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Military Psychology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/hmlp20

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To cite this article: Everett S. Spain , Eric Lin & Lissa V. Young (2020): Early predictors of successful military careers among West Point cadets, Military Psychology

To link to this article: https://doi.org/10.1080/08995605.2020.1801285

Published online: 16 Nov 2020.

MILITARY PSYCHOLOGY
https://doi.org/10.1080/08995605.2020.1801285

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Early predictors of successful military careers among West Point cadets

Everett S. Spain, Eric Lin, and Lissa V. Young

Department of Behavioral Sciences and Leadership, United States Military Academy, West Point, New York

ABSTRACT

The importance of leadership to organizational performance puts a premium on identifying future leaders. Early prediction of high-potential talent enables organizations to marshal scarce developmental resources and opportunities to those who are best positioned to show distinction in elevated roles. Much of the existing literature indicates that general mental ability remains the strongest predictor of future professional performance. Using data from 13 classes of West Point graduates who stayed in the Army to be considered for at least early promotion to the rank of major (N = 5,505), regression analyses indicate that cadet military grade point average surpasses both cognitive ability and academic performance by a considerable margin in the ability to predict future professional outcomes such as selection for early promotion or battalion command. Moreover, these differences in predicting managerial career outcomes endure over 16 years. Both practical and theoretical implications are discussed.

ARTICLE HISTORY
Received 12 February 2019
Accepted 29 May 2020

KEYWORDS
Talent management; predictors of performance; career performance; leadership development; academic performance

Introduction

In US military and civil service organizations, most management track employees start at an entry level, develop and are promoted up through organizational levels of leadership. Organizations that internally develop leaders face two distinct challenges. First, these organizations have a finite number of assignments or roles that accelerate professional development and provide opportunities to demonstrate high potential. Second, the size and quality of the talent pool for subsequent leadership promotion decisions are constrained by retention and the organizations' previous development and promotion decisions. As a result, the early identification of leadership potential can have a large impact on the quality of these organizations' future leaders (Chambers, Foulon, Handfield-Jones, Hankin, & Michaels, 1998; Sperber & Linder, 2018).

That top performers disproportionately drive organizational productivity has been well documented (Aguinis & O'Boyle, 2014; Lepak & Snell, 2002; Nieves & Quintana, 2018). Top executives in private sector firms account for up to 14.5% of firms' total profits (Ou, Waldman, & Peterson, 2018; Wasserman, Anand, & Nohria, 2010). This outsized influence of leaders on organizational performance has also been documented in public service organizations (Boyne, 2004; Meier & O'Toole, 2001; Porter & Kramer, 2018). It follows that the early identification of leadership potential can have a large impact on the organizations' future success (Chambers et al., 1998; Sperber & Linder, 2018; Tulgan, 2001). Using West Point graduates' application data, cadet performance data, and officer performance data, this study examines and compares three early predictors of long-term managerial job performance: cognitive ability, collegiate academic performance, and military performance while a West Point cadet. We compare how well these factors predict career outcomes of West Point graduates.

We are also interested in how the predictive power of such early indicators change over time. Roth, BeVier, Switzer, and Schipmman's 1992 meta-analysis found that academic grades predict performance with decreasing accuracy over time, with correlations of ρ = 0.23 for performance measured within 1 year, ρ = 0.15 within 2 to 5 years, and ρ = 0.05 for 6 or more years. Our study examines outcomes after 16 years, providing an opportunity to investigate predictors of success over a longer duration. Also, we believe our study adds to the conceptual understanding of what traits and behaviors identify a West Point cadet as more (or less) likely to achieve a future career outcome such as being selected for early promotion to battalion command.

Factors predicting future managerial job performance

Predictive power of cognitive ability

Hundreds of empirical studies have confirmed the positive relationship between general measures of cognitive

CONTACT Eric Lin eric.lin@post.harvard.edu; eric.lin@westpoint.edu Department of Behavioral Sciences and Leadership, United States Military Academy, 601 Cullum Road, Thayer Hall, Room 259G, West Point, NY 10996.

Division 19 (Society for Military Psychology) of the American Psychological Association

ability and occupational performance (Hunter, 1986; Hunter & Schmidt, 1996; Ree & Earles, 1992); many of them concluded that the primary way cognitive ability affects performance is through the acquisition of job knowledge (Borman, White, Pulakos, & Oppler, 1991; Schmidt, Hunter, & Outerbridge, 1986).

Collectively, these studies found that general cognitive measures were better than occupation-specific measures in predicting job performance and job training success (Hunter, 1986; Hunter & Hunter, 1984; Jensen, 1986; Kuncel, Hezlett, & Ones, 2004; Ree & Earles, 1991; Ree, Earles, & Teachout, 1994; Schmidt, 2002; Thorndike, 1986). However, a majority of these studies measured performance in terms of applied technical skills in non-leadership roles over relatively short periods of time.

This tends to hold in military contexts. Several studies of the US Air Force enlisted personnel compared both measurements of general mental ability and job-specific capabilities and experience to performance. These studies found the latter adds only marginal predictive value, with the strongest predictor being general mental ability (Ree & Earles, 1990, 1991, 1992; Ree et al., 1994). The primacy of general mental ability in job performance was also supported in a study examining job performance for nine types of enlisted soldier jobs in the US Army (McHenry, Hough, Toquam, Hanson, & Ashworth, 1990).

Beyond the ability for general intelligence, often noted as *g* (after Spearman's seminal 1904 paper), to predict technical performance, several studies have examined *g*'s ability to predict managerial performance. Bartone, Snook, and Tremble (2002) found that while cognitive ability (*g*) predicted the military performance of upperclass cadets at West Point, this relationship was moderated by each cadet's non-cognitive factors (e.g., social skills) and personality factors (e.g., agreeableness and conscientiousness). House and Aditya's (1997) examination of the literature concluded that intelligence was an important component to leadership. This was supported by Lord, De Vader, and Alliger's (1986) meta-analysis that reported a strong correlation between intelligence and leadership (ρ = 0.50). Yet, Judge, Colbert, and Ilies' (2004) meta-analysis challenged the strength of the relationship between *g* and leadership. In their study's 151 independent samples across 96 sources, they found that the correlation between intelligence and leadership was weaker than previously thought (ρ = 0.21). In this study, the authors found that perceptions of intelligence by others was a stronger predictor of that person's leadership (measured by group performance) than objective measures of intelligence, such as standardized tests.

Recent research has shown the link between intelligence and leader performance may be less clear in the military context. Controlling for hardiness, Bartone, Kelly, and Matthews (2013) identified a weak yet significant negative relationship between SAT scores and cadet job performance. They also found that SAT score did not predict the leadership behavior of adaptability as Army officers measured 3 years after graduation.

Our first hypothesis tested whether *g*'s ability to predict short-term performance in technical domains extends across a longer time frame in the military managerial context. We tested the hypothesis that West Point cadets with higher measured cognitive ability were more likely to be selected by the Army for early promotion or battalion command than West Point cadets with lower measured cognitive ability.

Predictive power of academic performance

Scholars have noted that performance is a function of both ability and motivation (Maier, 1955). Because college grades reflected both general mental ability and the propensity to engage in mental work, academic performance could have been a strong predictor of future managerial job performance.

Researchers have found modest correlations between academic performance and subsequent professional achievement in the civilian sector. Cohen's (1984) meta-analysis of 108 studies examining the relationship between college grades and adult achievement showed a small average positive correlation (ρ = 0.18). A more recent meta-analysis that included larger sample sizes found similar uncorrected correlations (r = 0.16) and stronger corrected correlations (ρ = 0.30) (Roth, BeVier, Switzer, & Schippmann, 1996).

Stronger relationships have been reported in the military context. Cohen's (1984) found the correlation between academic grades and subsequent military achievement to be higher (ρ = 0.39) than the correlation between academic grades and civilian achievement (ρ = 0.17), though a subsequent meta-analysis showed the academic grades' predictive ability in the military (ρ = 0.14) to be similar to business (ρ = 0.14), scientific (ρ = 0.12), and medical contexts (ρ = 0.11) (Roth et al., 1996). The strength of academic grades as a predictor of performance in the military domain has not yet been tested across longer time horizons. Our second hypothesis extends the prior work examining the relationship between academic performance and career outcomes by investigating it over a 10 to 20 year period. We tested the hypothesis that West Point cadets with higher measured academic performance were more likely to be

selected by the Army for early promotion or battalion command than West Point cadets with lower grades.

Predictive power of early leadership performance

Prior work has reported that many traits and behaviors feed into early officer career performance, which may be predictive of longer-term officer performance. Van Iddekinge, Ferris, and Heffner (2009, p. 464) concluded that "leadership represents a complex pattern of behavior, and models that include a single or small sets of traits do not reflect this reality." Zacarro (2007) observed that when large numbers of explanatory factors are investigated, they are rarely organized a coherent way to facilitate a clear understanding of leader performance. Leadership roles, such as serving as a military officer, are different from technical roles; beyond narrow expertise, leadership competence incorporates a broad range of behaviors and traits (Jensen, 2009; Tucker & Gunther, 2009; Zaccaro, LaPort, & José, 2013). Indeed, more recent research has shown that there are many non-cognitive variables that impact leadership. Examples include the leader's social judgment and job knowledge (Connelly et al., 2000), personality factors such as conscientiousness and agreeableness (Bartone, Eid, Johnsen, Laberg, & Snook, 2009; Van Iddekinge et al., 2009), interests, leadership self-efficacy, motivation to lead, leadership experiences (Chan & Drasgow, 2001), grit (Duckworth, Peterson, Matthews, & Kelly, 2007), hardiness (Bartone et al., 2009), and social intelligence (Ferris, Witt, & Hochwarter, 2001).

Early job performance has also been shown to reflect the success with which employees have applied their human capital to organization capabilities (Chatman, 1989; Edwards, 1991; O'Reilly, Chatman, & Caldwell, 1991). Indeed, employees' initial job performance has been shown to predict their performance 5 to 6 years later (Berlew & Hall, 1966), though such outcomes were reportedly moderated by organizational context (Allison & Long, 1990; Fallatah & Syed, 2018).

Scholars have found that measured leadership attributes have also been shown to predict officer performance (Paullin et al., 2014; Wolters et al., 2014). These attributes have been linked to officer performance across the major Army officer commissioning sources, including the Reserve Officers' Training Corps (Legree, Kilcullen, Putka, & Wasko, 2014), Officer Candidate School (Allen et al., 2014), and West Point (Kelly, Matthews, & Bartone, 2014). Bartone et al. (2013) found hardiness of cadets predicted subsequent near-term adaptability of new officers (3 years after graduation). Our current study extended further into the officer career, testing the relationship between cadet job performance and career outcomes 10 to 20 years later.

Though college students' leadership performance (e.g., serving as a resident assistant, sports team captain, social event organization, group planner) has not been studied as extensively as cognitive ability and academic grades, collegiate leadership performance may be indicative of early career leadership performance if the tasks and context are similar to the ones they will experience in their future profession. With their future roles as junior officers, cadets live within military-structured organizations (squads, platoons, companies), have US Army-style titles and responsibilities (team leader, squad leader, platoon leader, company commander), and are formally evaluated in very similar ways to how they will be evaluated as an officer. Given the similarity between cadet leadership roles and subsequent expectations for Army officers, we tested the hypothesis that a positive relationship exists beteen cadet leadership performance and subsequent officer selection for early promotion and battalion command.

Methods

Sample

Our sample of participants included all of the 11,975 US graduates of the 13 West Point classes from 1992 to 2004 who remained in the Army long enough to be considered for at least early promotion to the rank of major (N = 5,505). All of these officers incurred a 5-year active-duty service obligation following graduation, as well as received a commission in the US Army as a second lieutenant, where they could expect to be placed into subsequent and expanding leadership roles. For individuals in our sample, West Point required cadets to be at least 17 but not yet 23 years old on their day of matriculation to West Point, which corresponds to graduating between 21 and 26 years old (most were 22 at graduation).

The West Point graduates in our study were eligible to leave the Army after their 5-year active-duty commitment; a majority of West Point graduates left the service before they could be considered for promotion to major and command roles. There were many potential reasons why an officer may have chosen to leave the Army at any point after year 5, including but not limited to desire for career predictability or geographical stability and strong labor market value as a civilian professional. At the 8 to 10 year mark after commissioning, West Point graduates were considered for a 1-year early promotion to the rank of major, our first outcome of interest. The promotion has been referred to as "early" because only 2 to 10% of

all Army officers eligible were selected in their first year of consideration. The following year, those who were not selected early were considered again, and between 70 and 90% of them were selected for promotion to major (often referred to as "due course" promotion). From our sample's initial 11,975 graduating cadets, 5,505 graduates remained in the Army long enough to be considered for selection for early promotion to the rank of major. For early promotion to lieutenant colonel (also a 2 to 10% Army-wide selection rate), 1,559 of the original sample remained to be considered. For battalion command (a 20% Army-wide selection rate), 1,289 individuals remained to be considered.

Naturally, retention drives correlations between early promotions and accession to general officership, since only those who remain in the Army are considered for either. That said, selection for early promotion is a signal of recognized capability and potential, as approximately 80% of general officers were selected for early promotion at least once (Hicks, 1987).

Measures

Criterion variables

We used the dichotomous variables for each of three outcomes: early promotion to major (*EPM*), early promotion to lieutenant colonel (*EPL*), and selection for battalion command (*BC*) as our criterion variables. We defined each to take the value of 0 if the officer was considered for promotion or command but not selected, and 1 if the officer was considered and selected.

Every time Army officers changed jobs or supervisors, their supervisors gave them an Officer Evaluation Report (OER), which became part of the officers' official performance file. Annually, the Army held one promotion board for each rank and one selection board for battalion command. Only officers who were commissioned in a certain year were considered. An officer must have voluntarily continued in the Army to be considered (8 to 10 years for *EPM*, 15 years for *EPL*, and 16 years for *BC*); officers who voluntarily separated prior to this point were not considered. A board consisted of a sequestered group of senior officers who reviewed each of the eligible officers' OERs. Each board member rated each candidate's file, and the board members' scores were averaged to produce an overall candidate score. The board then selected the officers with the highest scores for early promotion. A nearly identical process was used to determine selection for battalion. Since Army officer promotion and selection board decisions are informed almost solely by officers' OERs, the Army officer promotion and command selection process is likely limited in measuring officers' maximal performance or technical performance.

We received these data from the US Army's Office of Economic and Manpower Analysis, who accessed each West Pointer's official electronic military record, including both cadet and officer data. While cadet performance data is not publicly available, the Army published the lists of officers selected during its promotion and command selection boards.

Predictor variables

Hypothesis 1 tests the predictive power of cognitive ability; we used cadet overall SAT scores (*SATTOT*) to measure this, based on the 1600-point SAT test that was given when our sample was applying to West Point. To be easily interpreted by our subsequent Logit analyses, we transformed *SATTOT* by dividing the raw score by 100 so that a 1-unit change in *SATTOT* was roughly equal to a 1-standard deviation change (1.06, or 106 points). Our sample's *SATTOT* minimum was 7.8 (780 points), its maximum was 16.0 (1,600 points), and its mean was 12.68 (1,268 points). Since *SATTOT*'s skewness was 0.24 and kurtosis was 0.77 (both evidence for a normal distribution with at least a 95% confidence), the *SATTOT* measure approximated a normal distribution.

For Hypotheses 2, 3, and 4, we tested academic GPA (*AGPA*) and military GPA (*MGPA*) as predictors of performance. Both performance measures were based on a 4.0 performance scale, with the following letter and number equivalents: A = 4.0, B = 3.0, C = 2.0, D = 1.0, and F = 0.0 with 0.33 points being added for a "+" and 0.33 points subtracted for a "–" (e.g., a B+ = 3.33).

AGPA captured the grade point average of each cadet's 42 academic courses taken while at West Point in fulfillment of his or her Bachelor of Science degree. It was calculated by multiplying each academic course's numeric grade value by the semester hours for that course, divided by total semester hours over 4 years. There was no formal grading curve for any class or overall *AGPA*.

MGPA captured each cadet's cumulative job evaluations ratings and military course grades over 4 years and reflected the cadets' overall performance in meeting military training requirements (Lewis et al., 2005). The majority (70%) of this score was the force-distributed evaluation of the cadets' job performances in each of their assigned followership or leadership roles. During their 11 terms, only 20% of cadets in any were allowed to receive an "A" rating, 40% of cadets were allowed to receive a "B," and the remaining 40% earned a "C" or below during each grading event (Milan, Bourne, Zazanis, & Bartone, 2002). After each

of the terms, cadets received a military development grade calculated by the following formula: 50% was assigned by their cadet company tactical officer (typically a US Army captain with legal command authority over a subgroup of 125 cadets), 30% was assigned by their immediate cadet boss, and 20% was assigned by their second- and third-level cadet bosses (Milan et al., 2002). Since cadets were typically in formal supervisory positions at all times apart from their first year at the Academy, "tactical officers and cadet supervisors are instructed to consider 12 behavioral domains in relation to the cadet's leader performance" (Bartone et al., 2009, p. 503). These include duty motivation, military bearing, planning and organizing, decision making, oral and written communication, delegating, supervising, developing subordinates, teamwork, influencing others, consideration for others, and professional ethics (U.S. Corps of Cadets, 1995), all of which were either direct or indirect expectations of Army officers (U.S. Army, 2019). The construct validity of the 12 behavioral domains' has been verified in prior work (Schwager & Evans, 1996).

In addition to the 70% of the *MGPA* derived by cadet job performance ratings, the remaining 30% came from the grades the cadets earned in their yearly military science courses, where cadets studied small unit tactics, military leadership doctrine, and developing and giving military operations orders. These courses were not included as part of cadets' *AGPA*. The combination of the 70% from mostly managerial job ratings and 30% from military-specific courses was combined into a single military development grade for each of the 11 cadet terms, and these grades were averaged over 4 years to make up each cadet's overall *MGPA*. According to West Point's Brigade Tactical Department (Brigade Tactical Department (BTD), 2018, p. 1), the Military GPA has been used to "assess [c]adets' performance, potential, and development" and reflects the cadets' potential as an Army officer.

Control variables

After reviewing all of the data readily available on West Point cadets' demographics and performance, we added several control variables to sharpen the measured influence of our predictor variables' over the criterion variables.

First, we controlled for physical GPA (*PGPA*) while at West Point. A cadet's *PGPA* was calculated with 50% of the grade being instructional coursework (such as gymnastics, swimming, boxing for men, and close quarters combat for women), 30% semiannual physical fitness test scores (push-ups, sit-ups, 2-mile run, and indoor obstacle course), and 20% competitive sport index (giving credit to cadets for playing varsity or club sports, and how well their teams did if they played intramurals). It was a 4-year cumulative grade and there was no forced curve. *PGPA* could potentially influence the criterion variables since Army officers were also given graded physical fitness tests at least every 6 months, and these scores were one of the few objective measures for comparison to other officers available to those who write their officer evaluations.

Next, we controlled for whether a cadet attended the United States Military Academy Preparatory School (*USMAPS*), which was located at Fort Monmouth, NJ, during the period of this study. The purpose of *USMAPS* was to provide a 1-year rigorous academic preparatory curriculum for young men and women who had strong leadership potential but who were initially academically unqualified for West Point. *USMAPS* was measured as a dichotomous variable, defined to take a value of 1 if a cadet attended *USMAPS* for the year prior to coming to West Point and a 0 if he or she did not. *USMAPS* attendance could have potentially influenced the criterion variables since *USMAPS* provided an additional year of human capital and personal and professional network development.

Recruited athlete (*RECATH*) was measured as a dichotomous variable, defined to take the value of 1 if that cadet was officially recruited by West Point's Directorate of Intercollegiate Athletics and a 0 if they were not. Being a *RECATH* could have signaled exceptional physical ability or experience working on high-performing teams, both of which could have predicted success as an officer.

We included two deployment time control variables: deployed years during the first 7 years (*DEP07*) and deployed years over the first 14 years of service (*DEP14*). Each of these was a continuous variable that indicated the total number of years that the officer had spent deployed. Officer ratings could have been influenced by demonstrated military skills gained during deployments. It is important to note that such controls are determined after GPA; as a result, while their inclusion helps isolate the effects of these factors, coefficients should be interpreted with caution.

Demographic controls included gender (*FEMALE*), which takes the value of 1 if the observation is female, 0 otherwise, and six binary ethnicity variables, defined as having the value of 1 if the cadet claimed that ethnicity and a value of 0 if not. Females made up 9% of our sample. Ethnicity indicator variables include *Caucasian, African-American, Hispanic-American, Asian-American*, and *Native-American*, and comprised 83%, 6.4%, 3.7%, 5.4%, and 0.6% of the sample, respectively, while other ethnicities made up 0.9%.

Finally, we included dummy variables for the Army branch into which a cadet was commissioned after graduation. Army branch (*BRCH*) dummies captured the 16 functional specialties that the participants joined upon graduation. They included Infantry (19.2%), Armor (11.4%), Engineer (12.1%), Field Artillery (12.8%), Aviation (12.0%), Air Defense Artillery (5.0%), Chemical (0.6%), Signal (4.9%), Military Intelligence (7.6%), Military Police (2.4%), Ordnance (2.0%), Transportation (2.1%), Quartermaster (2.6%), Finance (0.8%), Adjutant General (2.2%), and Medical Service (2.0%). During the time of this study, female cadets could not commission into Infantry or Armor, but could commission into any of the other 14 Army branches. Army branch could have influenced outcomes since senior officers who rate junior officers may have viewed some branches as having higher quality officers and rated them higher than junior officers who served in other branches.

The Year Group (*YG*) dichotomous variables captured the years each cadet graduated from West Point (1992–-2004). Each *YG* dummy was defined as having the value of 1 if the cadet graduated with that class and a value of 0 if he or she did not. Each cadet in the study graduated from only one class. This variable helped account for endogenous influences such as major US economy shifts, Army personnel policy changes, changing generational values of Army officers, etc.

Procedure

We tested whether the probability that a West Pointer's career outcome was predicted by models incorporating cognitive ability, West Point performance, attendance at West Point's preparatory school, deployment history, and demographic variables. The career outcomes of interested included the following:

- early promotion to major (*EPM*)
- early promotion to lieutenant colonel (*EPL*)
- selection for battalion command (*BC*)

Because each of the criterion variables were measured as binary outcomes, we used logit regression models. For the analysis of what factors predicted early promotion to major *(EPM)*, we applied the following model specification:

$$\begin{aligned} Logistic(EPM) = {} & \alpha + \beta_1 SATTOT + \beta_2 AGPA \\ & + \beta_3 MGPA + \beta_4 PGPA + \beta_5 USMAPS \\ & + \beta_6 RECATH + \beta_7 FEMALE \\ & + \beta_8 RACE + \beta_9 DEP07 + \beta_{10} YG \\ & + \beta_{11} BRCH + \varepsilon \end{aligned}$$

Similar equations were used for early promotion to lieutenant colonel (*EPL*) and selection for battalion command (*BC*), except the years deployed variable (*DEP14*) was used in place of *DEP07* for *EPM* and *BC*. To test the robustness of our three predictor variables, we examined each of their predictive power via five-step build models, where we first tested our predictors' main effects, and then sequentially added individual or small groups of control variables. We concluded our builds by adding the other two predictor variables. All standard errors were corrected for robustness to heteroskedasticity. In additional analyses to ensure the power of our predictive variables were unique over time, we also plotted their receiver operating characteristic (ROC) curves and marginal effects plots.

Results

The summary statistics of the criterion, predictor, and control variables are presented in Tables 1a–1c. We report overall summary statistics for the entire sample; additionally, we reported summary statistics separately for those officers leaving prior to promotion and for those remaining in the Army until the observed promotion decision. Summary statistics for those leaving before versus those who retained until the promotion to major are reported in Table 1a. Analogous statistics for the promotion to lieutenant colonel are reported in Table 1b and for battalion command in Table 1c. Comparisons of stayers versus leavers indicated that populations differed along measures of our predictor and control variables. Stayers had slightly higher *SATTOT, AGPA*, and *MGPA* scores compared to leavers. Stayers also had higher representation from those attending the Preparatory School. Leavers had a higher proportion of women officers as well as officers who were recruited athletes at the Academy. These mean comparisons are all statistically significant at the $p < .05$ level. Such differences between stayers and leavers indicated that additional analyses for addressing possible self-selection effects (since officers have choice to leave the Army after their five-year commitment) were warranted. After reporting our main results, such analyses were reported in the section on additional analyses and robustness checks.

Table 2 reports bivariate correlations. Several variables were significantly correlated at the $p \leq 0.05$ level, including the three criterion variables, where each had a positive and moderate correlation with each other. The correlation between early promotion to major (*EPM*)

Table 1a. Summary statistics by stayers and leavers for consideration for early promotion to major *(EPM)*.

				Stay for BZ to MAJ			Leave before BZ to MAJ				
Variable	Obs.	Mean	S.D.	Obs.	Mean	S.D.	Obs.	Mean	S.D.	t-statistic	Cohen's *d*
SATTOT	11,961	12.68	1.06	5,505	12.72	1.06	6,456	12.64	1.05	3.83*	−0.07*
AGPA	11,958	2.92	0.44	5,505	2.93	0.45	6,453	2.91	0.44	2.94*	−0.05*
MGPA	11,955	3.10	0.34	5,505	3.14	0.33	6,450	3.06	0.34	12.35*	−0.23*
PGPA	11,952	2.92	0.41	5,505	2.94	0.41	6,447	2.91	0.41	4.86*	−0.09*
USMAPS	11,975	0.14	0.34	5,505	0.15	0.35	6,470	0.13	0.34	2.64*	−0.05*
RECATH	11,974	0.20	0.40	5,505	0.16	0.36	6,469	0.24	0.42	10.54*	0.19*
FEMALE	11,975	0.13	0.34	5,505	0.11	0.31	6,470	0.15	0.36	6.11*	0.11*

*Means for West Pointers who stayed are significantly different than those who left at the $p < 0.05$ level

Table 1b. Summary statistics by stayers and leavers for consideration for early promotion to lieutenant colonel *(EPL)*.

				Stay for BZ to LTC			Leave before BZ to LTC				
Variable	Obs.	Mean	S.D.	Obs.	Mean	S.D.	Obs.	Mean	S.D.	t-statistic	Cohen's *d*
SATTOT	5,618	12.65	1.03	1,559	12.72	1.03	4,059	12.62	1.02	3.20*	−0.10*
AGPA	5,621	2.89	0.42	1,559	2.92	0.43	4,062	2.87	0.42	4.30*	−0.13*
MGPA	5,619	3.09	0.35	1,559	3.17	0.34	4,060	3.06	0.35	10.20*	−0.30*
PGPA	5,621	2.83	0.41	1,559	2.85	0.41	4,062	2.82	0.41	2.32*	−0.07*
USMAPS	5,630	0.14	0.34	1,559	0.17	0.37	4,071	0.13	0.33	4.22*	−0.13*
RECATH	5,630	0.20	0.40	1,559	0.14	0.34	4,071	0.22	0.42	7.18*	0.21*
FEMALE	5,630	0.11	0.32	1,559	0.09	0.29	4,071	0.12	0.33	3.28*	0.10*

*Means for West Pointers who stayed are significantly different than those who left at the $p < 0.05$ level

Table 1c. Summary statistics by stayers and leavers for consideration for selection for battalion command *(BC)*.

				Stay for BC			Leave before BC				
Variable	Obs.	Mean	S.D.	Obs.	Mean	S.D.	Obs.	Mean	S.D.	t-statistic	Cohen's *d*
SATTOT	4,746	12.64	1.03	1,289	12.69	1.04	3,457	12.62	1.03	2.13*	−0.07*
AGPA	4,748	2.87	0.42	1,289	2.89	0.43	3,459	2.86	0.42	2.54*	−0.08*
MGPA	4,746	3.11	0.35	1,289	3.18	0.34	3,457	3.09	0.35	8.57*	−0.28*
PGPA	4,748	2.82	0.41	1,289	2.83	0.41	3,459	2.82	0.41	0.85	−0.03
USMAPS	4,758	0.13	0.34	1,289	0.17	0.38	3,469	0.12	0.33	4.21*	−0.14*
RECATH	4,758	0.20	0.40	1,289	0.13	0.34	3,469	0.22	0.41	6.73*	0.22*
FEMALE	4,758	0.11	0.32	1,289	0.09	0.29	3,469	0.12	0.33	2.65*	0.09*

*Means for West Pointers who stayed are significantly different that those who left at the $p < 0.05$ level

Table 2. Descriptive statistics and bivariate correlations.

			Correlations										
Variable	Mean	SD	*EPM*	*EPL*	*BC*	*SAT-TOT*	*AGPA*	*MGPA*	*PGPA*	*US-MAPS*	*RE-CATH*	*FE-MALE*	*DEP07*
EPM	0.12	0.32	1										
EPL	0.11	0.31	0.32*	1									
BC	0.20	0.40	0.32*	0.39*	1								
SATTOT	12.67	1.06	−0.03	−0.05*	−0.11*	1.00							
AGPA	2.92	0.43	0.11*	0.02	−0.07*	0.49*	1						
MGPA	3.17	0.34	0.19*	0.15*	0.21*	0.11*	0.42*	1					
PGPA	2.85	0.41	0.13*	0.12*	0.07*	−0.03*	0.31*	0.37*	1				
USMAPS	0.17	0.38	−0.04*	−0.03	−0.04	−0.22*	−0.24*	−0.01	−0.04*	1			
RECATH	0.14	0.34	0.01	0.07*	0.03	−0.33*	−0.22*	−0.13*	0.11*	0.05*	1		
FEMALE	0.09	0.29	0.01	0.02	−0.02	−0.05*	0.01	0.01	0.03*	−0.02*	0.06*	1	
DEP07	0.44	0.49	0.12*	0.03	−0.10*	−0.01	0.00	0.04*	0.18*	−0.02	−0.02	−0.02	1
DEP14	1.50	1.01	0.14*	0.12*	0.00	−0.05*	−0.05*	−0.05*	−0.06*	0.03	0.02	−0.09*	−0.64*

N = 5,577– 1,289; *p <.05. The correlations that include performance measures reflect cumulative program scores as first-class cadets (seniors). EPM = Early Promotion to Major; EPL = Early Promotion to Lieutenant Colonel; BC = Designated for Battalion Command; SATTOT = SAT total score; AGPA = Academic GPA; MGPA = Military GPA; PGPA = Physical GPA; USMAPS = attended West Point's 1-year preparatory school; RECATH = recruited athlete; DEP07 = years deployed after 7 years as an officer; DEP14 = years deployed after 14 years as an officer.

and early promotion to lieutenant colonel (*EPL*) was ρ = 0.32; for early promotion to major (*EPM*) and battalion command (*BC*), the correlation was ρ = 0.32. For early promotion to lieutenant colonel (*EPL*) and selection for battalion command (*BC*), the correlation was ρ = 0.39. There was also correlation among our focal predictor variables, *SATTOT, AGPA*, and *MGPA*. These correlations highlighted the need to address the possible

distortions in estimates resulting from collinearity among measures, which we addressed in our section on additional analyses and robustness checks.

Did cognitive ability predict future officer career outcomes?

We hypothesized that a West Pointer's cognitive ability would be predictive of his or her officer career success. Our regression analysis showed that cognitive ability was a negative predictor of officer career success in both the short term and longer term. Table 3 reports regression results as exponentiated coefficients from logit models for ease of interpretation. These coefficients measured the change in odds-ratio associated with a single unit change in the covariate; a coefficient =1.0 predicts no change. Correspondingly, statistically significant coefficients >1.0 are positive predictors, and statistically significant coefficients between 0 and 1.0 are negative predictors.

One striking result is that for all reported models in Table 3, the coefficient on *SATTOT* was less than 1.0, meaning that higher *SATTOT* scores were statistically significant and consistently associated with smaller likelihood of being promoted early. In Table 3, Model 1, the coefficient of 0.92 suggested that a 100-point increase in a cadet's SAT score (which is approximately one standard deviation) was associated with an 8% decrease in odds of being promoted early to major. Controlling for number of years deployed increased this negative effect of measured cognitive ability by four percentage points (Model 2), with each positive unit change in *SATTOT* associated with a 12% smaller odds of early promotion. Controlling for gender increased the negative effect to 15% (Model 3), and this estimate was not materially changed by controls for whether the cadet was a recruited athlete or attended *USMAPS* (Model 4). Including academic and military GPA (*AGPA* and *MGPA*) as additional explanatory variables in Model 5 resulted in an even greater negative association between *SATTOT* and early promotion likelihood. *SATTOT* also negatively predicted *EPL* and *BC* deeper in an officer's career, with *SATTOT* coefficients of 0.83 (not significant at the $p < .05$ level) and 0.71 (significant at the $p< .01$), respectively. These results were reported in Models 6 and 7 of Table 3, which replicate Model 5 over the two additional criterion variables, *EPL* and *BC*.

To translate these differences in odds into specific differences in predicted probabilities, we used Model 5 to predict probabilities of *EPM*, holding other predictors at their mean. Figure 1 mapped the predicted probability

Table 3. Logistic regression (*SATTOT* build) for *early promotion to major (EPM), early promotion to lieutenant colonel (EPL)*, and *selection for battalion command (BC). All coefficients exponentiated.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable						
	– – – – – - *Early Promotion to Major* – – – – –					*EPL*	*BC*
SATTOT	0.92**	0.88***	0.85***	0.83***	0.73***	0.83*	0.71***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.09)	(0.06)
MGPA	-	-	-	-	6.76***	3.64***	3.44***
					(1.23)	(1.15)	(1.00)
AGPA	-	-	-	-	1.63***	1.26	0.80
					(0.23)	(0.36)	(0.19)
PGPA	-	-	-	-	1.55***	2.08***	1.77***
					(0.22)	(0.52)	(0.36)
DEP07	-	1.56***	1.55***	1.55***	1.56***	-	-
		(0.11)	(0.11)	(0.11)	(0.11)		
DEP14	-	-	-	-	-	1.74***	1.63***
						(0.15)	(0.13)
FEMALE	-	-	1.16	1.12	1.07	1.57	0.99
			(0.19)	(0.19)	(0.19)	(0.61)	(0.32)
RECATH	-	-	-	1.13	1.37**	1.93***	1.21
				(0.15)	(0.19)	(0.47)	(0.28)
USMAPS	-	-	-	0.63***	0.59***	0.61*	0.60**
				(0.10)	(0.09)	(0.17)	(0.13)
Year Group	-	in model	in model	in model	in model	in model	in model
Branch	-	in model	in model	in model	in model	in model	in model
Ethnicity	-	-	in model	in model	in model	in model	in model
Constant	0.35**	0.24***	0.37	0.49	0.00***	0.00***	0.22
	(0.18)	(0.14)	(0.23)	(0.33)	0.00	0.00	(0.30)
Observations	5,505	5,505	5,505	5,505	5,505	1,559	1,289

Statistically significant Logit coefficients greater than 1.0 are positive predictors, and coefficients between 0.0 and 1.0 are negative predictors. *SATTOT* = SAT total score; *MGPA* = Military GPA; *PGPA* = Physical GPA; *DEP07* = years deployed after 7 years as an officer; *DEP14* = years deployed after 14 years as an officer; *RECATH* = recruited athlete; *USMAPS* = attended West Point's 1-year preparatory school.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

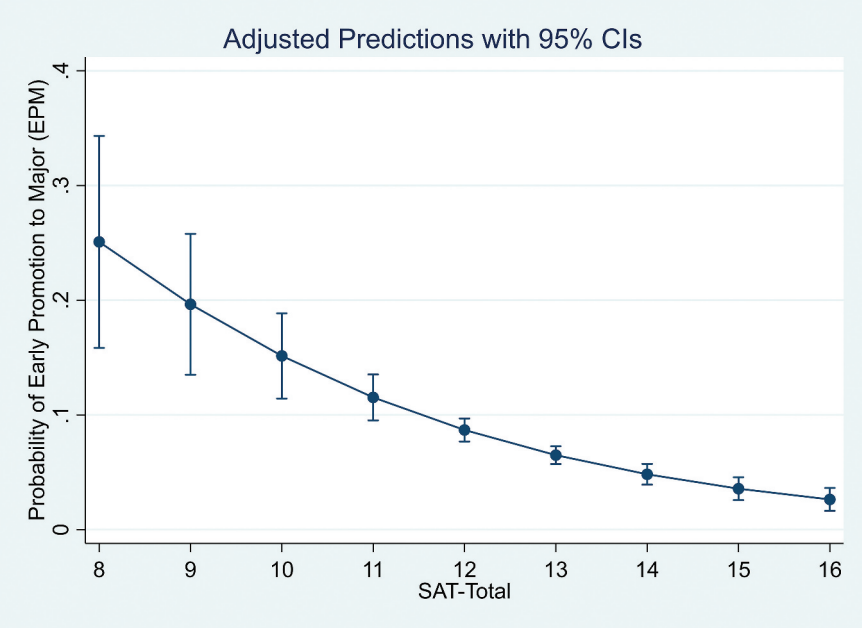

Figure 1. Likelihood of *EPM* across range of *SATTOT* (marginal effects). Notes: Marginal effects predict how the likelihood of the criterion variable occurring when the magnitude of an explanatory variable changes. This figure (based on the logit regression of Table 3, Model 5) illustrates that *SATTOT* remains a statistically significant predictor of *EMP* across the full range of *SATTOT* scores. It also demonstrates that the higher the *SATTOT* score, the smaller the magnitude of *SATTOT's* predicted effect on *EPM*. For example, an *SATTOT* of 9 (900 points) predicts a 16% to 34% probability of *EPM*, while an *SATTOT* of 15 (1,500 points) predicts 3% to 5% chance of *EPM*, with all other explanatory/control variables remaining constant. (significant at the $p < .05$ level)

of *EPM* for different *SATTOT* levels, holding other predictors at their mean values. Moving one standard deviation below to one standard deviation above the mean *SATTOT* (12.67) corresponded approximately to moving from a *SATTOT* of 11.67 (1,170 score) to 13.67 (1,370 score). This *SATTOT* change equated to moving from an 11.53% predicted probability of early promotion to major to a 6.5% predicted probability. These findings did not generally support the notion that cognitive ability is a strong predictor of professional success. Though these counterintuitive findings had been noted in prior work (Spain, Mohundro, & Banks, 2015), they should only be considered within the limitations of this study.

Did academic GPA performance predict future officer career outcomes?

To test our second hypothesis, we evaluated the predictive power of a West Pointer's *AGPA* on *EPM, EPL*, and *BC*, accounting for a host of controls. Logit regression results were reported in Table 4 using exponentiated coefficients for ease of interpretation. For Table 4, Model 1, the coefficient on *AGPA* of 2.17 indicated that all else being equal, moving from an *AGPA* of 2.4 to 3.4, for example, was associated with a 117% increase in the odds of *EPM*. In Model 2, we added control variables for number of deployed years, graduation year, and branch. Results were materially unchanged, with the coefficient on *AGPA* moving to 2.33. In Model 3, we added controls for gender; while the coefficient on gender was not statically significant, the inclusion of this control leaves the AGPA coefficient materially unchanged at 2.29 statistically significant at the $p \leq .05$ level. The addition of control variables for whether the cadet was a recruited athlete or attended *USMAPS* in Model 4 did not materially change the estimated effect of *AGPA*. Finally, in Model 5, we added controls for the other two types of grade point averages, *PGPA* and *MGPA*, as well as *SATTOT*. The inclusion of these controls attenuated the effect associated with *AGPA*, suggesting that a substantial portion of how *AGPA* drives career success was also correlated with the other performance measures. The coefficient on *AGPA* dropped to 1.63, suggesting a 1-point increase in *AGPA* is associated with a 63% ($p \leq 0.05$) increased odds of being selected for *EPM*. Model 5 of Table 4 suggested that *AGPA* as a measure contained predictive power for future career success independent of attributes measured by *PGPA* and *MGPA*.

To translate these differences in odds into specific differences in predicted probabilities, we plotted predicted probabilities in Figure 2, holding other predictors at their mean. Moving from one standard deviation below to one standard deviation above the mean *AGPA* corresponded

Table 4. Logistic regression (*AGPA* build) for *early promotion to major (EPM), early promotion to lieutenant colonel (EPL*), and *selection for battalion command* (BC). *All coefficients exponentiated.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable						
	– – – – – - *Early Promotion to Major* – – – – – -					*EPL*	*BC*
AGPA	2.17***	2.33***	2.29***	2.44***	1.63***	1.26	0.80
	(0.21)	(0.23)	(0.23)	(0.26)	(0.23)	(0.36)	(0.19)
SATTOT	-	-	-	-	0.73***	0.83*	0.71***
					(0.04)	(0.09)	(0.06)
MGPA	-	-	-	-	6.76***	3.64***	3.44***
					(1.23)	(1.15)	(1.00)
PGPA	-	-	-	-	1.55***	2.08***	1.77***
					(0.22)	(0.52)	(0.36)
DEP07	-	1.63***	1.64***	1.65***	1.56***	-	-
		(0.12)	(0.12)	(0.12)	(0.11)		
DEP14	-	-	-	-	-	1.74***	1.63***
						(0.15)	(0.13)
FEMALE	-	-	1.27	1.20	1.07	1.57	0.99
			(0.22)	(0.20)	(0.19)	(0.61)	(0.32)
RECATH	-	-	-	1.61***	1.37**	1.93***	1.21
				(0.20)	(0.19)	(0.47)	(0.28)
USMAPS	-	-	-	0.92	0.59***	0.61*	0.60**
				(0.14)	(0.09)	(0.17)	(0.13)
Year Group	-	in model	in model	in model	in model	in model	in model
Branch	-	in model	in model	in model	in model	in model	in model
Ethnicity	-	-	in model	in model	in model	in model	in model
Constant	0.01***	0.00***	0.00***	0.00***	0.00***	0.00***	0.22
	0.00	0.00	0.00	0.00	0.00	0.00	(0.30)
Observations	5,505	5,505	5,505	5,505	5,505	1,559	1,289

Statistically significant Logit coefficients greater than 1.0 are positive predictors, and coefficients between 0.0 and 1.0 are negative predictors. *SATTOT* = SAT total score; *MGPA* = Military GPA; *PGPA* = Physical GPA; *DEP07* = years deployed after 7 years as an officer; *DEP14* = years deployed after 14 years as an officer; *RECATH* = recruited athlete; *USMAPS* = attended West Point's 1-year preparatory school.
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

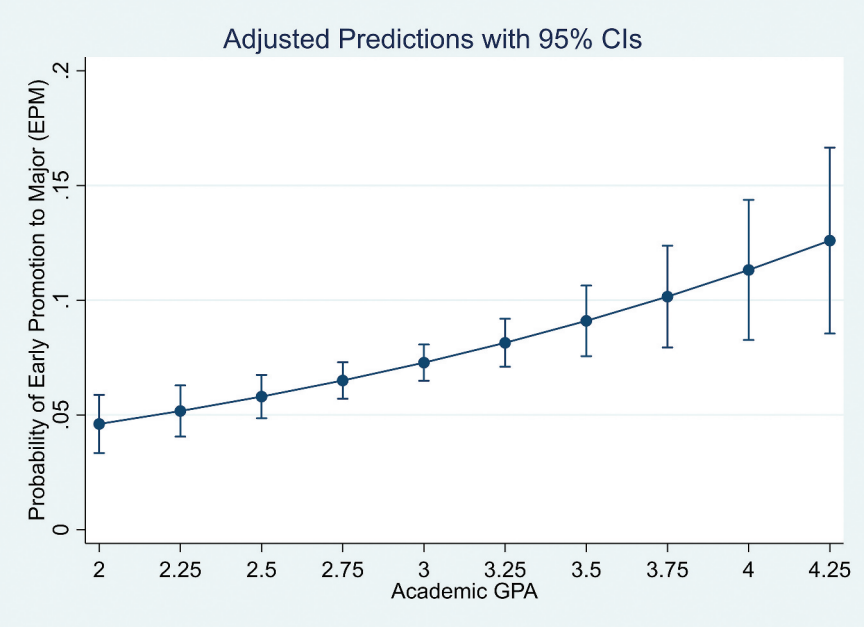

Figure 2. Likelihood of *EPM* across range of *AGPA* (marginal effects). Notes: see notes for Figure 1

approximately to moving from 2.5 to 3.3. Such a changed equated to moving from a 5.8% predicted probability of *EPM* to an 8.1% predicted probability.

For the other two possible outcomes further into a West Point officer's career, *EPL* and *BC, AGPA* did not maintain its predictive properties. In Table 4, Model

5 was replicated over these two additional outcome variables in Model 6 and Model 7 for those who remain in the Army to be considered for these promotions or selections. In Model 6 and 7, the *AGPA* coefficient was not statistically significant. This evidence indicated *AGPA* positively predicts future officer performance 7 to 10 years after West Point graduation but not 14 to 16 years after graduation.

Did military GPA predict future officer career outcomes?

Results investigating the impact of *MGPA* are reported in Table 5. Again, exponentiated logit model results were reported. A coefficient on *MGPA* of 7.73, reported in Model 1 from Table 5, indicated a 1-point increase in a West Pointer's *MGPA* (for example, going from a below-average 2.5 *MGPA* to an above-average 3.5 *MGPA*) predicted 673% increase in the odds of being selected for *EPM* ($p \leq 0.01$). In Model 2, we added control variables for number of deployed years, graduation year, and branch. The effect associated with a 1-point change in *MGPA* intensified to 824% increase in the odds of being promoted early to the rank of major. In Model 3, we added the control for gender; while the coefficient on gender was not statically significant, the inclusion of this control left the estimated effect of *MGPA* materially unchanged. Model 4's inclusion of control variables for *RECATH* and *USMAPS* intensified the estimated effect of a 1.0-point change in *MGPA* to 933% higher odds of *EPM*. Finally, in Model 5, we introduced controls for *SATTOT, PGPA* and *AGPA*. The inclusion of these controls attenuates the effect associated with *MGPA*, suggesting that a substantial portion of how *MGPA* drives career success is also correlated with the other predictor measures. In the (full) Model 5, the coefficient on *MGPA* dropped to 6.76, suggesting a 1-point increase in *MGPA* was associated with a 576% increase in the odds of being selected for *EPM* ($p \leq 0.01$). The coefficient on *MGPA* controlling for other measures of performance was notably strong (6.76), which was much more than the predictive power of either *AGPA* or *SATTOT*.

To translate these differences in odds into specific differences in predicted probabilities, we used Model 5 to predict probabilities of *EPM*, holding other predictors at their mean. Marginal effects of *MGPA* on *EPM* are plotted in Figure 3, holding other predictors at their mean values. Moving one standard deviation below to one standard deviation above the mean *MGPA* corresponded approximately to moving from a 2.8 to 3.5 *MGPA*. This equated to moving from a 3.5% to a 13.2% predicted probability of *EPM*.

Table 5. Logistic regression (*MGPA* build) for *early promotion to major (EPM), early promotion to lieutenant colonel (EPL)*, and *selection for battalion command (BC). All coefficients exponentiated.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable						
	- - - - - - *Early Promotion to Major* - - - - - -					*EPL*	*BC*
MGPA	7.73***	9.24***	9.06***	10.33***	6.76***	3.64***	3.44***
	(1.14)	(1.44)	(1.42)	(1.66)	(1.23)	(1.15)	(1.00)
SATTOT	-	-	-	-	0.73***	0.83*	0.71***
					(0.04)	(0.09)	(0.06)
AGPA	-	-	-	-	1.63***	1.26	0.80
					(0.23)	(0.36)	(0.19)
PGPA	-	-	-	-	1.55***	2.08***	1.77***
					(0.22)	(0.52)	(0.36)
DEP07	-	1.52***	1.52***	1.54***	1.56***	-	-
		(0.11)	(0.11)	(0.11)	(0.11)		
DEP14	-	-	-	-	-	1.74***	1.63***
						(0.15)	(0.13)
FEMALE	-	-	1.17	1.05	1.07	1.57	0.99
			(0.21)	(0.19)	(0.19)	(0.61)	(0.32)
RECATH	-	-	-	1.67***	1.37**	1.93***	1.21
				(0.22)	(0.19)	(0.47)	(0.28)
USMAPS	-	-	-	0.61***	0.59***	0.61*	0.60**
				(0.09)	(0.09)	(0.17)	(0.13)
Year Group	-	in model	in model	in model	in model	in model	in model
Branch	-	in model	in model	in model	in model	in model	in model
Ethnicity	-	-	in model	in model	in model	in model	in model
Constant	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.22
	0.00	0.00	0.00	0.00	0.00	0.00	(0.30)
Observations	5,505	5,505	5,505	5,505	5,505	1,559	1,289

Statistically significant Logit coefficients greater than 1.0 are positive predictors, and coefficients between 0.0 and 1.0 are negative predictors. *SATTOT* = SAT total score; *MGPA* = Military GPA; *PGPA* = Physical GPA; *DEP07* = years deployed after 7 years as an officer; *DEP14* = years deployed after 14 years as an officer; *RECATH* = recruited athlete; *USMAPS* = attended West Point's 1-year preparatory school.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

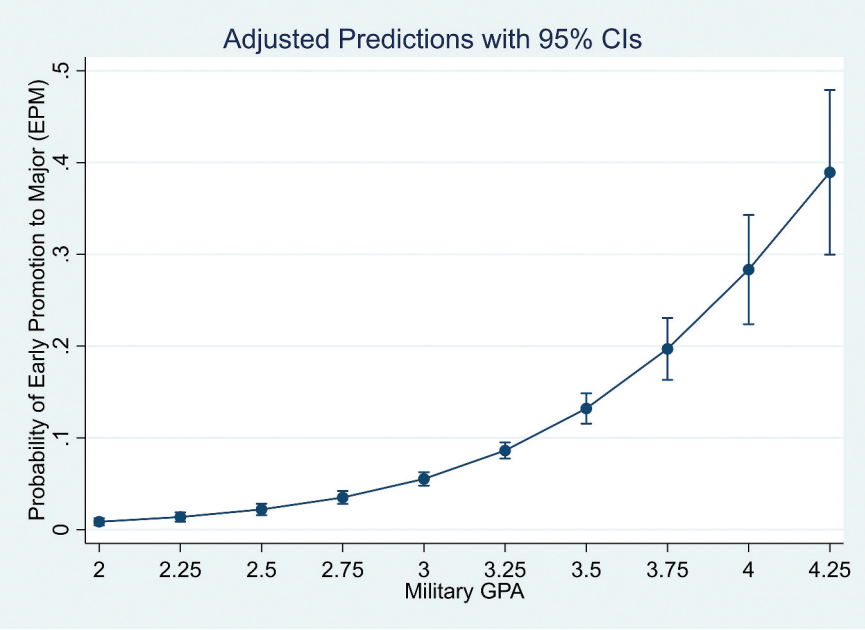

Figure 3. Likelihood of EPM across range of MGPA (marginal effects). Notes: see notes for Figure 1

For the other two outcomes, *EPL* and *BC, MGPA* maintained its predictive properties. In Table 5, Model 5 was replicated over these two additional outcome variables in Model 6 and Model 7 for those who remain in the Army to be considered for these promotions. The *MGPA* coefficient of 3.64 in Model 6 (*EPL*) was both substantively and statistically significant. In Model 7 (*BC*), the coefficient of 3.44 was also both substantively and statistically significant. While the magnitudes of estimated effects were smaller compared to that of the early promotion to major, they were still substantive accounting for how far off these career milestones were from the time their USMA grades were issued.

Which measure was the strongest predictor of officer career outcomes?

Beyond comparing the predictive power of the full-model coefficients of *AGPA* (β = 1.63) and *MGPA* (β = 6.76),[1] we calculated receiver operating characteristic (ROC) curves for the main effects of each predictor variable on *EPM*, reported in Figure 4. We computed the area under the curve (AUC) for each predictor, which is a measure of how well each predictor forecasts the outcome; the AUC captures the proportion of instances where a predictor would be able to accurately differentiate a randomly selected pair of cadets, one destined for early promotion or command and one who is not. In predicting early promotion to major (*EPM*), *MGPA*'s AUC was significantly larger than both *AGPA*'s and *SATTOT's* AUC at the $p \leq 0.05$ level. Replicating these analyses over the other two criteria variables (*EPL* and *BC*) yielded similar statistically significant results, except that for *EPL*, the AUCs for *SATTOT* and *AGPA* were not statistically significant from each other (additional outputs available from the authors upon request).

Additional analysis and robustness checks

Correlation among the criterion variables presents concern in interpreting our results. To address this, we introduced control variables in a step-by-step sequence, including the other predictor variables as controls. For each model, *MGPA* remained a positive and significant predictor throughout. *AGPA* only remained significant for *EPM*, but not for *EPL* and *BC*. *SATTOT* was negative and significant for *EPM, EPL*, and *BC* (see Models 1 to 5 of Tables 3, 4, and 5). Additionally, we computed variance inflation factors (VIF) on the full specification models using a linear probability model and found that none of our three criterion variables have concerning VIFs (each were lower than 2.5), suggesting distortions from multicollinearity in measured variables (Table 2) were not an issue.

Our predictor variables are observed at the time of graduation from the Academy; however, we observed the criterion variables at a later point in time. Between those time points, many officers choose to leave the Army. As discussed earlier, the observed differences between stayers and leavers motivated concerns of self-selection bias introduced by individuals making choices

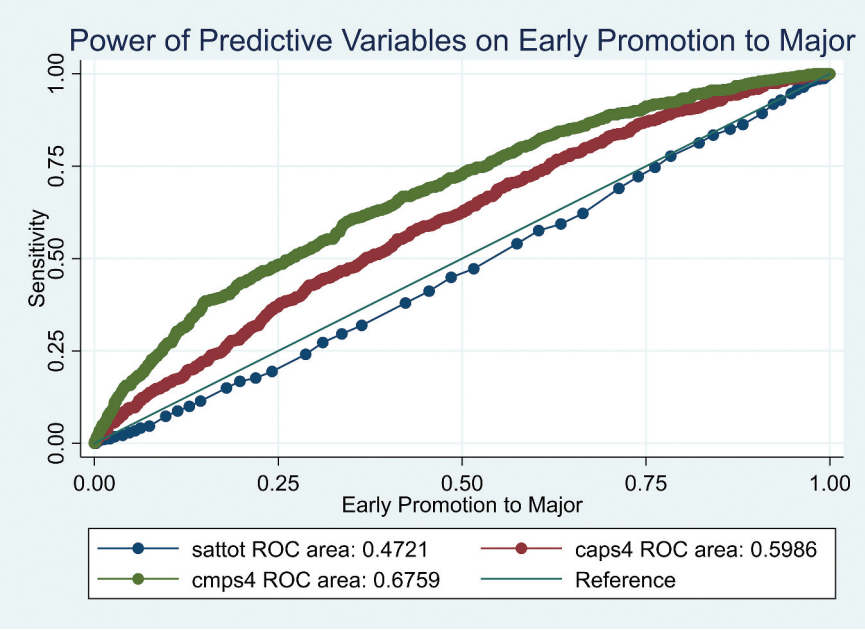

Figure 4. Predictive ability of *MGPA*, *AGPA*, & *SATOT* on *EPM* (ROC analysis). Notes: The ROC figure suggests that since *MGPA*, *SATTOT*, and *AGPA* have different areas under their curves, they are different in their predictive power on *EPM*. $\chi 2 = 34.55$, $p < .0001$

that end up creating an observed sample being inherently different from its larger population. If present, such self-selection effects could have been driving our results, and our estimated effects for our predictors of interested could be misestimated.

To test for the presence of self-selection bias, we conducted a number of tests. First, we compared the means of the predictor variables for the two populations using both a t-test and Cohen's *d* (see Tables 1a, 1b, and 1c). For the *EPM* outcome, we found that those who stay have slightly higher scores on *SATTOT* (1272 for stayers vs. 1264 for leavers), *AGPA* (2.93 for stayers vs. 2.91 for leavers), and *MGPA* (3.14 for stayers vs. 3.06 for leavers). Though these differences were all statistically significant at the $p < .05$ level, they were all substantively small, as shown by the small Cohen *d*'s statistics, which represent the difference of means in terms of standard deviations. These results suggested that when comparing stayer and leaver populations, measurement issues arising from range restriction should not have been more influential in one group over the other. The differences in means, however, draw attention to the fact that self-selection does present the risk that those staying in the service were somehow different from those who leave earlier.

As a second test for the presence of self-selection bias in our analysis, we used a Heckman-Probit model to test for self-selection bias via fully-specified models, including our three dependent variables being predicted by multiple explanatory and control variables (see Table 6). For the first criterion variable, *EPM*, we first estimate a first-stage equation in Model 3 that included our aforementioned predictors and their geographical region of origin (*REGION*) being used as the instrumental variable. To qualify as an instrument, *REGION* must reasonably affect the likelihood of retention, and be unlikely to affect the second-stage outcomes (*EPM*, *EPL*, or *BC*) apart from its influence through retention. Since high-schoolers from the Northeast US who decide to go to West Point are not leaving the geographic region of their family when attending West Point, it is reasonable that they would be less satisfied with the expected Army forced moves away from their home geographical region as an officer and would be more likely to leave the Army when given the chance than a West Pointer from any other region who already expressed his or her acceptability of living away from their family when he or she accepted their offer to attend West Point. At the same time, there is no reason to believe an officer from the Northeast would be a better or worse officer than a West Pointer from any other region.

The outcome of this first-stage equation is the likelihood of remaining in the Army long enough to be considered for early promotion to major. Next, per the Heckman procedure, we dropped the instrumental variables in estimating the second stage equation for the outcome of interest, *EPM*. The correlation in the error terms between the first and second stage models have been reported in Table 6, Model 2 and 3 as rho (ρ), and the precision of this estimate is reported in the *p*-value

Table 6. Heckman probit predicting promotion events and controlling for turnover.

	Early Promote to Major			Early Promote to Lieutenant Colonel			Selection for Battalion Command		
		Heckman Probit			Heckman Probit			Heckman Probit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Probit version of original equation (Table 5, Model 5)	2nd Stage (w/selection adjustments)	1st Stage	Probit version of original equation (Table 5, Model 6)	2nd Stage (w/selection adjustments)	1st Stage	Probit version of original equation (Table 5, Model 7)	2nd Stage (w/selection adjustments)	1st Stage
	Early Promote to MAJ	Outcome = Early Promote to MAJ (without *Home region* dummies)	Outcome = Still in Army after 7 years	Early Promote to LTC	Outcome = Early Promote to LTC (without *Home region* dummies)	Outcome = Still in Army after 14 years?	Select for Battalion Command	Outcome = Early Promote to BC (without *Home region* dummies)	Outcome = Still in Army after 14 years?
Midwest [a]	(0.03)		0.00	0.12		(0.05)	0.02		(0.08)
	(0.08)		(0.04)	(0.16)		(0.07)	(0.14)		(0.07)
Northeast	0.03		−0.09**	0.10		0.03	(0.12)		0.01
	(0.08)		(0.04)	(0.15)		(0.06)	(0.14)		(0.07)
Southeast	0.07		0.05	0.18		0.05	0.16		0.05
	(0.08)		(0.04)	(0.16)		(0.07)	(0.14)		(0.08)
Southwest	0.05		0.03	0.24		0.07	0.03		0.04
	(0.09)		(0.05)	(0.17)		(0.08)	(0.16)		(0.08)
Outside Continental US	(0.21)		−0.24***	0.09		−0.35***	0.00		−0.35***
	(0.18)		(0.07)	(0.24)		(0.10)	(0.21)		(0.10)
MGPA	1.04***	1.00***	0.39***	0.75***	0.55	0.43***	0.83***	0.61	0.42***
	(0.09)	(0.28)	(0.05)	(0.16)	(0.52)	(0.07)	(0.16)	(0.51)	(0.07)
AGPA	0.23***	0.23**	−0.18***	(0.02)	(0.01)	0.01	−0.25*	(0.20)	(0.04)
	(0.07)	(0.10)	(0.04)	(0.14)	(0.14)	(0.06)	(0.13)	(0.15)	(0.07)
N (# obs)	5,547	11,975		1,589	5,613		1,316	4,721	
pseudo R^2	0.12			0.09			0.17		
rho (ρ)		(0.14)			(0.45)			(0.47)	
p-value		0.86			0.65			0.63	
Instr.'s F-stat [b]		30.10***			25.03***			21.90***	
Constant	−4.30***	−4.04***	−1.32***	−4.23***	(2.70)	−2.12***	(1.04)	0.15	−1.79***
	(0.45)	(1.56)	(0.23)	(0.82)	(3.30)	(0.35)	(0.79)	(2.09)	(0.38)

*p ≤ 0.10, **p ≤ 0.01, and ***p ≤ 0.001

[a]*Home region dummies* were used as instrumental variables for the two-stage regression. They were included in comparison equations 1, 4, & 7, and in second-stage equations 3, 6, & 9. They were omitted intentionally on first-stage equations 2, 5, & 6. The region *West* is the instruments' reference category.

[b]Each of the three model's instrumental variables, the six geographical regions, were tested by a χ^2 test with five degrees of freedom, which, in large sample sizes such as these, approximates the F-Statistic. Each group's F-statistic was >10, giving evidence for their validity as instruments

-All models are controlled for *Graduation Year, Ethnicity, Female, Army Branch, Class Year, 1-Year Prep School, SAT Score, Time Deployed*, and *Army Branch* (function)

-The Heckman Model will not work with Logit on STATA 13.1, therefore we chose to do a parallel test using Probit.

-The β-values are probit coefficients, which are based around 0.0. A number below zero is negatively predictive, and a number above zero is positively predictive.

-Deployments were not used in the Heckman probit because they would cause all officers who left the Army prior to the date of the deployment variable to be dropped from the regressions.

-The smaller sample sizes of models 1, 4, and 7 are intentional. Equations 1, 4, and 7 are all controlled on West Pointers retaining in the Army until the point of that respective promotion/selection board, to ensure the regression results include those who were actually considered for promotion/selection. Likewise, the first- and second-stage equations were intestinally not controlled for surviving long enough to experience that promotion/selection event intentionally, as that would not allow accurate testing of selection bias.

-Deployment years were intentionally omitted from the selection bias analysis, as it is panel data that changes over time, and would necessarily limit the observations of the analysis by anchoring them to an arbitrary point in time.

below it. A *p*-value of 0.86 indicated that the correlation in error terms between the first and second stage was not statistically significantly different from zero, suggesting that the correlation in error terms was weak enough to indicate self-selection effects were not a concern. This was corroborated by comparing the coefficients on *MGPA* and *AGPA* between the standard probit model (Model 1) and the second-stage Heckman probit model (Model 2), which accounts self-selection effects in Table 6. The estimated coefficients were very similar. For the other criterion variables, *EPL* and *BC*, we similarly found the *p*-values on rho did not suggest self-selection effects caused material distortion in our estimates. Beyond a pair-wise comparison of means, the Heckman-Probit models were derived from fully-specified models designed to measure possible correlation in error terms directly; as such we considered the Heckman-Probit findings to be the more reliable test. The results indicated the self-selection bias did not materially affect our estimated results using our initial logit models.

Discussion

Summary

This study examines the predictors available when a cadet graduates West Point and their ability to predict officer career outcomes. A clear finding is that cadets' military grade point average (*MGPA)* strongly predicts their likelihood of being selected for early promotion or battalion command at 8 to 10 years, 15, and 16 years later. We also find that *SATTOT* has a negative predictive relationship with career success that generally holds at 8 to 10 years, yet is not significant at year 15, but is again significant at year 16. Also, we found that academic performance while a cadet has a positive predictive relationship with officer career outcomes at 8 to 10 years, yet loses its predictive power after that point. Moreover, we find that the *MGPA* is a much more powerful predictor than either *AGPA* or *SATTOT*. Even though we provide evidence that results are robust to turnover and we include a variety of controls, there are several potential hazards in directly interpreting our findings. These include range restriction (specifically on *SATTOT*) and the unspecified but likely presence of numerous mediating and moderating antecedents.

Military-specific cadet performance and officer career outcomes

Our finding that cadets' *MGPA* predicts their officer career success is supported by previous findings (Berlew & Hall, 1966), yet our study shows an increased magnitude of the relationship and extends the longevity of this relationship to at least 16 years. While West Point uses *MGPA* as a profession-specific performance measure for both leadership and military competency skills,[2] further research is needed to show what noncognitive characteristics drive *MGPA* and which of these are most predictive of future officer career outcomes. A few of the possibilities including conscientiousness, commitment, followership, charisma, technical skills, agreeableness, relationship strength, demographic similarity, etc. Additionally, since the *MGPA* is created through cadet performance reports which are similar in style, authorship, and frequency to the OERs they will later receive as Army officers, the *MGPA* may be more of an early career outcome than a measure of cadet military performance.

Cadet academic grades and officer career outcomes

Unsurprisingly, our study confirms the positive relationship between academic grades (*AGPA*) and career performance that was established through two meta-studies, particularly in the military context (Cohen, 1984; Roth et al., 1996). Considering that academic grades capture both cognitive ability and motivation (Maier, 1955) we are unable to imply anything specific about the academic grades to officer career performance relationship, except to note that this relationship lasts for only 7 to 9 years.

For *EPM, AGPA* is statistically significant. At *EML* and *BC*, which occur within a year of each other late in an officer's career, *AGPA* is significant for neither *EPL* nor *BC*. A potential explanation for this is that academic grades may not actually lose predictive power over time, but that the qualities associated with success later in officer careers have more to do with social (leadership) skills than individual intellectual ability.

Cognitive ability and officer career outcomes

We are surprised to find a negative association between cognitive ability and officer career outcomes at years 7 and 16. On its surface, this presents a contrast to well-established findings positively linking cognitive ability to future professional performance (Hunter, 1986; Hunter & Schmidt, 1996; Ree & Earles, 1992). Yet we are not suggesting that our study effectively refutes this previously established relationship. A major shortcoming in our analysis is the possibility that our predictive variables are more related to unspecified proximal antecedents (mediators and moderators) than they are of our criterion variables.

Another potential shortcoming in our analyses is the range-restriction of West Point cadets' SAT scores, which are higher than the general population. This

limits the validity of the finding both inside and outside of our particular context. For example, incremental intellectual potential may not be a significant differentiator for West Point officer selection due to prior selection effects driven by the actions of the admissions department. Those who are selected for promotions are already filtered for strong talent, increasing the relative predictive power of other attributes. Under such conditions, important factors such as cognitive ability can recede into the background or even reverse in direction, potentially helping explain our *SATTOT*'s negative relationship with *EPM* and *BC*. West Point is considered an elite institution of higher education and regularly rated by popular sources as among the most competitive colleges, our cadet sample's mean *SATTOT* score of 1,267 is substantially higher than the general population's 1,001 to 1,028 mean SAT scores during the years of this study (Aldric, 2019). The range of admitted West Point cadets has a higher lower-end and mean than the population of SAT takers at large.

Academic grades vs. military-specific cadet performance measures

Our findings indicate that *MGPA* is both a stronger and a longer-lasting indicator of West Pointer officer career success than *AGPA*. This implies an organization that can design, implement, and evaluate a profession-specific experience for its college-level potential employees may be at a distinct competitive advantage for identifying talent compared to an organization that primarily considers collegiate academic performance. The primary component of West Point's *MGPA* is performance observed working in a military leadership role. Organizations can include leadership performance in realistic job scenarios in their assessments of applicants or early employees through the use of internships and targeted, short-term experiences in leadership roles. The deliberate observation of such experience can provide additional insight into who may hold promise for future career success.

Physical GPA- More than just a control?

Our research design did not hypothesize a strong connection between *PGPA* and our criterion variables. Expecting that it would be highly correlated with *MGPA*, we included *PGPA* as a control. Though *PGPA* was moderately correlated with MGPA ($\rho = 0.37$), it was also shown to be strongly predictive of each officer career outcome (*EPM* β_{PGPA} = 1.55; *EPL* β_{PGPA} = 2.08, *BC* β_{PGPA} = 1.77), with each significant at the $p < .01$ level. Future research should be done to study the *PGPA* to understand the validity and mechanisms of its predictive power of West Pointers' career outcomes.

Limitations

At West Point, both academic and profession-related performance are assessed, making direct comparisons possible. Additionally, the military setting allows us to capture rich data on career performance that are plausibly comparable among individuals. These advantages enable the study of behavior-based measures of profession-specific capabilities and attributes and their merit as long-run predictors of career success.

The uniqueness of the military setting may restrict the extent to which we can expect our findings to generalize to other contexts. Given the close coupling between West Point and the Army, the Academy has access to insights in what makes for successful military officers, and it can integrate this into its measure of performance in *MGPA*. Such close coupling does not typically exist between many educational institutions and subsequent employers. While technical departments may have close ties to downstream employers of their graduates, most do not integrate employer-specific cultural values nor the employers' professional standards into the curriculum. To the extent such differences explain our results, they underline an opportunity for the Army to be less constrained by the findings of other studies in considering how to predict and develop its future leaders. The strong performance of *MGPA* as a predictor of career success may be driven by this close coupling between Academy curriculum and the needs of the Army. This could support emphasizing more professionally oriented measures in making personnel decisions in the Army.

We must interpret differential results among our outcome variables with caution. First, while the outcomes of early promotion and selection for battalion command are recognized indications of career success, they do not completely capture all attributes associated with desired enterprise-level leadership for the Army. As future measures of such leadership attributes become more reliable, the relationships uncovered in this work should be verified with such outcome measures. Second, our criterion variables of *EPM, EPL*, and *BC* are all career outcomes of interest; however, they are intrinsically related. Those who are observed being promoted to Lieutenant Colonel must first be promoted to the rank of Major. Thus, to some degree, the effects we observe in latter career outcomes, such as *EPL* and *BC*, may be reflecting what has already been captured in prior career outcomes (*EPM*). Given this concern, we do not interpret our results on these later career outcomes as providing distinct insights

into underlying associations found by investigating the early promotion to Major. Rather, they serve as consistency checks of the phenomenon we observe over a career. Finally, we acknowledge studies like this are vulnerable to selection effects (bias), since retention in the Army to the point of being considered for promotion is not a random process. Though we have employed several different tests to account for such selection effects, their cumulative results are inconclusive. Therefore, future research corroborating these findings using alternative empirical strategies could help mitigate such concerns.

Future research

These findings surface conditions in which the primacy of mental ability over job-specific capabilities as a predictor of performance may need to be revisited in future work. This future work could examine early measurements of manager- and leader-relevant capabilities and their predictive value for career attainment and could help to establish if our findings are confined to the specifics of military-based education or can be generalized to other settings. If generalizable, it remains an open question of why predictors of favorable managerial career outcomes should differ from other job-specific skills studied in prior work.

Though this paper illustrates the predictive properties of early academic and military performance on subsequent career performance, it does not empirically examine the reasons for the differences. Future work can unpack these measures more and investigate possible explanations for such differences.

We also suggest that future researchers pursue a more comprehensive deconstruction of the elemental and determinant composition of the *MGPA*. We speculate that the *MGPA* is such a strong determinant of future performance because it is so similar to the job types cadets will be performing as officers in the future; additionally, the process by which cadets are evaluated militarily resembles how Army officers are evaluated. Exploring the complexity and multifaceted nature of an Army officer's work and how abilities critical to such work are measured in the *MGPA*, we believe, is a fruitful direction for future research. If this construct could be broken down into identifiable and measurable parts, we would be able to more thoroughly inform leadership training at West Point, and potentially in other military and civilian contexts. This kind of specificity also would increase the efficiency of military training and leadership development, presumably because each trainee could be assessed on each of the components, and then specific training could target those domains in which the learner needs to improve.

Additionally, we believe more can be understood about the interaction of intelligence, physical capability, and military performance. It would be informative to understand how much of a cadet's physical prowess contributes to his or her military performance assessments. And similarly, it would advance this research if we could isolate the role intellectual capability plays in a cadet's military performance assessment. Parsing out each of these developmental domains and the impact they have on one another could potentially increase the quality and effectiveness of officer candidate and cadet training models.

Notes

1. Since logit (exponentiated) coefficients are based on 1.0-unit increment changes in the criterion variables, and the standard deviations of our three criterion variables are different from each other (σ_{SATTOT} = 1.06, σ_{MGPA} = 0.34, σ_{AGPA} = 0.43), caution should be taken when comparing the logit coefficients' magnitudes with each other. Interpreting marginal effects (such as through observing ROC curves) serve as more accurate approach of comparing the relative effect sizes of criterion variables.
2. "West Pointers' Military Development GPAs include measures of military class performance and of the cadet job performance in eleven followership and leadership positions across their four years as cadets. Unlike typical colleges, West Point, along with other military academies, also teaches and assesses behaviors and skills that are important to being an officer in the Armed Forces. Military GPA is meant to capture potential as an Army leader." (USMA *Brigade Tactical Department (BTD) Policy Letter #20 – Military Development Grading Policy*, (2018, p. 3)).

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Everett S. Spain http://orcid.org/0000-0001-8278-1899
Eric Lin http://orcid.org/0000-0002-7954-7652
Lissa V. Young http://orcid.org/0000-0003-0641-0628

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