Work that requires being thorough and paying close attention to details.
Concern for Others	Work that requires being sensitive to others' needs and feelings and being understanding.
Cooperation	Work that requires showing a cooperative and friendly attitude towards others one dislikes or disagrees with.
Dependability	Work that requires consistently meting obligations and completing duties on time.
Energy	Work that requires high levels of energy and stamina to perform successfully.
Independence	Work that requires accomplishing tasks alone, with little supervision or help from others.
Initiative	Work that requires taking on new or additional responsibilities that may fall outside of one's job duties.
Innovation	Work that requires much creativity and original thinking to perform successfully.
Leadership Orientation	Work that requires leading, taking charge, and giving direction.
Persistence	Work that requires performing tasks that take a long time to "get right" and overcoming several obstacles along the way.
Self-Control	Work that requires maintaining composure and keeping emotions and behavior in check even in very difficult circumstances.
Stress Tolerance	Work that requires dealing effectively with high-stress situations and accepting frequent criticism.
Cultural Tolerance	Work that requires interacting with people of different cultures and backgrounds, and appreciating differences in their values, opinions, and beliefs.

Table A.5. Description of WPA Dimensions and Facets

Dimension/Facet	Description
Realistic	Measures the importance individuals place on performing physically- or mechanically-oriented activities in their ideal job (e.g., working with tools).
Mechanical	Measures the importance individuals place on performing or pursuing mechanical-oriented activities in their ideal job (e.g., working with tools, machines, or equipment).
Physical	Measures the importance individuals place on performing or pursuing physical activities in their ideal job (e.g., using one's physical strength).
Investigative	Measures the importance individuals place on performing cognitively complex or demanding activities in their ideal job (e.g., solving problems).
Critical Thinking	Measures the importance individuals place on performing or engaging in activities that require critical thinking in their ideal job (e.g., solving problems).
Conduct Research	Measures the importance individuals place on performing or pursuing research-related activities in their ideal job (e.g., conducting scientific experiments).
Artistic	Measures the importance individuals place on engaging in creative or artistic-related activities in their ideal job (e.g., photography, drawing).
Artistic Activities	Measures the importance individuals place on performing or pursuing artistic-related activities in their ideal job (e.g., photography or graphic arts).
Creativity	Measures the importance individuals place on performing or engaging in activities that require creativity in their ideal job (e.g., coming up with creative ideas).
Social	Measures the importance individuals place on working with or for others in their ideal job (e.g., working in a team).
Work with Others	Measures the importance individuals place on performing or engaging in activities that require working with others in their ideal job (e.g., working in a team).
Help Others	Measures the importance individuals place on performing or engaging in activities that require helping others in their ideal job (e.g., teaching or counseling others).
Enterprising	Measures the importance individuals place on leading others or performing activities high in visibility and responsibility in their job (e.g., leading a team).
Prestige	Measures the importance individuals place on performing or pursuing opportunities that are prestige or status enhancing in their ideal job (e.g., jobs that emphasize personal success).
Lead Others	Measures the importance individuals place on performing or engaging in activities that require leading others in their ideal job (e.g., leading a large group of people).
High Profile	Measures the importance individuals place on performing or pursuing high profile or highly visible activities in their ideal job (e.g., working in a high profile organization).
Conventional	Measures the importance individuals place on performing activities that require a high attention to detail or following a highly structured set of processes and procedures (e.g., working with numbers, editing or proofreading text).
Information Management	Measures the importance individuals place on performing or engaging in activities that require managing information or data in their ideal job (e.g., working with numbers).
Detail Orientation	Measures the importance individuals place on performing or engaging in activities that require one to be detail oriented in their ideal job (e.g., double-checking one's work).
Clear Procedures	Measures the importance individuals place on performing or pursuing highly structured or organized activities in their ideal job (e.g., jobs with clear rules and procedures).

Table A.6. Description of AKA Scales

Scale	Description
Realistic	Measures the Solder's perception that the Army supports or affords opportunities to perform physically- or mechanically-oriented work activities (e.g., working with tools).
Investigative	Measures the Solder's perception that the Army supports or affords opportunities to perform cognitively complex or demanding work activities (e.g., solving problems).
Artistic	Measures the Solder's perception that the Army supports or affords opportunities to perform creative or artistic-related work activities (e.g., photography, drawing).
Social	Measures the Solder's perception that the Army supports or affords opportunities to work with or for others in their job (e.g., working in a team).
Enterprising	Measures the Solder's perception that the Army supports or affords opportunities to lead others or perform work activities high in visibility and responsibility (e.g., leading a team).
Conventional	Measures the Solder's perception that the Army supports or affords opportunities to perform work activities that require a high attention to detail or following a highly structured set of processes and procedures (e.g., working with numbers, editing or proofreading text).

Table A.7. Description of WVI Scales

Scale	Description
Ability Utilization	Measures an individual's preference for work that enables him or her to make use of their abilities.
Achievement	Measures an individual's preference for work that enables him or her to experience a sense of accomplishment.
Activity	Measures an individual's preference for work that involves a high level of activity.
Advancement	Measures an individual's preference for work that affords opportunities for advancement.
Autonomy	Measures an individual's preference for work that involves minimal or limited supervision.
Comfort	Measures an individual's preference for working in a comfortable and relaxed environment.
Co-Workers	Measures an individual's preference for work that affords opportunities to regularly interact with co-workers.
Creativity	Measures an individual's preference for work that involves being creative.
Emotional Development	Measures an individual's preference for work that enables him or her to gain personal discipline and maturity.
Esteem	Measures an individual's preference for work that enables him or her to feel valued by their organization.
Feedback	Measures an individual's preference for work that affords him or her opportunities for feedback on their performance.
Fixed Role	Measures an individual's preference for work that involves clear-cut roles and responsibilities.
Flexible Schedule	Measures an individual's preference for work that permits a flexible work schedule.
Home	Measures an individual's preference for work that does not require him or her to move or re-locate frequently.
Independence	Measures an individual's preference for working alone.
Influence	Measures an individual's preference for work that enables him or her to have an influence on others.
Leadership Opportunities	Measures an individual's preference for work that affords opportunities to lead others.
Leisure Time	Measures an individual's preference for work that permits him or her to pursue their non-work interests after hours.
Personal Development	Measures an individual's preference for work that involves learning new skills.
Physical Development	Measures an individual's preference for work that affords opportunities to improve his or her fitness.
Recognition	Measures an individual's preference for work that enables him or her to receive recognition for what they do.
Social Service	Measures an individual's preference for work that involves helping others.
Social Status	Measures an individual's preference for performing work that most people admire and respect.
Societal Contribution	Measures an individual's preference for performing work that makes a valuable contribution to society.
Supportive Supervision	Measures an individual's preference for working under supervisors who provide a lot of support and guidance.
Team Orientation	Measures an individual's preference for working closely with others.
Travel	Measures an individual's preference for work involving frequent or regular travel.
Variety	Measures an individual's preference for work involving having something different to do every day.

APPENDIX B: CORRELATIONS OF ATTRITION WITH PREDICTORS AND SELF-REPORT CRITERIA

Table B.1. Point-Biserial Correlations between Latent Predictor Factors and 3-48 Month Attrition

	n	3 Months	6 Months	9 Months	12 Months	18 Months	24 Months	30 Months	36 Months	42 Months	48 Months
Achievement Orientation	2,875 – 3,816	**-.06**	**-.08**	**-.09**	**-.09**	**-.07**	**-.06**	**-.06**	**-.04**	**-.04**	**-.06**
Affect Management	1,426 – 1,568	**-.06**	**-.10**	**-.09**	**-.09**	**-.08**	**-.08**	**-.07**	**-.06**	**-.06**	**-.06**
Agreeableness	2,796 – 3,712	**-.04**	**-.05**	**-.06**	**-.05**	**-.03**	-.02	-.02	-.02	-.01	-.01
Army Affective Commitment	3,058 – 4,056	**-.11**	**-.11**	**-.13**	**-.13**	**-.10**	**-.10**	**-.09**	**-.08**	**-.07**	**-.09**
Cognitive Aptitude	3,944 – 5,116	**-.03**	**-.04**	**-.05**	**-.04**	**-.05**	**-.05**	**-.06**	**-.07**	**-.08**	**-.08**
Conscientiousness	3,629 – 4,712	**-.05**	**-.06**	**-.06**	**-.04**	**-.04**	**-.04**	**-.04**	**-.04**	**-.03**	**-.04**
Internal Locus of Control	3,058 – 4,056	**-.06**	**-.06**	**-.07**	**-.06**	**-.05**	**-.05**	**-.04**	-.03	**-.03**	**-.03**
Openness	2,875 – 3,816	-.02	**-.04**	**-.04**	**-.04**	**-.03**	-.03	-.02	-.02	-.02	**-.03**
Physical Fitness	3,058 – 4,056	**-.07**	**-.12**	**-.13**	**-.13**	**-.12**	**-.12**	**-.12**	**-.10**	**-.10**	**-.13**
Practical Intelligence	3,494 – 4,535	**-.03**	**-.05**	**-.05**	**-.05**	**-.04**	**-.04**	**-.04**	**-.03**	**-.03**	-.03
Surgency	2,874 – 3,815	-.01	-.03	-.03	-.03	-.03	-.02	-.02	-.02	**-.02**	**-.03**

Note. Attrition variables are cumulative. Correlations in bold are statistically significant, $p < .05$.

Table B.2. Point-Biserial Correlations between End of Training Criteria and 6-48 Month Attrition

	n	6 Months	9 Months	12 Months	18 Months	24 Months	30 Months	36 Months	42 Months	48 Months
Adjustment to Army Life	897 – 1,285	**.07**	**.12**	**.16**	**.13**	**.12**	**.11**	**.11**	**.12**	**.14**
Army Fit	737 – 1,095	**-.11**	**-.13**	**-.16**	**-.10**	**-.07**	-.05	-.04	-.04	**-.07**
Attrition Cognitions	873 – 1,255	**.20**	**.24**	**.26**	**.18**	**.15**	**.12**	**.10**	**.10**	**.12**
Counterproductive Work Beh.	896 – 1,285	**.05**	**.05**	**.09**	**.05**	**.07**	**.07**	**.12**	**.12**	**.14**
Feelings about Joining Army	885 – 1,272	**.10**	**.14**	**.16**	**.14**	**.12**	**.10**	**.09**	**.09**	**.11**
Fitness	869 – 1,251	-.03	**-.09**	**-.12**	**-.12**	**-.10**	**-.07**	**-.06**	**-.05**	**-.10**
Long-Term Continuance	873 – 1,253	**-.07**	**-.06**	**-.09**	**-.05**	-.03	.00	.01	.01	.00
MOS Fit	870 – 1,251	**-.06**	**-.08**	**-.10**	**-.09**	**-.08**	**-.08**	**-.05**	**-.05**	**-.06**
Short-Term Continuance	872 – 1,253	**-.06**	**-.05**	**-.06**	-.04	-.03	-.01	.00	.00	-.02

Note. Attrition variables are cumulative. Correlations in bold are statistically significant, $p < .05$.

Table B.3. Point-Biserial Correlations between In-Unit 1 Criteria and 18-48 Month Attrition

	n	18 Months	24 Months	30 Months	33 Months	36 Months	39 Months	42 Months	45 Months	48 Months
Army Fit	684 – 972	.00	-.05	**-.13**	**-.15**	**-.18**	**-.17**	**-.21**	**-.21**	**-.22**
Attrition Cognitions	702 – 996	**.12**	**.18**	**.28**	**.30**	**.32**	**.32**	**.34**	**.33**	**.34**
Counterproductive Work Beh.	704 – 999	.03	**.11**	**.16**	**.19**	**.22**	**.23**	**.24**	**.27**	**.29**
Fitness	640 – 911	**-.13**	-.02	-.03	**-.08**	**-.09**	**-.10**	**-.10**	**-.11**	**-.13**
Job Satisfaction	690 – 981	.00	**-.05**	**-.10**	**-.10**	**-.11**	**-.09**	**-.11**	**-.12**	**-.13**
Long-Term Continuance	698 – 991	-.03	**-.10**	**-.15**	**-.17**	**-.17**	**-.17**	**-.22**	**-.23**	**-.20**
MOS Fit	691 – 978	-.02	-.05	**-.08**	**-.08**	**-.11**	**-.11**	**-.14**	**-.15**	**-.14**
Short-Term Continuance	699 – 993	.05	-.05	**-.10**	**-.12**	**-.12**	**-.12**	**-.17**	**-.19**	**-.15**

Note. Attrition variables are cumulative. Correlations in bold are statistically significant, $p < .05$.

Table B.4. Point-Biserial Correlations between In-Unit 2 Criteria and 36-48 Month Attrition

	n	36 Months	39 Months	42 Months	45 Months	48 Months
Army Fit	542 – 730	**-.07**	**-.07**	**-.13**	**-.17**	**-.16**
Attrition Cognitions	565 – 757	**.14**	**.17**	**.23**	**.32**	**.32**
Fitness	555 – 742	.05	-.02	-.04	**-.13**	**-.09**
Job Satisfaction	559 – 747	-.05	-.06	**-.07**	**-.11**	**-.11**
Long-Term Continuance	563 – 755	**-.06**	**-.09**	**-.15**	**-.19**	**-.17**
MOS Fit	562 – 753	-.05	-.04	-.06	**-.07**	-.06
Short-Term Continuance	564 – 756	-.05	**-.06**	**-.09**	**-.14**	**-.12**

Note. Attrition variables are cumulative. Correlations in bold are statistically significant, $p < .05$. * There was no attrition among Soldiers with Effort and Peer Support ratings during the 24-30 month time period.

APPENDIX C: SUPPLEMENTAL CHAPTER 8 TABLES

Table C.1. MOS Included in Differential Validity Analyses

Code	Title
09S	Commissioned Officer Candidate
11B	Infantryman
11C	Indirect Fire Infantryman
13B	Cannon Crewmember
13D	Field Artillery Automated Tactical Data Systems Specialist
15T	UH-60 Helicopter Repairer
19D	Cavalry Scout
19K	Armor Crewman
21B	Combat Engineer
21E	Heavy Construction Equipment Operator
25B	Information Systems Operator-Analyst
25U	Signal Support Systems Specialist
31B	Military Police
35F	Intelligence Analyst
35N	Signals Intelligence Analyst
42A	Human Resources Specialist
68W	Health Care Specialist (Combat Medic)
74D	Chemical, Biological, Radiological, and Nuclear (CBRN) Specialist
88M	Motor Transport Operator
91B	Wheeled Vehicle Mechanic
92A	Automated Logistical Specialist
92F	Petroleum Supply Specialist
92G	Food Service Specialist
92R	Parachute Rigger
92Y	Unit Supply Specialist
94F	Computer/Detection Systems Repairer

Table C.2. Results for an Attrition Model Containing Nine Experimental Predictors, Cognitive Aptitude, and Education Tier

	Fixed Effects					Random Effects		
Month/Predictor	Coeff	*SE*	*t*-ratio	*OR*	*p*	*SD*	VarComp	χ^2
3	**-2.35**	0.07	**-32.71**	0.09	.00			
4	**-3.29**	0.10	**-32.65**	0.04	.00			
6	**-2.74**	0.08	**-32.45**	0.06	.00			
9	**-3.07**	0.10	**-31.79**	0.05	.00			
12	**-3.15**	0.10	**-31.22**	0.04	.00			
15	**-3.09**	0.10	**-30.84**	0.05	.00			
18	**-3.11**	0.10	**-30.37**	0.04	.00			
21	**-3.31**	0.11	**-29.56**	0.04	.00			
24	**-3.08**	0.10	**-29.66**	0.05	.00			
27	**-3.44**	0.12	**-28.50**	0.03	.00			
30	**-3.21**	0.11	**-28.62**	0.04	.00			
33	**-3.42**	0.12	**-27.70**	0.03	.00			
36	**-3.07**	0.11	**-28.12**	0.05	.00			
39	**-3.34**	0.12	**-27.15**	0.04	.00			
42	**-3.21**	0.12	**-25.99**	0.04	.00			
45	**-3.24**	0.13	**-24.11**	0.04	.00			
48	**-3.41**	0.15	**-22.36**	0.03	.00			
Achievement Orientation	**0.18**	0.06	**3.19**	1.20	.01	0.12	0.01	17.09
Agreeableness	0.02	0.06	0.40	1.02	.69	0.12	0.01	25.44
Army Affective Commit	**-0.24**	0.05	**-4.81**	0.79	.00	0.13	0.02	27.79
Cognitive Aptitude	0.00	0.00	-0.34	1.00	.74	0.01	0.00	25.80
Conscientiousness	**-0.08**	0.03	**-2.37**	0.93	.03	0.05	0.00	15.91
Education Tier	**-0.43**	0.07	**-5.94**	0.65	.00	0.21	0.05	**49.28**
Fitness Orientation	**-0.27**	0.05	**-5.90**	0.76	.00	0.16	0.03	**45.32**
Internal Locus of Control	**0.15**	0.06	**2.53**	1.16	.02	0.13	0.02	23.80
Openness	-0.01	0.06	-0.23	0.99	.82	0.15	0.02	18.84
Practical Intelligence	-0.06	0.06	-0.96	0.95	.35	0.13	0.02	21.93
Surgency	-0.02	0.05	-0.33	0.98	.74	0.11	0.01	22.19

Note. *SE* = Standard Error. *OR* = Odds Ratio. VarComp = Variance Component. Coefficients in bold are statistically significant, $p < .05$. Approximate degrees of freedom = 39,117 (time dummies) and 22 (predictors). All continuous predictors centered at their group mean.