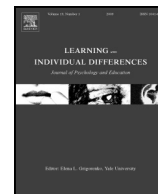




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## Who's getting the grades and who's keeping them? A person-centered approach to academic performance and performance variability

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## ABSTRACT

The current study used a person-centered approach to explore individual differences in academic performance, as a complement to traditional variable-centered approaches. Personality traits, intellectual ability, and more mutable study skills, habits, and attitudes were used to predict academic performance as indexed by GPA and variability in grades across classes (academic variability). Conscientiousness, intellectual ability, motivation, and anxiety were identified as the strongest predictors of GPA and academic variability using a variable-centered approach. These factors were included in an exploratory cluster analysis to extract four distinct student profiles: *High-Achievers*, *Low-Achievers*, *Strugglers*, and *Settlers*. These achievement profiles, and particularly *Strugglers* and *Settlers*, express complex within-profile variable interactions that the traditional variable-centered approach failed to capture. Our findings speak to research and practice on academic interventions, and provide fodder for future research on individual differences and performance.

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Bivariate relationships between personality, intelligence, and grade-point-average (GPA) dominate the research on academic performance. This reflects a variable-centered (rather than a person-centered) approach, with an emphasis on fixed individual differences. In an attempt to extend the practicality and nuance of this literature, the current study takes a person-centered approach and emphasizes mutable, controllable individual differences. We reintroduce grade variability (Bakan, 1971), a measure of the variability in performance across courses within a specific academic period, as a performance metric to work in tandem with GPA over the same time period. We also identify the most robust antecedents to performance, and combine these factors into student profiles. Whereas variable-centered approaches tend to alienate individual students, profiles allow for an appreciation of the natural within-person co-occurrence of variables. Put simply, profiles allow for holistic impressions of students that should better approximate actual students, and in turn have distinct implications for future research and practice. We first discuss our metrics of student performance, and then move to the mutable and immutable factors of interest.

There are many ways to operationalize student success, but grades stand above all others. The majority of the previous literature has assessed performance with self-reported GPA (Fenning & May, 2013), actual GPA (De Clercq, Galand, Dupont, & Frenay, 2013; Komaraju, Ramsey, & Rinella, 2013), or grades on tests and exams in a particular

course (Dollinger, Matyja, & Huber, 2008; Paunonen & Ashton, 2001, 2013). One aspect of academic performance that has been relatively ignored is the variability of students' grades across classes. Indeed, we could find only a single study exploring variability in academic performance. Bakan (1971) examined the performance of high school students across a 5-year period. She found that students with average GPA, but higher academic variability, experienced a steeper drop in performance across the high school period and a decrease in self-concept of general school ability. We reasoned that GPA as a single global performance indicator should be comparatively insensitive to changes in environmental and psychosocial factors. Instead, circumstance and psychological state could produce more measurable differences in academic variability, as in Bakan's (1971) study. Academic variability might offer unique insight into relationships between individual differences and outcomes, like dropout, that can be attenuated with interventions (Robbins, Oh, Le, & Button, 2009). Indeed, students that have trouble adapting to changing circumstances, who are less mature, that feel anxious and restless, are the most likely to drop out of school (Tinto & Cullen, 1973). Where GPA is fairly well captured from a trait and ability perspective, academic variability might help capture the role of changing psychological state.

Academic variability, in combination with GPA, can thus introduce a fresh perspective on the interplay of individual differences, academic outcomes, and potential interventions. The composite interactive effects of these variables – as in achievement profiles – might be particularly interesting and useful. For example, two students might be targeted for interventions. Even if they hold the same GPA, a holistic

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consideration of individual differences in personality, aptitude, study habits, and attitudes could necessitate different interventions for each student. Perhaps one is highly motivated and conscientious, but extremely anxious, and the other simply has low cognitive aptitude. The former might benefit from counseling or Attributional Retraining (Hamm, Perry, Clifton, Chipperfield, & Boese, 2014), and the latter might need extra skill development and remedial tutoring. Moreover, where the former student's profile might indicate burnout (May, Bauer, & Fincham, 2015) or maladaptive perfectionism (Zhang, Gan, & Cham, 2007), the latter student could be psychologically healthy. Of course, for these profiles to work as described, they must consist of robust state and trait individual differences. Although relatively stable (i.e., immutable) and variable (i.e., mutable) individual differences often correlate (De Feyter, Caers, Vigna, & Berings, 2012; Komarraju, Karau, & Schmeck, 2009; Komarraju et al., 2013), we chose to differentiate between these factor types to determine the practical utility of the mutable factors after controlling for personality and aptitude.

### 1. Stable and mutable individual differences

Relatively stable or immutable individual difference factors are frequently studied as antecedents of academic performance. Of these, the most prevalent are cognitive factors such as intelligence and verbal ability (Chamorro-Premuzic & Furnham, 2008; Dollinger et al., 2008; Furnham, Monsen, & Ahmetoglu, 2009; Ransdell, 2001), and personality factors like conscientiousness (Chamorro-Premuzic & Furnham, 2008; Conard, 2006; Furnham & Monsen, 2009; McAbee & Oswald, 2013; Poropat, 2009, 2014; Vedel, 2014). For personality, conscientiousness holds the strongest association with academic outcomes; it should be noted, however, that there is evidence for relationships between multiple aspects of personality (openness, neuroticism, agreeableness, extraversion) and academic performance (e.g., Gallagher, 1996; Laidra, Pullman, & Allik, 2006; Poropat, 2009). Although intellectual ability and personality traits may change across the lifespan (Deary et al., 2012; Roberts, Walton, & Viechtbauer, 2006), for students, these factors are more fixed and less amenable to change over the short-term. Therefore, however robust the relationship between more stable factors and performance, the practical benefit of understanding this relationship is consequently limited. Thankfully, a number of individual differences that can more easily be controlled or changed also relate to performance.

Several mutable individual difference variables can aid academic performance and persistence. Meta-analytic studies have found that study habits, skills, and attitudes significantly predicted academic performance after controlling for personality, cognitive aptitude, standardized tests and high school grades (Richardson, Abraham, & Bond, 2012; see also Robbins et al., 2004). Addressing these, scholastic interventions have improved motivational, emotional, and social states, and led to better performance and higher retention rates (Covington, 2000; Hamm et al., 2014; Richardson et al., 2012). Indeed, a common contention in the literature is that aptitude tests (measuring immutable factors) determine what students *can do*, whereas mutable and motivational factors determine what students *will do* (Chamorro-Premuzic & Furnham, 2006; Furnham et al., 2009; Kriegbaum, Jansen, & Spinath, 2015; Sackett, Schmitt, Ellingson, & Kabin, 2001). This contention is further evidenced by studies on work performance that suggest personality and ability tend to associate more strongly with maximum performance, where motivation relates more closely to typical performance (Beus & Whitman, 2012). Because we are interested in holistic individual difference profiles, we chose to explore the combined effects of personality, cognitive aptitude, and mutable study habits, skills, and attitudes.

Although we differentiate between what we term mutable and immutable factors, the effect of personality traits and/or cognitive ability on academic performance may be partially mediated through more effective study skills and attitudes (Credé & Kuncel, 2008; Corker, Oswald, & Donnellan, 2012; Keiser, Sackett, Kuncel, & Brothen, 2016).

Taking this perspective, study habits and skills predict such a large component of academic performance that Credé and Kuncel (2008) refer to these variables together as the “third pillar of academic success” (p.425). Thus, the determinants of student success are likely a complex interaction of within-person processes.

### 2. Current study

The first aim of the current study was to examine the predictive properties of mutable and immutable factors on students' academic performance as represented by GPA and academic variability. We operationalized academic variability as the standard deviation of all final course grades across an academic year. In particular, we were interested in the incremental effects of controllable factors on performance, beyond the effects of personality and cognitive aptitude. Once the most robust predictors of performance were identified, we targeted these variables to extract individual difference profiles to gain a person-centered perspective on the data. In this way, the current study parallels Ackerman and colleagues' trait-complex approach, where combined intraindividual differences are considered more useful for predicting academic performance than individual trait measures (Ackerman & Heggstad, 1997; Ackerman, Kanfer, & Beier, 2013).

As noted above, personality and cognitive ability are well-established predictors of grades that are typically considered stable and relatively immutable. To serve as a proxy for intelligence, we used a measure of verbal ability that strongly relates to both verbal intelligence and general intelligence (Vernon & Kantor, 1986). We also measured the Big Five personality traits (McCrae & Costa, 2004). Consistent with established trends (Chamorro-Premuzic & Furnham, 2008), personality and cognitive ability were expected to show robust relationships to GPA. For personality we included all dimensions of the Big Five, as past research has shown relationships with academic outcomes. However, we expected trait conscientiousness in particular should positively predict GPA (Poropat, 2009, 2014).

**H1.** Intelligence, as assessed by verbal ability, would positively correlate with GPA.

**H2.** Conscientiousness would positively correlate with GPA.

To our knowledge, the impact of personality and cognitive ability on academic variability has never been measured, and for this reason we included all dimensions of the Big Five in our model. However, there is reason to predict specific relationships between some traits and academic variability. Neuroticism is characterized by emotional instability and propensity for distress (McCrae & Costa, 2004). Students higher on neuroticism should be more impulsive and susceptible to fluctuations in anxiety and affect over time, which we expected to manifest as fluctuations in performance (academic variability). Conscientiousness is defined by diligence and carefulness in goal-seeking behavior (McCrae & Costa, 2004), and should associate with more consistent performance over time and lower levels of academic variability.

**H3a.** Neuroticism would positively correlate with academic variability.

**H3b.** Conscientiousness would negatively correlate with academic variability.

Twelve self-reported mutable factors were included, and are meant to represent a variety of individual differences that hold academic value beyond intelligence and personality. The first ten of these are subsumed under the general *skill*, *will*, and *self-regulation* components of the Learning and Study Strategies Inventory (Weinstein, Palmer, & Shulte, 2002) – in combination, these have been demonstrated to be one of the best non-intelligence predictors of performance (Credé & Kuncel, 2008). Cognitive flexibility and metamemory are also included. Cognitive flexibility is associated with executive function and involves adaptability to new circumstances and problems (Dennis & Vander Wal, 2010), and has

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