Journal of Research in Personality xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Journal of Research in Personality

journal homepage: www.elsevier.com/locate/jrp

Personality attributes that predict cadet performance at West Point

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ARTICLE INFO

Article history:
Received 28 August 2016
Revised 17 October 2016
Accepted 25 October 2016
Available online xxxx

Keywords:
Broad intelligences
Spatial intelligence
Personal intelligence
Big Five
GPA
Military performance
Personality

ABSTRACT

Using data from the United States Military Academy at West Point ($N = 1102$ and $N = 1049$) from two successive years, we examined psychological measures of cadets and the correlations of those measures with consequential outcomes such as cadet performance and leadership potential. We examined four broad intelligences, two of which were thing-focused (spatial and mathematical) and two people-focused (verbal and personal intelligences) and their predictions to thing- and people-centered courses (e.g., chemistry versus psychology). We found support for a thing-people differential in reasoning. The broad intelligences and the Big Five personality traits also predicted academic and other performance criteria at consequential levels.

1. Introduction

Personality can be regarded as the organization of an individual's major psychological subsystems, including intelligences, socio-emotional styles, and self-control (Funder, 2013; Larsen & Buss, 2014; Mayer, in press). Personality traits describe the functioning of those systems—and many of those traits predict important life outcomes. An individual's general mental ability predicts their school and work performance evaluations in the $r = 0.45$ to 0.55 range (Deary, 2012; Salgado, Anderson, Moscoso, Bertua, & de Fruyt, 2003; Schmidt & Hunter, 2004) and conscientiousness predicts career success at $r = 0.22$ (Barrick & Mount, 1991, p. 15; see also, Judge, Colbert, & Ilies, 2004; Judge, Klinger, & Simon, 2010; Schneider & Newman, 2015).

Personality traits often affect one another. For example, interests and intelligences may grow together, with interests guiding thoughts, and intellectual success in a specific area enhancing interest in the subject (Ackerman, 2014; Ackerman & Kanfer, 2004; Rolfhus & Ackerman, 1999). Some people are more interested in things than people, whereas other people exhibit the reverse trend. People vary markedly in their interests in things or people beginning by the third grade, and by young adulthood their interests are related to their subsequent intellectual development and occupational choices (Ackerman, 2014; Graziano, Habashi, Evangelou, & Ngambeki, 2012; Rolfhus & Ackerman, 1999). Mechanical engineers and accountants prefer to work with things; social workers and sales people, with people—and some like both—or neither (Holland, 1966; Tay, Su, & Rounds, 2011).

1.1. General intelligence and broad intelligences

Although much about intellectual ability can be characterized by general intelligence—a person's capacity to solve problems regardless of area (Gottfredson, 1997), contemporary researchers also examine a second tier of between 8 and 16 intelligences, referred to as *broad intelligences*—that exhibit partial independence from overall mental ability (Flanagan, Alfonso, Ortiz, & Dynda, 2013; McGrew, 2009; Schneider & Newman, 2015). Among these broad intelligences, several are focused on *things* and several on *people*. For example, spatial intelligence concerns reasoning about things such as objects in space; mathematical-quantitative intelligence also is concerned with the numerical qualities of objects (things). By comparison, personal intelligence, defined as the ability to reason about personality in oneself and others, is focused on people; emotional and social intelligences also are people-centered (Gardner, 1983; Mayer, 2014; Salovey & Mayer, 1990; Wong, Day, Maxwell, & Meara, 1995). Verbal intelligence is likely near the

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http://dx.doi.org/10.1016/j.jrp.2016.10.012
0092-6566/

middle of the continuum, given that language understanding requires vocabulary and comprehension in the realms of both things and people.

In the present study, we examine the personality attributes of two successive classes of cadets at West Point with a focus on their mental ability traits and how those affect their performance. Included in our study are spatial, quantitative, verbal and personal intelligences, as well as measures of the Big Five personality traits of Extraversion, Neuroticism, Openness, Agreeableness and Conscientiousness. Among our key aims is to provide the first tests of whether personal intelligence correlates with actual coursework and other outcomes of importance among cadets. A second is to determine whether cadet intelligences, including both thing- and person-focused abilities, predict their performance in corresponding thing-versus-person-focused courses. Finally, we explore whether these associations hold after controlling for some reasonable confounds. We also will correlate Big Five traits with cadets' performance, and we hope to replicate findings that both the SAT and Conscientiousness predict school performance—helpful to reaffirm (if we can) amidst the current of uneasiness over non-replications in psychology (e.g., Pashler & Wagenmakers, 2012).

1.2. Personal intelligence as an intelligence about people

1.2.1. Overview of personal intelligence and its measurement

Many intelligences are thing related such as spatial and quantitative intelligences; other less-studied mental abilities may be more focused on people. Personal intelligence was proposed as a potentially-unmeasured and overlooked broad intelligence that involves the ability to reason about both personality and personality-relevant information in oneself and others (Mayer, 2008, 2009). More specifically, people with personal intelligence were said to solve problems that included (a) identifying personality-relevant information, (b) forming accurate models of one's own and others' personalities, (c) guiding choices using personality-relevant information and (d) systematizing one's goals accordingly.

To provide a "proof of concept" that personal intelligence exists, a *Test of Personal Intelligence* (*TOPI*) was developed consisting of approximately 120 multiple-choice questions that asked diverse types of questions about personality. For example, the following item assessed trait understanding:

01. A person is tactless and lacks a sense of humor. Which of the following is most likely to describe this person:
  a. disagreeable
  b. neurotic
  c. carefree
  d. desiring of attention

(Mayer, Panter, & Caruso, 2012)

Here the answer is "a," disagreeable, because tactlessness and a lack of humor and are instances of disagreeableness, according to research on the Big Five (Goldberg & Rosolack, 1994). The TOPI items were designed to assess the four areas of problem-solving proposed by the theory. Across three earlier studies, findings indicated that the overall Test of Personal Intelligence was reliable and that personal intelligence could be modeled as a single broad intelligence, using scales reflecting the four problem-solving areas of the theory as indicator variables (Mayer et al., 2012). Personal intelligence also resembled other broad intelligences in that its test scores correlated about $r = 0.35$ with verbal intelligence and $r = 0.65$ with emotional intelligence. Recently, researchers have found that emotional intelligence (measured as a mental ability) fits well with within the broad intelligence group (Legree et al., 2014; MacCann, Joseph, Newman, & Roberts, 2014); personal intelligence, while more recently proposed and less studied to-date, also appears to be a candidate for inclusion in the group based on findings so far (Mayer, Caruso, & Salovey, 2016).

1.2.2. Predictions from personal intelligence and other broad intelligences

Little is known to-date about the relation of personal intelligence with real life phenomena: Do people with higher personal intelligence exhibit better college performance? Are they perceived differently from others? Many of the broad intelligences—particularly thing-related intelligences—predict consequential outcomes such as school and job performance (Deary, 2012; Fernández-Berrocal & Extremera, 2016; Lopes, 2016; Schmidt & Hunter, 2004). It seems reasonable that personal intelligence—as a possible broad mental ability—also would reflect such outcomes.

In our studies here, we further suppose that *thing* intelligences will correlate more highly with performance at thing-focused tasks such as those predominantly required in science and engineering courses, whereas *people*-centered intelligences will exhibit stronger relationships with courses more focused on people such as those in English, philosophy, psychology, management, and leadership, in which students must (depending upon the course) understand characters in literary works, or how people feel when being treated unethically, as well as people's varied motivations and consequent behavior. Our predictions developed from earlier findings that broad abilities are differentially predictive of targeted outcomes: Emotional intelligence is related to better interpersonal outcomes (Mayer, Roberts, & Barsade, 2008) and people high in spatial intelligence gravitate to more thing-oriented fields such as the sciences and engineering, or aspects of fields such as the arts that emphasize the visual—e.g., painting and graphic design—rather than, for example, creative writing (Wai, Lubinski, & Benbow, 2009).

1.2.3. Relations to the Big Five

Personal intelligence also may be related to people's Big Five traits. Although most intelligences are unrelated to Conscientiousness and Agreeableness, individuals with people-focused understanding better monitor their own personal strengths and weakness. They may therefore exhibit more responsibility in making and meeting commitments than others—which they may report as higher levels of Conscientiousness. Such individuals may also appreciate other people's individuality and as a consequence know how to better meet their needs (if they wish to), and therefore report higher Agreeableness—findings supported by earlier research (Joseph & Newman, 2010; Mayer et al., 2012). Like other intelligences, personal intelligence is likely also to exhibit correlations at around $r = 0.20$ with Openness (DeYoung, 2011).

2. Introduction to the present studies

To test whether (and how) intelligences correlate with performance outcomes, we will examine two classes of cadets who attended the U.S. Military Academy at West Point (hereafter, West Point), evaluating their levels of broad intelligences and comparing those with several academic and extracurricular outcomes. West Point provides a four-year college education in which cadets complete a core academic curriculum consisting of slightly more than 20 courses divided among the liberal arts, sciences, and engineering (Office of the Dean, 2014). The exact number depends on the student, as some will place out of one or more courses or begin in an advanced-level course.

Our data set will include the SAT-math as a measure of mathematical-quantitative intelligence, the Occupational

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Information Network (O*NET) spatial ability test, SAT-verbal, and the Test of Personal Intelligence, Version 1.4.

2.1. Hypotheses

We expected with some confidence to find that all four intelligence assessments would correlate positively with one another. That said, the correlation between personal intelligence and diverse intelligences has not been studied before. Second, we expected the intelligences to exhibit distinct patterns in their relation to the Big Five traits, with most intelligences exhibiting a low positive correlation with Openness, and with personal intelligence exhibiting a further relation with both Conscientiousness and Agreeableness.

We expected, third, that all the broad intelligences would correlate individually with overall academic performance at West Point with, fourth, both spatial and personal intelligences correlating with academic and other outcomes incrementally above the total SAT (often used as a proxy for general mental ability).

Fifth, we hypothesized that students' course performance would divide into thing-versus-people centered course performance, with certain students excelling in science and mathematics, others in English, philosophy and other people-related humanities courses, or in both, or in neither.

Sixth, we hypothesized that "thing" intelligences would correlate most highly with thing-focused courses and that "people" intelligences would correlate most highly with courses focused on people. We also will examine mentors' (tactical officers') evaluations of their cadets, where we expected a similar pattern for their ratings of the cadets' qualities—that is, with some cadets appearing more technologically adept and others as more people persons.

Finally, we expected to find that self-control, as measured by Conscientiousness in the Big Five would correlate with performance as well.

2.2. Participants

Participants were the members of two successive classes of West Point cadets in 2014 and 2015. We will refer to the first-tested class as the *main* sample; the second as the *replication* sample.

2.2.1. Main sample

Participants in the main sample were 1102 cadets in the graduating class of 2014 with an age range from 20 to 26 (M = 21.72) and included 197 women and 905 men. The data allows for four categories of race/ethnicity. Eight hundred and twenty-six cadets identified as White, 80 as Black, 93 as Hispanic and 103 as Other (chiefly Asian and Pacific Islander).

2.2.2. Replication sample

Participants in the replication sample were 1049 cadets in the graduating class of 2015. The sample had an age range from 19 to 25 (M = 20.80) and included 174 women and 875 men. Seven hundred and forty-nine students identified as White, 105 as Black, 97 as Hispanic and 99 as Other.

2.2.3. Sample size and power

Psychologists believe that broad intelligences predict incrementally above general mental ability, often explaining an additional 2% or more of the variance of performance, indicated by a partial correlation of about $r = 0.14$. The *Ns* studied here—approximately 1000 cadets in each sample—were large enough to correctly reject the null hypothesis if the effect sizes were $r = 0.1$ or above, with a probability of 0.89 in the main and replication groups individually.

3. Methods

3.1. Psychological tests employed

3.1.1. Measures of mental ability

3.1.1.1. The SAT. In the main sample, 932 cadets and 893 cadets in the replication sample had SAT scores in their files, with subscores for verbal, mathematical and writing abilities (the latter not used here).

*3.1.1.2. The O*NET measure of Spatial Ability.* Developed by the U.S. Department of Labor Employment and Training Administration as part of the Occupation Net Ability Profiler (National Center for O*NET Development, 2015), the O*NET measure of Spatial Ability is composed of 20 pictorial items. Each item depicts a 2-dimensional cut-out shape—in one example, a symmetrical cross—in a box to the left. Test-takers must then pick one of four shapes to the right that would result if the shape were bent and/or folded into three dimensions. (The cross-like object makes a box with an open top).

3.1.1.3. The TOPI 1.4. The Test of Personal Intelligence is an ability-based measure of reasoning about personality composed of 93 multiple-choice items with four alternatives each. Correct answers are keyed to relevant research findings in personality psychology. For instance, in the sample TOPI question presented earlier of the tactless, humorless person, the correct answer of "disagreeable" was based on correlations among the relevant traits. The test yields an overall score and, in its more recent forms, two additional subscales that are not scored here (Mayer, Panter, & Caruso, 2014).[3]

3.1.2. Measures of socio-emotional styles and of self-control

3.1.2.1. The Five Factor Test. This 100-item measure of the big five draws its items from the International Personality Item Pool (Goldberg et al., 2006; Gow, Whiteman, Pattie, & Deary, 2005), downloaded from http://ipip.ori.org/newNEODomainsKey.htm. The measure includes 20 short phrases to reflect each of the five traits, for example, "Make people feel at ease" for Agreeableness and "Feel threatened easily" for Neuroticism. Responses are made on a 5-point scale from "Very Inaccurate" to "Very Accurate." In the Replication sample, the scale was trimmed based on a factor analysis such that the revised scales had fewer items: Neuroticism to 11 items, Extraversion to 15, Openness, 14, Conscientiousness, 19 and Agreeableness, 19. This had negligible consequences for the scale reliabilities (see Table 2, note b).

3.1.2.2. Grit. The 12-item Grit scale measures perseverance and goal-commitment under pressure (Duckworth, Peterson, Matthews, & Kelly, 2007).

3.2. Outcome measures employed

3.2.1. Course-Level and general academic performance

Academic performance was reflected by the cadets' GPA in individual courses from the core curriculum at West Point. Twenty-six course GPAs were combined into the overall academic GPA. In certain instances, the specific course GPA was drawn either from the

[3] The 93 item TOPI 1.4 was created as a subset of the TOPI 1.2Rf, a reformatted version of the TOPI 1.2. The online manual for the TOPI 1.4 can be found at http://personalintelligence.info/wp-content/uploads/2014/09/TOPI-1.4-Manual-Distr-Ver-2015-01-23.pdf. Coefficient alpha reliabilities for the TOPI 1.4 for the main and replication samples (see Table 2) were calculated based on a separate data file constructed of the cadets' item-level responses to the TOPI measure. Two factor-based subscales of the test were under exploration at the time of this work and were not scored here owing to their unfinished status.

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basic course that most cadets took or from an advanced-placement alternative that the cadet substituted for the basic course. This likely added a small amount of noise to the data but otherwise left the data unaffected.

3.2.2. General military performance (reported on a GPA scale)

The cadets' overall military performance can be thought of as an index of their job performance: the level at which they fulfill their military roles including carrying out jobs such as Squad Leader or Platoon Sergeant. Although general military performance involves jobs rather than courses, it is also reported at West Point on a GPA-like scale referred to as military GPA.

3.2.3. Physical performance scale (reported on a GPA scale)

The cadets also were assigned a physical score that reflects a combination of their performance in physical education courses and their scores on tests of physical abilities and endurance, also reported on a GPA-like scale.

3.2.4. Tactical officers' talent ratings

At West Point, each officer-in-training is assigned a tactical officer who monitors their progress and provides counseling to them. The data we drew upon (see Procedure) included the tactical officers' ratings of each cadet they supervised along 20 talents that ranged from *communicator*, to *physically fit*, to *technologically adept*. We employed three composites: thing-oriented talent, people-oriented talent, and overall talent. The thing-focused composite included five talent ratings: *detail-focused*, *logical/analytical*, *process disciplined*, *spatially intelligent*, and *technologically adept*. The people-focused composite included ten talent ratings: *communicator*, *cross-culturally fluent*, *inspirational leader*, *interpersonal*, *introspective*, *mentally tough*, *perceptive/intuitive*, *problem-solver*, *project manager* and *prudent risk taker*. The five additional talents included in the total were *innovative*, *interdisciplinary*, *multi-tasker*, *physically fit*, and *tactile/kinesthetic.*

3.2.5. Measures of leadership

Leadership capacity is generally reflected in military responsibilities in the 3rd and 4th years, indexed as military GPA for those years (Bartone, Snook, Forsythe, Lewis, & Bullis, 2007, p. 495; Kelly, Matthews, & Bartone, 2014). In addition, we employed a diverse set of measures potentially related to leadership that included the number of officer positions the cadet held in campus clubs and organizations and the number of captaincies in team sports. Also included was the *inspirational leader* talent from the Tactical Officers' Ratings.

3.2.6. Omitted variables

The above variables represented those most relevant to the specific hypotheses we hoped to test. We excluded other less-relevant or less complete variables that were in the data file. These included the cadets' scores on the ACT (a second college admissions test), because they largely duplicated scores on the SAT and roughly 11% fewer cadets included them than SATs in their admissions materials. We also omitted a second set of talent ratings completed by officers who reviewed the cadets' total files, because their judgments were made with test-score and academic record information, and were potentially influenced by that information. Also omitted were physical measures of height and weight, as well as a further group of variables that did not specifically relate to our hypotheses (e.g., prior military service; domestic/foreign exchange student).

3.3. Procedure

The Office of Economic and Manpower Analysis originally collected the data in support of the Talent-Based Branching Program at West Point. West Point officers use the information to determine the employment placement of the cadets in the Army (Colarusso, Heckel, Lyle, & Skimmyhorn, 2016). Upon graduation the cadets are commissioned as officers, and go on to serve in one of seventeen basic branches in the U.S Army including Infantry, the Corps of Engineers, and Military Intelligence. The Talent-Based Branching program collects data about each cadet's skills, knowledge, and behaviors to help the Army and the cadets decide in which branch of the Army they are best fit to serve.

The cadets were tested in a high-stakes environment in that they understood that (a) they would receive occupational counseling around the results, and (b) that officials of the Talent-Based Branching Program would employ the results—along with other information—to determine whether they would receive a military assignment that was their first, second, or lower-ranked choice.

Cadets in the two classes took the psychological tests online in one of several proctored mass-testing sessions. The testing used a secure survey response system operated by the United States Army.[4] Cadets who were foreign exchange students, stationed overseas, or otherwise not available were contacted and logged into the system to take the tests on their own. The program also requested that the cadets complete an online resume to help demonstrate their talents to the Army in support of their branch assignments. This resume included a section about the cadet's leadership roles in clubs and sports. The students' administrative records included SAT scores, GPAs, and other academic outcome variables drawn on here.

The program also sent surveys to the cadets' tactical officers. Each officer supervises approximately 30 cadets from each class year, providing each cadet with feedback and counseling so as to guide them through their studies. The tactical officers were requested to assess each cadet on a series of 20 talents (see Measures).

3.3.1. Availability of data

These data are restricted by the Office of Economic and Manpower Analysis (OEMA) at the United States Military Academy at West Point in compliance with the Privacy Act of 1974 and existing data use agreements, and consequently are not publically available.

4. Results

4.1. Preliminary data analyses

4.1.1. Screening for attentive responding

The final main sample consisted of test scores from 1102 cadets; the replication sample of 1049. Beforehand, the Office of Economic and Manpower Analysis screened the initial test responses for excessive repetition of a single letter response (e.g., greater than 60% of an "A" response), as well as for "unlikely virtues" and other signs of problematic responding. On those bases, the OEMA flagged just under 4% of the test-takers as providing possibly-questionable responses. Forty-one individuals of the initial main sample and 31 in the replication sample whose data appeared problematic were then given an opportunity for a retesting. Twenty-two cadets in the main sample and 27 of those in the

[4] The online system required some of the longer items on the *Test of Personal Intelligence 1.4* to be shortened; the changes may have slightly depressed the performance of one subtest; an implementation error affected one item as well. We expect that these changes had negligible impact on the TOPI findings given that it has 93 items.

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Table 1
Means and standard deviations of major variables for the main and replication samples.

Major variables	Main sample				Replication sample			
	N	Mean	SD	Range	N	Mean	SD	Range
Measures of mental ability								
SAT total	932	1266.9	128.43	850–1600	893	1261.9	134.7	820–1590
SAT Verbal	932	625.7	74.89	400–800	893	621.8	77.45	390–800
SAT Math	932	641.2	70.43	400–800	893	640.2	74.10	410–800
Spatial intell.	1064	16.6	3.87	0–20	1036	17.4	2.64	5–20
Personal intell.	1063	78.5	10.64	21.5–95.7	1037	80.7	10.57	15.1–98.9
Measures of socio-emotional and self-control								
Extraversion	1063	75.46	13.58	30–100	1037	70.56	11.73	30–95
Neuroticism	1063	42.64	11.72	20–88	1037	24.41	7.28	11–55
Openness	1063	72.52	11.29	37–99	1037	43.41	6.83	14–70
Agreeableness	1063	74.87	9.64	30–98	1037	45.55	6.42	19–92
Conscientiousness	1063	81.56	10.28	33–100	1037	76.33	9.36	43–95
Grit	1063	46.28	5.62	20–59	1037	46.46	5.41	24–60
Tactical officer talent ratings								
Overall	962	2.20	0.38	1.1–3	910	2.29	0.43	1–3
People talents	987	2.19	0.40	1–3	1018	2.23	0.48	1–3
Thing talents	891	2.18	0.47	1–3	884	2.41	0.47	1–3
General grades and scores								
Academic GPA	1102	3.12	0.49	2.02–4.26	1049	3.11	0.52	1.79–4.25
Military point score	1102	3.12	0.34	1.98–4.08	1049	3.10	0.37	1.96–4.03
Physical fitness score	1102	2.97	0.36	2.03–4.08	1049	2.96	0.38	1.74–4.06
Broad course GPAs								
People courses	1102	3.02	0.47	1.79–4.14	1049	3.00	0.50	1.62–4.22
Thing courses	1101	3.14	0.53	1.40–4.30	1045	3.21	0.66	1.17–4.33
Leadership variables								
Office-holding	1102	0.18	0.61	0–6	1049	0.11	0.45	0–5
Presidencies	1102	0.06	0.28	0–3	1049	0.04	0.20	0–2
Officerships	1102	0.11	0.36	0–3	1049	0.08	0.29	0–3
Team captaincies	1102	0.21	0.48	0–3	1049	0.10	0.33	0–2
Inspir. lead. rating-tac	945	2.11	0.65	1–3	952	2.23	0.70	1–3
3rd–4th yr. leader score	1102	3.07	0.47	1.50–4.25	1049	3.06	0.53	0.42–4.16
Mil. leadership course	1101	3.15	0.60	1.0–4.33	1049	3.09	0.66	1.00–4.33

replication took the tests a second time and the test scores from their second sitting were substituted for their original data. The remaining instances of problematic data from the main and replication samples were removed for the purposes of these analyses.[5] Decisions as to inclusion of data in the files were made without any input from the authors, by independent parties whose priorities were solely to ensure that as many cadets as possible could be represented by valid test results.

4.1.2. Handling missing data

The testing system did not allow for omitted answers and there were therefore no missing data for the tests of spatial intelligence, personal intelligence, the Big Five traits or grit. Roughly 90% of the cadets—932 and 893—also had their SAT scores on file.

4.1.2.1. Tactical officer ratings. Tactical officers rated each of their supervisees on 20 talents. If they were unsure of a rating, they left the survey item blank. Where there were fewer than 3 ratings within a category (thing-oriented, people-oriented), or fewer than 8 ratings for the total, we coded the score as missing. There were between 891 and 987 usable responses in the main sample for the three composites, and between 884 and 1018 for the replication.

4.1.2.2. Other issues. Cadets were encouraged to report their club leadership positions for the online resume (see Procedure). About a fifth of the cadets left these questions blank; given the context, we interpreted the blanks as a lack of leadership positions and recoded their responses as zero leadership positions.

4.2. Means and standard deviations of the key variables

Table 1 reports the *N*s, means, standard deviations, and range for the key variables of interest for both samples, organized into categories of (a) mental abilities, (b) socio-emotional style and self-control (the Big Five), (c) tactical officer talent ratings, (d) general grades and related scores, (e) broad course cluster grades, and (f) leadership variables. We next examine correlations among these measures.

4.3. Correlations among groups of psychological variables

4.3.1. Mental ability measures

We had predicted that the broad intelligences would be moderately correlated with one another—a near ubiquitous finding in the study of mental abilities. Table 2 (upper left) shows correlations in the main sample for the broad intelligences, from an $r = 0.17$ between SAT-math and personal intelligence (and $r = 0.17$ between SAT-verbal and spatial intelligence), to an $r = 0.56$ between SAT-math and verbal. Results were near identical in the replication sample (Table 2, lower portion). The positive manifold among these measures provides evidence that they all "correlate as if" they are broad intelligences. This is new information regarding personal intelligence.

[5] The numbers of flagged and retested cadets were compiled by OEMA officials in response to a request made by the authors two years after the original data collection. The OEMA based their figures on a careful evaluation of their records from that earlier time. Because this was a reconstruction, however, some of the relevant numbers supplied may deviate slightly from the actual values.

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Table 2
Reliabilities and correlations among measures of mental ability, socioemotional style and self-control for the main and replication samples.

	Measures of intelligence					Measures of socio-emotional style and self control					
	SAT total	SAT verbal	SAT-math	Spatial intell.	Person. intell.	Extraversion	Neurot	Openness	Agreeable	Cns	Grit
Original sample[a]											
Mental abilities											
SAT Total	1.00										
SAT Verbal	.89**	1.00									
SAT Math	.88**	.56**	1.00								
Spatial intell.	.26**	.17**	.31**	1.00							
Personal int.	.27**	.30**	.17**	.23**	1.00						
Socio-emotional style and self-control											
Extraversion	−.27**	−.25**	−.23**	−.07*	−.07*	1.00					
Neuroticism	.06	.05	.06	−.03	−.07*	−.42**	1.00				
Openness	.12**	.22**	−.02	.03	.11**	.19**	−.07*	1.00			
Agreeableness	−.08*	−.05	−.09	−.03	.16**	.16**	−.36**	.22**	1.00		
Conscientious.	−.03	−.02	−.02	.07*	.15**	.26**	−.41**	.08*	.26**	1.00	
Grit	−.01	.01	−.03	.05	.15**	.20**	−.39**	.06	.22**	.75**	1.00
Reliabilities	na	na	na	na	.86	.93	.90	.86	.84	.91	.80
Replication sample[a,b]											
Mental abilities											
SAT Total	1.00										
SAT Verbal	.89**	1.00									
SAT Math	.88**	.58**	1.00								
Spatial intell.	.30**	.23**	.30**	1.00							
Personal int.	.28**	.32**	.17**	.20**	1.00						
Socio-emotional style and self-control											
Extraversion	−.13**	−.11**	−.13**	−.01	.07*	1.00					
Neuroticism	−.08*	−.08*	−.06	−.11**	−.08*	−.21**	1.00				
Openness	.28**	.34**	.16**	.11**	.18**	.28**	−.22**	1.00			
Agreeableness	−.10**	−.08*	−.10**	.04	.19**	.09**	−.25**	.09	1.00		
Conscientious.	.00	−.01	.02	.05	.16**	.22**	−.28**	.22**	.23**	1.00	
Grit	−.09*	−.07*	−.09**	.02	.10**	.23**	−.33**	.18**	.19**	.74**	1.00
Reliabilities	na	na	na	na	.84	.91	.87	.87	.80	.90	na

[a] *$p < .05$, **$p < .01$, two-tailed.
[b] The Big Five scales were shortened slightly in the replication sample but the reliabilities were mostly unchanged.

4.3.2. Measures of socio-emotional style and self-control

We further predicted that the broad intelligences would be mostly independent of the socioemotional and self-control traits that make up the Big Five. This, too, occurred, as shown in the lower left side of the upper half of Table 2. There, 17 of the 25 correlations in the main sample ranged between $r = -0.10$ to +0.10. Fewer broad intelligences than predicted correlated positively with Openness in the main sample, only verbal and personal intelligences at $r = 0.22$ and 0.11, $ps < 0.01$, respectively, but all four intelligences correlated with Openness in the replication. As predicted, personal intelligence correlated with Conscientiousness and Agreeableness, $r = 0.15$ and 0.16 in the main sample and $r = 0.19$ and 0.16 in the replication, $ps < 0.001$. These findings reproduce earlier results (Mayer et al., 2012) and increment our confidence that personal intelligence exhibits positive correlations with agreeableness and conscientious at levels non-overlapping with zero (95% CIs of 0.09 to 0.21, 0.10 to 0.22, 0.13 to 0.24, and 0.10 to 0.22, respectively). Also in both samples, cadets with higher extraversion had lower SAT scores on average, suggesting that introverts may need to exhibit more academic skill to be admitted to West Point relative to extraverts.

4.4. Relations among outcome measures

4.4.1. Academic, military and physical outcomes

Cadets who scored highly in one of the academy's three GPAs tended to do well in other areas of performance as well: In the Main Sample, cadets who were academically higher-performing did better at their military jobs, $r = 0.55$ and performed better physically, $r = 0.37$. Cadets with higher military GPAs also performed at higher physical levels, $r = 0.47$, all $ps < 0.01$. The parallel results were $r = 0.57$, 0.38, and 0.47 in the replication group, all $ps < 0.01$.

4.4.2. Tactical-officer talent ratings of cadets

The tactical officer talent ratings also exhibited a general effect in that cadets who were rated high or low in one area often were rated similarly in the other. The people- and thing-related talent ratings correlated $r = 0.66$ with one another and correlated $r = 0.94$ and 0.84 with the overall talent ratings of which they were a part in the main sample and $r = 0.75$, 0.96 and 0.87 in the replication. The $r = 0.66$ correlation between the people and thing talents (the response options were independent of one another) suggest that the two composites reliably reflect the tactical officers' overall impressions of the cadets, and may also reflect a halo effect (e.g., Nathan & Tippins, 1990).

4.4.3. Leadership variables

Leadership is a multifaceted concept and we examined the relations among a similarly multifaceted group of variables that included the number of club officerships and team captaincies, perceived leadership as reflected in the tactical officer ratings, military leader performance as reflected in 3rd and 4th year military scores, assessed on a GPA scale, a course in military leadership (Psychology 300), and even their physical fitness score, also on a GPA scale, which could also influence perceptions of leadership.

Year 3 and 4 leadership performance and the course on military leadership were most highly correlated ($r = 0.38$ and 0.45,

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Table 3
Correlations among leadership variables in the main and replication samples.

	Club and team experience		Rated leadership	Physical performance	Military job and course performance	
	Office-holding	Team captaincies	Insp.-leader-tactical	Physical fitness score	3rd–4th year leader score	Military leadership course
Main study[a]						
Office-holding	1.00					
Team captaincies	.01	1.00				
Insp.-leader—tactical	−.02	.10**	1.00			
Physical fitness score	−.02	.10**	.24**	1.00		
3rd–4th year leader score	.06	.02	.35**	.33**	1.00	
Military leadership course	−.03	.02	.13**	.37**	.38**	1.00
Replication study[a]						
Office-holding	1.00					
Team captaincies	.08**	1.00				
Insp.-leader—tactical	.03	.05	1.00			
Physical fitness score	−.03	.07*	.21**	1.00		
3rd¯4th year leader score	.10**	.08**	.38**	.33**	1.00	
Military leadership course	.06	.04	.22**	.39**	.45**	1.00

[a] *$p < .05$, **$p < .01$, two-tailed.

ps < 0.001) in the main and replications samples. The next highest relation was between the tactical officer's rating of inspirational leadership and the Year 3 and 4 military leadership evaluations, with *r*s = 0.35 and 0.38 across samples (see Table 3); this may have arisen because the raters were familiar with the cadets' performance in their military responsibilities. Similar correlations emerged between physical fitness and grades in the military leadership course, perhaps because cadets who are inclined to do well militarily also see fitness as a key to success. The next highest ratings in both samples, most in the vicinity of $r = 0.20$ to 0.35, *ps* < 0.01, were among physical fitness, inspirational leadership ratings, 3rd and 4th year military performance reflective of leadership, and the aforementioned academic course in leadership. Being captain of an athletic team also correlated with physical fitness GPA, *r*s = 0.07 to 0.10. Beyond those, the correlations were slight. Overall, holding a leadership position—club presidencies, officerships and team captainships—was largely uncorrelated with academic or tactical-officer-rated quality of leadership. These relationships are consistent with the complex, multifaceted nature of leadership itself. Because the variables often appeared distinct from one another, we did not attempt to further aggregate the leadership criteria.

4.5. Relationships between the broad intelligences and general academic, military and physical performance outcomes

To test our hypothesis that the broad intelligences would relate to broad academic performance among the cadets, we correlated the broad intelligences with the academic and military outcome measures.

Under "General Performance" in Table 4, and focusing on the main sample initially (Table 4, left) the overall SAT predicted academic GPA in the main sample $r = 0.64$, $p < 0.01$. Spatial and personal intelligences also predict GPA at levels of $r = 0.21$ and 0.18 respectively, *ps* < 0.01. SAT, spatial and personal intelligences also correlated with military job performance (military GPA) $r = 0.20$, 0.12, and 0.13, respectively, *ps* < 0.05. SAT Total, SAT Math and spatial intelligence correlated with physical GPA at $r = 0.10$, 0.15 and 0.07 respectively, *ps* < 0.05. All four intelligences also exhibited modest correlations, from $r = 0.07$ to 0.11, *ps* < 0.01 for overall

Table 4
Predicting consequential outcomes from measures of mental abilities.[a]

Outcome variables	Main sample					Replication sample				
	SATs			Supplemental		SATs			Supplemental	
	Total	Verbal	Math	Spatial Intell.	Pers. Intell.	Total	Verbal	Math	Spatial Intell.	Pers. Intell.
General performance										
Academic point scale	.64**	.55**	.58**	.21**	.18**	.61**	.52**	.56**	.17**	.27**
Military point scale	.20**	.18**	.17**	.12**	.13**	.22**	.20**	.19**	.10**	.17**
Physical point scale	.10**	.04	.15**	.07*	−.02	.08*	.03	.12**	.06*	.04
Talent rating overall	.10**	.08*	.10*	.10**	.11**	.11**	.11**	.09*	.07*	.11**
Tailored outcomes: course GPAs and tactical officer ratings										
Coursework										
People-focused	.62**	.60**	.49**	.15**	.22**	.60**	.56**	.50**	.12**	.29**
Thing-focused	.61**	.45**	.64**	.24**	.14**	.63**	.48**	.64**	.20**	.22**
Talent ratings										
People-focused	.05	.04	.05	.06	.10**	.07	.07	.05	.06	.09**
Thing-focused	.18**	.15**	.16**	.15**	.12**	.12**	.10**	.10**	.05	.11**
Leadership outcomes										
Office-holding	.04	.05	.02	−.04	−.02	.10**	.09**	.08**	.05	.06
Team captain	.00	−.02	.02	.03	.01	.00	.01	−.01	−.00	.05
Insp. Leader—tactical	.01	.05	−.05	.05	.08*	.07*	.08*	.06	.02	.05
3rd–4th year leader score	.17**	.16**	.14**	.09**	.12**	.19**	.18**	.16**	.08**	.14**
Mil. leadership course	.34**	.29**	.32**	.08**	.18**	.36**	.32**	.31**	.03	.22**

[a] *$p < .05$, **$p < .01$.

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talent ratings. Values for the replication sample (Table 4, right) were very similar except that the TOPI predicted GPA somewhat higher at $r = 0.27$, $p < 0.001$.

Our hypothesis that the individual broad intelligences would correlate with general academic outcomes was supported; they also related to military task performance and evaluations of talent.

4.6. A thing-versus-people model of performance

4.6.1. Testing the thing-versus-people model for academic course performance

To test our hypothesis that academic performance divided into thing- and people-focused areas, we first conducted an exploratory factor analysis of the student performance across the 26 required courses at West Point for the main sample. For this and subsequent analyses, we used criteria for a good fit that included meeting values of "near 0.95" on the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), and a Root Mean Square Error of Approximation (RMSEA) of less than 0.08 (Boomsma, Hoyle, & Panter, 2012).

A two-factor exploratory solution of the student GPAs yielded first two factors corresponding to the hypothesized thing- and people-focused courses, but did not meet our fit criteria ($\chi(274) = 2031.74$, CFI = 0.92, TLI = 0.90 and RMSEA = 0.08). We were, however, able to obtain a better fit in a four-factor exploratory solution that added two additional factors that loaded two language courses (factor 3) and two introductory history courses (factor 4), respectively $\chi(227) = 776.58$, CFI = 0.97, TLI = 0.96 and RMSEA = 0.05. We then attempted a confirmatory factor analysis (CFA) on the same sample. In order to fit the model, we combined student GPAs in two chemistry courses that exhibited collinearity. This new CFA model met fit criteria for the Main sample ($\chi(228) = 1229.49$, CFI = 0.95, TLI = 0.95 and RMSEA = 0.06), and near equally in a cross-validation that employed the Replication sample ($\chi(267) = 1249.65$, CFI = 0.95, TLI = 0.95 and RMSEA = 0.06). This result provides support for dividing coursework into thing- and people-areas.

Based on these results, we created a thing-oriented GPA scale that averaged the GPAs from 8 math, chemistry, information technology, and physics courses. The corresponding people-oriented GPA scale averaged GPAs from 18 English, law, philosophy, psychology, social sciences (e.g., political science), and one environmental science course. The four history and foreign language courses (initially assigned to the 3rd and 4th factors) also were included in the people-oriented scale on the bases of their a priori classification as humanities and the 3rd and 4th factor correlations of $r = 0.68$ and 0.73 with the people-oriented factor. The overall correlation of the thing- versus people-oriented courses was $r = 0.78$ in the main sample and $r = 0.83$ in the replication.

4.6.2. Correlations between broad intelligences and tailored academic outcomes

The second portion of Table 4, "Tailored Outcomes" indicates the correlations between the thing- and people-oriented intelligences (SAT-math and spatial, on the one hand; SAT-verbal and personal, on the other) with thing- and people-related courses. The pattern of correlations provided evidence for our hypothesis that intelligences that matched courses would correlate more highly with them. For example, the correlation between personal intelligence and performance in person-related courses was $r = 0.22$ $p < 0.001$ in the main sample, whereas its correlation with thing-related courses was $r = 0.14$ $p < 0.001$. The difference in correlation, $r_{diff} = 0.087$, was significant ($t = 4.34$, $p < 0.001$) according to standard formulae (Lee & Preacher, 2013). In both samples, each of 8 r_{diffs} (computed similarly from the differences between four pairs of correlations, with each pair representing one matched and one mismatched coupling between an intelligence and course-type × 2 samples) was in the direction predicted and significant at the $p < 0.001$ level or higher. In order of SAT-math, Spatial, SAT-verbal and TOPI scores, the $r_{diffs} = 0.145$, 0.088, 0.150 and 0.087 in the main study, and $r_{diffs} = 0.140$, 0.078, 0.088 and 0.067 in the replication.

4.6.3. Regression test of the tailored academic outcome hypothesis

A second rather different test of this hypothesis employs multiple linear regression to examine the *incremental* prediction of broad intelligences targeted to a particular course area (i.e., thing- and person-) beyond less-related intelligences. In four regressions reported in Table 5, the intelligences less related to a

Table 5
Do broad intelligences predict with specificity? Ordinary least square regression for thing- and person-centered course GPAs.

Dependent (Predicted) variable		Broad mental abilities (Predictors)[a,b]											
		Main sample						Replication sample					
	Steps:	(1)			(2)			(1)			(2)		
		B	95% CI	*beta*	B	95% CI	*beta*	B	95% CI	*beta*	B	95% CI	*beta*
GPA in person-related courses	Variables	Thing-focused int.			All four intelligences			Thing-focused int.			All four intelligences		
	SAT verbal				.003***	.003, .003	.46***				.002***	.002, .003	.37***
	TOPI 1.4				.003*	.000, .005	.06*				.007***	.004, .010	.14***
	SAT Math	.003***	.003, .004	.48***	.001***	.001, .002	.21***	.003***	.003, .004	.50***	.002***	.001, .002	.27***
	O*Net Spatial	.003	−.004, .010	.03	.002	−.005, .009	.02	−.001	−.013, .011	−.004	−.010	−.021, .001	−.05
	R	.489			.633			.495			.615		
	R-sqr.	.239			.400			.245			.378		
	Adj. *R*-sqr.	.237			.397			.243			.375		
	Observations	897						882					
GPA in thing-related courses	Variables	People-focused int.			All four intelligences			People-focused int.			All four intelligences		
	SAT verbal	.004***	.003, .005	.45***	.001***	.001, .002	.15***	.004***	.003, .004	.45***	.001	.001, .002	.13***
	TOPI 1.4	.001	−.003, .005	.01	.000	−.003, .003	.00	.005**	.001, .009	.08**	.006	.002, .009	.09***
	SAT Math				.005***	.004, .006	.53***				.005	.004, .006	.54***
	O*Net Spatial				.012**	.003, .022	.07**				.001	−.013, .015	.01
	R	.456			.647			.484			.655		
	R-sqr.	.208			.418			.234			.430		
	Adj. *R*-sqr.	.206			.415			.232			.427		
	Observations	897						882					

[a] *$p < .05$, **$p < .01$, ***$p < .001$.
[b] All regressions include a constant term but we omit those coefficients for parsimony.

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course area were entered in a first step shown in the first column (1), and the more course-related intelligences in the second column (2) to see whether the more-related intelligences provided incremental prediction over the less-related intelligences. Adding the more course-related intelligences did indeed increment prediction above the less-related intelligences significantly for both thing- and people-related coursework, for both samples (replication to the right).

Consider who succeeds at people-centered courses (Table 5, top sections). The "thing" mental abilities—SAT-math and O*Net spatial—were used to predict person-centered course success in both the main and replication samples. SAT-math exhibited standardized *b*s = 0.48 and 0.50; spatial intelligence added little or nothing to the prediction in either sample, *b*s = 0.03 and 0.004, *n.s.* By comparison, however, the thing- and person-focused mental abilities used together told a different story: SAT-verbal became the most important predictor with a *b*s = 0.46 and 0.37 across samples, followed by SAT-math with *b*s = 0.21 and 0.27, and the personal intelligence measure, with *b*s = 0.06 and 0.14. (*p*s < 0.05 to 0.001). All told, person-related measures of mental ability incremented the prediction over thing-related abilities alone from $R = 0.489$ to 0.633 in the main sample and $R = 0.495$ to 0.615 in the replication ($p_{changes} < 0.001$).

The same general results held, although less strongly, in predicting thing-related courses. Among the first variables entered, SAT-Verbal predicted overall course performance well with *b*s = 0.45 in both samples, and personal intelligence added significantly to the prediction in the replication sample only, $b = 0.08$, $p < 0.01$. Examining all four measures together, SAT-math predicted thing-related course performance best, with *b*s = 0.53 and 0.54 across samples, followed by SAT-verbal, with *b*s = 0.15 and 0.13, with spatial intelligence adding an incremental prediction to the main sample ($b = 0.07$, $p < 0.01$), but not to the replication, and personal intelligence adding nothing in the main sample, but making a significant contribution in the replication ($b = 0.09$, $p < 0.001$). Here, thing-related measures of mental ability incremented the prediction over person-related abilities alone from $R = 0.46$ to 0.65 in the main sample and $R = 0.48$ to 0.66 in the replication ($p_{change} < 0.001$).

4.6.4. A Thing-versus-people model of performance: testing the hypothesis among talent ratings

Returning to Table 4, the correlations between the broad intelligences and the thing- and people-related talents also are displayed. Contrary to the pattern for course performance, the effects of broad intelligences on the cadets' thing- and people-centered talents seemed undifferentiated: All four broad intelligences correlated more highly with thing- than people-related talents. Personal intelligence generally correlated most highly with both kinds of talent ratings, suggesting that cadets with higher personal intelligence were better able to impress their tactical officers than cadets lower in the ability, and that the tactical officers' talent ratings may be based on interpersonal factors more so than on an ability to gauge mental abilities.

4.7. Correlates with leadership outcomes

The bottom section of Table 4 indicates that the broad intelligences also predicted third and fourth-year military performance—which is regarded as an index of leadership. Individually, all four intelligences correlated significantly in the predicted direction from $r = 0.09$ to 0.16 in the Main and $r = 0.08$ to 0.18 in the Replication samples respectively. A simple regression entering all four broad intelligences yielded an $R = 0.19$, $p < 0.001$ in the main sample, with only the SAT-verbal and TOPI 1.4 attaining significant betas of 0.09 and 0.08, $p < 0.05$. The same pattern of significance for SAT-verbal and the TOPI 1.4 repeated in the replication, with an overall $R = 0.23$, $p < 0.001$, and betas of 0.10 and 0.13, *p*s < 0.05 and 0.001 respectively. We observed similar results for the military leadership course, where all four intelligences correlated significantly in the predicted direction from $r = 0.08$ to 0.32 in the main sample and $r = 0.03$ to 0.32 in the replication samples, and only spatial intelligence did not correlate significantly.

4.8. Key correlations with the socio-affective and self-control measures

Table 6 presents the results germane to our final prediction that Conscientiousness—a Big Five trait reflecting self-control—would correlate highly with important outcomes. As predicted, Conscien-

Table 6
Predicting consequential outcomes from socio-affective and self-control measures.[a]

	Main sample						Replication sample					
	Extraversion	Neurot	Openness	Agreeable	Cns	Grit	Extraversion	Neurot	Openness	Agreeable	Cns	Grit
General academic outcomes												
Academic point scale	−.20**	.05	.08*	−.05	.25**	.16**	−.14**	.03	.20**	−.03	.28**	.10**
Military point scale	.03	−.06*	.02	.09**	.40**	.30**	.04	.02	.08**	.07**	.41**	.23**
Physical point scale	.10**	−.13**	−.07*	.02	.22**	.17**	.04	−.01	−.01	.00	.20**	.13**
Talent rating overall	.06	−.06	.06	.07	.24**	.20**	.10**	−.02	.06	.04	.24**	.15**
Tailored outcomes: course GPAs and tactical officer ratings												
Coursework												
People courses	−.18**	.04	.14**	−.02	.24**	.18**	−.10**	.02	.26**	−.03	.28**	.11**
Thing courses	−.20**	.06*	−.01	−.06	.17**	.10*	−.17**	.01	.12**	−.04	.21**	.05
Talent Ratings												
People talents	.14**	−.08*	.06	.10**	.21**	.17**	.12**	−.04	.06	.06	.20**	.12**
Thing talents	−.09*	.01	.08*	.02	.23**	.18**	.03	−.05	.04	.03	.26**	.16**
Leadership outcomes												
Office-holding	.00	.09**	.07*	.04	−.02	−.05	.06*	−.05	.09**	.01	.06	.05
Team captain	.10**	−.07*	.02	.00	.05	.06	.00	−.06*	−.03	.04	.09**	.09**
Insp. Leader—tactical	.17**	−.09**	.08*	.07*	.20**	.15**	.08*	−.00	.03	.02	.18**	.12**
3rd–4th year leader score	−.04	.01	.03	.12**	.31**	.21**	.01	.05	.08**	.10**	.35**	.18**
Mil. leadership course	−.07*	.01	.04	−.02	.30**	.20**	−.07*	.04	.12**	.03	.30**	.15**
N for the measure[b]	1063	1063	1063	1063	1063	1063	1037	1037	1037	1037	1037	1037

[a] *p < .05; **p < .01, two-tailed.
[b] The *N* = 932 for correlations with the SAT; the *N* for the composite talent ratings were also lower (*N* = 748–938), and lower also for individual talent ratings (e.g., *N* = 590–695 for spatially intelligent).

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tiousness correlated positively with all three GPA measures—academic, $r = 0.25$, military, $r = 0.40$ and physical, $r = 0.22$, $ps < 0.01$ in the main sample and similarly in the replication. Tactical officers also rated conscientious cadets higher in overall talents $r = 0.24$ across the two samples, $ps < 0.01$. Unlike the broad intelligences, Conscientiousness correlations were non-specific over both the thing- and people-centered course grades and over the thing and people talents. Conscientiousness further correlated with tactical officer ratings of inspirational leadership, 3rd and 4th-year military leadership, and military leadership course grades. Grit, which correlated $r = 0.75$ and 0.74 with Conscientiousness in the Main and Replication samples, had similar but generally weaker relationships with the same criteria.

5. Discussion

5.1. Summary of results

We examined the relationship between psychological variables and consequential outcomes among two successive classes of cadets at the United States Military Academy at West Point—"main" and "replication" samples. Our focus was in particular on broad intelligences, including the recently-proposed *personal intelligence*, and examining their relation to outcomes including the cadets' academic performance, performance of military responsibilities, physical ability, and leadership. We divide our discussion of the key findings into three areas: predictions of outcomes, new findings regarding personal intelligence, and organizing the broad intelligences.

5.2. Predictions of outcomes—general effects

5.2.1. Correlations with academic and military-performance outcomes

The broad intelligences examined in this study, along with Conscientiousness from the Big Five, could be used to estimate both key academic and early-stage military performance among these college-age cadets. All four broad intelligences studied here were correlated with academic performance. That was no surprise regarding the SAT-verbal and -math scores, as those are designed for the purpose. Spatial intelligence, too, has shown important predictions in this area previously (Wai et al., 2009). This was, however, the first test of personal intelligence in this regard and was positive. All four broad intelligences also correlated with the cadets' performance of military tasks (reflected by the military point scale rating).

5.2.2. Correlations of broad intelligences with leadership performance

Personal intelligence, and to a lesser extent spatial intelligence, were also related to 3rd-and-4th year military performance, which is regarded as especially indicative of leadership (Bartone, Snook, & Tremble, 2002; Kelly et al., 2014), at $rs = 0.12$ and 0.09 in the main sample and $rs = 0.14$ and 0.08 and in the replication sample, $ps < 0.01$.

Office-holding appeared to be distinct from talent at leadership. None of the intellectual or Big Five variables correlated consistently with actual office-holding and team captaincies across the two studies excepting Big Five openness ($r = 0.07$ and 0.09 across the samples, $p < 0.05$).

5.2.3. The performance of the Big Five

We also found that Conscientiousness, a trait of the Big Five, correlated with academic and other outcomes in robust ways. Conscientiousness revealed across-the-board relationships with academic GPA, military performance and physical achievements in both studies, in the $r = 0.20$ to 0.40 range. Conscientiousness similarly correlated with overall talent ratings by tactical officers at about $r = 0.25$ across samples, and with leadership as reflected in 3rd and 4th-year military performance in the vicinity of $r = 0.30$ across samples. These findings are of theoretical importance and of practical interest.

The Big Five trait of Conscientiousness is a robust correlate of consequential outcomes, but applied psychologists have noted that it is reasonably easy to "fake high" on conscientiousness and have explored some of the conditions under which this occurs (Birkeland, Manson, Kisamore, Brannick, & Smith, 2006; Komar, Brown, Komar, & Robie, 2008; Peterson, Griffith, Isaacson, O'Connell, & Mangos, 2011). Although in the high stakes testing situation examined here there was some suggestion that the cadets portrayed themselves a bit more positively than the norm, it was difficult to be certain as the closest comparison group we could find was that of Scottish college students, who vary according to their culture and setting from these participants (Gow et al., 2005). Regardless, the cadets here reported a broad range of conscientiousness (there was little evidence of restriction of range in the cadets' responses)—with many owning up to a considerable degree of carelessness. It may be that some cadets acknowledged their low conscientiousness because they were honest and direct under most or all circumstances, including high stakes testing.

Alternatively, perhaps the cadets and people more generally who endorse items reflecting their low conscientiousness are generally unaware of the key findings regarding the importance of conscientiousness to high performance, and therefore fail to appreciate the uses to which their self-acknowledged carelessness could be put. If the latter were the case, and public awareness of the importance of self-reported conscientiousness to selection were to rise, savvy test-takers could learn to change their answers under high stakes conditions and thereby reduce the validity of the tests' predictions over time. Future research will be needed to study this possibility.

5.3. New findings about personal intelligence and other broad intelligences

Our findings provided new and important evidence as to the nature of personal intelligence and other intelligences.

5.3.1. "Behaving like an Intelligence"

A hallmark of mental abilities is that they share a *positive manifold*—they all correlate positively with one another. In a first of this research, we examined whether personal intelligence would exhibit a positive manifold with SAT-math, SAT-verbal, and spatial intelligence. It did. The finding provides support for the conceptualization of personal intelligence as a broad intelligence. (Earlier findings indicated that personal intelligence correlated with vocabulary ability, Mayer et al., 2012).

5.3.2. Personal intelligence exhibited a distinct pattern of correlations with the Big Five

A second key finding about personal intelligence was its distinct pattern of correlations with the Big Five. Intelligence researchers commonly observe that general intelligence is related to openness—and that verbal intelligence exhibits stronger relations with openness than non-verbal (Ackerman & Heggestad, 1997; DeYoung, 2011). That was the case here: In the main sample, SAT-verbal and personal intelligence correlated with psychological openness ($rs = 0.22$ and 0.11), but SAT-math and spatial intelligence did not; in the replication, all four broad intelligences correlated with openness, but SAT-verbal and personal intelligence exhibited correlations somewhat higher than SAT-math and spatial intelligences ($rs = 0.34$ and 0.18 versus 0.16 and 0.11).

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Beyond that, personal intelligence exhibited a unique correlational pattern with Agreeableness and Conscientiousness in both studies (Study 1 $rs = 0.16$ and 0.15; Study 2 $rs = 0.19$ and 0.16, $ps < 0.001$), whereas no other broad intelligence in these studies exhibited such relationships. The only other intelligence that exhibits such a relationship with Agreeableness and Conscientiousness that we know of is emotional intelligence, which correlates at levels of $r = 0.25$ and 0.12, respectively (Joseph & Newman, 2010, Table 2). These findings suggest that people-focused intelligences such as emotional and personal intelligences may share certain relationships with self-control and interpersonal behavior that other intelligences do not.

5.3.3. Predictions to academic and professional training and performance

Most importantly, personal intelligence was effective at predicting key academic and military outcomes. In the main sample, the multiple regression from the SAT-math and spatial intelligence to person-related courses rose from $R = 0.49$ to 0.63 when SAT-verbal and personal intelligence were added (the parallel value in the replication sample was $R = 0.50$ to 0.62). In both the main and replication samples, the standardized *betas* for personal intelligence alone—even with three other broad intelligences entered, were statistically significant ($b = 0.06$ and 0.14, $ps < 0.05$ and 0.001).

5.4. Can using a thing- and person-related continuum help organize the broad intelligences and their predictions?

If one accepts that personal intelligence is likely a broad intelligence, the question follows, "How many broad intelligences are there?" And this becomes of concern because one cannot easily measure them all. One way to organize broad intelligences so as to be sure to represent them adequately, we argued here, is into thing-centered and person-centered groups (sometimes referred to as "cool" and "hot" groups). We organized both our intelligences and our outcomes (where possible) into thing- and person-centered groups based on their earlier theoretical assignments (Mayer et al., 2016).

In fact, course performance (GPA) in the core curriculum at West Point was successfully modeled by dividing it primarily into thing- and people-oriented courses, with two smaller factors describing language and history courses. The model fit was excellent across both the main and replication studies. The approach indicates that some cadets are good at thing-related courses (science and technical), others at people-courses (humanities, social sciences), and still others are good at both—or neither.

Crucially, we found that when intelligences and coursework were organized into thing- and people-centered groups, SAT-math and spatial intelligence (the more "thing-like" intelligences) correlated with heighted performance at thing-centered courses, whereas SAT-verbal and personal intelligences (the more "people-like" intelligences) correlated with heightened performance at person-centered courses. This also provides support for this proposed classification. Future work with a larger number of broader intelligences than the four used here could test whether a correlational structure among the intelligences exists that is congruent with the theory. The person-thing distinction certainly fit cadet course performance, which readily divided into thing- and people-focused performance areas. Meanwhile, the successful differential predictions from intelligences to academic outcomes in two independent samples provide further evidence for the model.

5.5. Practical considerations

We have found that broad intelligences have their own unique signatures and predictive power in relation to academic and military performance overall, and to specific areas of academic (and presumably) later professional performance as well. Existing testing programs require little modification to include broad intelligences, and research models that include them fit data better than those using general intelligence alone. Differentiated mental abilities such as spatial and personal intelligences, and mathematical and verbal problem-solving may heighten predictions over the use of *g* alone at levels of about 2–6% variance—with partial correlations controlling for *g* between $r = 0.14$ and 0.24 (Ackerman, 2014; Schneider & Newman, 2015).

Under conditions specified by Rosenthal and Rubin (Rosenthal, 1990; Rosenthal & Rubin, 1982) an incremental correlation of $r = 0.1$ can reclassify 10% of a population more accurately as to whether their performance will be above or below average. The research here and elsewhere indicates that the use of *g* and broad intelligence scores together would incrementally predict consequential outcomes at about that level.

Some researchers also have argued that scales of broad intelligence may deliver a fairer testing experience for the test-taker (Schneider & Newman, 2015). It does seem likely that test-takers prefer the more tailored information provided by multiple valid score reports to single summary scores. These multiple ability measures have the additional advantage of being relatively resistant to faking when compared to self-report scales (Peterson, Griffith, Isaacson, O'Connell, & Mangos, 2011).

5.6. Study limitations

There are some limits to the generalizability of our findings. The two samples, although large, both drew on cadets at West Point, who are not entirely representative of the US population: The cadets are highly talented individuals relative to the general population, are predominantly male, and have greater interests in engineering and the military than is typical. We have no theoretical reason to believe that this sample's characteristics might limit the generalization of the findings, but there could be additional factors that render the results different from those of the general population.

A second limitation is that the present study examined just four broad mental abilities out of up to a dozen more that might have been included, from auditory ability to memory retrieval capacity (Carroll, 1993; Flanagan et al., 2013; McGrew, 2009). A further limitation is modest strength of the relationships reported. Although the correlations appear stable and replicable, they are, on the whole, short of eye-popping in their levels. This is often the reality of correlational relations from personality to major life outcomes: Other factors including situational influences, chance events, and psychosocial qualities that have been omitted here may ultimately contribute. Those limits acknowledged, stable, predictable correlations can add to our understanding and practical decisions regarding selection.

5.7. Concluding comment

Applied research in mental abilities today can be thought of as following two tracks: refinement of what we already know and exploration of what we do not. The present studies helped refine what we already know: The inclusion of broad intelligences can often enhance correlations with key criteria. They also continue exploration into what we do not yet know: This was the first large sample study to compare personal intelligence with abilities such as spatial intelligence, verbal intelligence, and mathematical reasoning. It was also the first to correlate personal intelligence with consequential outcomes such as academic and military task performance. These relationships are useful to understand because they can be used to enhance people's knowledge as to their strengths

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and weaknesses, and, potentially, to train them to higher levels of performance in the areas of their choice. Such assessments can help to guide people toward the educational and career paths that may draw out their best possible future performance.

Author notes

The authors are grateful to Luke B. Gallagher of the Office of Economic and Manpower Analysis, who managed the data files in these studies. Rachael Cavallaro and Tyler J. Mulcahy helped prepare the tables. Jayne Allen, Bonnie Barlow, Kateryna Sylaska, and Tyler Mulcahy all read and commented on an earlier draft of this work.

The opinions expressed by the authors are their own and do not reflect those of the U.S. Army or the Department of Defense.

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