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Personality and Academic Performance in College

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Abstract

Personality and Academic Performance in College

Jacob Alderson

Despite mounting evidence for the role of personality in predicting college level academic performance, there are aspects of this association that are still unexplained. With a sample of U.S. undergraduates at a large Appalachian university, this study sought to further establish what is already known about the association between personality and grade point average, credits earned, and retention rates by testing for both linear and quadratic effects. Results showed linear positive effects of conscientiousness, negative linear effects of openness and nonlinear effects of neuroticism for GPA. However, personality traits were not associated with either retention or credits earned. These findings suggest that neuroticism may be predictive of GPA in ways previous research has not uncovered and suggests certain personality traits may be curvilinearly associated with GPA. Moreover, these findings should encourage administrators and researchers to understand how to foster certain personality traits in college students.

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Personality and Academic Performance in College

Across all racial and ethnic groups, the percentage of U.S. adults enrolling in a bachelor's degree program steadily increased from the late 1970's (Nietzel, 2019), peaked in 2010, and has been consistently decreasing by an average of 2.6% ever since (Hanson, 2021). This trend is not expected to reverse direction and may in fact worsen in light of the COVID-19 pandemic. Estimates from the 2019-2020 academic year indicate a decrease in enrollment of 6.9% across four-year U.S. universities, and retention rates for students in lower socioeconomic strata and two-year universities has decreased by 6% (Sedmak, 2020). The shifts occurring in higher education have led some to argue that a college degree is no longer worth pursuing citing increased tuition costs, a changing labor market, and fewer opportunities available for recent graduates as evidence (Karpis, 2020; Shell, 2018). However, this claim has its critics. Graduating from a university is associated with having a higher average income compared to those without degrees (Abel & Dietz, 2014). Moreover, in a comprehensive national review of the differences between those who complete and do not complete higher education, college graduates reported having greater opportunities for social connection, reported feeling a greater sense of accomplishment, and reported better long-term health outcomes in comparison to those with only a high school education (Oreopoulos, 2013). Understanding the factors that predict college success therefore is essential.

Long standing predictors of college success include proxies for cognitive ability such as high school grade point average, standardized test scores (e.g. Scholastic Aptitude Test (SAT) & American College Testing (ACT)), and intelligence (IQ) (Allensworth & Clark 2020; Sternberg et al., 2001). Those scoring higher in these measures typically perform well in college. However, these measures do not fully explain why some individuals struggle versus succeed in college

(Sparkman, Maulding, & Roberts, 2012). Thus, attention has shifted to a focus on more individual difference factors that may predict academic success, such as personality traits (Poropat, 2009). Since personality traits represent the relatively enduring patterns of thoughts, feelings, and behaviors that make individuals unique, it is possible that personality traits could provide a more nuanced understanding of who succeeds in college. As such, the current study sought to expand what is known about the association between personality characteristics and academic success across a diverse set of outcomes including grade point average (GPA), credits earned, and retention. We also extend preliminary work suggesting there might be both linear and curvilinear associations between the Big Five personality traits and academic outcomes (Cucina & Vasilopoulos, 2006; Robbins et al., 2006).

Personality and Academic Performance

The Five-Factor model of personality has garnered wide-spread use in predicting many important life outcomes over recent decades (John & Soto, 2017). Regardless of the particular inventory used, the model captures five key personality traits, conscientiousness, openness, agreeableness, extraversion, and neuroticism. Many studies conclude that the Big 5 is associated with "academic performance" (Corazzini et al., 2021; Furnham et al., 2003; Tross et al., 2000). However academic "performance" or "success" are rather broad and amorphous terms. Indeed, operationalizing academic success is the subject of several reviews and a key issue for educators and researchers alike (Kuh et al., 2006; York, Gibson, & Rankin, 2015).

The majority of studies exploring personality-academic associations typically operationalize college success by examining GPA (Mammadov, 2021). Although GPA is a relatively easy outcome to obtain using official registrar records, it does not fully capture the students who decide to withdraw from college. Unfortunately, relatively few studies have

assessed whether personality traits are associated with a student persisting or dropping out of college, with even fewer studies examining if students eventually return. This is problematic as retention, particularly in the first year of college, has been identified as a key outcome measure by institutional research offices (Wilford & Schaler, 2005).

Lastly, there is a dearth of studies examining credits earned as an outcome. This is a major weakness because credits earned is a proxy for how efficiently students are progressing through their undergraduate degree. For example, a student can have a high GPA for a given semester (an example of "academic success"), but they could have dropped several classes or registered for less than 12 credits making them a part-time student. While the semester could be viewed as successful in terms of the GPA earned, the student could now be behind his/her peers with respect to graduating on time, not to mention at-risk of losing financial aid and health insurance. Studies have shown that students who fall "off-track" (less cumulative credits earned than expected) are at a greater risk of not being retained and ultimately not completing their degree (Aiken et al., 2020). Similarly, those who take more credits per semester are more likely to earn better grades and persist to degree completion. To the author's best knowledge, no studies have currently assessed the Big 5 model of personality as it relates to credits earned in the U.S. education system. Although it is not a goal of the current study to identify the best measure of "academic success", we examined three different academic outcomes to better understand how each of the Big 5 personality traits predict specific aspects of academic performance.

Personality and Grade Point Average (GPA)

Conscientiousness

Conscientiousness represents the extent to which one is orderly, achievement striving, and goal oriented. Conscientiousness is the Big 5 personality trait that is most strongly associated

with academic success. Higher levels of conscientiousness predict a higher GPA across multiple cultures and countries including the U.S. (Komarraju et al., 2009), Italy (Corazzini et al., 2021), Iran (Hakimi, Hejazi, & Lavasani, 2011), Southeast Asia, and Australia (Trapmann, 2009). Conscientiousness is not only the most consistent predictor of GPA; it also is the personality trait with the strongest effect. Meta-analytic work suggests that conscientiousness alone explains anywhere from 4% to 8% of the variance in one's GPA, whereas the other personality traits taken together explain roughly 2% to 4% of the variance (Mammadov, 2021; O'Connor & Paunonen, 2007; Poropat, 2009; Trapmann, 2009; Vedel, 2014). For comparison, other well-known predictors such as high school GPA and SAT/ACT scores, on average, explain 18% and 16% percent of the variance in undergraduate GPA respectively (Higgins et al., 2007; Mammadov, 2021; Robbins et al., 2006). Moreover, in a meta-analytic regression of academic performance on personality and cognitive ability, scoring a standard deviation higher on conscientiousness was associated with a 0.35 increase in GPA, which is quite substantial considering that the difference between getting a B+ or an A could be partially determined by one's level of conscientiousness, for example. (Mammadov, 2021). Thus, conscientiousness has a significant and meaningful association with GPA even when accounting for the unique effects of intelligence. Conscientiousness is also the only trait that does not significantly decrease in its predictive validity as students make their way into tertiary education (Mammadov 2021; Poropat, 2009). That is to say, conscientiousness is beneficial for students in primary, secondary, and post-secondary education.

It is also important to note that although the question *if* conscientiousness predicts academic success is well established, the question of *why* conscientiousness is beneficial for academic success is not as well understood. Studies have linked higher conscientiousness to

[1]improved study habits (Marcela, 2015), more consistent classroom attendance, higher self-efficacy (Conrad & Patry, 2012), and an increase in academic motivation (Feyter et al., 2012). Therefore, it is likely that the ability to be persistent and goal directed is a driver of higher GPAs in students with higher levels of conscientiousness.

Openness

Openness to new experiences is a trait that measures how artistic, imaginative, and intellectually inclined a person is. Findings have been somewhat inconclusive regarding the association between openness and academic success. Some individual studies have found a positive association between openness and GPA (Gerbino et al., 2017; Verbee et al., 2021) while others have found no association (Conard, 2006; McCredie & Kurtz., 2020). Some meta-analyses conducted in recent years have generally found low but statistically significant positive associations between openness and GPA (Richardson, Abraham, and Bond, 2012 ($N = 128,402$); Trapmann et al., 2007 ($N = 10,855$), while Poropat (2009) ($N = 23,225$) found no association with GPA. Mammadov (2021) ($N = 413,074$) found openness significantly predicted GPA ($r=.13$)[1]. However, when cognitive ability was controlled for, its predictive power was reduced substantially such that it predicted only 1% of the variance in GPA. This association did remain statistically significant ($p<.001$). Both the Poropat (2009) and Mammadov (2021) studies were unique relative to the other meta-analyses in that cognitive ability was controlled for. As a result, it is possible that higher levels of openness may be more strongly associated with better academic outcomes in studies that do not account for intelligence, due to shared variance.

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[1] It should be noted that the later meta-analyses cited have substantial overlap with earlier ones including much, if not all of the same studies

The mixed findings in the present literature may also reflect differences in the underlying facets/aspects that constitute trait openness. Depending on the particular Big 5 inventory used, different aspects of openness might be over-represented. For example, measures typically include two key aspects of openness: creativity and intellectual curiosity. In the context of predicting academic performance, an interest in ideas and intellectual matters may be more relevant than how creative a person is. Getzka & Hell (2017) conducted a meta-analysis specifically to tease apart which facets/aspects of openness explain the positive associations to GPA seen in the literature. They concluded that openness to ideas ($r = .06$) and openness to values ($r = .08$), facets of McCrae and Costa's (2008) Big 5 model, were the only two facets that were significantly related to GPA. These mean correlations were of similar magnitude to those found in the prior meta-analytic work cited.

Furthermore, the researchers also examined "intellect" a higher order facet of trait openness. Intellect can be thought of as the dimension of openness that expresses one's need for cognition, exploring new ideas, and engaging in intellectual discussions. Intellect was reported to have a mean correlation of .18 with GPA, the highest association found between any dimension of openness and academic performance in any meta-analysis to date (Gatzka & Hell, 2017). It should be clarified however that the creativity dimension of trait openness was beneficial for some artistic majors in the Humanities. This is in keeping with past work which found the creativity dimension of openness uniquely predictive of creative achievement in the arts whereas intellect was uniquely predictive of achievement in the sciences (Kauffman et al., 2015). With this in mind, it is reasonable to conclude that the association between openness and academic performance is largely driven by the intellectual dimension of the trait, but the creative aspect is beneficial for those in creative type majors.

Agreeableness

Agreeableness measures how caring, trusting, and compassionate a person is. Agreeableness has consistently been shown to be a weak predictor of GPA in post-secondary education with most individual studies of undergraduates (Burks et al., 2015, Smidt, 2015) and meta-analyses (Richardson, Abraham, & Bond, 2012; Trapmann, 2009) reporting non-significant results. It is worth noting however, that higher levels of agreeableness were associated with better grades in elementary school with diminishing (but still significant) predictive validity for middle and high school students (Poropat, 2009 Mammadov, 2021). It is presumed that the cooperative aspects of trait agreeableness are what accounts for its association with academic success at earlier timepoints in education. Earlier grade levels typically involve more collaborative learning environments and, due to smaller classes with a single teacher throughout the day, the ability to establish a closer relationship with the teacher. The importance of agreeableness, therefore, may be a reflection of the benefit strong interpersonal skills have on younger students' success. However, these skills are not as relevant in a post-secondary setting. As such, agreeableness has received little attention in the literature as it has consistently shown to be a relatively weak predictor of academic success in college.

Extraversion

Extraversion captures the extent to which people are positive in affect, sociable, and gregarious. Most individual studies report extraversion having no significant effect on undergraduate GPA (Conard 2006; Gray & Watson, 2003; Komarraju et al., 2009). However, other studies have found a negative association between extraversion and undergraduate GPA/grade(s) attained (Furnham et al., 2003; Noftle & Robbins, 2007; Paunonen & Ashton, 2013). Though it should be clarified that this negative association is most commonly observed in

studies making use of psychology students, more specifically first year psychology students. Therefore, it is tentative at best to claim a negative association exists between trait extraversion and all undergraduate student's performance. The overall conclusion from the meta-analytic literature points to no association between trait extraversion and academic performance in undergraduates (O'Conner & Paunonen, 2007; Poropat, 2009; Vedel, 2014).

One limitation of the current state of the literature is the lack of research assessing the impact online learning has in relation to the predictive validity of the Big 5, especially in regards to extraversion. This is highly relevant when considering the COVID-19 pandemic which forced many schools and universities to transition to remote learning. Yu (2021) looked at the effects of the Big 5 on online learning outcomes during the COVID-19 pandemic with a sample of Chinese undergraduates. The researchers found that students scoring higher on extraversion had worse learning outcomes (e.g. exam grades, quiz grades, participation points). This may be due to students higher in extraversion feeling not as connected to their instructors, peers, and University as a whole due to their isolation. Thus, they may be less invested in their schooling and lack the motivation to succeed in their courses. Overall, this initial study suggested that being in an online learning environment may have an effect on which of the Big 5 traits are related to academic performance. However, it is important to recognize that this study did not compare these students to an in-person condition or students from previous "in-person" semesters. This, in conjunction with the sample being limited to Chinese students, may limit the generalizability of the findings making replication of these results paramount.

Neuroticism

Neuroticism, or emotional stability, captures the intensity and consistency with which one feels negative emotions such as anger, anxiety, and/or depression, and overall patterns of

emotional reactivity. Neuroticism appears to have no association with undergraduate GPA as none of the meta-analyses cited found a significant association (e.g. O'Connor & Paunonen, 2007; Poropat, 2009; Trapmann, 2007). It should be clarified, however, that some individual studies have shown that higher levels of neuroticism were associated with lower GPAs among medical students (Baghat and Nayek, 2014) and undergraduates (Komarraju et al., 2009) as well as lower final exam grades for undergraduates (Furnhamm et al., 2003). Interestingly, higher neuroticism was associated with higher GPA's for Arts/Humanities majors specifically (Vedel, 2015). While a majority of studies have not detected an effect of trait neuroticism on GPA, there may be effects that are masked due to the assumption of a linear association between personality and GPA. As such, it will be revisited in the context of curvilinearity more generally in a subsequent section.

Retention

Retention is the term used to describe whether a student persists through university or drops out prior to degree completion. Retention is a key marker for success for institutional research offices and universities alike (National Student Clearing House, 2022). Broadly speaking, retention efforts are most commonly directed towards first year undergraduates as they are most likely to not return for further schooling relative to students farther along in their undergraduate career (Wilford & Schaler, 2005). However, the measurement of retention itself is not a simple binary of leaving or persisting, and studies only assessing first year dropout rates fail to capture a broader range of student experiences. For example, a student can register for a given semester, but withdraw from their classes at a later time point. If the student chooses to again register for a subsequent semester, they will be classified as retained at both time points despite having completed no coursework. This is a difficult issue for researchers and

administrators to solve and reflects an inherent limitation of using registration as an outcome measure as opposed to semester completion rates.

Moreover, students have the ability to transfer schools or take "gap" semesters/years and ultimately return to higher education, sometimes returning to the same institutions they "dropped out" from. In both of these instances, these students would simply be classified as "not retained" despite the fact they could have ultimately returned at a later time. An open, and understudied, research question therefore is whether or not there are individual differences that are not being captured due to the failure to track retention (and return) rates in the proceeding years of a student's exit. Thus, it is essential to longitudinally follow a cohort of students to capture such complex exits and entries within the college setting.

Personality and Retention

Retention as it relates to personality traits is relatively understudied in comparison with other markers of academic success (e.g., GPA). Indeed, none of the previously discussed meta-analyses have inspected retention as it relates to the full Big 5 model of personality. Trapmann (2007) was able to explore neuroticism extraversion and openness, ($k \leq 5$) but had an insufficient number of studies to assess agreeableness or conscientiousness ($k < 3$). No association was found for the three traits that were assessed. However, single studies have reported that conscientiousness was a more powerful predictor of 1st year retention relative to cognitive factors such as high school GPA and SAT/ACT scores (Tross et al., 2000). Scott, Braley, & Spidahl (2018) found that grit, a construct very similar to conscientiousness, was also a better predictor of 1st year retention in comparison with high school GPA and SAT scores such that scoring 1 standard deviation higher in grit was associated with a 13% reduced risk of dropout. Lemming and Hogan (2017) found that prudence, a measure in the Hogan Personality Inventory similar to

that of trait conscientiousness, was not a significant predictor of first year retention, but

significantly accounted for .5%, 1.4%, and 2.3% of the variance in student retention over the 2nd,

3rd, and 4th year respectively. Lastly, Moses et al. (2011) found that higher levels of openness

was associated with an 8.5% reduced risk of drop out in a sample of first year engineering

students. Overall, it is difficult to draw definitive conclusions about which of the Big 5

personality traits most consistently relate to student attrition/retention due to the dearth of

research using the Big 5 model itself. It is reasonable to conclude however that conscientiousness

may have the most pronounced association. Those who are conscientious are more self-

regulated, persevering, and goal oriented in general and have shown to be more persistent in

scholastic contexts specifically (Conrad 2012). This, along with the available studies inspecting

this association, point towards conscientiousness as the most important Big 5 personality trait as

it relates to retention. However, some work has suggested a curvilinear relationship between

aspects of personality and retention (Robbins et al 2006). These findings will be discussed in a

subsequent section on curvilinearity.

Credits Earned

To the author's knowledge, only one published study at present has directly assessed the

Big 5 model of personality as it relates to credits earned (Feyter., et al 2012). Though it should

be clarified that this study was carried out in Belgium using the European Credit Transfer

System (ECTS). The ECTS system allows students to specify a set number of credit hours they

wish to take prior to the beginning of the academic year. Students are expected to earn 60 credits

with variations from this amount coming from students either failing parts of a course and/or

electing to take classes with lower difficulty (and therefore are worth less credits). This outcome

measure was operationalized by examining the proportion of earned credits in comparison with

the number of credits attempted. Higher levels of conscientiousness, agreeableness, and neuroticism were associated with a greater proportion of credits earned while higher levels of extraversion were associated with a smaller proportion of credits earned.

Credits earned is an outcome measure sparsely used in the personality literature. This is unfortunate, as completing more credits per semester enables students to complete their degree in a shorter amount of time. Moreover, graduation rates for students who take 4-5 years to complete their degree are significantly higher than that of students who take 6 or more years (Wilford & Schaler, 2005). Fortunately, there are some outcome measures that have been assessed that can help to elucidate which of the Big 5 personality traits may relate to the number of credits one takes and completes. For example, one proxy that can be looked at in lieu of the number of credits one earns is time to degree completion. Students in American universities need to complete 12-15 credits a semester to finish in 5 to 4 years respectively. Students who take fewer than this number of credits are at a higher risk of drop out and ultimately not finishing their degree (Aiken et al 2020). Importantly, this study also concluded that cumulative credit hours earned was the most important factor in determining the likelihood of ultimate degree completion in comparison with other factors such as major and high school GPA.

Some studies have assessed personality as it relates to time to graduation from university. For example, Kappe (2012) found that higher levels of openness and neuroticism were associated with a longer time to graduation, while higher levels of conscientiousness was associated with a reduced time to graduation. While difficult to draw direct parallels to the number of credits a student earns, this does suggest that those higher on conscientiousness may take more credits on average compared to those lower on the trait. Though, Akos and Jen (2012) found no association between grit, a construct similar to conscientiousness, in relation to the number of credit hours

earned in a sample of first year U.S. undergraduates. Moreover, a longer time to complete one's

degree does not necessarily mean a student is taking less credits per semester. For example, those

higher on trait openness may have a wider array of creative and/or intellectual interests perhaps

resulting in them switching majors at some points. They may also take more classes that might

not be counted towards their major credit requirements. Therefore, a study using the full Big 5

model of personality in conjunction with credits earned as an outcome measure is essential.

Curvilinearity, Personality and Academic performance

One assumption that much of the current literature presupposes is that personality traits

and academic success are related in a linear fashion. That is to say, the association between

personality and academic performance is assumed to be best expressed as a straight line with a

unidirectional slope. This is in contrast with polynomial (curvilinear) associations where there

are changes in the direction of the slope at different levels of the variables involved. This has

been pointed out as an area of concern, (Poropat, 2009; Vedel, 2014) but there is a relative dearth

of research on curvilinear effects. This is problematic, as higher or lower levels of certain traits

may not be equally beneficial and, in some cases, could even be detrimental to performance. For

example, the classic Yerkes-Dodson law of arousal (1908) demonstrates a reverse U-shaped

association between anxiety and performance such that at very low and very high levels of

anxiety performance suffers. However at "average" levels of anxiety, performance is most

optimal. Such U-shaped or reverse U-shaped effects will not be uncovered in typical regression-

based models unless a polynomial term is added. Thus, the current state of findings on

personality and academic success may not be adequate. While studies assessing curvilinearity are

scarce, there are two key studies at present that report curvilinear effects.

Robbins and colleagues (2006) examined whether scores on the Student Readiness Inventory, a scale that measures a student's personality within a scholastic context, predicted first-year GPA and retention rates. Examples of "traits" include academic discipline, emotional control, and social support. Ten scales were analyzed with first semester GPA, cumulative first year GPA, and first year retention rates. Of relevance were the quadratic effects found for emotional control and social activity in the first semester and first year. More specifically, students with exceptionally low and high levels of emotional control had lower GPAs in comparison with students at more moderate levels. Emotional control also had a quadratic association with 1st year retention in this same direction. With regards to social activity, those scoring the highest had the lowest GPAs and those scoring average to low had the most optimal GPAs. Those scoring the lowest had slightly worse GPAs than those low or average. It may be the case that too much social activity is disruptive to one's academic performance, while too little engagement with others may leave students without the support needed for success. Similarly with emotional control, too little negative affect may leave students unworried about the consequences of poor academic performance (or dropping out), while too much concern may adversely affect their performance or likelihood of staying at university. Although the constructs are not identical, this may provide evidence for trait neuroticism and extraversion as potentially having curvilinear effects in the first semester and first year of college—effects not seen in the meta-analytic findings as a result of not being tested for.

Cucina and Vasilopoulos (2006) tested for both linear and curvilinear associations of conscientiousness and openness on first semester GPA in a sample of psychology undergraduates. Conscientiousness was found to have an inverted "U" shaped association with GPA. Students who were particularly low or high on conscientiousness had lower GPA's than

those who were more moderate on the trait, though it should be qualified that those highest in conscientiousness had higher GPAs than those lowest. Those who are lower in trait conscientiousness performing worse than those higher is in keeping with the current literature. However, it is less clear why those at the highest level of conscientiousness perform slightly worse than those who are more moderate. One possible explanation is that those highest on trait conscientiousness are involved in a larger amount of goal related activities besides the classes they are currently enrolled in. For example, these highly conscientious students may be involved in more extracurricular's (e.g. job, internship) which may result in having less time for school work specifically. Conscientiousness has also been correlated with increases in perfectionism over time, which may contribute to hindered course performance due to a fixation on meeting irrationally high standards set for oneself. (Stoeber, Otto, & Dalbert, 2009).

For openness, a traditional "U" shaped association was observed such that those particularly low or high had higher GPA's better than those who are moderate on the trait (Cucina & Vasilopoulos, 2006). Interestingly, those lowest in trait openness had the highest GPAs. Unfortunately, little explanation was offered by the researchers (and the broader literature in general) to explain the "U" shaped curve that was detected. As such, it is difficult to draw definitive conclusions as to why this might be the case. One possible explanation may lie in the sample of students used in tandem with the underlying facets of trait openness. The sample recruited was composed entirely of psychology students and mostly females at a single University. This is relevant as prior work has shown a negative linear association between openness to ideas (a facet of openness) and psychology students (Vedel, 2015). Since psychology students are less likely to have higher levels of this facet this may partially account for those lowest on openness having the highest GPAs in this study. Regardless, the

generalizability of these findings is difficult to determine making replication of these analyses in a more general undergraduate population paramount.

Statement of the Problem

Exploring associations between personality traits and academic performance is important because identifying the individual difference factors that either help or hinder college performance can be used by administrators and advisors to identify those individuals at-risk and thus in need of important resources, as well as developing broader institutional programs aimed at identifying and targeting said risk factors. Although there is much research and corresponding meta-analytic summaries suggesting that personality is important for understanding academic performance at the collegiate level, there are limitations with the current body of work that can be remedied with the current study.

One of the main limitations of the current literature is an exclusive focus on GPA as the most important marker of academic performance. Part of the over reliance on GPA might stem from the ease with which this data can be obtained from official university records. GPA is also a valid and widely accepted academic performance measure that is associated with important real-world outcomes (e.g. job performance, salary) (Higgins et al., 2007; Westrick, 2017). Yet, there are other aspects of academic performance that can be informative of student progress. For example, whether students persist or drop-out of college is important because of the financial ramifications (for both the students and the university) of delaying or not completing a college degree (Oreopoulous, 2013). No meta-analysis to date has been conducted on the association between the full Big 5 model of personality and retention largely due to a lack of a sufficient number of studies examining it (Poropat, 2009; Trapmann, 2007; Vedel, 2014). Furthermore, the studies that do examine GPA or retention, almost exclusively focus on first semester or first year

GPA. While it is true that dropout rates decline precipitously after the first year of college (Wilford & Schaler, 2005), performance and persistence remains important throughout one's entire college career. By focusing on first-year outcomes, existing research also fails to account for the possibility of students returning to university after a period away (e.g., strategic leaving for financial reasons or in response to health concerns such as those seen with COVID-19).

Credits earned is another criterion for academic success that has received sparse attention in the present literature. Earning a consistent and sufficient number of credits is related to finishing one's degree in a reasonable amount of time, and, in American universities, is typically related to how much financial aid one receives. To the researchers' knowledge, no studies other than (Feyter et al., 2012) have related the Big 5 model of personality to credits earned. The limited literature on this outcome measure is troublesome as there may be individual differences that account for the number of credit hours one completes. This outcome also represents a unique aspect of academic performance/success that is not captured by GPA or retention. Student's may persist through the first year or few years of university with a sufficient GPA, yet if they are completing an insufficient number of credits, they may ultimately not attain a degree.

Another concern lies in the lack of replication of the curvilinear findings cited earlier. There is little reference in the present literature of quadratic effects even being tested for despite calls to do so (Poropat, 2009; Vedel, 2014). Thus, it is not clear if these effects were not reported because effects were not statistically significant, or because they were never tested in the first place. Moreover, the previous work that does test for quadratic effects only uses first semester and/or first year GPA. Therefore, the current study was exploratory in part as quadratic effects were tested over the first three years.

Overall, the current study attempted to fill several gaps in the current literature by examining longitudinal associations between personality traits and a diverse set of academic outcomes. I explored cumulative GPA at the end of the first semester, first year, and third year. I also examined first year retention and retention rates across the first 3-years of university. Lastly, I examined whether or not someone has earned the appropriate number of credits earned by the end of their 3rd year to be considered making adequate degree progress. The 3-year cutoff was selected since, at the time of the current study, the cohort data was collected from had only completed their first 3 years of their undergraduate degree.

Research Questions

Research Question 1: Are the Big 5 personality traits associated with 1ˢᵗ semester GPA?

I hypothesized that extraversion and neuroticism would have a quadratic association with 1st semester GPA such that moderate levels of both traits will be associated with a higher GPA than either extreme. I hypothesized that openness would have a quadratic relationship with 1ˢᵗ semester GPA such that lower and higher levels of the trait will be associated with a higher GPA compared to more moderate levels. I further hypothesized that higher levels of conscientiousness would be associated with a higher 1st semester GPA. I hypothesized that Agreeableness would not be related to 1st semester GPA.

1b: **Are the Big 5 personality traits associated with cumulative 1st year GPA?**

I hypothesized that extraversion and neuroticism would have a quadratic association with 1st year GPA such that moderate levels of both traits would be associated with a higher GPA than either extreme. I hypothesized that openness would have a quadratic relationship with 1ˢᵗ year GPA such that lower and higher levels of the trait will be associated with a higher GPA compared to more moderate levels. I further hypothesized

that higher levels of conscientiousness would be associated with a higher 1st year GPA. I hypothesized that Agreeableness would not be related to 1st year GPA.

1c: **Are the Big 5 personality traits associated with cumulative 3rd year GPA?**

I hypothesized that extraversion and neuroticism would have a quadratic association with cumulative 3-year GPA such that moderate levels of both traits would be associated with a higher GPA than either extreme. I hypothesized that openness would have a quadratic relationship with cumulative 3-year GPA such that lower and higher levels of the trait will be associated with a higher GPA compared to more moderate levels. I further hypothesized that higher levels of conscientiousness would be associated with a higher cumulative 3-year GPA. I hypothesized that Agreeableness will not be related to cumulative 3-year GPA.

Research Question 2: Do the Big 5 personality traits predict the odds of drop-out over the first three years of college?

2a: Do the Big 5 personality traits predict the odds of drop-out at any time point during the first 3 years of college?

I hypothesized that higher levels of conscientiousness would be associated with a reduced odds of drop-out at any point during the first three years of college. I hypothesized that openness, agreeableness, extraversion, & neuroticism would not be related to the odds of drop-out at any point during the first three years of college. To date, no prior research has assessed curvilinear effects for this outcome measure, as such tests for quadratic effects were exploratory in nature.

2b: Do the Big 5 personality traits predict the odds of drop-out after the first year of college?

I hypothesized that higher levels of conscientiousness would be associated with a reduced odds of drop-out after the first year of college. I hypothesized that neuroticism would have a quadratic association with first year drop out such that moderate levels of neuroticism would be associated with a reduced odds of dropping out in comparison with more extreme levels of the trait. I hypothesized that openness, agreeableness, and extraversion would not be related to the odds of drop-out after the first year of college.

Research Question 3: Are the Big 5 personality traits associated with maintaining the minimum earned credits per semester to be considered a full-time student over the first 3 years of college?

I hypothesized that higher levels of conscientiousness and openness would be associated with an increased odds of completing the minimum number of credits needed to be considered a full-time student over the first three years of college. I hypothesized that agreeableness, extraversion, & neuroticism would not be related completing the minimum number of credits needed to be considered a full-time student over the first three years of college. To date, no prior research has assessed curvilinear effects for this outcome measure, as such tests for quadratic effects were exploratory in nature.

Methods

Participants

The present study utilizes data from the College Student Transition (CST) study. This study surveyed a representative sample of incoming first year freshmen from a large public Mid-Atlantic institution throughout their first year of university. In total, four waves of data at unique timepoints in the 2019-2020 academic year were collected. Out of an incoming class of 3,855 students, 775 were randomly selected and completed a baseline electronic survey via Qualtrics

before the beginning of their orientation (7/31/2019-8/16/2019). All predictor variables were assessed at Wave 1 with all academic outcomes encapsulated in the University Registrar Office reports sent to the study team. The final report was sent in July 2022, including the first three years of data on this cohort (freshman through junior year).

Ethical Considerations

This study was approved by the university's Institutional Review Board (IRB) and a Certificate of Confidentiality from the National Institutes of Health was obtained (Check, Wolf, Dame, & Beskow, 2014). A Certificate of Confidentiality adds an extra layer of confidentiality protection to participants as those not connected to the study (e.g., University officials, campus police, etc.) are unable to access research participants' personal, identifiable information. Once data was downloaded, a unique identification number was assigned to each participant that only the principal investigator could link in a password-protected file on a password-protected computer. Any identifiable information was stripped from the survey data. In addition, since we did ask sensitive questions about childhood adversity, mental health, etc., we provided resources at the end of the survey (e.g., National Suicide Hotline, University Counseling Center) in case participants felt that they needed assistance.

Procedure

In the summer of 2019, the institution's Office of Enrollment Management provided a list of 4,329 incoming freshmen and their contact info. This list was then subject to the study's inclusion criteria leaving a total of 3,855 eligible participants to recruit. Participants were removed if they were transfer students (17 students), or were either below 18 as of August 1, 2019 or would be over 21 as of May 15, 2020 (457 students). Based on the funding available, the initial recruitment goal was 800 students.

To ensure an accurate representation of academic abilities within the sample, eligible participants were split into two groups via an academic risk score provided by the university. This was a composite of high school GPA and SAT scores with a possible range of 66 (those at highest risk) to 139 (those at lowest risk). Our sample was split into high risk (66-109, N=1845) and low risk (110-39 N=2010) conditions for further sampling with a goal of recruiting 400 students from each. Recruitment started on July 31st, 2019 and ended August 16, 2019 to ensure participants completed the baseline assessment before orientation for the upcoming academic year began. For the high-risk group, 400 students were randomly selected and were sent an email to participate. A follow up email was sent one week later. At this time, an additional 400 new students were randomly selected without replacement, with these students also receiving a follow up email one week later. This procedure was repeated until approximately 1300 eligible participants were emailed, 331 of whom consented to the study. This same procedure was carried out for the low-risk group with approximately 1100 participants emailed, and 443 consenting to the study. Note, males were oversampled in both the high and low-risk groups to ensure a roughly even split of males/females were included in the study.

Interested participants followed the link provided in the email to a Qualtrics survey. The first page of the survey outlined the basic details of the study. Following this, participants were able to electronically consent to the study via the "Yes I willingly Consent" answer choice on the following Qualtrics page. Participants then completed the baseline assessment. Average time for completion was 30 minutes with a range spanning from 15 to 60 minutes. Upon completion participants were welcomed to the study and notified of when the next three waves of data collection would begin. To incentivize continued participation and reduce attrition rates, participants were sent check-in emails throughout the semester along with a study brochure that

detailed who the sample was composed of (age, origin, race etc.). To further increase participation, a monetary reward was given for completing each wave of data. At the end of the study (May 2020), participants were paid electronically via an amazon.com gift card. If they completed all 4 waves they received $50, for completing 3 waves they received $40, for 2 waves $30, and just baseline $20.

Measures and Variables

Covariates

Age, gender, race, standardized test score (ACT/SAT), first generation status, and perceived socioeconomic status were used as covariates in the present study so study findings would be comparable to prior studies that also included these as covariates in their statistical models (Burks et al., 2015; Noftle & Robbins, 2007). Each participant's birthday was provided by the institution so that an exact age in decimal places could be calculated. Participants were asked to identify their gender with a choice of male, female, or other. Since only six individuals chose the "other" category, they were removed from the study to simplify analyses due to lack of sufficient power. Participants identified their race using 6 different categories (1=American Indian/Alaskan Native, 2=Black, 3=White, 4=Mixed, 5=Unknown, 6=Other). To simplify analyses and maximize variability, race was dummy coded such that 0 = White/Caucasian and 1 = all other minority groups. Socioeconomic status was measured with the MacArthur Scale of Subjective Social Status (Adler et al., 2000) where participants were asked "Imagine that this ladder shows how your society is set up. At the top of the ladder are the people who are the best off - they have the most money, the highest amount of schooling, and the jobs that bring the most respect. At the bottom are people who are the worst off - they have the least money, little or no education, no jobs or jobs that no one wants or respects. Now think about your family. Please tell

us where you think your family would be on this ladder. Select the number of the rung that best represents where your family would be on this ladder." First generation status and standardized test score for each participant were obtained via the University's registrar office. A student was deemed first generation if neither of their parents/legal guardians have obtained a degree in higher education. Data on both students ACT and SAT scores were available, however for ease of interpretation ACT scores were used. If participants only had an SAT score reported, there score was translated to its ACT equivalent using a conversion chart (ACT.org).

Personality Traits

Participants completed a version of the Big Five Inventory (BFI-2) (Soto & John 2017) during the initial baseline assessment. The 60-item scale has five subscales capturing each of the key personality traits: conscientiousness (e.g. "is efficient, gets things done", $\alpha = .85$), openness (e.g. "is complex, a deep thinker", $\alpha = .78$), agreeableness (e.g. "is helpful and unselfish with others" $\alpha = .78$), extraversion (e.g. "is full of energy", $\alpha = .86$), and neuroticism (e.g. "worries a lot", $\alpha = .89$). Using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), participants rated to what extent they agreed with each item. A mean score was created such that higher scores represented higher standing on that trait (see Table 1 for a full breakdown).

Academic Outcomes

Grade Point Average (GPA)

Students grade point averages were obtained via the institution's registrar office (See Figure 6 for a timeline of the data collection process). GPA was measured on a 4-point continuum and was calculated by multiplying a value associated with grade earned in the course (A=4, B=3, C=2, D=1, F=0) by the number of credits it was worth. For example, if in a semester

a given student received an A, B, and C respectively in courses all worth three credits each, they would have 27 GPA units overall. This value would then be divided by the number of credits attempted during the semester (nine) for a semester GPA of 3.0. GPA after the end of the first semester (M_{gpa} = 3.11, SD = .89), the cumulative GPA at the end of the first year (M_{gpa} = 3.24, SD = .79), and the cumulative GPA at the end of the third year (M_{gpa} = 3.39, SD = .47) were used in the present analyses (see Table 1 for a full breakdown).

Retention

Student retention rates were obtained via the university's registrar office. To be considered "retained" a student must have registered and completed some coursework (at least 1 credit hour) for the semester they registered. Importantly, a student could drop out and not return for the proceeding semester, but later be retained if they registered and completed courses again at a subsequent time point. A total of 106 students were not retained from the first to the second year of university with an additional 115 dropping out at some point before the end of their third year. In total, 554 students persisted through all 3 years with 221 dropping out for at least one semester (see Figure 1 for a visual breakdown).

Credits Earned

Credits a student attempted (credits a student registered for) and completed (earned by completing the course) were obtained via the university's registrar office. To be considered a full-time student by the university, a student must register and complete 12 credits (usually 4 classes) worth of coursework each semester. We calculated whether or not a student averaged at least 12 credits across the 6 academic semesters (72 total credits earned) in order to classify students as either "on-track" or not "on-track" to graduate within 5 years. Note, if students completed credits over their 2020 or 2021 summer sessions, these were included in their total

credits earned. Using this threshold, a binary variable was constructed to compare those that met the minimum credit threshold (N = 562) versus those who did not (N = 207) for the three years of data available (see Table 1 for a full breakdown).

Preliminary Analyses

Data Management and Cleaning

All Qualtrics survey responses and registrar data was downloaded to SAS for analysis.

Univariate Checks

Univariate analyses for normality (skew, kurtosis, outliers) were conducted on each of the variables to ensure the assumption of normality was met. All variables fell within the accepted skewness and kurtosis values of plus or minus 3. Outliers (plus or minus 3.3 standard deviations away from the mean) for each of the variables were inspected. While there were two outliers for trait openness and agreeableness respectively, removal of these participants did not impact findings. As such, these participants were kept in.

Bivariate Checks

Pearson's correlation coefficients are reported in a matrix table (See Table 2) for all of the covariates, personality traits, and GPA outcomes in order to assess initial linear associations and check for potential issues of multicollinearity (r > .8). No correlations suggested issues with multicollinearity to be present.

Multivariate Checks

Analyses using Cook's D and discrepancy/leverage values revealed that no data points were exerting undue influence on the regression models. Inspection of the Q-Q plot's and histograms of the standardized residuals showed no signs of violating the assumption of

normality. Lastly, tolerance values, variance inflation factor (VIF), and condition indices all fell within acceptable parameters confirming that there was no issue with multicollinearity present.

Primary Data Analyses

A series of multiple linear regression analyses were estimated to determine if each of the personality traits predicted each GPA outcome. First, a model with all covariates and each of the Big Five traits was tested. The second model then included a quadratic effect for each personality trait (e.g., neuroticism^2) to test for non-linear associations. A third model then included a cubic effect for each personality trait (e.g., neuroticism^3) as it is customary to test at least two thresholds for polynomial effects (Grant, 1956). Note, analyses did not go beyond a cubic effect because of the lack of prior findings in this area, and a lack of theoretical rationale for doing so. Importantly, if both linear and quadratic effects were significant for a particular variable, it is appropriate to interpret the quadratic term as that best fits the data relative to the lower order linear term (Cohen, 1968). Any quadratic/cubic effects detected were plotted using excel in order to interpret the curvilinear effect using the mean and +/- 2 standard deviations around the mean.

A series of logistic regression analyses were estimated to determine if each of the personality traits predicted retention status and whether or not they earned the minimum number of credits. First, a model with all covariates and each of the Big Five traits was tested. The second model then included a quadratic effect for each personality trait (e.g., neuroticism^2) to test for non-linear associations. A third model then included a cubic effect for each personality trait (e.g., neuroticism^3) as it is customary to test at least two thresholds for polynomial effects. Note, we did not go beyond a cubic effect because of the lack of prior findings in this area, and a lack of theoretical rationale for doing so.

Age, gender, race, socioeconomic status, first generation status, and standardized test score were the covariates included in every model. Alpha was set at 0.05 to determine statistical significance. However, since we conducted a large number of tests, we employed a False Discovery Rate (FDR) (Benjamini and Hochberg, 1995) procedure to test the robustness of effects. The FDR is more optimal than other common alpha adjusters such as Bonferroni because it protects against making Type II errors, yet still controls Type I error. It is particularly useful in early-stage or discovery phase research where Type II errors represent a major peril, which is true of the present study.

Sensitivity Analyses

There are multiple covariates that were not included in our main analyses but were included in sensitivity analyses to inspect potential differences that would arise when including these variables in the models. One such covariate is academic risk score. This is a composite measure of high school GPA and standardized test scores (e.g. SAT, ACT) that was provided by the registrar office. While it could be argued that including past academic performance measures would be a worthy addition to our current models, there are some important limitations to address when using a measure containing high school GPA. Firstly, it is clear that past GPA will significantly predict subsequent college GPA. As such, high school GPA may exhibit an undue influence on the overall regression model. What's more troublesome is that past GPA could be a function of past personality. If personality is associated with one's GPA, then including a past measure of GPA will account for variance in personality that we wish to tease apart with the personality measures included at present. However, if the personality traits remain significant with the inclusion of this variable this suggests that present levels of a certain personality trait will matter over and above that of prior levels.

A second variable that will be relegated to a sensitivity analysis is academic major. A student's major was obtained from the University's registrar office. Our models used a STEM (n = 434) vs non-STEM (n = 330) dichotomy. Unfortunately, this distinction does not capture the full breadth of majors our sample has (n > 80). While we did explore other options (e.g. classification by college the major belonged to) these nominal variables would be difficult to interpret in a regression model. While analyses focused on differences by major are worthwhile, they are beyond the scope of the present study. As such we only inspected differences between STEM and non-STEM majors.

We also included measures of rurality (isolation score) and whether or not students received a PROMISE scholarship as sensitivity analyses. The isolation score for each student was calculated via a measure provided by Doogan and colleagues (2018). In short, it represents the geographic isolation where people live, and can be interpreted as the average exposure to geographic isolation by residents of the state. Higher scores reflect higher levels of isolation. Looking at the impact rurality has on GPA, retention rates, and credits is interesting and has implications for administrators should it be significant. PROMISE is a program that offers additional scholarship funds to students who reside in the state that the University data was collected from. A student qualifies for this program if they have been continuously living in the state for 12 months and have a graduating high school GPA of over 3.0. While it is interesting to see if these students (n = 141) differ from others in meaningful ways, the fact that only residents from this particular state are eligible reduces the generalizability of the findings.

A final area that will be inspected is the impact of COVID-19 on the spring semester of 2020. Participants completed four waves of data throughout their freshman year (2019-2020). The fourth wave of data was collected from April through early May. This afforded the

researchers of the CST the opportunity to ask students how COVID-19 had impacted their
semesters to this point. Three questions will be looked at in separate regressions (with
covariates) predicting students' spring semester GPA. On a scale of 1 to 5, (1 being very
dissatisfied and 5 being very satisfied), in light of the COVID-19 pandemic how satisfied are you
with your overall: 1. Well-being 2. Stress/anxiety 3. Happiness. COVID-19 and its effects on
student's academic performance is an important topic to address, however it is beyond the scope
of the present study and will only be looked at supplementally.

Results

Table 3 displays the hierarchical models for personality predicting first-semester GPA. In
Model 1 being female, having a higher SAT/ACT score, and scoring higher on conscientiousness
were all significantly associated with a higher GPA after the first semester. Adding the quadratic
effects for each of the personality traits in Model 2 revealed a significant neuroticism squared
effect. Cubic effects were also tested, but none of these approached statistical significance. To
ensure multicollinearity was not driving our quadratic effect, we dropped all non-significant
quadratic effects for our final model (Table 4). The gender effect was reduced to non-
significance, but all other significant effects remained from Model 1 and 2. Figure 2 illustrates
the effect of neuroticism squared such that there is a general positive association between it and
first semester GPA, but at one or two standard deviations above the mean this effect levels off.

Table 5 displays the hierarchical models for personality predicting first year cumulative
GPA. In Model 1, being white, female, non-first generation, having a higher SAT/ACT score,
scoring higher on conscientiousness and scoring lower on openness were all significantly
associated with a higher GPA after the first year. Adding the quadratic effects for each of the
personality traits in Model 2 revealed a significant neuroticism and openness squared effect.

Cubic effects were also tested revealing a significant effect for neuroticism cubed, however upon further inspection the results were uninterpretable graphically and were likely a result of too many predictors in our model. To ensure multicollinearity was not driving our quadratic effects, we dropped all non-significant quadratic effects for our final model (Table 6). Race and the quadratic effect for openness (See Figure 4) were reduced to insignificance when applying the False-Discovery Rate (FDR) procedure, but all other significant effects remained from Model 1 and 2. Figure 3 displays the effect of neuroticism squared on first year GPA. Similar to the relationship for first semester GPA there is a general positive association, but at one or two standard deviations above the mean this effect levels off.

Table 7 displays the hierarchical models for personality predicting 3-year GPA. In Model 1 being female, having a higher SAT/ACT score, and scoring higher on conscientiousness were all significantly associated with a higher GPA after 3 years. Adding the quadratic effects for each of the personality traits in Model 2 revealed a significant neuroticism squared effect. Cubic effects were also tested, but none of these approached statistical significance. To ensure multicollinearity was not driving our quadratic effect, we dropped all non-significant quadratic effects for our final model (Table 8). All significant effects from Model's 1 and 2 remained significant. Additionally, lower levels of openness significantly associated with a higher 3-year GPA, however after applying the FDR procedure it was reduced to insignificance. Figure 5 displays the effect of neuroticism squared on 3-year GPA. In keeping with the relationships for first semester and first-year GPA there is a general positive association, but at one or two standard deviations above the mean this effect levels off.

Table 9 displays the hierarchical models for personality predicting first year retention. In Model's 1, 2, & 3 only having a higher SAT/ACT score was associated with an increased odds

of being retained. None of the personality traits or their quadratic terms approached statistical
significance.

Table 10 displays the hierarchical models for personality predicting three-year retention.
In Model's 1, 2, & 3 only having a higher SAT/ACT score and not being a first-generation
student were associated with an increased odds of being retained. None of the personality traits
or their quadratic terms approached statistical significance.

Table 11 displays the hierarchical models for personality predicting credits earned. In
Model's 1, 2, & 3 being white, female, having a higher SAT/ACT score and not being a first-
generation student were associated with an increased odds of being on time to graduate in five
years. None of the personality traits or their quadratic terms approached statistical significance.

Supplemental analyses

When including IR level as a covariate, there was a significant association with all three
GPA outcomes such that having a lower IR level (i.e. less academic risk) was associated with
having a higher GPA. The effect of conscientiousness for first semester and first year GPA
remained significant, while the effect for cumulative 3-year GPA was reduced to insignificance.
For neuroticism, all effects became insignificant when including IR level. For openness, the
quadratic and linear effects for 1st year GPA were unaffected, however there was no significant
linear effect for 3-year cumulative GPA. Having a lower IR level did significantly associate with
increased odds of being retained after the first and third year and with being on time to graduate.

When including a STEM vs. non-STEM dichotomous variable, results demonstrated that
not being in a STEM major was associated with having a higher GPA relative to STEM majors
in the first semester but did not associate with GPA after the first or third year. The inclusion of
major as a covariate did not affect the significance of any of the associations between the

personality traits and GPA. Academic major did not significantly associate with odds of being retained after the first or third year or with being on time to graduate.

When including whether or not students received the Promise scholarship as a covariate, results demonstrated that receiving the scholarship was associated with higher GPAs for the first semester and first year, but not for cumulative 3-year GPA. No existing significant associations between personality traits and any of the GPA outcomes were affected by the inclusion of this covariate. Being a Promise scholarship student was not associated with retention at either time point or being on time to graduate.

When including isolation score as a covariate, results demonstrated that isolation was not associated with any of the GPA outcomes, retention at either time point, or being on time to graduate. Isolation score did not affect the significance of any of the associations between the personality traits and GPA.

When including participants satisfaction with either well-being, anxiety/stress, or happiness in light of the COVID-19 pandemic into models predicting the GPA of students' spring semester of their freshman year (independently from each other), all three significantly associated with GPA. More specifically higher levels of satisfaction associated with higher GPA's. However, both the quadratic and linear effect of neuroticism were reduced to insignificance suggesting that these questions accounted for variance attributable to a person's general level of negative emotion.

<div align="center">**Discussion**</div>

The current study explored associations between the Big 5 personality traits and various academic outcome measures across a 3-year period. As hypothesized, higher levels of conscientiousness was associated with a higher 1st semester, 1st year, and cumulative 3-year

GPA. For trait openness, there was partial evidence in support of our hypotheses. Higher levels of openness were associated with lower cumulative GPA at the 1-year and 3-year mark, but the 3-year association was reduced to insignificance once the FDR criteria was applied. Quadratic effects were found for first year GPA in the hypothesized direction such that there was a "U" shaped association. However, this association was no longer significant once the FDR criteria was applied. Neuroticism demonstrated a quadratic relationship with first semester, first year, and cumulative three-year GPA such that there was a positive relationship present (those highest in neuroticism had the highest GPA's), but this association weakened as neuroticism increased. That is to say, higher neuroticism was associated with a higher GPA, but at one or two standard deviations above the mean this effect levels off. Contrary to expectations, no significant linear or quadratic effects of extraversion were present for any of the three GPA outcomes used. As expected, agreeableness had no relationship with any of the three GPA outcomes used. With regards to retention and credits earned, none of the hypotheses were supported as no personality traits were significantly associated with any of these academic outcomes.

Conscientiousness

Conscientiousness, in keeping with prior studies, was significantly associated with higher GPAs across all three outcome measures. Every standard deviation increase in conscientiousness was associated with a roughly .05-.14 increase in raw GPA units. This is a small but noticeable effect in that, holding all else constant, variations in levels of conscientiousness could account for up to .56 GPA points. Importantly, even in models including including institutional risk score, a composite measure of high school GPA and standardized test score, conscientiousness maintained its predictive validity. This is important to note as a variable that includes prior GPA also then contains variance that would be attributable to a student's personality in high school.

Therefore, even when past personality traits (and cognitive ability) are controlled for, present levels of conscientiousness remain an important factor in one's GPA.

It is necessary then, to consider why conscientiousness is beneficial for one's GPA. One study demonstrated that student's higher in conscientiousness had higher GPAs which were partially explained through higher levels of academic self-efficacy and lower levels of test anxiety (Conrad, 2012). Conscientiousness has also been linked to effective learning styles such as elaborate processing and synthesis analysis (Komarraju, 2011; Marcela, 2015). Conscientiousness has also been shown to moderate the relationship between academic motivation and grades such that higher levels of academic motivation are beneficial for a student's grades only when they are high on conscientiousness (Feyter et al., 2012). Taken together, it is clear that students with higher levels of conscientiousness are likely to engage in responsible behaviors and adopt strategies that are conducive to success in their coursework. Moreover, this study confirms prior findings on the relationship between conscientiousness and college GPA and supports the notion that present levels of the trait are influential in predicting performance over and above the influence of cognitive ability and prior levels of personality.

Openness

For openness, partial support was found for our hypotheses. Quadratic effects were found for first year GPA such that there was a "U" shaped association with higher and lower levels of openness being associated with higher GPAs in comparison with moderate levels. Though this association was no longer significant once applying the FDR criteria. Along with this, a significant negative linear association was seen with first year GPA and cumulative 3-year GPA. However, once the FDR criteria was applied the cumulative 3-year association was insignificant. The quadratic effect found for first year GPA parallels previous work which found a similar "U"

shaped relationship between trait openness and 1st semester GPA (Cucina & Vasilopoulos, 2006). It is surprising, however, that there was a significant negative linear association with first year GPA and 3-year GPA. To the researcher's knowledge, no prior study has reported such an association. Openness has been shown to positively correlate with verbal intelligence and verbal SAT scores (Noftle & Robbins, 2007), and since these are some of the main predictors of academic performance (Allensworth & Clark, 2020), it is curious that our results yielded a negative linear relationship for these outcome measures.

One possible explanation for this relationship lies in the mixed nature of trait openness. Researchers typically agree that openness consists of two distinct aspects that capture a person's interest in art, music, and aesthetics versus a person's desire to engage in cognitively stimulating tasks, ideas, or conversations respectively. These different dimensions of openness have been referred to by some researchers as sensio-aesthetic openness and intellect openness (DeYoung et al., 2016). Some have even called for splitting these two dimensions into different personality traits altogether arguing that they are conceptually too different to both be characterized under a single umbrella trait (Douglas, Bore, & Munro, 2016; Vartanian et al., 2018). With regards to academic performance, these dimensions of openness have been shown to have differential predictive validity. Sensio-aesthetic openness has been shown to be related to higher GPA's in Arts/Humanities majors, but has been negatively associated with GPA for all other majors (Kaufmann, 2016). Conversely the intellectual aspect of openness has positively associated with higher GPA's across all majors (Gatzka & Hell, 2017).

Openness may then have competing facets/aspects that are working in opposite directions in regard to student performance. For example, it may be the case that the quadratic relationship at present was a consequence of students possessing lower levels of intellect openness and/or

higher levels of sensio-aesthetic openness. Moreover, the negative linear relationship(s) detected

may be a consequence of the inclusion of a cognitive ability measure (SAT/ACT) in the model.

Variance that is shared between the intellectual aspects of openness and cognitive ability may

have been accounted for in the SAT/ACT score included leaving variance only attributable to the

creative aspects of trait openness.

Extraversion

Contrary to the hypotheses, the present study found no evidence for a significant linear or

quadratic relationship between extraversion and GPA. This finding, while not hypothesized, is

not unexpected given that the published meta-analytic work at present has found no evidence of

a significant effect for extraversion (Poropat 2009, Mammadov, 2021). However, social activity,

a trait in the Student Readiness Inventory, has been positively associated with GPA in multiple

studies (Noftle & Robbins, 2007, Robbins et al., 2004). With this trait being conceptually similar

to that of the Big 5 trait extraversion, it is important to understand why the former construct

relates to college GPA while the latter does not.

One possible explanation may lie in the lack of facet level analysis of these Big 5 traits.

The facet of sociability for extraversion may better capture the underlying construct that the SRI

dimension of social activity captures. Similar to the points made prior regarding openness,

perhaps this specific facet of extraversion does relate to academic performance while the other

facets and the broader trait itself have no bearing. However, in the few studies that have

inspected academic performance and the facets of the Big 5, there is little evidence to support

this claim (Vedel, 2015; Intell, 2018).

Perhaps it is the differences in the personality measures utilized that can help to explain

why these similar constructs do not have the same relationships with GPA. The present study

measured personality via the BFI-2, a long standing and widely accepted measure of personality with relationships to a variety of outcomes across multiple domains (Soto & John, 2017). However, a more specific measure of personality, one that captures students' temperaments in an academic setting specifically, may be a more optimal measure to utilize. The Student Readiness Inventory was designed specifically for the purpose of assessing how prepared a student may or may not be for the transition to college (Le et al., 2005). Importantly this measure's subscales (particularly the traits of emotional control and social activity) have been shown to have strong convergent validity with the Big 5, but has roughly 15% more predictive validity for a student's GPA (Peterson, Casillas, & Robbins, 2006). Therefore, one potential implication of this study's null findings for extraversion is that other more nuanced measures of personality, ones that directly assess the thoughts, dispositions, and attitudes of a person as a student, may improve a university's ability to determine who is at highest risk of struggling academically during their transition to college in comparison with traditional personality measures.

Neuroticism

In keeping with expectations, there were significant quadratic effects for neuroticism for all three GPA outcome measures. However, the shape of the relationship was different than hypothesized with higher neuroticism associating with a higher GPA, but at one or two standard deviations above the mean this effect leveled off. To the author's present knowledge, this is the first study to demonstrate quadratic effects for trait neuroticism and GPA. A prior study utilizing the SRI did find significant quadratic effects for emotional control and 1st semester and 1st year GPA (Robbins et al., 2006). However, there was a reverse "U" shape present meaning that, in contrast to the present study, those highest and lowest on trait emotional control had lower GPA's than those who were at mean level. The current findings do not concur with the meta-

analytic work at present, which has found little evidence for an association between neuroticism and college GPA (Poropat, 2009; Vedel, 2014). Moreover, studies that have detected an effect have typically found a negative association (Bhagat & Nayak, 2014; Chamorro & Furnham, 2003; Smidt, 2015).

It is important to note that when removing standardized test scores from the model the quadratic (and linear) effect for neuroticism was reduced to insignificance. As a result, the addition of this covariate into the model may have produced a suppression effect whereby the additional variance accounted for by this new predictor inflated the predictive value of neuroticism. For cases of suppression, there is typically a high correlation between the two predictors and adding a suppressor variable into the model may reduce R^2 (Tzlegov & Henick, 1991). This was not the case at present as R^2 significantly improved when adding standardized test score as a covariate, and there was no significant correlation between it and trait neuroticism. Moreover, there is strong theoretical justification for including standardized test scores as it acts as a proxy for intelligence (Allensworth & Clark, 2020). Additionally, Mammadov (2021) reported a similar result when conducting a meta-analytic regression of the Big 5 and cognitive ability. While in the broader meta-analysis neuroticism was unrelated, when cognitive ability was included in a regression model neuroticism was significant (and positively associated). Therefore, it is reasonable to interpret the current quadratic effects of neuroticism as present when holding the intelligence level across students constant.

As the quadratic effects found at present are novel, it is important to try and understand why the effects of neuroticism on GPA detected are positive, and why there is a "leveling off" of its benefits at higher levels of the trait. Interestingly, one study comparing different measures of the Big 5 and academic performance found a significant positive linear effect for neuroticism

when using the BFI while no significant effect was found using the NEO-FFI (Noftle & Robins, 2007). The present study makes use of the BFI-2 which may help to explain why a positive linear effect was seen along with the quadratic effects.

Research has demonstrated that higher levels of neuroticism indirectly associated with higher GPA's through higher levels of external academic motivation (Komarraju, 2009). Another study found that anxiety, a facet of neuroticism, was the single facet that positively associated with academic motivation (Apostolov & Geldenhuys, 2020). Since students with heightened levels of anxiety are more externally motivated to perform well, perhaps those higher in trait neuroticism are more motivated academically via anxiousness at the thought of failing. Studies have demonstrated that neuroticism is linked to brain structures associated with avoidance motivations (Prabhakaran, Kraemer, & Thompson-Schill, 2011). Therefore, at the behavioral level, students who are higher in neuroticism may be more motivated to avoid missing deadlines, avoid being unprepared for exams, and avoid failing coursework. Moreover, perhaps the BFI-2 weights the anxiety dimension of neuroticism more heavily relative to other Big 5 inventories further explaining the general positive effect of neuroticism detected.

However, our findings suggest that this increased anxiety about academic performance has diminishing returns at higher levels. One explanation for this may be that students with moderate to high levels of neuroticism are affected similarly to each other, but different than students with lower levels of neuroticism. For example, one study demonstrated that academic self-efficacy (the belief that one can succeed in their coursework), moderated the effect of neuroticism on GPA such that students with moderate to high levels of neuroticism were unaffected by higher levels of academic self-efficacy while students at low levels of neuroticism benefitted from high levels of academic self-efficacy and were worse off at lower levels (Feyter

et al., 2012). If students at moderate and high levels of neuroticism are similarly unaffected by factors such as internal belief about their abilities, perhaps their external motivation to succeed is comparable. Importantly the studies that found a positive relationship between external motivation and neuroticism did not test for quadratic effects. If the relationship between neuroticism and external motivation is akin to the relationship between neuroticism and GPA found at present, it would be reasonable to conclude that similar levels of motivation is one possible explanatory factor. While these findings are both novel and promising, future research should seek to replicate these results with different samples of college students and different Big 5 inventories.

Retention and Credits Earned

Contrary to expectations, no personality traits were significantly associated with retention status at any time point measured or with being on time to graduate in 5 years. Although little research has been conducted on these outcome measures and the Big 5 specifically, this finding is somewhat surprising. Past studies have found that some aspects of personality, namely traits such as grit, prudence, and conscientiousness, predict an increased odds of retention and completing one's degree on time (Kappe. 2012; Lemming & Hogan, 2017; Scott, Braley, & Spidahl, 2018; Tross et al., 2000). Our lack of findings then could be a consequence of multiple factors. First, our retention measure may mistakenly conflate students who have transferred to a different university with those who have dropped out of college altogether. Dropout data was acquired from our universities registrar office which can track when students drop out and return to this specific university, but it is difficult to track if students end up transferring to a different university at a later time point. Of the 225 students that dropped out at some point during the 3 years of data collected, 163 of them dropped out after finishing either one or two years. While

we classify all of these students as having not been retained, it is possible that these students simply transferred to a different university. Studies have demonstrated that commitment to and engagement with a university are important factors in whether or not a student transfers to a different university (Hammond et al., 2007). Therefore, these students that transferred may differ from the students that truly dropped out confounding our measure of personality's effect on retention.

With regards to credits earned, perhaps using a measure such as time till degree completion would have yielded different results. The present study utilizes data from a cohort of students who have only completed 3 years of university. As such, it is possible that some students will graduate in less than 5 years but are taking courses at a different rate than our expected cutoff. However, it is important to consider the possibility that personality may not hold significant predictive power for the number of credits students complete or whether or not they are retained. How many credits a student wishes to enroll in, and how many credits a student actually enrolls in are not always equal. For example, a certain course the student needs may not be offered in a particular semester, or that student may have been unable to register due to the course being full. Moreover, external factors such as financial constraints, engagement with the university, and familial support have been shown to associate with retention and degree completion (Alvarez-Perez et al., 2021; Bernardo et al., 2022; Sosu & Pheunpha, 2019). Although the current study did not find evidence for an association between personality and retention or credits earned, there were some covariates in the models that did significantly predict odds of retention and being on track to graduate. Perhaps then this null finding with regards to personality provides evidence that some external factors are more important for university administrators to assess.

For both of these outcome measures, it is possible that COVID-19 played a role in confounding the results. For retention, perhaps there were students who dropped out due to the COVID-19 pandemic (who would not have otherwise) with the expectation of returning to school once the pandemic was over. These students may differ from other students who dropped out for more "traditional" reasons (e.g. low grades, financial trouble). Moreover, due to the shift to virtual and hybrid learning models. There may have been students who are no longer on track to graduate in five years as a consequence of certain courses not being offered remotely, or due to the added stress of the pandemic affecting how many courses they chose to enroll in. Such nuanced data on the impact of COVID-19 was not available for the current study, and future research should seek to understand how COVID-19 impacted the decision making of students with regards to their academic plans.

Covariates

While not the focus of the present study, several of the covariates used as controls in the final models reported were consistently significant with effects sometimes larger than that of the personality traits. This is especially true with regards to credits earned and retention where none of the personality traits were significant. Standardized test scores and first-generation status consistently predicted GPA, odds of being retained, and odds of being on track to graduate. Standardized test scores accounted for roughly 18-20% of the variance in one's GPA and higher scores were associated with 13% increased odds of being retained and 16% increased odds of being on time to graduate. This is unsurprising as standardized test scores have proven to be one of the most reliable and valid measures available to predict college success (Wai, Brown, & Chubris, 2018). First-generation status was associated with a 58% increased odds of dropping out before the completion of junior year and a 69% increased odds of not being on time to

graduate. Importantly, no significant mean personality differences were present between first-generation and non first-generation students. This finding is essential for administrators who wish to identify students most in need of support. Given that first-generation status, when holding constant intelligence and personality, was a significant predictor of dropout and being off track to graduate, future research should seek to understand what external factors/supports are missing in first-generation students' college experience.

Limitations & Future Directions

The current study attempted to look at the association between personality and a variety of academic outcomes in a novel way. While this study does add to the existing literature, there are some important limitations that future research should address. First, this study is hindered in that the sample of students utilized comes entirely from one university. This makes the findings at present more difficult to generalize to other universities, as student bodies at different universities may differ in terms of the range of cognitive abilities and familial backgrounds present (Wai, Brown, & Chubris, 2018). Students from prestigious coastal colleges such as the Ivy League or California's UC system for example, may attract students with higher cognitive abilities and have families with a history of higher education. For these universities, the limited variability in intelligence could change the role personality plays for these students. Moreover, less of the student body may be first-generation in comparison with the university this sample was recruited from. These differences in demographics may impact the role personality as well as correlates such as first-generation status play in predicting student success. However, since our sampling methods achieved a high degree of diversity of those lower versus higher academically functioning, we believe our findings do have some generalizability.

This study tracked a cohort of students from their freshman year (Fall 2019) through the end of their junior year (Spring 2022). This means that this cohort was impacted by the COVID-19 pandemic and had some of their coursework completed entirely virtually. However, the university this sample was recruited from had a mixed models classroom structure throughout much of the pandemic. While all students were instructed virtually for the final three months of their freshman year (Spring 2020), some students either partially or fully returned to campus for their sophomore year (Fall 2020 – Spring 2021) with others remaining entirely virtual depending on their major and classes enrolled in. Data on whether a student's classes were taught remotely, in person, or with a hybrid model were not measured, thus limiting the present study's ability to discern the impact of the COVID-19 pandemic. Researchers who have access to the method of instruction utilized during this time period should seek to understand how individual's personality traits associate with course performance and course satisfaction.

However, the present study did have data on students' opinions regarding the impact the COVID-19 pandemic had on their personal lives. The fourth wave of data collected began in late April and ended in the middle of May. As a result, participants were able to detail how the first month of the COVID-19 pandemic affected their lives thus far. When asked if COVID-19 had impacted your overall levels of anxiety, happiness, and wellbeing, students who reported feeling dissatisfied on any of these questions had lower GPAs for the spring 2020 semester. While this was not the focus of the present study, this information suggests that the effects of COVID-19 on students' mental health may have impacted course performance. Future researchers with access to more nuanced data on the psychological effects of COVID-19 should seek to relate these variables to academic outcomes in the semesters following COVID-19.

It is important to reiterate that examining personality traits at the facet level may provide more nuanced information regarding academic outcomes. While some studies have already attempted this (Apostolov & Geldenhuys, 2020; Intell, 2018; Vedel, 2015) none have assessed potential quadratic effects of the personality facets. While this study found that openness and neuroticism had a significant quadratic effect in relation to GPA, this may be a reflection of competing linear trends at the facet level or a true quadratic effect with a specific facet(s). This is a key issue for future research to address, particularly with a trait as complex as openness. Researchers should seek to employ different methodology such as bi-factor modeling to answer such questions. Bi-factor modeling would allow for researchers to assess the unique variance attributable to the broader trait itself while simultaneously inspecting the effects of each facet independently (Nguyen & Biderman, 2013).

Implications

In past studies, researchers have called for the inclusion of measures of personality in admissions decisions for the purpose of increasing the likelihood of admitting students who are most likely to succeed (Conard, 2006). This suggestion, while sounding promising initially, is not without its drawbacks. College admissions are a high stakes enterprise with students and parents devoting substantial time and effort to ensure the highest chance of being admitted. The use of a self-report measure of personality would likely be confounded by users answering dishonestly for the purposes of appearing highly motivated/qualified. Moreover, this view also downplays the natural development of personality over time. While personality traits have been viewed as relatively stable attributes (Atherton et al., 2020), studies have demonstrated that the transition from high school into young adulthood is accompanied by changes in personality (Parker et al., 2012). Specifically, this time of emerging adulthood is typically associated with

increases in conscientiousness, on average (Roberts et al., 2017). While in its infancy, there is

also a growing body of research that suggests personality traits can be adjusted through

interventions in as little as 24 weeks (Roberts et al., 2017). With this in mind, researchers should

seek to use data on students' personality not for the purpose of prediction, but rather for the

purposes of improving student outcomes. School administrators could seek to employ personality

interventions such as the PEACH program on students' smartphones to improve levels of

conscientiousness (Steiger et al., 2018). These changes at the personality level could result in the

adoption of behaviors, routines, and strategies that are more advantageous to academic success.

Conclusion

The present study assessed linear and quadratic effects of personality traits on GPA,

retention, and credits earned. Results confirmed the importance of personality, namely the

influence of conscientiousness, neuroticism and openness, on GPA. Conscientiousness, aside

from cognitive ability measures, is one of the most consistent predictors of GPA making it a key

personality trait to encourage in students. The quadratic effects seen for neuroticism and

openness are promising and suggest that personality may influence GPA in ways previous

research has not uncovered. It appears that increases in neuroticism may be beneficial for

student's GPA though at higher levels this effect is diminishing. Openness may have a quadratic

relationship with GPA, but more work at the facet level needs to be done before definitive

conclusions can be made. This study found no evidence of a relationship between any of the

personality traits and retention or credits earned over a three-year period. Future research should

focus on external factors and characteristics such as first-generation status when determining

who is at the highest risk of not graduating. Overall, it is clear that personality does matter when

predicting student performance. Universities, administrators, and educators alike should seek to

promote this information, and encourage thoughts, behaviors, and dispositions that are conducive to success in undergraduate.

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Table 1

Descriptive Study Information.

	M (SD)	**Range**	**N (%)**
Age	18.61 (.33)	18.08-20.11	-
Gender			
Male	-	0-1	387(50.33)
Female	-	0-1	382(49.67)
Race			
White	-	0-1	694(90.25)
Minority	-	0-1	75(9.70)
SES	6.56 (1.51)	1-10	-
First Generation	24.02 (4.52)	14-36	-
First Gen		0-1	162(21.07)
Non-First Gen		0-1	607(78.93)
SAT/ACT			
Conscientiousness	3.56 (.67)	1.42-5.00	-
Neuroticism	2.84 (.84)	1.00-5.00	-
Openness	3.68 (.63)	1.42-5.00	-
Agreeableness	3.75 (.59)	1.58-5.00	-
Extraversion	3.44 (.75)	1.42-5.00	-
First semester GPA	3.11 (.89)	0-4.00	769
First year cumulative GPA	3.24 (.79)	0-4.00	724
3-year cumulative GPA	3.39 (.47)	1.55-4.00	554
Total credits earned	80.09 (33.77)	0-187	-
> 12 per semester			562(73.08)
< 12 per semester			207(26.92)

Note. SES = Socioeconomic status, GPA = Grade point average

Table 2

Correlational matrix for GPA and predictors

	1st Sem GPA	1yr GPA	3yr GPA	Age	Race	Gender	SES	First Generation	ACT Score	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
1st Sem GPA	-	**0.89**	**0.72**	-0.04	-0.06	-0.03	**0.12**	**-0.13**	**0.38**	**0.08**	**0.07**	**0.18**	**-0.11**	0.04
1yr GPA	**0.89**	-	**0.82**	-0.03	**-0.11**	**-0.08**	**0.16**	**-0.16**	**0.41**	**0.08**	0.05	**0.18**	**-0.08**	0.03
3yr GPA	**0.72**	**0.82**	-	-0.05	-0.04	**-0.10**	0.06	**-0.10**	**0.41**	0.01	-0.03	0.08	-0.04	0.02
Age	-0.04	-0.03	-0.05	-	0.03	0.07	-0.04	0.05	-0.05	0.05	0.05	0.00	-0.03	-0.02
Race	-0.06	**0.11**	-0.04	0.03	-	0.00	**0.12**	0.07	-0.04	0.05	**-0.11**	-0.07	0.00	0.06
Gender	-0.03	**0.08**	**0.10**	0.07	0.00	-	0.04	-0.01	**0.16**	-0.04	**-0.09**	**-0.20**	**-0.27**	-0.07
SES	**0.12**	**0.16**	0.06	-0.04	**0.12**	0.04	-	**-0.35**	**0.13**	**0.15**	0.06	0.06	**-0.16**	-0.01
First Generation	**-0.13**	**-0.16**	**-0.10**	0.05	0.07	-0.01	**-0.35**	-	**-0.14**	-0.06	-0.06	0.05	0.02	-0.02
ACT Score	**0.38**	**0.41**	**0.41**	-0.05	-0.04	**0.16**	**0.13**	**-0.14**	-	-0.04	**-0.10**	**-0.09**	-0.06	**0.20**
Extraversion	**0.08**	**0.08**	0.01	0.05	0.05	-0.04	**0.15**	-0.06	-0.04	-	**0.12**	**0.18**	**-0.36**	**0.16**
Agreeableness	**0.07**	0.05	-0.03	0.05	**-0.11**	**-0.09**	0.06	-0.06	**-0.10**	**0.12**	-	**0.28**	**-0.25**	**0.13**
Conscientiousness	**0.18**	**0.18**	0.08	0.00	-0.07	**-0.20**	0.06	0.05	**-0.09**	**0.18**	**0.28**	-	**-0.20**	**0.08**
Neuroticism	**-0.11**	**-0.08**	-0.04	-0.03	0.00	**-0.27**	**-0.16**	0.02	-0.06	**-0.36**	**-0.25**	**-0.20**	-	**0.09**
Openness	0.04	0.03	0.02	-0.02	0.06	-0.07	-0.01	-0.02	**0.20**	**0.16**	**0.13**	**0.08**	**0.09**	-

Note. Bolded values indicate significant correlations at $p < .05$

Table 3

Linear Regression Models for First-Semester G.P.A.

	Model 1			Model 2			Model 3		
	b (se)	β	*p* value	b (se)	β	*p* value	b (se)	β	*p* value
Age	-0.02 (.03)	-0.02	.572	-0.02 (.03)	-0.02	.565	-0.02 (.03)	-0.02	.556
Race	-0.05 (.03)	-0.02	.597	-0.06 (.10)	-0.02	.519	-0.07 (.10)	-0.02	.509
Gender	-0.13 (.06)	-0.07	.048	-0.12 (.06)	-0.07	.055	-0.12 (.06)	-0.07	.061
SES	0.02 (.03)	0.03	.449	0.02 (.03)	0.02	.590	0.02 (.03)	0.02	.572
FirstGen	-0.14 (.08)	-0.07	.058	-0.16 (.08)	-0.07	.037	-0.15 (.08)	-0.07	.046
SAT/ACT	0.08 (.01)	0.42	.000	0.08 (.01)	0.42	.000	0.08 (.01)	0.42	.000
Conscientiousness	0.15 (.03)	0.16	.000	0.03 (.23)	0.03	.910	0.56 (1.1)	0.63	.602
Neuroticism	-0.01 (.03)	-0.02	.699	0.48 (.18)	0.54	.009	-0.16 (.83)	-0.18	.832
Extraversion	0.05 (.03)	0.06	.109	0.22 (.22)	0.29	.295	-0.70 (1.1)	-0.79	.505
Agreeableness	0.05 (.03)	0.05	.140	0.28 (.27)	0.32	.292	-0.75 (1.4)	-0.85	.592
Openness	-0.06 (.03)	-0.07	.061	-0.33 (.25)	-0.37	.181	0.08 (1.2)	0.09	.946
C^2	-	-	-	0.03 (.05)	0.13	.602	-0.23 (.48)	-1.20	.640
N^2	-	-	-	-0.04 (.04)	-0.57	.006	0.18 (.32)	1.02	.576
E^2	-	-	-	-0.04 (.04)	-0.21	.401	0.36 (.44)	2.06	.415
A^2	-	-	-	-0.06 (.06)	-0.26	.394	0.48 (.70)	2.32	.495
O^2	-	-	-	0.06 (.05)	0.26	.260	-0.14 (.57)	-0.74	.800
C^3	-	-	-	-	-	-	0.03 (.05)	0.75	.591
N^3	-	-	-	-	-	-	0.04 (.04)	-0.88	.376
E^3	-	-	-	-	-	-	-0.04 (.04)	-1.24	.366
A^3	-	-	-	-	-	-	-0.05 (.07)	-1.43	.440
O^3	-	-	-	-	-	-	0.02 (.05)	0.61	.705

Note. Model 1 R^2 = 21.66% , Model 2 R^2 = 22.84%, Model 3 R^2 = 23.09%

Table 4

Final *Linear Regression Model for First Semester G.P.A.*

	b (se)	β	*p* value	FDR Criteria
Age	-0.02 (.03)	-0.02	.498	.042
Race	-0.06 (.10)	-0.02	.548	.05
Gender	-0.12 (.06)	-0.07	.053	.025
SES	0.02 (.03)	0.02	.517	.046
FirstGen	-0.15 (.08)	-0.07	.042	.021
SAT/ACT	**0.08 (.01)**	**0.43**	**.000**	.008
Conscientiousness	**0.14 (.03)**	**0.16**	**.000**	.004
Neuroticism	**0.51 (.18)**	**0.57**	**.005**	.017
Extraversion	0.05 (.03)	0.06	.125	.038
Agreeableness	0.06 (.03)	0.06	.081	.033
Openness	-0.06 (.03)	-0.06	.067	.029
Neuroticism^2	**-0.10 (.04)**	**-0.60**	**.003**	.013

Note. $R^2 = 22.57\%$

Table 5

Linear Regression Models for First Year G.P.A.

	Model 1			Model 2			Model 3		
	b (se)	β	*p* value	b (se)	β	*p* value	b (se)	β	*p* value
Age	-0.01 (.03)	-0.02	.612	-0.01 (.03)	-0.02	.637	-0.01 (.03)	-0.01	.673
Race	-0.05 (.03)	-0.02	.049	-0.17 (.09)	-0.07	.044	-0.18 (.09)	-0.07	.039
Gender	-0.19 (.06)	-0.12	.001	-0.18 (.06)	-0.12	.001	-0.18 (.06)	-0.12	.001
SES	0.04 (.03)	0.05	.160	0.03 (.03)	0.04	.220	0.03 (.03)	0.04	.228
FirstGen	-0.17 (.07)	-0.09	.011	-0.18 (.07)	-0.09	.008	-0.18 (.07)	-0.09	.008
SAT/ACT	0.08 (.01)	0.46	.000	0.08 (.01)	0.45	.000	0.08 (.01)	0.45	.000
Conscientiousness	0.13 (.03)	0.16	.000	0.03 (.21)	0.03	.899	-0.07 (1.0)	-0.09	.846
Neuroticism	0.00 (.03)	0.00	.999	0.38 (.16)	0.49	.020	-0.91 (.66)	-1.18	.173
Extraversion	0.05 (.03)	0.07	.054	0.11 (.19)	0.15	.544	-0.59 (.91)	-0.76	.522
Agreeableness	0.02 (.03)	0.03	.404	0.15 (.24)	0.20	.522	-1.21 (1.2)	-1.56	.319
Openness	-0.07 (.03)	-0.09	.001	-0.50 (.21)	-0.65	.018	0.52 (1.0)	0.67	.619
C^2	-	-	-	0.02 (.04)	0.13	.634	0.05 (.44)	-0.32	.905
N^2	-	-	-	-0.08 (.03)	-0.50	.015	0.47 (.28)	3.12	.088
E^2	-	-	-	-0.01 (.04)	-0.09	.726	0.28 (.38)	1.86	.461
A^2	-	-	-	-0.03 (.06)	-0.16	.598	0.66 (.60)	3.71	.270
O^2	-	-	-	0.09 (.05)	0.57	.040	-0.40 (.49)	-2.39	.411
C^3	-	-	-	-	-	-	0.00 (.04)	-0.07	.963
N^3	-	-	-	-	-	-	0.06 (.03)	-2.00	.045
E^3	-	-	-	-	-	-	-0.03 (.04)	-1.07	.438
A^3	-	-	-	-	-	-	-0.07 (.06)	-2.14	.242
O^3	-	-	-	-	-	-	0.05 (.05)	1.66	.294

Note. Model 1 $R^2 = 26.22\%$, Model 2 $R^2 = 27.32\%$, Model 3 $R^2 = 28.00\%$

Table 6

Final Linear Regression Model for First Year G.P.A.

	b (se)	β	*p* value	FDR Criteria
Age	-0.01 (.03)	-0.02	.623	.05
Race	-0.17 (.09)	-0.67	.045	.035
Gender	**-0.18 (.06)**	**-0.12**	**.001**	**.015**
SES	0.04 (.03)	0.05	.200	.042
FirstGen	**-0.18 (.07)**	**-0.09**	**.001**	**.012**
SAT/ACT	**0.08 (.01)**	**0.45**	**.000**	**.008**
Conscientiousness	**0.12 (.03)**	**0.16**	**.000**	**.004**
Neuroticism	**0.39 (.16)**	**0.51**	**.012**	**.023**
Extraversion	0.05 (.03)	0.06	.077	.038
Agreeableness	0.03 (.03)	0.04	.313	.046
Openness	**-0.50 (.21)**	**-0.66**	**.018**	**.027**
Neuroticism^2	**-0.08 (.03)**	**-0.53**	**.009**	**.019**
Openness^2	0.10 (.05)	0.57	.039	.031

Note. $R^2 = 27.27\%$

Table 7

Linear Regression models for 3-year GPA

	Model 1			Model 2			Model 3		
	b (se)	β	*p* value	b (se)	β	*p* value	b (se)	β	*p* value
Age	-0.02 (.03)	-0.02	.572	-0.02 (.03)	-0.02	.565	-0.02 (.03)	-0.02	.556
Race	-0.05 (.03)	-0.02	.597	-0.06 (.10)	-0.02	.519	-0.07 (.10)	-0.02	.509
Gender	-0.13 (.06)	-0.07	.048	-0.12 (.06)	-0.07	.055	-0.12 (.06)	-0.07	.061
SES	0.02 (.03)	0.03	.449	0.02 (.03)	0.02	.590	0.02 (.03)	0.02	.572
FirstGen	-0.14 (.08)	-0.07	.058	-0.16 (.08)	-0.07	.037	-0.15 (.08)	-0.07	.046
SAT/ACT	0.08 (.01)	0.42	.000	0.08 (.01)	0.42	.000	0.08 (.01)	0.42	.000
Conscientiousness	0.15 (.03)	0.16	.000	0.03 (.23)	0.03	.910	0.56 (1.1)	0.63	.602
Neuroticism	-0.01 (.03)	-0.02	.699	0.48 (.18)	0.54	.009	-0.16 (.83)	-0.18	.832
Extraversion	0.05 (.03)	0.06	.109	0.22 (.22)	0.29	.295	-0.70 (1.1)	-0.79	.505
Agreeableness	0.05 (.03)	0.05	.140	0.28 (.27)	0.32	.292	-0.75 (1.4)	-0.85	.592
Openness	-0.06 (.03)	-0.07	.061	-0.33 (.25)	-0.37	.181	0.08 (1.2)	0.09	.946
C^2	-	-	-	0.03 (.05)	0.13	.602	-0.23 (.48)	-1.20	.640
N^2	-	-	-	-0.04 (.04)	-0.57	.006	0.18 (.32)	1.02	.576
E^2	-	-	-	-0.04 (.04)	-0.21	.401	0.36 (.44)	2.06	.415
A^2	-	-	-	-0.06 (.06)	-0.26	.394	0.48 (.70)	2.32	.495
O^2	-	-	-	0.06 (.05)	0.26	.260	-0.14 (.57)	-0.74	.800
C^3	-	-	-	-	-	-	0.03 (.05)	0.75	.591
N^3	-	-	-	-	-	-	0.04 (.04)	-0.88	.376
E^3	-	-	-	-	-	-	-0.04 (.04)	-1.24	.366
A^3	-	-	-	-	-	-	-0.05 (.07)	-1.43	.440
O^3	-	-	-	-	-	-	0.02 (.05)	0.61	.705

Note. Model 1 $R^2 = 21.61\%$, Model 2 $R^2 = 23.34\%$, Model 3 $R^2 = 24.94\%$

Table 8

Final Linear Regression Model for 3-year GPA

	b (se)	β	*p* value	FDR Criteria
Age	-0.01 (.02)	-0.02	.540	.038
Race	-0.06 (.07)	-0.04	.365	.033
Gender	**-0.16 (.04)**	**-0.16**	**.000**	**.004**
SES	0.00 (.02)	0.00	.982	.042
FirstGen	-0.08 (.05)	-0.06	.121	.029
SAT/ACT	**0.05 (.00)**	**0.46**	**.000**	**.008**
Conscientiousness	**0.05 (.02)**	**0.11**	**.001**	**.013**
Neuroticism	**0.28 (.11)**	**0.60**	**.014**	**.021**
Extraversion	0.00 (.02)	0.00	.924	.05
Agreeableness	0.00 (.02)	0.00	.924	.046
Openness	-0.04 (.02)	-0.09	.037	.025
Neuroticism^2	**-0.06 (.02)**	**-0.64**	**.008**	**.017**

Note. $R^2 = 22.62\%$

Table 9

Logistic Regression Models for first year retention

	Model 1		Model 2		Model 3	
	OR (95% CI)	*p* value	OR (95% CI)	*p* value	OR (95% CI)	*p* value
Age	0.91 (0.73-1.12)	.347	0.90 (0.73-1.12)	.349	0.90 (0.73-1.12)	.334
Race	0.89 (0.45-1.78)	.749	0.83 (0.41-1.67)	.604	0.86 (0.42-1.74)	.671
Gender	0.85 (0.53-1.36)	.488	0.82 (0.50-1.33)	.417	0.82 (0.51-1.35)	.439
SES	0.92 (0.73-1.17)	.500	0.91 (0.72-1.15)	.429	0.89 (0.70-1.14)	.356
FirstGen	0.62 (0.37-1.05)	.073	0.59 (0.34-1.01)	.051	0.59 (0.34-1.01)	.056
SAT/ACT	1.14 (1.08-1.20)	.000	1.15 (1.09-1.22)	.000	1.15 (1.09-1.22)	.000
Conscientiousness	1.07 (0.84-1.36)	.598	2.21 (0.43-11.3)	.343	96.4 (0.06-999)	.223
Neuroticism	0.99 (0.76-1.30)	.956	2.54 (0.66-9.71)	.172	8.83 (0.04-999)	.431
Extraversion	1.16 (0.91-1.48)	.238	3.39 (0.77-15.0)	.107	0.29 (0.00-446)	.741
Agreeableness	1.19 (0.94-1.52)	.153	2.75 (0.43-17.7)	.287	0.00 (0.00-24.8)	.168
Openness	0.83 (0.65-1.00)	.142	2.15 (0.35-13.1)	.408	23.5 (0.01-999)	.464
C^2	-	-	0.86 (0.60-1.22)	.395	0.15 (0.01-4.28)	.264
N^2	-	-	0.83 (0.64-1.08)	.171	0.50 (0.05-4.76)	.545
E^2	-	-	0.81 (0.60-1.09)	.160	2.38 (0.11-53.2)	.585
A^2	-	-	0.83 (0.53-1.28)	.396	66.8 (0.31-999)	.124
O^2	-	-	0.92 (0.55-1.22)	.317	0.24 (0.00-13.5)	.490
C^3	-	-	-	-	1.20 (0.85-1.68)	.298
N^3	-	-	-	-	1.06 (0.82-1.36)	.664
E^3	-	-	-	-	0.89 (0.65-1.23)	.485
A^3	-	-	-	-	0.65 (0.39-1.09)	.103
O^3	-	-	-	-	1.13 (0.77-1.68)	.535

Table 10

Logistic Regression Models for 3 year retention

	Model 1		Model 2		Model 3	
	OR (95% CI)	*p* value	OR (95% CI)	*p* value	OR (95% CI)	*p* value
Age	1.00 (0.85-1.18)	.967	0.99 (0.84-1.18)	.975	0.99 (0.84-1.18)	.957
Race	0.75 (0.44-1.27)	.289	0.75 (0.44-1.27)	.280	0.75 (0.44-1.29)	.294
Gender	0.83 (0.57-1.19)	.307	0.83 (0.57-1.20)	.321	0.84 (0.58-1.22)	.368
SES	1.10 (0.92-1.31)	.312	1.09 (0.91-1.31)	.341	1.08 (0.90-1.30)	.390
FirstGen	0.63 (0.42-0.95)	.029	0.62 (0.41-0.94)	.023	0.61 (0.40-0.93)	.023
SAT/ACT	1.14 (1.09-1.19)	.000	1.14 (1.09-1.19)	.000	1.14 (1.09-1.19)	.000
Conscientiousness	1.12 (0.93-1.35)	.234	1.89 (0.52-6.89)	.334	182 (0.42-999)	.093
Neuroticism	0.97 (0.79-1.19)	.739	1.12 (0.38-3.31)	.842	0.99 (0.01-90.3)	.998
Extraversion	0.95 (0.78-1.14)	.570	0.64 (0.17-2.38)	.509	4.36 (0.01-999)	.646
Agreeableness	1.13 (0.94-1.36)	.200	2.60 (0.58-11.68)	.212	0.00 (0.00-15.7)	.193
Openness	0.91 (0.76-1.10)	.334	0.61 (0.78-1.54)	.536	9.07 (0.01-999)	.565
C^2	-	-	0.89 (0.68-1.18)	.427	0.12 (0.01-1.70)	.113
N^2	-	-	0.97 (0.79-1.20)	.791	0.11 (0.16-6.69)	.980
E^2	-	-	1.08 (0.84-1.40)	.550	0.49 (0.04-6.79)	.591
A^2	-	-	0.82 (0.58-1.17)	.272	21.3 (0.36-999)	.141
O^2	-	-	1.10 (0.78-1.54)	.608	0.30 (0.01-10.0)	.500
C^3	-	-	-	-	1.24 (0.94-1.63)	.130
N^3	-	-	-	-	0.99 (0.81-6.69)	.954
E^3	-	-	-	-	1.08 (0.93-1.41)	.558
A^3	-	-	-	-	0.73 (0.49-1.08)	.112
O^3	-	-	-	-	1.14 (0.81-1.60)	.459

Table 11

Logistic Regression Models for Credits Earned

	Model 1		Model 2		Model 3	
	OR (95% CI)	*p* value	OR (95% CI)	*p* value	OR (95% CI)	*p* value
Age	0.98 (0.83-1.17)	.836	0.98 (0.82-1.17)	.797	0.98 (0.82-1.17)	.828
Race	0.48 (0.28-0.82)	.008	0.47 (0.28-0.81)	.006	0.48 (0.28-0.82)	.007
Gender	0.67 (0.45-0.99)	.042	0.67 (0.45-0.99)	.042	0.68 (0.46-1.01)	.055
SES	0.99 (0.83-1.20)	.979	0.99 (0.82-1.20	.938	0.98 (0.81-1.18)	.798
FirstGen	0.60 (0.39-0.93)	.023	0.59 (0.38-0.92)	.019	0.57 (0.37-0.89)	.014
SAT/ACT	1.16 (1.11-1.22)	.000	1.16 (1.11-1.22)	.020	1.17 (1.11-1.22)	.000
Conscientiousness	1.20 (0.99-1.46)	.067	2.27 (0.59-8.76)	.233	95.4 (0.19-999)	.153
Neuroticism	1.04 (0.83-1.29)	.759	1.69 (0.54-5.24)	.364	4.70 (0.05-491)	.514
Extraversion	1.01 (0.82-1.23)	.954	0.86 (0.23-3.46)	.861	71.6 (0.11-999)	.197
Agreeableness	1.17 (0.96-1.42)	.117	1.96 (0.39-9.69)	.412	0.03 (0.00-187)	.435
Openness	0.86 (0.71-1.05)	.135	0.50 (0.09-2.78)	.426	141 (0.00-999)	.214
C^2	-	-	0.87 (0.65-1.17)	.351	0.15 (0.01-2.66)	.197
N^2	-	-	0.91 (0.73-1.13)	.392	0.59 (0.09-4.11)	.595
E^2	-	-	1.03 (0.79-1.34)	.844	0.16 (0.01-2.48)	.190
A^2	-	-	0.89 (0.61-1.29)	.533	7.35 (0.10-562)	.368
O^2	-	-	1.13 (0.78-1.65)	.523	0.08 (0.00-3.10)	.174
C^3	-	-	-	-	1.19 (0.90-1.59)	.229
N^3	-	-	-	-	1.05 (0.84-1.31)	.663
E^3	-	-	-	-	1.21 (0.91-1.59)	.187
A^3	-	-	-	-	0.82 (0.54-1.24)	.335
O^3	-	-	-	-	1.29 (0.91-1.85)	.157

Figure 1. Retention Rate
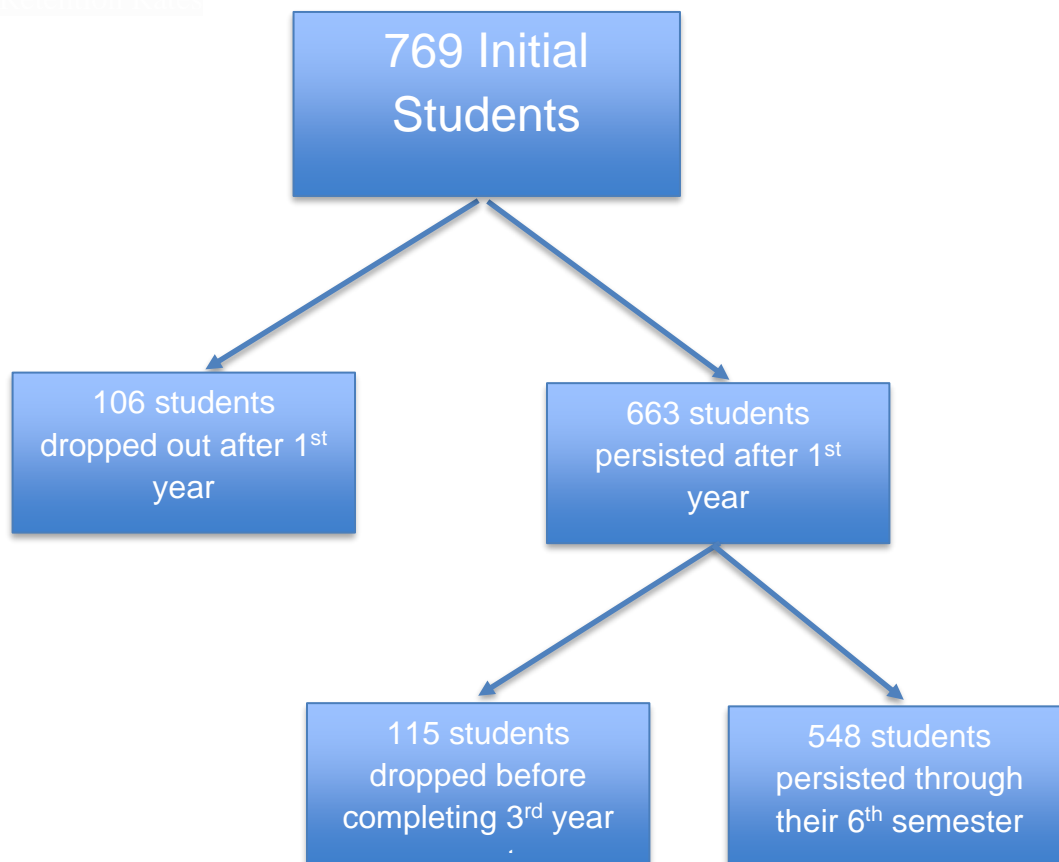
Figure 2

Neuroticism and First Semester GPA
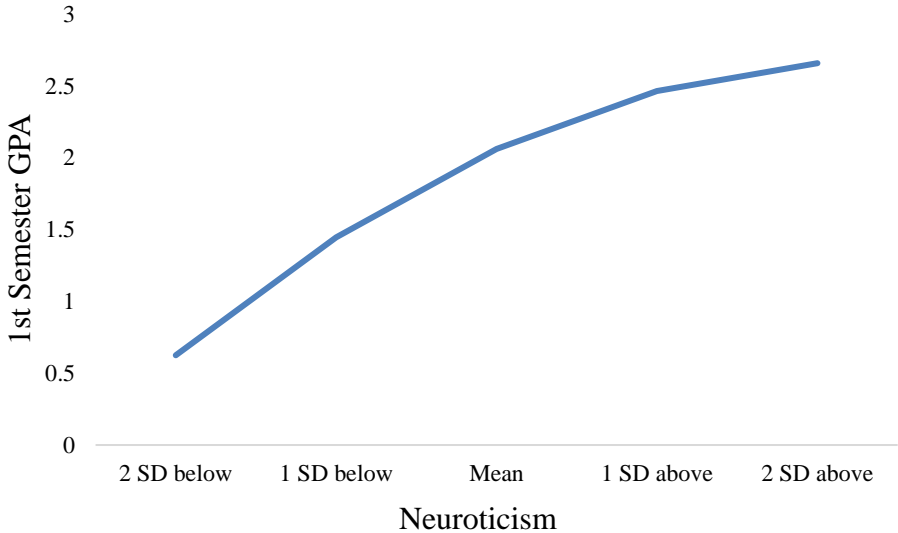
Figure 3

Neuroticism and 1st Year GPA
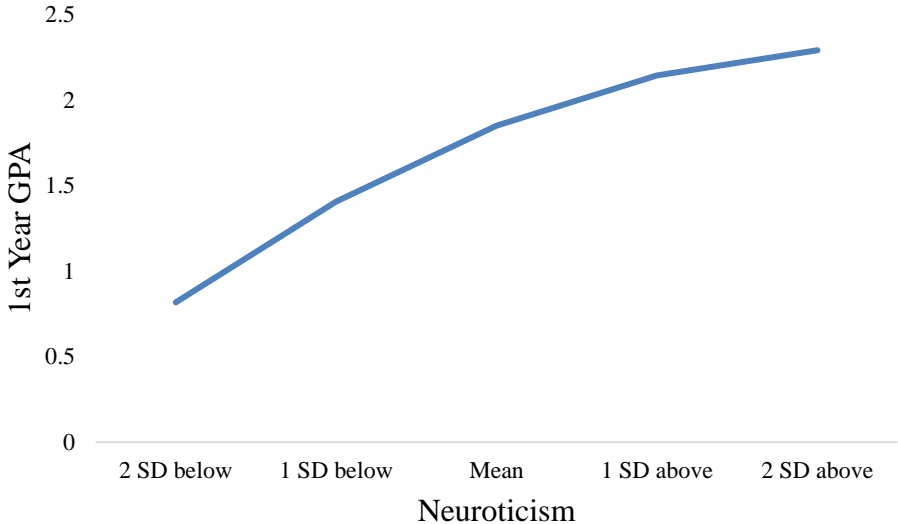
Figure 4

Openness and First Year GPA
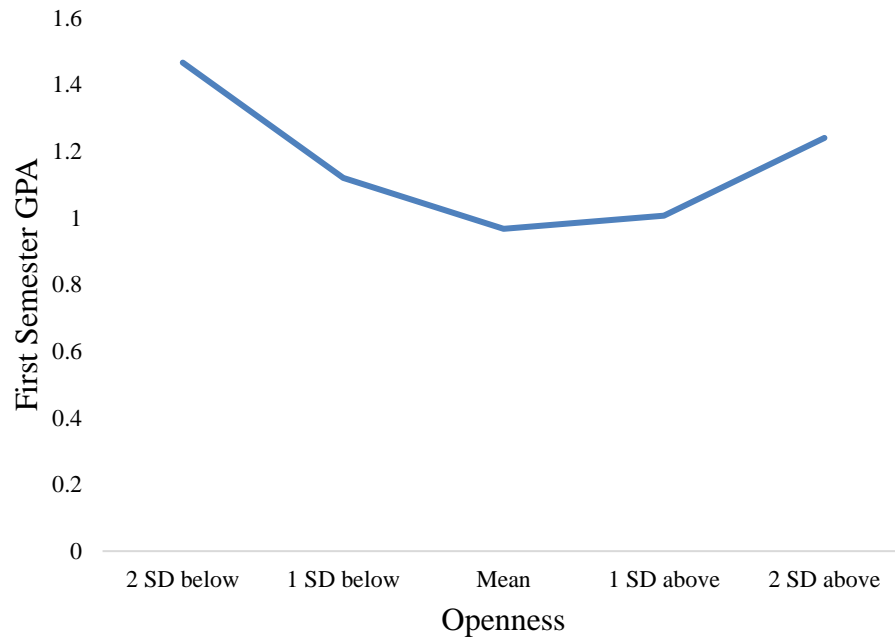
Note. This association was initially significant (p = .039) but was insignificant once applying the FDR procedure.

Figure 5

Neuroticism and 3 Year GPA
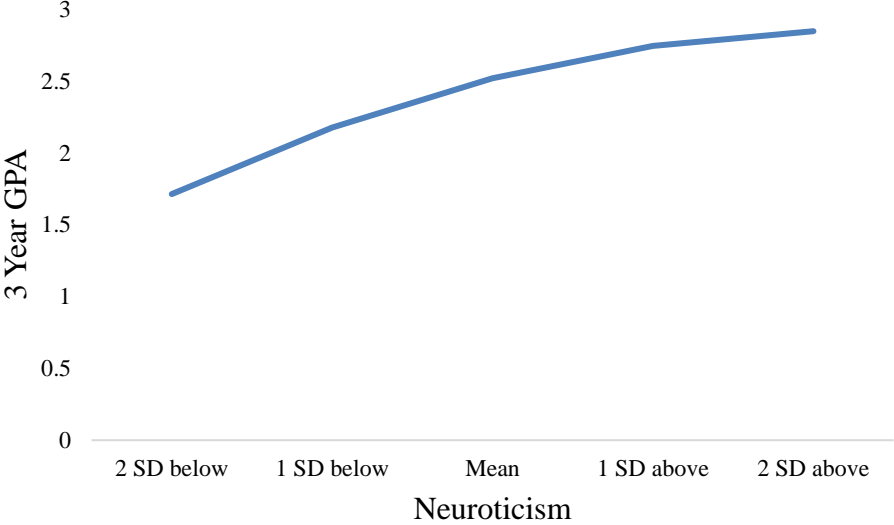
Figure 6

A timeline of the data collection process
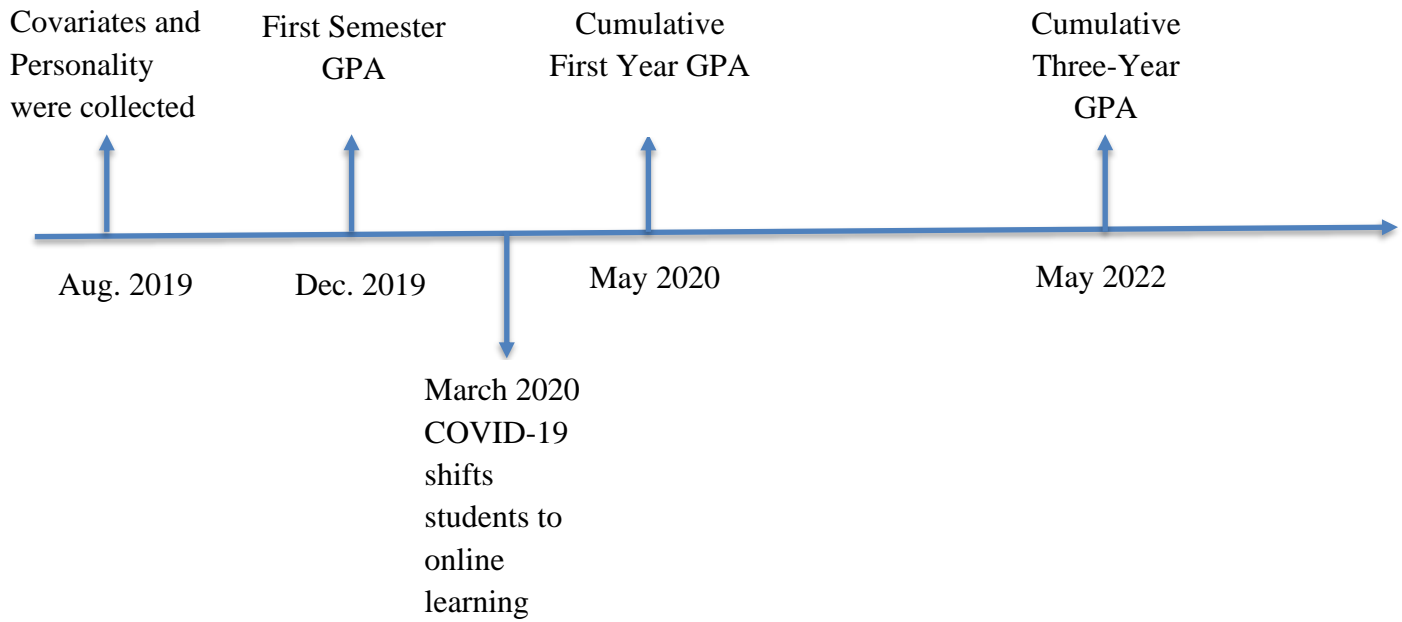
Appendix A
Demographics

1. As of today, are you 18 years of age or older?

   ○ Yes

   ○ No

2. What is your ethnicity?

   ○ Hispanic or Latino

   ○ Not Hispanic or Latino

3. What is your race?

   ○ American Indian/Alaskan Native

   ○ Black or African American

   ○ White/Caucasian

   ○ Mixed

   ○ Unknown

   ○ Other (please specify) _____

4. What is your gender?

   ○ Male

   ○ Female

   ○ Other (please specify) _____

5. Imagine that this ladder shows how your society is set up. At the top of the ladder are the people who are the best off - they have the most money, the highest amount of schooling, and the jobs that bring the most respect. At the bottom are people who are the worst off - they have the least money, little or no education, no jobs or jobs that no one wants or respects.

Now think about your family. Please tell us where you think your family would be on this ladder. Select the number of the rung that best represents where your family would be on this ladder.

   ○ 1 = worst off, 2, 3, 4, 5, 6, 7, 8, 9, 10 = best off

Best off

Worst off

Appendix B
Big 5 Personality Inventory

	1 Disagree strongly (1)	2 Disagree a little (2)	3 Neutral/no opinion (3)	4 Agree a little (4)	5 Agree strongly (5)
I am someone who...is outgoing, sociable (1)	○	○	○	○	○
is compassionate, has a soft heart (2)	○	○	○	○	○
tends to be disorganized (3)	○	○	○	○	○
is relaxed, handles stress well (4)	○	○	○	○	○
has few artistic interests (5)	○	○	○	○	○
has an assertive personality (6)	○	○	○	○	○
is respectful, treats others with respect (7)	○	○	○	○	○
tends to be lazy (8)	○	○	○	○	○
stays optimistic after experiencing a setback (9)	○	○	○	○	○
I am someone who... is curious about many different things (10)	○	○	○	○	○
rarely feels excited or eager (11)	○	○	○	○	○
tends to find fault with others (12)	○	○	○	○	○
is dependable, steady (13)	○	○	○	○	○
is moody, has up and down mood swings (14)	○	○	○	○	○
is inventive, finds clever ways to do things (15)	○	○	○	○	○
tends to be quiet (17)	○	○	○	○	○
feels little sympathy for others (18)	○	○	○	○	○
is systematic, likes to keep things in order (19)	○	○	○	○	○
I am someone who...can be tense (20)	○	○	○	○	○

is fascinated by art, music, or literature (21)

is dominant, acts as a leader (22)

starts arguments with others (23)

has difficulty getting started on tasks (24)

feels secure, comfortable with self (25)

avoids intellectual, philosophical discussions (26)

is less active than other people (27)

has a forgiving nature (28)

I am someone who...can be somewhat careless (29)

is emotionally stable, not easily upset (30)

has little creativity (31)

is sometimes shy, introverted (32)

is helpful and unselfish with others (33)

keeps things neat and tidy (34)

worries a lot (35)

values art and beauty (36)

finds it hard to influence people (37)

I am someone who...is sometimes rude to others (38)

is efficient, gets things done (39)

often feels sad (40)

is complex, a deep thinker (41)	○	○	○	○	○
is full of energy (42)	○	○	○	○	○
is suspicious of others' intentions (43)	○	○	○	○	○
is reliable, can always be counted on (44)	○	○	○	○	○
keeps their emotions under control (45)	○	○	○	○	○
has difficulty imagining things (46)	○	○	○	○	○
I am someone who...is talkative (47)	○	○	○	○	○
can be cold and uncaring (48)	○	○	○	○	○
leaves a mess, doesn't clean up (49)	○	○	○	○	○
rarely feels anxious or afraid (50)	○	○	○	○	○
thinks poetry and plays are boring (51)	○	○	○	○	○
prefers to have others take charge (52)	○	○	○	○	○
is polite, courteous to others (53)	○	○	○	○	○
is persistent, works until the task is finished (54)	○	○	○	○	○
tends to feel depressed, blue (55)	○	○	○	○	○
I am someone who...has little interest in abstract ideas (56)	○	○	○	○	○
shows a lot of enthusiasm (57)	○	○	○	○	○
assumes the best about people (58)	○	○	○	○	○
sometimes behaves irresponsibly (59)	○	○	○	○	○
is temperamental, gets emotional easily (60)	○	○	○	○	○

is original, comes up with new ideas (61)

○   ○   ○   ○   ○