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Grit and Hardiness as Predictors of Performance Among West Point Cadets

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The U.S. Military Academy has historically used an academically weighted composite of aptitude, leadership, and physical ability indices for selection of candidates and to predict their performance at the Academy. Researchers at West Point have begun to investigate the incremental contribution of a variety of less traditional nonaptitude or noncognitive factors in predicting performance. Particular focus has centered on hardiness and grit because they have been shown to predict persistence through Cadet Basic Training (CBT) and achievement in the first year at the Academy. In the current investigation, we further examined the predictive validity of grit and hardiness, and their subfacets, on retention and performance through the full 4-year West Point program with data from 1,558 cadets, comprising the West Point classes of 2009 and 2010. Results of regression analyses indicate that whereas grit interest and hardiness commitment were the sole predictors of attrition from CBT, only grit effort predicted persistence across the remaining 4 year period. College Entrance Exam Rank (CEER), a traditional measure of academic success, did not predict persistence. In terms of performance, grit interest, and hardiness control added to CEER in the prediction of 4-year academic performance. Although CEER continued to be the best predictor of military performance, grit effort and hardiness commitment were also important contributors. Finally, grit effort also added to the Athletic Activities Score and CEER in predicting physical performance. These results indicate that the noncognitive factors grit and hardiness are important predictors of success in military officer candidates. We discuss the implication of our findings for selection and prediction of performance of within military environments.

Keywords: grit, hardiness, leadership, noncognitive

Central to the mission of the U.S. Military Academy (USMA) at West Point is providing leaders of character who are prepared for a career of service to the nation as officers in the U.S. Army. Similar to other highly selective colleges and universities, West Point accomplishes this charge in a manner designed to maximize retention and conserve valuable resources by striving to attract, select, and train individuals with the greatest likelihood of success. With a long-established application process, containing sequential hurdles, and a favorable pool of highly qualified and motivated applicants, good selection decisions are typically made. Those accepting an offer of admission generally go on to have a positive developmental experience, graduate, and continue to demonstrate exemplary performance as U.S. Army officers. Despite these appealing circumstances, there is continual interest in understanding additional factors that might incrementally contribute to what is predictive of successful performance. Where practical, these insights could be incorporated into the selection and training processes, offering the potential for an even more effective selection system or de-

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velopmental experience and subsequent performance at, and beyond, West Point.

Assessments of cadet personality, aptitude, and performance have been demonstrated to be of importance to subsequent officer performance and leadership. In a classic study, Ricciuti (1955) reported that ratings of aptitude for service in Naval Academy cadets were significantly correlated with their subsequent performance as officers serving in the Navy. The aptitude for service ratings consisted of peer and superior officer ratings, relative to the student's performance of duty, attitude, bearing and dress, and overall desirability as a potential junior Naval officer. Yammarino and Bass (1988) found that ratings of Naval Academy cadet military performance predicted subsequent leadership performance evaluations after graduation. Matthews (2011) found that two character strengths—bravery and persistence—were associated with successfully coping with combat stress among Army officers deployed in Afghanistan and Iraq. We have found that among West Point cadets, personality assessments made at time of entry predict ratings of officer leadership up to 3 years following graduation from West Point (Bartone et al., 2013). As past research has indicated (Ricciuti, 1955; Yammarino & Bass, 1988), precommissioning performance is linked to officer performance. To the extent that predictions of cadet performance can be improved, it should ultimately result in better performing officers.

Successful performance at West Point has been forecast through the use of weighted preselection composites, including measures of: academic aptitude called the College Entrance Examination Rank (CEER), comprised of grade point average, high school class rank, and standardized test scores (SATs or ACTs); leadership ability (extracurricular involvement); and physical fitness (Athletics Activities Score [AAS], reflecting a candidate's high school athletic participation). These composites are combined to produce a Whole Candidate Score (WCS). The WCS has been shown in previous studies to be the best predictor for West Point cadet academic, military, and physical performance (Matthews, Peterson, & Kelly, 2006; Westphal, Bonanno, & Bartone, 2008).

Over the last decade, West Point researchers have been engaged in an exploration of the contribution of other, more noncognitive or nonaptitude factors to the performance of cadets at the USMA and beyond. The term noncognitive has been used broadly to include nonacademic or personality attributes, attitudes, values, or social beliefs, such as persistence, conscientiousness, motivation, and emotional intelligence (see, e.g., Schmitt, 2012; Hyatt, 2003). Schmidt and Hunter (1998) highlighted the importance of noncognitive factors in their analysis across numerous studies, typically providing a 20% increase over more traditional cognitive ability measures in predicting outcomes such as training success and job performance.

The USMA at West Point provides an ideal setting for investigation of the value of both traditional predictors of successful performance, such as the WCS, and more innovative indices that might offer increased explanatory power and insight into effective performance at West Point and beyond. With its inherent challenges in academic work, military training, physical fitness, and character development, the 47-month West Point experience provides ample demands and stressors that draw upon both traditional academic and noncognitive capability for successful adaptation and performance. Not only do new cadets encounter the challenges and obstacles facing other college students (academics, adjusting to a new environment, gaining new friends, growing apart from old ones, etc.), but they must also adjust to military life. The adjustment is profound. Prior to arriving at West Point, the new cadets reported they slept an average of nine hours per night and arose at eight o'clock in the morning. At West Point, they awake well before six o'clock and average only 4 hours and 50 minutes of sleep on school nights during the fall semester (Miller & Shattuck, 2005). Their day continues until lights-out/taps at midnight.

Cadets must learn military customs, courtesies, and history. Male cadets receive a "high and tight" haircut, and female cadets must keep their hair within strict grooming standards. Suddenly, they find themselves at the bottom of a rigid military command and control hierarchy—their mistakes (and there are many) are corrected on the spot with assertive, if not aggressive, corrections. Then they must complete basic training in the field, learning how to march, fire weapons, and fight with bayonets and pugil sticks. The week before classes begin, field

training concludes with a lengthy and grueling road march, requiring the carrying of rifles and a combat field load, beginning well before dawn.

If they make it through cadet basic training in their first summer, cadets then face a daunting academic schedule. The first 2 years consists of core courses in science, math, English, a foreign language, and the behavioral and social sciences. There is no grading "curve" at West Point. Cadets must perform to a high academic standard or fail a course. Failing two courses ordinarily results in dismissal from the academy. Moreover, cadets must adhere to a rigid code of conduct and honor, violations of which might also result in dismissal. In addition to academic courses, all cadets take courses in military science, physical training, and military development.

All cadets must compete in a sport—either intercollegiate or intramural. They do not get their summers "off." Summers are spent attending Army schools like Airborne, Air Assault, and others. Between the freshman (or "plebe") and sophomore ("yearling") year, they participate in a lengthy infantry leadership exercise. Between the yearling year and the junior ("cow") year, they spend three weeks attached to an operational Army unit, often in distant parts of the globe, serving as "third" lieutenants. During this summer they might also complete a 3-week long academic internship. Upon graduation from their senior ("firstie") year, the new second lieutenants are obligated to spend a minimum of 5 years of active duty in the Army. These days, duty is dangerous—to date, more than 40 West Point graduates have died in combat operations in Iraq and Afghanistan.

Our research program has been directed toward the study of a variety of noncognitive factors with conceptual links to successful adaptation in a stressful environment: personality hardiness, grit, resilience skills, and a broad array of character strengths. The central research question addressed is in this article is "What contribution do specific noncognitive factors provide beyond that of the more conventional whole person measures, such as the WCS, or the more academically focused, CEER? The general approach to this research has been to collect the more traditional preselection indicators of success utilized in the WCS and CEER noted in preceding paragraphs. In addition to these measures, other metrics of a more noncognitive nature were captured from the same individuals/cohorts at entry to West Point. These cognitive and noncognitive measures were then matched with subsequent indices of cadet cumulative academic, physical, and military performance at graduation and retention at the academy. The noncognitive measures were then generally examined to determine their incremental contribution over the composite of traditional indicators toward predicting important outcomes. These included two noncognitive variables noted above that have been studied frequently within the context of West Point: grit and psychological hardiness.

Earlier research examining grit and hardiness at West Point generally focused on these constructs separately and their relationship to early attrition at CBT. Maddi, Matthews, Kelly, Villarreal, and White (2012) examined both grit and hardiness, but they focused on attrition and overall cadet performance at the end of the first academic year at West Point. Further, the predictor of cadet retention and overall performance was the WCS, a global composite that included both cognitive (SATs, class rank, etc.) and more noncognitive (leadership roles and engagement with extracurricular activities) elements that are likely expressions of grit and hardiness, thus clouding the unique contribution of these noncognitive factors to the prediction of important outcomes. Although these studies have been insightful, the present study will examine the extent to which the more specific factors and facets of grit and hardiness are predictive of earlier attrition during CBT and longer term attrition and specific (academic, military, and physical) performance measured at the end of the 4-year period at West Point. In addition, the present study uses a cleaner measure of cognitive ability (CEER) in examining the contribution of grit and hardiness beyond cognitive ability to success in important retention and performance outcomes.

Grit

Initial work explored the construct of grit, defined as the sustained and passionate pursuit of a given interest or goal (Duckworth, Peterson, Matthews, & Kelly, 2007). Its emphasis is long-term stamina rather than short-term intensity—maintaining effort and interest over years,

despite such problems as distractions, lack of feedback, plateaus in progress, setbacks, and failures (Duckworth & Eskreis-Winkler, 2013; Duckworth et al., 2007). Conceptually, grit has an obvious link with the demands required for successful performance at West Point. Grit, or "firmness of character," is synonymous with fortitude or courage and is the essence of what the Academy sustains and builds in its cadets and graduates. Further, its importance to successful performance as an Army Officer and leader of character might be particularly important given the growing demands on today's Army, which have led to more frequent and lengthy deployments, resulting in little time at home and with their community and which has an impact on morale and retention.

In the original work (Duckworth et al., 2007), with two separate classes, grit was found to be a robust predictor of attrition from CBT, whereas the WCS was not. Cadets who were a standard deviation higher than average on grit were over 60% more likely to complete summer training ($\beta = .48$, $OR = 1.62$, $p < .001$).

Hardiness

Another psychological construct relevant to adaptation to demanding environments is hardiness, a personality dimension linked to continued health and performance in a variety of stressful circumstances (Kobasa, 1979). Hardiness develops early in life and is reasonably stable over time, though it is amenable to change and is probably trainable under certain conditions (Kobasa, 1979; Maddi & Kobasa, 1984). Conceptually rooted in existential psychology (Maddi, 1967), hardiness involves a set of attitudes or beliefs, including a high sense of commitment (vs. alienation), the capacity to feel deeply involved or engaged in activities of life, confidence in one's ability to control (vs. powerlessness) events and influence outcomes, and greater openness to challenge (vs. threat) in life—perceiving variety and change as a chance to learn and grow (Kobasa, 1979; Maddi & Kobasa, 1984). Because hardiness involves how one responds to stressful circumstances (i.e., willingness to stay engaged, struggle to have influence on outcomes, and posture toward the need to change), it has been conceptualized as an expression of existential courage (Maddi, 2004). Persons high in hardiness have been demonstrated to be more resilient when exposed to a range of environmental stressors and tend to remain healthy and perform well despite high stress levels (Bartone, 1989; Bartone, 1999; Bartone, 2000). They seem to interpret stressful and even painful experiences as a normal aspect of existence, a part of life that is, overall, interesting and worthwhile. In sum, the available evidence suggests that hardiness is an important noncognitive construct that is relevant to successful military performance.

Early research on hardiness was conducted in 2005 (Kelly, Matthews, & Bartone, 2005) with the USMA Class of 2008 ($N = 1{,}223$) as Plebes. A measure of cadet hardiness and the WCS were examined with respect to retention during the first summer training experience (CBT) and first academic semester at West Point and cadet performance during that same period. The hardiness facet of commitment was found to be a predictor of retention, $R = .17$, $F(7, 1116) = 2.19$, $p < .03$. Both hardiness commitment and hardiness control added to WCS in predicting military performance during that first year at West Point, $R = .36$, $F(7, 1{,}061) = 22.79$, $p < .001$.

The present study follows up the work on grit and hardiness reviewed above by examining the degree to which these personality constructs would be useful in predicting more long-term measures of attrition and academic, military, and physical performance beyond the first year, including the full 47-month tenure at West Point leading to graduation. Here, brief self-report measures of hardiness (Bartone, 1995) and grit (Duckworth et al., 2007) were collected at entry and linked with the traditional preselection composites of academic success. These predictor measures were then subsequently linked with indices of retention and performance 4 years later at graduation. The central question to be addressed was to what degree grit and hardiness would be associated with longer term, sustained performance, beyond the novel experience of CBT and the first academic year to the end of the 4-year program.

Method

Participants

The primary population of interest was the 1,310 cadets comprising the West Point Class of

2010. This class entered the Academy in July, 2006 and was typical of recent West Point cohorts in terms of gender (14% female), race (24% non-White), recruited athletes (17%), combat veterans (2%), and age ($M = 19$ years). After attrition of 52 cadets (4%) during the 7 weeks of basic training and another 264 cadets over the remaining 3.5 years at the academy, the original class cohort was reduced by 20.2%, resulting in 1,046 cadets (79.8%) retained until graduation.

A secondary comparison population of participants was the 1,248 cadets comprising the West Point Class of 2009. This class entered the Academy in July, 2005 and was 15% female, 25% non-White, 21% recruited athletes, 2.6% combat veterans, and had a mean age of age 19 years. After attrition of 61 cadets (5%) during the 7 weeks of basic training and another 191 cadets over the remaining 3.5 years at the academy, the original Class of 2009 cohort was reduced by 20.2%, resulting in 996 cadets (79. 8%) retained until graduation.

The CBT provides a fast-paced series of physically demanding military training activities and drills that take place primarily in a field environment. This training includes, for example, individual and team obstacle courses, land navigation exercises, timed road marches while carrying heavy military gear, and marksmanship training. In contrast, the academic cycle emphasizes academic work, with a greater focus on individual study and writing.

Predictor Variables

Summary statistics for the eight predictor and three criterion variables are included in Table 1.

CEER. The CEER is calculated by using either the ACT or SAT Verbal and Math score, along with class rank in a weighted formula. This is used as the primary predictor of academic achievement during the first year at West Point.

AAS. The AAS is a composite score calculated by the USMA admissions office that reflects a candidate's high school athletic participation in accordance with the number of sports, years, and team role (e.g., Team Captain is scored higher than mere participation). This score provides a measure of a candidate's athletic involvement or participation.

WCS. The WCS is a weighted composite score that reflects past performance of applicants to West Point, including academic aptitude and performance (grade point average, high school rank, SAT scores, CEER score), community leadership score (involvement in leadership roles within extracurricular activities, including school officers, newspaper, music, scouting, sports teams, debate, foreign study, and faculty appraisals of math, English, and science), and physical fitness (performance on standardized physical exercises including push-ups, pull-ups, crunches, shuttle run, basketball throw, and mile run). The WCS was collected from official application records.

Table 1
Summary Statistics for Predictor and Criterion Variables

Measure	Class of 2009			Class of 2010		
	N	*M*	*SD*	*N*	*M*	*SD*
CEER	1248	604	68	1310	602	63
AAS	1248	619	100	1310	612	103
WCS	1248	6069	452	1310	6063	413
Grit effort	1248	4.04	.57	1308	4.06	.54
Grit interest	1248	3.47	.77	1308	3.44	.76
Hardiness commitment	1248	2.13	.38	1310	2.12	.40
Hardiness control	1248	2.00	.39	1310	2.02	.42
Hardiness challenge	1248	1.69	.52	1310	1.69	.51
APS	988	3.03	.52	1063	3.05	.49
MPS	988	3.22	.40	1063	3.24	.38
PPS	988	2.95	.40	1063	2.96	.35

Note. CEER = College Entrance Exam Rank; AAS = Athletics Activities Score; WCS = Whole Candidate Score; APS = Academic Program Score; MPS = Military Program Score; PPS = Physical Program Score.

Hardiness. *Personality hardiness* can be defined as a pattern of attitudes or skills that provides the existential courage and motivation needed for enhanced performance in stressful circumstances (Maddi, 2004; Maddi, 2007). As noted earlier, hardy individuals tend to interpret stressful and painful experiences as a normal aspect of existence, part of a life that is overall interesting and worthwhile. The three facets associated with hardiness (Kobasa, 1979) are (a) a high sense of life and work commitment (vs. alienation), which means vigorous engagement with others and activities of work and life; (b) a greater feeling of control (vs. powerlessness), which is the belief that you can choose and influence events of your experience; and (c) an openness to change and challenge (vs. threat) in life, which is appraising trying situations as an opportunity for growth and learning.

Hardiness was measured with a brief 15-item survey covering the three conceptually important hardiness facets of commitment, control and challenge. Sample items, include following: "Most of my life gets spent doing things that are meaningful" (commitment), "By working hard you can nearly always achieve your goals" (control), and "Changes in routine are interesting to me" (challenge).

It shows excellent psychometric properties, including Cronbach's alpha coefficients ranging from .70 to .77 for the facets to .83 for the overall scale (Bartone, 1995). This scale has demonstrated appropriate criterion-related validity in several samples, with respect to both health and performance under high-stress conditions. Notably, scores on this hardiness measure were predictive of illness/symptom indicators and health behaviors in a large group (N = 787) of male and female Army Reservists mobilized for the Gulf War (Bartone, 1999). Also, as hardiness theory would predict, Army Special Forces candidates who scored high on this measure were more likely to succeed in a rigorous and highly stressful selection course (Bartone, Roland, Picano, & Williams, 2008).

Cadets were provided the following brief instructions: "Below are statements about life that people often feel differently about. Please show how much you think each one is true. Give your own honest opinions. . . There are no right or wrong answers." Response options included "*Not at all true*," "*A little true*," "*Quite true*," and "*Completely true*."

Grit. Grit involves an unswerving, sustained, and passionate pursuit of a given interest or goal. Its emphasis is on long-term perseverance, despite setbacks and distractions. This study used a 12-item scale for measuring grit (Duckworth et al., 2007) derived from a pool of items tapping the attitudes and behaviors characteristic of high-achieving individuals, including the ability to sustain effort in the face of adversity (e.g., I have overcome setbacks to conquer an important challenge") and the consistency of efforts over time ("I have difficulty maintaining my focus on projects that take more than a few months to complete"). The 12 items cover two factors labeled *consistency of interests* and *perseverance of effort*. This scale has demonstrated excellent psychometric properties, including measures of internal consistency for the overall scale (α = .85) and for each six-item factor (consistency of interests: α = .84; perseverance of effort: α = .78), and criterion-related validity across a variety of achievement realms requiring sustained and focused application of talent over time (Duckworth et al., 2007). Instructions ask the respondent to use the response options to indicate how much the statements are like him or her. Response options on a five-point Likert-type rating scale, ranging from 5 (*very much like me*) to 1 (*not like me at all*).

Criterion Variables

Academic Program Score (APS). The APS represents the cumulative grade point average for all academic subjects completed at West Point, excluding Military Science and Physical Education core courses. The grade point average is the sum of the numeric grades (on a 4.0 scale) earned in each course, times the credit hour weight of the course, divided by the total credit hours completed.

Military Program Score (MPS). The Military Program Score at West Point consists of 16 activities evaluated by the cadet's military chain of command and instructors. These include summer training, military performance during each term, and Military Science (MS) courses. MS courses are graded like other academic courses. All other Military Program activities (summer detail and academic year duty positions) are evaluated using the Military Development (MD) grade. The MPS represents the

weighted average of the MD grades in each activity combined with MS course grades. The weights are progressive; activities completed at higher levels of responsibility generally have greater weight.

The MD grade is assessed for every cadet twice each term and during each summer training detail. Thus, the MD grade is the experience-based, summative assessment of a cadet's performance for a specified performance period in an assigned duty position and a corresponding class role. The MD grade represents an overall judgment by cadet and officer/NCO raters and is based on developmental data, personal observations, and other reports as measured against a set of criteria that identify expectations of growth and achievement across a range of performance.

Information regarding cadet performance and behavior that is used to formulate the MD grade comes from multiple sources, including feedback from above (chain of command), across (through peer reviews), and below (through subordinate reviews), as well as observations from others in the cadet's environment who have a unique view of cadet performance (e.g., coaches, club officers-in-charge, staff, and faculty). As the cadet participates in class, company duties, chain of command positions and other activities, performance feedback is generated for deriving the MD grade.

Both Cadet Observation Reports (CORs) and Periodic Development Reports (PDRs) are used by the cadet's tactical officer in assignment of an MD grade. Observations from the numerous opportunities to observe leader behavior and duty performance might be formally recorded on CORs or PDRs. Cadets will receive some number of CORs as, for example, they receive a minimum of two or three CORs depending upon their summer detail. CORs are used to provide feedback on specific observed behavior, (e.g., "unshined shoes" or "excellent performance on quiz") and its impact on the mission. They are sent to the observed cadet and the cadet's tactical officer.

Cadet chain of command, staff and faculty, and officers also regularly complete PDRs. These provide an important tool in evaluating a cadet's performance and development. They allow an evaluator to observe performance, record specific leadership behaviors of the rated individual, categorize them as effective or ineffective, and provide immediate feedback to the observed cadet and chain of command. Opportunities would include for example, conduct of unit training, such as Physical Fitness Training, road marches, or other performance-oriented training, preparation or conduct of unit inspections, or leading peers in any structured situation.

PDRs are completed regularly by staff and faculty as an important tool in evaluating a cadet's development and providing him or her with feedback. The form contains 48 behaviors, which are grouped under "Character" (e.g., "Demonstrate personal values consistent with Army's values") or "Competence" (e.g., "Arrive on time and prepared for formations, classes, and duty assignments" or "Demonstrate an appropriate level of professional knowledge/judgment"). Raters select an option reflecting the frequency of the observed behavior in the time period under evaluation from *never* to *always*. Open-ended comments are also encouraged.

The MD grade serves several functions. It is used for coaching and feedback, to formulate recommendations to further the development of each cadet, and for selection for appropriate duty positions and summer training options. The Military Program graded events (or activities) for the summer training periods include CBT, Cadet Field Training, Cadet Leader Development Training, Summer Garrison Regiment, Summer Leader Experience, Cadet Troop Leader Training/Drill Cadet Leader Training, and participation in the Air Assault School chain of command.

Physical Program Score (PPS). The PPS at West Point is used to capture the performance of cadets in the physical athletic program. The PPS is computed at the end of each academic year. The PPS comprises three components: Instructional coursework (weighted 50%), fitness testing (weighted 30%), and Competitive Sports Index (CSI; weighted 20%). The CSI is used to evaluate athletic performance at the corps squad (recruited athlete), competitive club, and intramural level. Performance is captured four times per year through a system combining input from sports monitors, cadets, officers in charge, and coaches.

Attrition/retention. This represents a cadet's status as either separated from or retained at the military academy. For this study, attrition

was examined at two key points. The first was at the conclusion of CBT. CBT begins in late June. The new cadet reports to the West Point football stadium and, after a short greeting, is given 90 s to say goodbye to his or her family. Within 8 hours of arrival, new cadets will receive vaccinations, gear, and clothing. They begin to learn to stand, march, and behave like a West Point cadet. New cadets start their day at 0530 with physical conditioning (stretching, running, close quarters combat, and conditioning road marches). The following weeks include nuclear, biological, chemical training; mountaineering; general military subjects; warrior competition; basic rifle marksmanship; individual and squad tactics and techniques; hand grenades; leader reaction course; confidence obstacle course; individual proficiency training; and first aid training. By the end of CBT, the new cadet will have completed several 3-mile, 6-mile, and 8-mile road marches with full equipment to prepare for the 12-mile road march out to Lake Frederick and a 15-mile road march back to the barracks at the end of the second detail.

The second key point for examining attrition starts at the end of CBT and continues until graduation. A typical daily schedule begins with breakfast at 0655, followed by 4 hr of class or study, lunch, 1 hr for activities sponsored by the Commandant or Dean, an additional 2 hr of class or study, and 1.5 hr of athletics, parades, extracurricular activities, or free time. The evening is devoted to supper, cadet duties, extracurricular activities, 3 hr of study time, taps, and lights out at midnight.

Attrition rates at West Point have shifted over the past decade reflecting USMA's evolution from an attritional model toward a more developmental approach that seeks growth and improvement of cadets. Nonetheless, the 10-year separation average is 4.4% separating from West Point during CBT and an additional 10-year average of 17.6% separating during the remaining 45 months of tenure at the Academy. The 10-year average West Point graduation rate is 78%, with an attrition rate of 22%.

Procedures

Each entering class of West Point cadets participates in a routine institutional group testing activity on their second or third day after arrival. The testing session typically consists of a battery of paper-and-pencil measures requiring two and one half hours. The testing is administered by staff from the Office of Institutional Research. For the present study, cadets were provided systematic instruction and allotted ample time to complete each of the instruments. The test administrator informed cadets of the value of their participation and encouraged them to be forthright in their responses. Cadets were also informed that their participation was voluntary and that the information provided would be treated as confidential. Cadets were observed to be highly motivated and diligent in completing the testing.

The preselection composites (WCS, AES, and CEER) along with follow-up measures of academic, military, and physical performance at West Point were collected from official cadet records. Retention information was collected at two key intervals, at the end of CBT, and at the end of the 4-year program (at graduation). The general statistical approach involved examining grit and hardiness for their contribution to predicting (beyond the preselection composites) cadet performance and retention across the 47-month tenure at West Point.

As noted earlier, in prior work at West Point, grit was found to be a robust predictor of attrition from CBT, whereas WCS was not. It was also found to be a modest predictor of first-year military performance ($r = .19$, $p < .001$). The present study was a follow-up to this research, involving the collection of longer term measures of attrition and of academic, military and physical performance beyond the first year, to include the full 47-month tenure at West Point leading to graduation.

Results

The bivariate correlations among the independent and dependent variables for the Class of 2010 are presented in Table 2. Grit is shown to have had a moderate correlation with hardiness ($r = .34$, $p > .01$), with grit effort being most highly correlated with the facets of hardiness commitment ($r = .43$, $p > .01$), and control ($r = .37$, $p > .01$). The grit total, grit effort, and hardiness control scores were modestly correlated with the MPS ($rs = .14 – .15$, $p > .01$), and to a lesser degree with the PPS ($rs = .09–.10$, $p > .01$). The grit and hardiness total scores, along with their respective facet scores,

Table 2
Correlations Among the Independent and Dependent Variables

Variable	CEER	WCS	Grit			Hardiness				APS	MPS
			Total	Interest	Effort	Total	Commitment	Control	Challenge		
WCS	.90**										
Grit											
Total	−.03	.03									
Interest	−.02	.02	.88**								
Effort	−.04	.03	.75**	.35**							
Hardiness											
Total	−.04	.00	.34**	.21**	.38**						
Commitment	−.01	.03	.41**	.27**	.43**	.76					
Control	−.13**	−.09**	.32**	.20**	.37**	.69**	.51**				
Challenge	.02	.04	.01	−.01	.03	.65**	.16**	.04			
APS	.59**	.56**	.05	.06	.02	−.01	.07	−.02	−.04		
MPS	.29**	.36**	.14**	.10**	.15**	.10**	.15**	.08**	−.01	.61**	
PPS	.11**	.24**	.09**	.06*	.10**	.05	.09**	.02	.02	.44**	.47**

Note. $N = 993–1,310$. The correlations with performance measures reflect cumulative program scores as seniors. CEER = College Entrance Exam Rank; WCS = Whole Candidate Score; APS = Academic Program Score; MPS = Military Program Score; PPS = Physical Program Score.
* $p < .05$. ** $p < .01$.

were generally unrelated to the APS. As expected, the more traditional academically weighted CEER ($r = .59$, $p > .01$) and WCS ($r = .56$, $p > .01$) composites were strongly predictive of APS.

Initial analyses were conducted to examine potential differences in the two noncognitive variables under consideration, grit and hardiness, as well as the traditional preselection indices, between cadets who separated from West Point versus those who persisted. Analyses were conducted comparing USMA Class of 2010 cadets (a) who separated during the initial 6 weeks of CBT with scores from cadets who persisted and (b) who separated any time after CBT through graduation with those who persisted through that same period.

The means and *t* test results displayed in Table 3 confirm that grit was a significant and meaningful differentiator between those cadets who separated during CBT ($N = 52$, $M = 3.54$, $SD = .60$) versus the vast majority of the class who persisted beyond CBT ($N = 1,256$, $M = 3.76$, $SD = .54$, $p = .004$, $d = .38$). An examination of the two factors of grit indicates that the grit interest factor is what differed between the two groups ($d = .44$). Cadets who persisted beyond CBT ($M = 3.45$, $SD = .75$) reported higher levels of grit-interest (at entry) than cadets who separated during CBT ($M = 3.09$, $SD = .88$, $p = .001$, $d = .44$), but no significant differences were observed between these two groups on the grit effort factor. Grit was also shown to be a significant differentiator for post-CBT attrition. During this academically focused period of time, grit effort was shown to be a differentiating factor between cadets who separated from West Point ($N = 212$, $M = 3.98$, $SD = .62$) and those who persisted through graduation ($N = 1,044$, $M = 4.08$, $SD = .52$, $p < .01$, $d = .18$).

In terms of hardiness, differences between separated and persistent cadets were observed during the perhaps more novel and demanding CBT but not during the extended and academically focused period of time following CBT. Although the hardiness total score was statistically different ($p < .05$, $d = .27$) for those separated during CBT ($N = 50$, $M = 1.86$, $SD = .29$) compared with those who persisted ($N = 1,183$, $M = 1.94$, $SD = .30$), the hardiness commitment facet was shown to be the sole significant hardiness facet ($p < .01$; $d = .40$) that was helpful in discriminating between the CBT attrition group ($N = 52$, $M = 1.96$, $SD = .44$) and the group exhibiting persistence throughout this period ($N = 1,258$, $M = 2.13$, $SD = .40$).

None of the three composites supporting the admissions process (WCS, CEER, and AAS) was found to be significantly different between those cadets who persisted and those who sep-

Table 3
Differences in Study Variables for Separated and Persistent USMA Class of 2010 Cadets During Cadet Basic Training (CBT) and Post-CBT

	CBT			Post-CBT		
Grit	Separated	Persistent	Cohen's *d*	Separated	Persistent	Cohen's *d*
Total						
Mean	3.54	3.76	.38**	3.69	3.77	.14
SD	.60	.54		.59	.52	
N	52	1,256		212	1,044	
Interest						
Mean	3.09	3.45	.44***	3.41	3.46	.06
SD	.88	.75		.79	.75	
N	52	1,256		212	1,044	
Effort						
Mean	3.99	4.06	.13	3.98	4.08	.18**
SD	.53	.54		.62	.52	
N	52	1,256		212	1,044	
Hardiness						
Total						
Mean	1.86	1.94	.27*	1.93	1.95	.06
SD	.29	.30		.32	.30	
N	50	1,183		205	978	
Commitment						
Mean	1.96	2.13	.40**	2.11	2.13	.05
SD		.44	.40		.41	.40
N	52	1,258		212	1,046	
Control						
Mean	1.96	2.02	.14	1.99	2.02	.07
SD	.42	.42		.43	.42	
N	52	1,258		212	1,046	
Challenge						
Mean	1.70	1.69	.02	1.70	1.69	.02
SD		.50	.51		.56	.50
N	52	1,258		212	1,046	
WCS						
Mean	6045	6063	.04	5951	6086	.32***
SD	370	415		432	407	
N	52	1,258		212	1,046	
CEER						
Mean	600	603	.05	588	605	.27***
SD	65	63		65	62	
N	52	1,258		212	1,046	
AAS						
Mean	610	612	.02	621	610	.11
SD	112	103		103	103	
N	52	1,258		212	1,046	

Note. WCS = Whole Candidate Score; CEER = College Entrance Exam Rank; AAS = Athletics Activities Score.
* $p < .05$. ** $p < .01$. *** $p < .001$.

arated during CBT. As expected, the academically weighted CEER and WCS were shown to differentiate cadets who separated (CEER: $N = 212$, $M = 588$, $SD = 65$; WCS: $N = 212$, $M = 5{,}951$, $SD = 432$) from those who persisted (CEER: $N = 1{,}046$, $M = 605$, $SD = 62$; WCS: $N = 1{,}046$, $M = 6{,}086$, $SD = 407$) during the much more academically intensive post-CBT tenure at West Point (CEER: $p < .001$, $d = .27$; WCS: $p < .001$, $d = .32$).

Grit and hardiness were further examined for their ability to predict attrition during CBT, and attrition during the 45-month period from the end of CBT through graduation. Logistic re-

gression analyses were conducted separately with the West Point Classes of 2010 and 2009 that included the grit and hardiness facet scores and the academically oriented CEER score as predictors of attrition during CBT (see Table 4), and attrition occurring after completing CBT (see Table 5). The predictor variables were standardized to assist in interpretation of the results. The individual facets and factors were used as independent variables to highlight their unique contributions to predicting attrition. CEER was included as an independent variable since it was considered to be the best available measure of academic, that is, cognitive, ability. As Table 4 indicates, grit interest was a significant predictor of CBT attrition with the Class of 2010 ($\beta = .39$, $OR = 1.47$, $p = .006$) and also the Class of 2009 ($\beta = .55$, $OR = 1.73$, $p = .000$). It is not surprising that the two most highly correlated factors ($r = .43$, $p < .01$), hardiness commitment (Class of 2010: $\beta = .40$, $OR = 1.49$, $p = .02$) and grit effort (Class 2009: $\beta = .31$, $OR = 1.36$, $p = .03$) were alternately demonstrated as important to predicting CBT attrition. Although not interchangeable, the addition of one to the other does not result in a significant increase in the ability to predict CBT attrition. Results in Table 5 show that in both of the classes, grit effort (Class of 2010: $\beta = .18$, $OR = 1.20$, $p = .03$; Class of 2009: $\beta = .19$, $OR = 1.21$, $p = .03$) and CEER score (Class of 2010: $\beta = .29$, $OR = 1.34$, $p < .000$; Class of 2009: $\beta = .35$, $OR = 1.41$, $p < .000$) were predictive of the more academically oriented post-CBT attrition.

Stepwise multiple regressions were conducted separately again for Class 2010 and 2009, examining both the traditional and more noncognitive predictors of academic, physical, and military performance at USMA. In terms of academic and military performance, the separate grit/hardiness factors and facets were included as predictors, along with the traditional predictor of academic performance, CEER score. Table 6 shows prediction of academic performance over the 4-year period at West Point was dominated, as expected, by the academically weighted CEER score ($R^2 = .343$, $p < 001$). Both grit interest (F for Δ in $R^2 = 10.82$, $p < .001$) and hardiness control (F for Δ in $R^2 = 4.05$, $p < .05$), not unexpectedly, added only slightly to CEER in the prediction of the APS, incrementally increasing the explained variance from .34 to .35 for the Class of 2010. The more noncognitive factors did not significantly contribute to APS for the Class of 2009.

Table 7 demonstrates both grit effort and hardiness commitment to be important unique contributors, beyond CEER score, in predicting military performance in the Class of 2010. Grit effort added to the predictive power of the CEER, increasing the explained variance in 4-year cumulative military performance from .077 to .104 (F for Δ in $R^2 = 29.88$ $p < .001$). Hardiness commitment provided additional

Table 4
Logistic Regression Analysis for Predicting Attrition from Cadet Basic Training (CBT) as West Point Freshmen

Predictor	β	*SE* β	χ^2 (*df* = 1)	*p*	*OR*
		Class of 2010[a]			
Constant	3.328	.159	440.269	.000	27.876
Hardiness					
Commitment	.399	.165	5.839	.016	1.491
Grit					
Interest	.388	.142	7.442	.006	1.475
		Class of 2009[b]			
Constant	3.276	.164	400.275	.000	26.459
Grit	.547	.136	16.160	.000	1.728
Interest					
Effort	.317	.149	4.526	.033	1.373

Note. Variables entered on Step 1 were grit effort, grit interest, hardiness commitment, hardiness control, hardiness challenge, and College Entrance Exam Rank.
[a] $N = 52$ separated at CBT vs. 1,256 cadets who persisted. [b] $N = 60$ separated at CBT vs. 1,188 who persisted.

Table 5
Logistic Regression Analysis for Predicting Attrition After Cadet Basic Training (CBT) Until Graduation From West Point

Predictor	β	*SE* β	χ^2 (*df* = 1)	*p*	*OR*
		Class of 2010[a]			
Constant	1.630	.78	440.182	.000	5.104
CEER	.294	.078	14.218	.000	1.341
Grit effort	.183	.085	4.615	.032	1.201
		Class of 2009[b]			
Constant	1.644	.081	412.221	.000	5.153
CEER	.347	.080	18.809	.000	1.414
Grit effort	.194	.092	4.439	.035	1.214

Note. Variables entered on Step 1 were grit effort, grit interest, hardiness commitment, hardiness control, hardiness challenge, and College Entrance Exam Rank (CEER).
[a] $N = 52$ separated at CBT vs. 1,256 cadets who persisted. [b] $N = 60$ separated at CBT vs. 1,188 who persisted.

unique predictive power for MPS (F for ΔR^2 = .104–.11 = 6.4, $p < .001$). For the Class of 2009, only grit effort added to CEER in predicting cumulative military performance (MPS: F for ΔR^2 = .138 to .158 = 23.06, $p < .001$).

In terms of physical performance, the grit/hardiness factors and facets and CEER score were again used as predictors along with the traditional predictor of physical performance, the AAS. Table 8 shows that grit effort significantly added to the contributions of the AAS and CEER in predicting the PPS in both classes, slightly increasing the explained variance from .079 to .087 (F for $\Delta R^2 = 9.49$, $p < .01$) for the Class of 2010, and from .091 to .108 (F for $\Delta R^2 = 18.65$, $p < .01$) for the Class of 2009.

To summarize the key results, analyses with the West Point Classes of 2009 and 2010 indicate that the facets of grit and hardiness which were helpful in predicting cadet persistence are specific to the situational demands of CBT (CBT) and the more academically focused post-CBT period. Although the total scores for grit and hardiness were different for those who separated from CBT than for those who persisted through, cadets who at entry had rated themselves higher on their ability to sustain and focus the application of their talent (grit-

Table 6
Stepwise Multiple Regression Predicting Cumulative Academic Performance as West Point Seniors

	Model 1			Model 2			Model 3		
Variable	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β
				Class of 2010[a]					
CEER	.01	.00	.59***	.01	.00	.59***	.01	.00	.60***
Grit interest				.05	.02	.08***	.05	.02	.07**
Hardiness control							.06	.03	.05*
R^2		*.343*			*.349*			*.352*	
F for change in R^2		551.78***			10.82***			4.047*	
				Class of 2009[b]					
CEER	.01	.00	.67***						
R^2		*.46*							

Note. Variables entered on Step 1 were grit effort, grit interest, hardiness commitment, hardiness control, hardiness challenge, and College Entrance Exam Rank (CEER).
[a] $N = 1{,}060$. Final model, $F(3, 1057) = 191.13$, $p < .001$. [b] $N = 987$. Final model, $F(1, 986) = 822.70$, $p < .001$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7
Stepwise Multiple Regression Predicting Cumulative Military Performance as West Point Seniors

Variable	Model 1			Model 2			Model 3		
	B	*SE*	β	*B*	*SE*	β	*B*	*SE*	β
Class of 2010[a]									
CEER	.00	.00	.29***	.00	.00	.31***	.00	.00	.30***
Grit effort				.12	.02	.17***	.09	.02	.13***
Hardiness commitment							.10	.03	.10**
R^2		.086			.114			.122	
F for change in R^2		99.78***				32.86***		9.98**	
Class of 2009[b]									
CEER	.00	.00	.37***	.00	.00	.37***			
Grit effort				.10	.02	.14***			
R^2		.138			.158				
F for change in R^2		157.87***			23.06***				

Note. Variables entered on Step 1 were grit effort, grit interest, hardiness commitment, hardiness control, hardiness challenge, and College Entrance Exam Rank (CEER).
[a] $N = 1{,}060$. Final model, $F(3, 1{,}057) = 48.92$, $p < .001$. [b] $N = 987$. Final model, $F(2, 985) = 92.23$, $p < .001$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

interest) or maintain an attitude of commitment or engagement with others and to the work or activities required for success (hardiness commitment) were more likely to persist at CBT. Grit interest and hardiness commitment were found to be the key drivers in predicting persistence in CBT. Further, the traditional indices of academic success were not able to discriminate between or help predict those cadets who persisted and those separated. Analysis of persistence beyond CBT across the remaining 4-year period found grit effort to be a better predictor than the more traditional CEER score.

In terms of cumulative (over a 4-year period) academic performance, as expected, CEER was

Table 8
Stepwise Multiple Regression Predicting Cumulative Physical Leader Performance as West Point Seniors

Variable	Model 1			Model 2			Model 3		
	B	*SE*	β	*B*	*SE*	β	*B*	*SE*	β
Class of 2010[a]									
AAS	.00	.00	.23***	.00	.00	.27***	.00	.00	.26***
CEER				.00	.00	.17***	.00	.00	.17***
Grit effort							.06	.02	.09**
R^2		*.052*			*.079*			*.087*	
F for change in R^2		58.58***			30.27***			9.49**	
Class of 2009[b]									
AAS	.00	.00	.21***	.00	.00	.24***	.00	.00	.24***
CEER				.00	.00	.22***	.00	.00	.23***
Grit effort							.09	.02	.13***
R^2		*.042*			*.091*			*.108*	
F for change in R^2		43.50***			53.16***			18.65**	

Note. Variables entered on Step 1 were grit effort, grit interest, hardiness commitment, hardiness control, hardiness challenge, Athletic Activities Score (AAS) and College Entrance Exam Rank (CEER).
[a] $N = 1{,}060$. Final model $F(3, 1{,}057) = 33.56$, $p < .001$. [b] $N = 987$. Final model $F(3, 984) = 39.79$, $p < .001$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

the predominant predictor, with grit interest and hardiness control adding to its prediction. The added value of grit and hardiness was perhaps most important with respect to military performance at West Point. Although CEER continued to be the best predictor, grit effort and hardiness commitment were important contributors to the prediction of military performance. Finally, grit effort also added to both the AAS and CEER in predicting physical performance.

Discussion

This study focused on the related constructs of grit and hardiness and their unique factors or facets and their effects beyond traditional indices on measures of effectiveness, including persistence, and academic, military, and physical performance. The findings are somewhat intuitive: For example, commitment implies an action orientation toward others and the demands of the situation. Individuals high in hardiness commitment were thus more likely to obtain the benefits of social support and identification with the group, with a concomitant avoidance of passivity or isolation—all of which are ingredients for success. In a similar fashion, cadets who maintain greater levels of that element of grit defined as sustained effort were more likely to endure and complete the arduous 47-month West Point experience. Individuals exerting sustained effort not only stayed in the game but also focused their energy and activity toward attaining the desired outcome of graduation.

These findings are in line with earlier studies suggesting grit as a predictor of CBT retention (Duckworth & Quinn, 2009; and Duckworth et al., 2007). They also support other findings, including the earlier work of Bartone, Eid, Johnsen, Laberg, and Snook (2009), who found that hardiness, as well as Big Five extraversion, predicted performance in cadet summer field training, whereas only Big Five conscientiousness and hardiness predicted performance during the academic cycle. Thus, noncognitive factors like grit effort and hardiness appear to be especially important for successful adaptation to the nonacademic demands of military academy life.

The attrition measure used in the present study was a global one, incorporating all categories of cadet attrition. But we know that those who leave do so for a variety of reasons. For example, some cadets leave because of injury, some leave because of unforeseen family illness, some fail to meet weight or fitness standards, and some leave for "motivational" reasons. Considering that very different influences might be at work for these different attrition groups, a more fine-grained analysis should be undertaken that looks at the potential influence of personality variables like hardiness or grit on different attrition groups.

Results also point out the difficulty of predicting persistence, as none of the three composites supporting the admissions process (WCS, CEER, and AAS) were found to be effective in predicting whether cadets would persist or separate during CBT. In fact, only hardiness commitment and grit interest were of value in predicting attrition from CBT. Likewise, grit effort was more important than CEER score in predicting post-CBT persistence through graduation.

In terms of performance at West Point, prior investigation by Duckworth et al. (2007) with this same class of USMA cadets found overall grit provided an increase over the traditional WCS in predicting academic performance during the cadet's first academic year. The present study used a cleaner metric of prior academic performance, in addition to grit and hardiness, to predict academic performance over an extended period of 4 years, finding only a slight contribution of grit to the prediction of academic performance. It appears that, at least for this unique population of academically accomplished USMA cadets, grit's contribution to forecasting academic success, beyond that provided by an academically weighted composite, dissipates after the particularly strenuous first year.

More important, and in line with expectations, grit effort, as well as hardiness commitment added significant value to the academically oriented CEER composite for predicting cumulative military performance across the 4-year West Point experience. In terms of physical performance, there was some modest increase in the ability to explain this outcome provided by grit effort that reached beyond that provided by a measure of physical aptitude and by the CEER.

We have seen that cadet performance predicts subsequent officer performance (Ricciuti, 1955; Yammarino & Bass, 1988). There is clear evi-

dence that hardiness, measured shortly after cadets arrive for initial training at West Point, is predictive of leadership ratings following graduation and commissioning. A recent follow-up with the Classes of 2005 and 2006 (Bartone, Kelly, & Matthews, 2013) examined the same hardiness rating made at entry to West Point and its ability to predict performance ratings made by commanders of those same cadets as junior officers 3 years after graduation (a total of 7 years after the rating). WCS was also used as a predictor. Results found the hardiness control facet to be the sole significant predictor of adaptability performance, explaining 11% of the variance, and the strongest predictor of leadership performance, explaining 9% of the variance. Although prior "military performance" at West Point was the best predictor of military performance as a junior officer, the hardiness facets of challenge and control increase the explained variance from 7% to 15%.

In sum, the noncognitive attributes of grit and hardiness are clearly important contributing factors to retention and performance in the demanding professional military environment of West Point. The results offer additional evidence supporting the notion that factors other than a traditional cognitively weighted composite can provide incremental, and in some instances, singular ability to predict important outcomes of persistence and performance in a strenuous training environment. These findings indicate that the explanatory power of cognitive aptitude alone is incomplete, particularly for predicting important nonacademic outcomes.

Although the observed mean differences, correlations, and effect sizes are modest, we judge them to be meaningful and of practical significance in this context, especially considering that attraction and selection to West Point effectively restricts entry to only those candidates with the highest levels of achievement—or the grit/hardiness intrinsic to their levels of success. The inherent restriction in the range of ratings has not been corrected and is perhaps operating to diminish and mask the full strength of the relationship (Cohen, 1988). Thus, the true strength of the grit performance–retention relationship is likely stronger and might be more demonstrable in settings where there is greater variation in the trait-like qualities of grit and hardiness and performance.

The results from this study lead to more practical considerations of their utility. The addition of grit or hardiness as a component in a selection system, for example, though compelling, would need to overcome the transparency inherent in a self-report measure of this socially desirable construct. Measures of grit and hardiness could also be useful in a diagnostic sense, with implications for appropriate support, particularly during the type of novel, highly demanding experience requiring sustained commitment and effort, like CBT. Intervention programs might be developed; for example, pairing individuals, perhaps on the basis of risk levels, to serve as a support mechanism through the more turbulent initial training. Others might need some level of coaching, social/peer support, or perhaps would benefit from one of several available hardiness training or resilience-skills development programs to increase one's resilience—perhaps similar to the hardiness training developed by Maddi (2007) involving coping, socially supportive interactions, and self-care exercises.

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