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Predictors of Success among High School Students in Advanced Placement and International Baccalaureate Programs

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Abstract

Research has shown that students in Advanced Placement (AP) classes and International Baccalaureate (IB) programs experience higher levels of stress compared to students in general education classes. Elevated stress can serve as a risk factor for students' academic and mental health problems. Given the documented stress of these students, additional investigations are needed to more fully understand how students experience these curricula and the factors associated with positive student outcomes. Thus, we set out to identify factors associated with success among AP/IB students, with an emphasis on exploring potentially malleable factors that could be targeted with existing or newly developed interventions. Data were collected via self-report measures and school records from 2379 students (grades 9-12) enrolled in AP or IB in 20 school programs in one state. We examined the relationships among 34 predictors (e.g., stressors, coping styles, student engagement, family factors, school factors, and demographic features) of success. Success was represented by five outcomes in two domains: mental health (life satisfaction, psychopathology, school burnout) and academic (GPA, AP/IB exam scores). Better outcomes in both domains were associated with higher levels of achievement motivation and cognitive engagement, as well as lower levels of parent-child conflict, stress from major life events, and use of avoidance coping strategies. Higher levels of affective engagement, use of approach coping, and authoritative parenting were robust predictors of positive mental health outcomes and unrelated (in multivariate analyses) to academic outcomes. Findings have implications for subsequent development of intervention efforts targeting factors associated with student success.

Keywords: accelerated curricula, high school students, risk and resiliency factors, student success

Predictors of Success among High School Students in Advanced Placement and International Baccalaureate Programs

More high school students are seeking, and being offered, enrollment in accelerated curricula that prepare them for college and/or yield college credit than in previous decades. Two such accelerated curricula are Advanced Placement (AP) and International Baccalaureate (IB) classes and programs (Thomas, Marken, Gray, & Lewis, 2013). There is increasing diversity among students enrolled in AP/IB, in terms of ethnic and linguistic backgrounds, socioeconomic status, academic preparation, and prior experience managing rigorous academic coursework (Handwerk, Tognatta, Coley, & Gitomer, 2008; McKillip & Mackey, 2013). In evaluating student success within these more diverse programs, researchers have raised questions of how success should be defined in terms of domains and indicators. Completion of accelerated courses was once considered the primary indicator of student success (Adelman, 2006), but performance on the end-of-course exam has been argued by some as a more accurate indicator of student success (Ackerman, Kanfer, & Calderwood, 2013) than mere participation in AP or IB courses.

An exclusive focus on academic skills and test performance may be too narrow, however; students' quality of life and mental health outcomes are also relevant within a holistic definition of student success. The importance of considering such indicators of emotional well-being is due in part to the recognition that high school students in AP and IB classes report significantly higher levels of stress associated with intense curricular demands compared to students in general education (Suldo & Shaunessy-Dedrick, 2013a; Suldo, Shaunessy, Thalji, Michalowski, & Shaffer, 2009). Examining the emotional well-being of a population with greater stress is justified by research with general samples of youth that has established positive associations between stress and mental health problems, particularly internalizing symptoms (Grant, Compas,

Thurm, McMahon, & Gipson, 2004; Kiang & Buchanan, 2014) and reduced life satisfaction (Moksnes, Lohre, Lillefjell, Byrne, & Haugan, 2016).

Building on Roeser, Eccles, and Sameroff's (2000) view of adolescents' psychosocial functioning in the school context that posits the relevance of two interconnected domains, social-emotional (mental health) and academic functioning, we used a multidimensional framework to define student success in AP or IB that included positive indicators of emotional well-being (i.e., life satisfaction) in addition to negative indicators of psychological distress (i.e., symptoms of psychopathology and school burnout). This approach is consistent with modern views of mental health that recognize that although an absence of symptoms is desirable, the presence of positive emotions is optimal and constitutes thriving (Howell, Keyes, & Passmore, 2013). Additionally, our framework for defining student success included two indicators of academic functioning—grades earned in courses (grade point average; GPA) and performance on end-of-course AP and IB exams. We examined outcomes in each domain (mental health and academic) rather than presume success in one domain translates to success in the other.

In the next section, we provide contextual information about AP courses and the IB Program, followed by discussion of stress experiences and outcomes observed among students in AP and IB. Then, we describe potential factors associated with student success as indicated by theory and prior empirical research across multiple disciplines. The range of predictor variables spans intrapersonal, environmental, and demographic features. Intrapersonal factors include students' engagement at school and strategies for coping with academic demands. Environmental factors span the family and school contexts relevant to learning. Whereas students enter AP/IB with no way of changing earlier learning histories or demographic circumstances, several cognitive and behavioral features of students, as well as their interactions with and support from

others at home and school, are presumably more malleable. Our research aligns with a major goal of education research, which is to "explore relations among variables in order to identify malleable factors predictive of achievement and potentially amenable to intervention" (Institute of Education Sciences [IES], 2017a, papa. 3) with malleable factors defined as "things that can be changed by the education system to improve student education outcomes" (IES, 2017b, p. iv). Accordingly, we were particularly interested in identifying factors that could logically be targeted by existing or newly developed skill-building interventions for students and the adults in their lives.

In the absence of a single theoretical framework applicable to the understudied population of AP/IB students, we took an exploratory approach by considering relevant factors identified empirically in studies focusing on academic success of general samples of adolescents, and/or the smaller literature base specific to students in AP/IB or related samples, such as students identified as gifted. Even though not all students in AP/IB are gifted, AP and IB programs are "two of the most common methods of serving advanced learners in high school" (Foust, Hertberg-Davis, & Callahan, 2008, p. 121) and are sought by students who have been described as gifted, high achieving, or advanced (Hertberg-Davis, Callahan, & Kyburg, 2006; Kyburg, Hertberg-Davis, & Callahan, 2007). The gifted education literature is also relevant since it has historically examined both the academic and social-emotional issues pertinent to students identified as gifted as well as learners considered academically advanced in comparison to same-age peers. Using this exploratory approach our goal was to identify a smaller set of factors associated with AP/IB students' mental health and academic outcomes.

Accelerated High School Curricula

Advanced Placement courses and IB programs are among the most prevalent accelerated

curricular options for high school students. Policy initiatives have addressed the need for increased rigor in high school through accelerated coursework such as AP and IB (Spalding, Eden, & Happner, 2012). For example, some states require *all* public high schools to offer advanced coursework (primarily through AP), many states provide financial incentives for schools and districts based on AP or IB student enrollment and end-of-course exam performance (Jackson, 2010; McBride Davis, Slate, Moore, & Barnes, 2015), and more than half of the states offer distance-learning opportunities for students to pursue AP coursework (Spalding et al., 2012). Such initiatives and other advocacy efforts have fostered the expansion of access to college-level high school coursework, particularly for students from socioeconomic and ethnic groups historically underrepresented in such courses or in college (Jeong, 2009; Spalding et al.).

Both AP and IB courses offer students the opportunity to earn college credit and target a similar pool of learners, though AP and IB program designs and requirements differ. In the past, high school juniors and seniors were the primary consumers targeted; increasingly, schools have offered freshmen and sophomores limited access to AP courses or a pre-IB curriculum. Both AP and IB courses include end-of-course exams, which many universities recognize for college credit (AP) or even advanced standing. In terms of the program design, the IB Diploma (IBD) program is an internationally recognized, comprehensive liberal arts program that emphasizes content depth through multi-year courses, critical thinking experiences (e.g., an independent research project culminating with an essay), and service to the community (International Baccalaureate Organization [IBO], 2015). In contrast to the multi-year, multidisciplinary design of the IBD program, AP courses are offered on a course-by-course basis, whereby students select from among those offered at their school. While schools may offer as many as 38 courses in multiple content areas, students customize their program of study and have latitude in the

selection of the number of subject areas pursued (College Board, 2015).

Stress and Student Outcomes

Regardless of academic curriculum, adolescent students experience a variety of stressors including those associated with hormonal changes, developmental tasks, and navigating social and intrapersonal experiences (McNamara, 2000). Stress has been conceptualized as *perceived stress*, which reflects stress experienced subjectively after one's set of resources to deal with a given challenge are taxed (Lazarus & Folkman, 1984), and *environmental stress*, which reflect the cumulative number of objective external events that are experienced that pose a threat to one's well-being (Grant et al., 2003). External events include major disruptions such as death or relocation, as well as chronic conditions such as conflict in relationships and pressure to achieve.

Comparisons of stress levels of high school students in different curriculum groups indicate that students in AP and IB perceive a significantly higher level of stress as compared to students in general education, even after accounting for between-group differences in personality and family SES (Suldo & Shaunessy-Dedrick, 2013a), an elevation that is detectable by the first semester of participation in IB (Suldo & Shaunessy-Dedrick, 2013b). The perceived stress that students in AP, IB, or highly selective high schools report stems from a relatively unique source of environmental stressors—academic *demands* (i.e., an often overwhelming academic workload due to a greater daily amount of homework and extensive projects, combined with pressure to succeed; Leonard et al., 2015; Suldo et al., 2009), as compared to the typical teenager whose school stressors are more likely to pertain to academic *struggles* (i.e., poor grades, challenges with course content and teachers) and a mix of social and transitional issues (Byrne, Davenport, & Mazanov, 2007). Stress may be conceptualized as a risk factor (i.e., exposure to a measurable source of adversity) that increases the odds of an unfavorable outcome for students (Masten,

Cutuli, Herbers, & Reed, 2009).

Negative sequelae of stress stemming from such heightened academic demands include chronic fatigue and maladaptive coping strategies such as sleep deprivation, substance use, and social isolation (Foust, Hertberg-Davis, & Callahan, 2009; Leonard et al., 2015; Suldo et al., 2008). Studies of high school students in college preparatory programs document inverse associations between life satisfaction and stress, as indicated by global stress ratings and physical symptoms of stress (Feld & Shusterman, 2015) or environmental stressors from various domains (Suldo, Dedrick, Shaunessy-Dedrick, Roth, & Ferron, 2015). Further, Suldo et al. (2009) found that the magnitude of the positive correlations between stressors (at school, with parents, or with peers) and adverse outcomes (academic problems and psychopathology, especially externalizing behaviors) were greater for IB students in comparison to correlations observed among peers in general education. Such findings suggest that students in accelerated programs may be more sensitive to manifesting adverse effects of stress than peers not pursuing accelerated curricula.

Resiliency Factors

Masten and colleagues' work (2009) on resiliency provides a useful framework for exploring the seemingly contradictory findings that (a) the elevated and unique stress experienced by AP/IB students is associated with negative outcomes (Suldo et al., 2009), but (b) many AP/IB students have superior academic functioning and comparable mental health relative to general education students despite higher levels of perceived stress within their curricular context (Suldo & Shaunessy-Dedrick, 2013a). Within this framework, Masten et al. (2009) define assets or promotive factors as variables that predict better outcomes in general across youth samples, akin to main effects in regression analyses. Protective factors reflect a group-level feature that "predicts positive outcome in the context of risk or adversity" (p. 119), often

detected via moderator analyses. Assets and protective factors likely exist for AP/IB students that either offset or buffer against the risk factor of stress, in view of research findings that indicate that AP/IB students, on average, have better academic outcomes (higher grade point averages, more school attendance, and far fewer discipline referrals) and conventional social-emotional functioning in comparison to general education students (Shaunessy, Suldo, Hardesty, & Shaffer, 2006; Suldo & Shaunessy-Dedrick, 2013a). Specifically, mean levels of global life satisfaction, internalizing and externalizing forms of psychopathology, and social problems do not differ between groups of students in AP, IB, and general education after accounting for personality and economic influences on mental health outcomes that may also differ between curriculum groups (Suldo & Shaunessy-Dedrick, 2013a). Further, IB students reported particularly positive social functioning in terms of greater satisfaction with friendships and fewer affiliations with deviant peer groups. Engagement theory (e.g., Finn & Zimmer, 2012; Reschly & Christenson, 2012), which has been used to account for school success in general samples, identifies student engagement as a possible promotive factor linked to student success. The next section discusses the construct of student engagement and its potential role in student success.

Student engagement and academic motivation. Student engagement is a multidimensional construct with at least three subtypes: behavioral (e.g., participation in school-related activities, such as extracurricular clubs and athletics, and on-task behavior in the classroom), affective (e.g., positive emotions at school, and feelings of belongingness to one's school and teachers), and cognitive (e.g., goal setting, self-regulation, and strategizing; Reschly & Christenson, 2012). Some frameworks include affect towards school, including feelings about teachers and peers, as a component of engagement (e.g., Appleton, Christenson, Kim, & Reschly, 2006). Other models posit that such identification with one's school (i.e., affective

engagement) may serve an agentic function that facilitates behavioral engagement (Voelkl, 2012). Gifted high school students who like their school and feel strong connections with their teachers evidence superior academic outcomes (Rita & Martin-Dunlop, 2011). Aspects of cognitive engagement such as self-discipline (Peterson, Duncan, & Canady, 2009) and grit (Duckworth & Seligman, 2005) have also been linked to greater academic performance.

Whereas engagement often reflects active involvement in a task, motivation for academic success pertains to intent and the underlying psychological processes that create a drive to learn and achieve, including competence beliefs, autonomy, and relatedness (Skinner & Pitzer, 2012). Despite theoretical distinctions, engagement and motivation are often examined together (for an example, see Martin, 2007). Interrelationships between the two constructs include the notions that (a) motivation may be necessary but not sufficient for engagement; (b) motivation supports engagement, which, in turn, leads to achievement; and (c) bidirectional associations exist, for instance: positive outcomes of engagement lead to success experiences at school, which leads to increased motivation (e.g., competence beliefs; Eccles & Wang, 2012). For gifted students, greater academic performance has been linked to positive attitudes towards learning and motivation for academic success (McCoach & Siegle, 2003a; Reis, Colbert, & Hebert, 2005).

In qualitative research with AP/IB students (n = 30), parents (n = 64), and teachers (n = 47) from six schools, students affirmed a strong work ethic and achievement motivation as critical to academic success, and often noted the importance of seeking and maintaining support from a broad network of peers, parents, and teachers (Shaunessy-Dedrick, Suldo, Roth, & Fefer, 2015). When asked what helped students succeed, adults echoed the merits of a strong achievement orientation, as well as participation in extracurricular activities, purposeful stress-management strategies, and support at home and school (Shaunessy et al., 2011).

Family factors. In the family context, authoritative parenting practices (Blondal & Adalbjarnardottir, 2014) and parental involvement in school (Wang & Sheikh-Khalil, 2014) have been shown to be positively related to high school students' academic engagement and achievement. Parenting practices within an authoritative style include high levels of both demandingness and responsiveness; in other words, conveying acceptance, support, and togetherness in combination with promoting age-appropriate independence and individuality. In addition to greater student engagement, positive correlates of authoritative parenting during the teenage years include higher rates of high school completion and postsecondary degree attainment (Blondal & Adalbjarnardottir, 2014; Majumder, 2016).

Current conceptualizations of parental involvement recognize three primary dimensions—school-based (e.g., attending meetings and events at school, communicating with teachers), home-based (e.g., homework support, creating a home that is conducive to learning via structure and access to educational materials), and academic socialization (e.g., conveying high expectations for achievement, preparing for college)—with higher levels of the latter two dimensions particularly salient to academic success among secondary students (Hill & Tyson, 2009). Literature on high-achieving students supports the relevance of family contexts for academic performance. Gifted children often come from intellectually stimulating homes with active parental involvement, exposure to academic and cultural experiences, and minimal conflict (Gottfried, Gottfried, Bathurst, & Guerin, 1994). Students in AP/IB also acknowledge that discord at home poses challenges to success at school, and emphasize emotional support and home-based forms of parental involvement in school as assets (Shaunessy-Dedrick et al., 2015).

School factors. High-achieving students have friendships with high-achieving peers (Ryan, 2001), relationships with supportive adults, and participate in multiple extracurricular

activities; whereas underachieving gifted students often lack positive peer networks and constructive use of after-school time (Reis et al., 2005). Similarly, AP/IB students, teachers, and parents describe connections to classmates that support academic excellence (e.g., form study groups) and create a sense of belongingness in the classroom (Shaunessy et al., 2011; Shaunessy-Dedrick et al., 2015) as helpful to student success. Student success may also be related to a school's supports for transitions and emotional or academic needs. For instance, after one district implemented policy changes that coupled increased access to accelerated courses with academic support for struggling students (e.g., after-school tutoring and content-specific "workshops"), the rate of IB diploma attainment increased (Burris, Wiley, Welner, & Murphy, 2008).

Student coping behaviors. Students' strategies for coping with academic challenges have been identified as critical predictors of student success. Skinner and Pitzer (2012) noted:

> … from episodes of effective coping may come the development of durable long-term motivational mindsets and skill sets, such as an autonomous learning style or mastery orientation, self-regulated learning, a positive academic identity, and eventually ownership for one's own progress in high school. (p. 24)

Accordingly, Reis and colleagues' (2005) longitudinal study of academically talented high school students indicated ties between academic success and coping through cognitive reappraisal and problem-solving strategies. Qualitative studies with samples of IB students (Suldo et al., 2008) and high school juniors enrolled in multiple college-level courses at highly selective private schools (Leonard et al., 2015) indicated that these youth perceive a variety of problem-focused, emotion-focused, and avoidance coping strategies as effective, with a unique emphasis on active attempts to manage academic demands through adaptive time and task management strategies as well as through sacrificing sleep. Attempts to manage academic

stressors through deliberate procrastination or substance use were largely acknowledged as ineffective—but not uncommon—strategies.

Coping behaviors described by youth can be grouped together for a more parsimonious examination with consideration of the function (a coping family) or a category/style (way of coping). A measure specific to how AP/IB students manage academic stress suggested 18 primary ways of coping, as assessed by the Coping with Academic Demands Scale (CADS; Suldo, Dedrick, Shaunessy-Dedrick, Fefer, & Ferron, 2015). Initial use of the CADS with 727 AP/IB students confirmed greater academic achievement and emotional well-being co-occurred with more frequent use of strategies involving time and task management and turning to family in response to academic stressors, whereas coping through reducing effort on schoolwork co-occurred with worse outcomes. In reflecting on factors that placed students at risk for adverse outcomes, many parents and teachers of AP/IB students described maladaptive coping strategies (e.g., procrastination, withdrawal, becoming emotional); they underscored the importance of strong organizational and time management skills to student success, as a general trait in addition to being relevant in times of stress (Shaunessy et al., 2011).

When AP/IB students have sufficient effective coping strategies, their curricular demands pose less risk and may even allow students to judge a stressor to provide an opportunity for growth. Such positive cognitive responses to a stressor made possible by task-focused coping skills are captured in the construct of eustress (“good stress”; McGowan, Gardner, & Fletcher, 2006). Eustress is accompanied by desirable psychological states, such as feelings of hope, vigor, meaningfulness, and positive affect, which further perpetuate task engagement (Nelson & Simmons, 2011).

Student demographic and past educational features. Teachers of AP/IB students often

cite perceived mismatches between the curriculum demands and some students' skill or ability level as detrimental to student success (Shaunessy et al., 2011). This concern with students' baseline level of skills is consistent with the reality that success in any academic pursuit is influenced by aspects of students' educational histories that are in place well before the course begins, such as academic preparation as reflected in rigor of prerequisite coursework (Burris, Heubert, & Levin, 2004) and prior grades and scores on standardized achievement tests (Casillas et al., 2012). Participation in specialized programs for students identified as gifted may also have a positive influence on a student's subsequent academic and socioemotional outcomes (Kim, 2016), although the variability in programming and selection of students poses challenges with understanding the potential impact of gifted education.

Student achievement can also be partly predicted by demographic variables. These include family resources, with learners from families with greater financial resources and parental education generally achieving higher academic performance (Casillas et al., 2012; Sirin, 2005); gender, with girls more likely to complete high school and earn good grades (Voyer & Voyer, 2014) but boys more likely to perform well on high stakes tests of content knowledge (O'Reilly & McNamara, 2007); and race and ethnicity, with higher levels of achievement found among Asian students (Hsin & Yu, 2014) and lower achievement among African-American and Hispanic students (Hemphill & Vanneman, 2010; Kao & Thompson, 2003; Vanneman, Hamilton, Baldwin Anderson, & Rahman, 2009) relative to the achievement of white students.

Study Objectives

The overarching purpose of this project was to empirically identify factors within high school students in AP and IB programs and within their environments that were associated with their academic performance and mental health. In addition to identifying bivariate correlates, we

looked for unique effects of intrapersonal and environmental predictors of student success in addition to other plausible factors such as students' prior academic skills and rigor of previous educational preparation (i.e., number of high school courses completed in middle school; 8th grade performance on statewide tests of curricular content proficiency), demographic features (i.e., gender, ethnicity, SES), and levels of stress stemming from academic demands, parent-child conflict, economic concerns, etc. The intrapersonal factors examined included achievement motivation; cognitive, affective, and behavioral forms of student engagement; strategies used to cope with academic demands and eustress; and organizational and time management skills. The family factors included authoritative parenting (emotional support, autonomy promotion) as well as indicators of home-based parental involvement in school and achievement expectations. The school factors included support perceived from classmates and available schoolwide. We explored potential interactions between predictors to identify, for example, environmental factors that may buffer students from experiencing poor outcomes in the face of specific stressor types, and predictors that may be especially salient for a demographic group.

Methods

Participants

The sample included 2379 students (n = 1229 in IB programs; n = 1150 in AP classes) from 20 programs (10 IB and 10 AP) from 19 schools across five geographically diverse school districts (1 rural, 2 suburban, 2 urban) from a southeastern state. Students were in grades 9 (25.4% of sample), 10 (27.1%), 11 (24.9%), and 12 (22.6%). The sample was diverse with respect to gender (37.8% male), socioeconomic status (27.7% eligible for free or reduced-price lunch; approximately 63% of mothers and 56% of fathers had college degrees or higher), race/ethnicity (49.4% Caucasian; 13.5% Asian; 12.3% Hispanic, 11.8% African American;

13.0% multiracial), and family language (10.7% of students were English Language Learners [ELL]; 89.3% not identified as ELL). Most ELL (10.1% of sample) had exited an ESOL program at least two years prior; the remainder ELL (0.6%) were enrolled in an ESOL program or receiving 2-year follow-up services. Over one-fourth of participants (28.2%) were identified as intellectually gifted.

Procedures

Data collection. From each of the 20 programs, two teachers per grade level recruited one class of students to participate in the research. Regarding participation rate, 61.5% of the targeted sample secured written parent permission, provided student assent, and completed the self-report measures. The research team administered the paper-and-pencil surveys to large groups of students in March – May 2012. In August 2012, districts provided the research team with participants' electronic transcripts, which included grades earned in high school courses, performance on end-of-course AP and IB exams as well as the statewide achievement test scores in 8th grade, and demographic characteristics.

Measures and indicators. Most constructs were assessed using data from students' school records or well-established self-report measures with evidence of reliability and validity among adolescents. Table 1 lists the predictor and outcome variables, sample items, support for reliability in the current sample, and references to studies that provide support for the measures' psychometric properties including evidence of validity. Reliability estimates reflect the Cronbach's alpha value for all items that contribute to the variable.

In the event an adequate measure was not available, we developed items that were grounded in sentiments expressed in qualitative studies of AP/IB students (Shaunessy et al., 2011; Shaunessy-Dedrick et al., 2015). Those new measures (i.e., Home Environment Scale,

Extracurricular Activity Scale) and measures from research with adults that we modified for youth, specifically the Eustress Scale (O'Sullivan, 2011) and Time Management Behavioral Scale (Mudrack, 1997), were piloted with 57 students (in grades 9, 10, and 12) in AP and IB courses just prior to this study. The sample of students in the pilot was not part of this study's 2379 participants, but was drawn from two of the schools that took part in this study. For these four measures, all items retained in data analyses are provided in Table 1 along with a summary of findings from our exploratory factor analyses (EFA) when applicable.

Overview of Analyses

We examined both bivariate and multivariate associations between predictors and outcomes to understand (a) the absolute magnitude of the bivariate link between any predictor and an outcome, and (b) the strength of association with an outcome after the other predictors and robust interactions between predictors were accounted for in a model. Our statistical modeling strategy was motivated by the recognition of the nested nature of our sample, the challenges inherent in the interpretation of parameter estimates when independent variables are correlated, interest in potential moderators, and the presence of missing data.

Nested sample. Because our sampling consisted of multiple levels, programs and then students within those programs, we worked within a multilevel modeling framework (Raudenbush & Bryk, 2002). Given the number of academic programs was relatively small (n = 20), we estimated the models using restricted maximum likelihood estimation (Dedrick et al., 2009) as operationalized in the Mixed Procedure in SAS. The intraclass correlations (ICCs) for the outcome measures of life satisfaction, psychopathology, school burnout, GPA, and AP/IB exam scores were .022, .014, .031, .066, and .345, respectively. To account for these between program differences we considered for each outcome a model where only the intercepts varied

randomly across programs (a relatively simple variance structure) and a model where the intercepts and all slopes varied randomly across programs (a relatively complex variance structure). For all but one outcome, the random intercept model provided better fit. For AP/IB exam scores, the fit improved with the addition of random slopes, χ_2 (32) = 65.1, $p < .05$. For this outcome, a sensitivity analysis was conducted comparing results of the model with and without random slopes. No differences were found in which fixed effects (i.e., regression coefficients) were and were not statistically significant. Given our research focus on the fixed effects and the similarity in fixed effect results across the simple and complex variance structure assumptions, we did not explore the models of intermediate complexity (i.e., the $1.71 \times 10_{10}$ models that have some fixed and some random slopes). For consistency and parsimony in model reporting, we present the findings for the random intercept models here (the findings from the random slopes models may be obtained from the authors).

Intercorrelated predictors. Because our predictor variables were expected to be intercorrelated we built our main effects model based on our review of the literature and included all constructs that were identified, as opposed to using variable selection strategies to choose among the identified constructs. When independent variables are correlated, variable selection strategies (e.g., stepwise) generally lead to biases in the estimates of the coefficients of the included variables (Whittingham, Stephens, Bradbury, & Freckleton, 2006), whereas it has been shown for multilevel models that the fixed effects are unbiased when all independent variables are included, even when the independent variables are correlated as high as $r = .70$ (Shieh & Fouladi, 2003). Still, multicollinearity is a concern because as the correlation among predictors increases the standard errors of the regression coefficients become increasingly biased as do the variance components (Shieh & Fouladi, 2003). To limit the potential negative effects of

multicollinearity, we included only a single variable for each construct we wanted represented in our model, which in some cases led to the creation of a composite variable from multiple conceptually and empirically correlated measures. For instance, the 18 scales on the CADS were factor analyzed yielding five higher-order factors that captured well the coping constructs we wanted to include in our model. Table 1 lists the CADS scales that comprise each coping composite retained for analyses. Similarly, multiple measures were combined to form composite variables of achievement motivation, cognitive engagement, behavioral engagement, affective engagement, authoritative parenting, socioeconomic status, and 8th grade academic skills (see Table 1). After creating composites, we ran preliminary analyses to examine the degree of multicollinearity among our predictors. The average absolute value of the correlation between predictors was equal to .11, with the strongest correlation being -.57 between authoritative parenting and stress from parent-child conflict. The four other large correlations ($r \geq .50$) were: student organizational skills with approach coping ($r = .55$) and cognitive engagement ($r = .56$), and cognitive engagement with motivation ($r = .55$) and approach coping ($r = .50$). A full intercorrelation matrix is available from the authors. The variance inflation factors (VIF) for the set of predictors ranged from 1.16 for eustress to 2.69 for cognitive engagement, all well below both the conservative limit of 5 and liberal limit of 10 (Craney & Surles, 2002).

Moderation. We grand mean centered all continuous predictor variables and considered all possible two-way interactions. At this juncture in our model development we went to a more exploratory approach because: (a) the previous research did not provide sufficient guidance to choose a priori among the 561 possible two-way interactions, and (b) the number of interactions was too large to include all interactions without creating multicollinearity problems and estimation instabilities. We randomly split the sample into two subsamples of equal size, the first

for exploration and the second for confirmation of the interactions that emerged in the exploratory sample. For the exploratory subsample we: (1) used Proc GLMSELECT, ignoring the nested structure of the data, to select an initial subset of two-way interactions, (2) ran Proc Mixed with multiple imputation to account for the nested structure of the data and missing data, where we initially specified the model to include all 34 main effects and the two-way interactions suggested by Proc GLMSELECT, and (3) stepped through a series of models using Proc Mixed (with multiple imputation) where we removed one non-significant interaction ($p > .05$) at a time until all remaining interactions were statistically significant, resulting in a range from four interaction terms for life satisfaction up to nine interaction terms for GPA. Given that there were so many interactions considered in the exploration (561 per outcome), the opportunity for an interaction to have been identified as a result of a Type I error was relatively large and thus we used the second subsample to confirm the interactions found in our exploratory sample. Specifically, the model that resulted from the exploratory sample was rerun with the confirmatory sample, and any interactions that were found to also be significant in the confirmation sample were retained for our final analyses.

Final models and residual analysis. The final models, which were estimated using the complete sample, were based on the a priori specification of the models' main effects coupled with the results of the previously described preliminary analyses, which were run to identify interaction terms and an appropriate variance structure. Each outcome y for the i_{th} student in the j_{th} program was modeled as a function of 34 main effects (Xs), k – 34 interaction terms (Zs), program level random error (u_j), and student level random error (e_{ij}). More formally,

$$y_{ij} = \beta_0 + \sum_{i=1}^{34} \beta_i X_i + \sum_{i=35}^{k} \beta_i Z_i + u_j + e_{ij}$$

$$u_j \sim N(0, \sigma_u^2)$$

$$e_{ij} \sim N(0, \sigma_e^2)$$

The residuals at each level of the model for each outcome were examined using the SAS macro MIXED DX (Bell, Schoeneberger, Morgan, Kromrey, & Ferron, 2010). The most notable departure from distributional assumptions was for GPA, which had negatively skewed residuals at level 1 (*sk* = -0.92, *ku* = 1.75) and negatively skewed residuals at level 2 (*sk* = -1.04, *ku* = 0.80). We chose not to transform it because the departure from normality was relatively mild, interpretations are more straightforward with the untransformed GPA scale, and our focus was on the fixed effects; when multilevel models are estimated using restricted maximum likelihood, their fixed effects are unbiased and the corresponding standard errors are accurate even when there are more severe departures from normality than we encountered (Maas & Hox, 2004).

Treatment of missing data. To minimize the amount of missing data a research team member privately skimmed over each page in the survey packet as students returned the packets. During this response verification process, students were shown any items that were skipped or had multiple responses, and asked to recheck their response. For all variables from the survey packet and most district collected variables the amount of missing data was negligible (0% missing data on 33 variables and < 0.5% missing data on five other variables). There were two district collected variables, however, where the amount of missing data was notable. First, 13.5% of the participants had missing values for their 8th grade achievement as measured by the Florida Comprehensive Assessment Test (FCAT), presumably due to students who moved into the district or moved from a private school into a public school; and 10% of the sample had no value for AP/IB exam scores, mostly underclassmen in the pre-IB curriculum who had yet to take an AP or IB exam. Because listwise deletion would result in the loss of over 5% of the sample, the

results presented here are based on multiple imputation (Graham, 2009) with 50 imputed data sets. The imputed data sets were obtained using the MI Procedure in SAS using all of our analysis variables. The results of the multilevel modeling analyses were aggregated across the 50 imputed data sets using the MIANALYZE Procedure in SAS. Analyses based on listwise deletion are available from the authors and the findings were similar to those based on multiple imputation, with strong correlations between the standardized effects obtained from the two missing data treatments (*r* ranges from .971 for AP/IB exam scores to .997 for psychopathology).

Results

Descriptive Statistics for the Mental Health and Academic Outcomes

The sample evidenced considerable diversity on academic and mental health outcomes. Regarding the latter, the mean score for life satisfaction was 4.26 (*SD* = 0.96; range = 1.00 to 6.00), comparable to the average score (4.24, *SD* = 1.04) from research with a general sample of 500 teenagers recruited from all academic tracks within large public high schools that did not offer IB (Suldo, Gelley, Roth, & Bateman, 2015). A mean score ≥ 4.0 is generally considered in the positive range, as seen in about 66.5% of participants in the current sample. On the measure of psychopathology, the sum raw scores of symptoms (*M* = 25.66, *SD* = 11.56; range = 0 to 78) indicted that 15.1% of participants fell in the range for elevated risk for having or developing a behavioral or emotional problem, based on the threshold (*T* > 60) established in the combined-gender norms for 15-18 year olds; 13% of youth in the national normative sample (*n* = 1000) were classified in the elevated risk range (Kamphaus & Reynolds, 2007). The mean level of school burnout (an indicator of emotional distress specific to the school context) was 3.60 (*SD* = 1.07; range = 1.00 to 6.00), with 71% of students endorsing symptoms of burnout (i.e., mean scores greater than 3.0). Mean burnout scores from other samples of American youth are

currently not available.

On academic outcomes, the mean GPA for courses completed in the spring 2012 semester was 3.29 (*SD* = 0.63; range = 0.33 to 4.00), with 75.7% of students having a mean GPA at or above the "B" range (≥ 3.0). On the variable reflecting average score on AP and IB exams taken that school year (variable scaled on the AP metric, as described in Table 1), the mean score was 2.56 (*SD* = 1.10; range = 1.00 to 5.00), with 42.9% of participants having an average AP/IB exam score ≥ 3.0, which typically constitutes a passing score. A closer look at AP exam participation among the 2034 students in the sample who took at least 1 AP exam indicated an average of 2.1 exams (*SD* = 1.4) with a positively skewed distribution: 47.2% took 1, 22.8% took 2, 16.1% took 3, 6.8% took 4, 4.5% took 5, 1.9% took 6, 0.5% took 7, and 3 students (0.2% of students in AP courses) took 8 or 9 exams. Regarding performance, the average AP pass rate (number of AP exams with score ≥3 / number of AP exams taken) among these students was 49.1%. According to the College Board, of students in grades 9 – 12 (*n*=4,622,435) taking AP exams in 2016, 57% earned a 3 or better (College Board, 2016a). In the state from which the current sample was drawn, 50.9% of all students taking AP exams earned a 3 or higher (2016b). For both the state and nation, these percentages include both public and private school students. Regarding performance in IB, 74.7% of IB seniors in the sample (*n* = 300) earned the IB diploma. According to a representative from the IBO (E. Vanderkamp, personal communication, October 4, 2017), the IB diploma pass rate for public schools in the state from which this sample was drawn is 74.1%, and the pass rate for public schools in the U.S. is 65.6%.

Bivariate Relationships between Predictors and Student Outcomes

Table 2 presents correlations between the indicators of student success in the mental health and academic domains. The correlations between the three mental health measures were

moderate to large, ranging from .43 to .62, as was the correlation between the two indicators of academic achievement (r = .42). The correlations between mental health and academic achievement variables were small, ranging from .08 to .22.

Table 2 also presents correlations between the 34 predictor variables and the five mental health and academic outcomes. Similar patterns in the correlations can be seen across the mental health outcomes, with higher levels (i.e., $r \geq .20$) of life satisfaction and lower levels of psychopathology and burnout being associated with higher levels of student motivation, engagement (especially cognitive and affective), classmate support, family support (especially authoritative parenting and home support for learning), student organizational skills, coping though approach strategies, less frequent coping alone or through avoidance or rumination, and lower levels of stressors. There were small to no associations between mental health outcomes and student demographic features or past educational history.

The patterns of correlations with predictors were similar for the two academic achievement variables, but these patterns were in some respects distinct from what was seen for the mental health outcomes. As with the mental health outcomes, better academic outcomes were associated with (i.e., $r \geq .20$) higher levels of motivation, cognitive engagement, home support for learning, and lower levels of avoidance coping. Higher levels of academic achievement were associated positively with academic skills in 8th grade, rigor of middle school courses, gifted education, higher SES, participation in IB, and schoolwide academic supports—all variables that had small or very small associations with most mental health outcomes.

Multivariate Relationships between Predictors, Interactions between Predictors, and Each Mental Health and Academic Outcome

The multivariate models for life satisfaction, psychopathology, school burnout, academic

GPA, and AP/IB exam scores explained an estimated 48%, 64%, 55%, 32%, and 47% of the outcome variance, respectively. A summary of the results of the multilevel models is provided in Table 3 (limits of 95% confidence intervals for the model parameters) and Table 4 (standardized effect size estimates). Perusal of these tables shows that for each outcome, the effects sizes varied across predictors. Given the descriptive nature of this study, we focus on the size of the effect estimates in our presentation of results. We highlight the factors that either had a standardized effect estimate (β) of at least .10 for an outcome, or had β estimates of at least .05 for two outcomes in the same domain (i.e., at least two of the three mental health outcomes, or both academic outcomes). A β of .10 represents a small effect; in a study comparing a treatment group to a control group of equal size, a β of .10 would equate to a *d* of .20. The detection of multiple smaller effects is of practical significance in light of consistency across outcomes.

Promotive factors. When higher scores on a factor were associated with more desirable outcomes, we considered the factor to be a potentially promotive factor (Masten et al., 2009). Factors that were associated with better mental health as reflected in higher life satisfaction (LS), lower levels of psychopathology (P), and/or lower levels of school burnout (SB) were achievement motivation (β_{LS} = .12, β_{P} = -.16, β_{SB} = -.20), cognitive engagement (β_{P} = -.14, β_{SB} = -.13), affective engagement (β_{LS} = .08, β_{P} = -.09, β_{SB} = -.08), authoritative parenting (β_{LS} = .22, β_{P} = -.19, β_{SB} = -.06), approach/problem-focused coping (β_{LS} = .09, β_{P} = -.09, β_{SB} = -.06), and grade level (β_{LS} = .06, β_{P} = -.07). Factors associated with higher achievement as reflected in higher course grades (GPA) and/or higher AP and IB exam scores (Exams) were motivation (β_{GPA} = .05, β_{Exams} = .13), cognitive engagement (β_{GPA} = .26), eustress (β_{GPA} = .08, β_{Exams} = .08), 8th grade academic skills (β_{GPA} = .34, β_{Exams} = .40), and SES (β_{GPA} = .12, β_{Exams} = .09).

Risk factors. When higher scores on a factor were associated with less desirable

outcomes, we considered the factor to be a potential risk factor. The factors associated with worse mental health included avoidance coping (β_P = .09, β_{SB} = .15), alone coping (β_{LS} = -.13, β_P = .11, β_{SB} = .10), stress from parent-child conflict (β_{LS} = -.05, β_P = .05), stress from academic/ social struggles (β_P = .11), stress from family financial problems (β_{LS} = -.19, β_P = .05), stress from academic requirements (β_{SB} = .30), and stress from major life events (β_{LS} = -.10, β_P = .05). The potential risk factors for achievement variables were avoidance coping (β_{GPA} = -.13), stress from parent-child conflict (β_{GPA} = -.11, β_{Exams} = -.08), and stress from major life events (β_{GPA} = -.10). Each of these risk factors for academic achievement potential was also a mental health risk factor.

Mixed factors. There were some factors that were potentially promotive of mental health, while being potential risk factors for academic achievement. Specifically, classmate support was promotive of higher life satisfaction (β_{LS} = .05) and lower psychopathology (β_P = -.16), while also being related to lower GPA (β_{GPA} = -.07) and lower AP/IB exam scores (β_{Exams} = -.06). Similarly, coping through diversions appeared promotive of all mental health variables (β_{LS} = .09, β_P = -.08, β_{SB} = -.07) while being related to lower AP/IB exam scores (β_{Exams} = -.09). Conversely, there was a factor that was potentially promotive of academic achievement while being a risk factor for mental health. Coping through rumination had slight positive relationships with both GPA (β_{GPA} = .07) and AP/IB exam scores (β_{Exams} = .05), while being consistently associated with worse mental health outcomes (β_{LS} = -.15, β_P = .23, β_{SB} = .22).

Moderation of effects. There were no significant interactions among the predictors within the confirmation subgroup for life satisfaction, psychopathology, or AP/IB exam scores. There were two moderated relationships for school burnout and one for GPA; the magnitude and direction of these effects are included in Tables 3 and 4. For the most part, the effects of

promotive and risk factors did not appear to be meaningfully moderated by other factors. The one exception was that the promotive effects of motivation on school burnout were strengthened when there were higher levels of cognitive engagement ($\beta_{SB} = .10$).

Discussion

This study determined levels of success of high school students in rigorous college-level courses, namely Advanced Placement (AP) and International Baccalaureate (IB) classes, and identified factors associated with the variability observed in multiple dimensions of success. This study is unique in scale and design in that it consisted of a large and diverse sample of 2379 students in AP and IB across 19 high schools, and explored a range of potential intrapersonal and environmental predictors of student success. Additionally, this study broadened the conceptualization of student success to include multiple indicators across two domains--academic achievement (GPA and AP/IB exam scores) and mental health outcomes (life satisfaction, psychopathology, and school burnout).

Using this multidimensional conceptualization of success, we identified sizable percentages of AP/IB students with suboptimal functioning (i.e., 15 – 33% of students evidenced low emotional well-being as reflected in levels of life satisfaction, mental health problems, or academic burnout; nearly a quarter of students had GPAs under a 3.0; and less than half of students earned passing scores on their AP/IB exams). These findings challenge the assumption that students in accelerated curricula may be less in need of supports by mere virtue of their history of academic success that led to enrollment in AP/IB classes. Instead, the presence of a sizeable number of youth with low life satisfaction, symptoms of psychopathology risk or academic burnout suggest that AP/IB students mirror typical teenage development, which is marked by increases in frequency of mental health problems (Merikangas et al., 2010).

This variability in mental health and academic outcomes that includes less than optimal outcomes for some of these students raises questions about what factors might be associated with success. The current study is among the first large-scale efforts to explore factors associated with resiliency among teenagers in AP/IB. Findings suggest a number of intrapersonal and environmental assets—that is, variables for which higher levels predict more positive outcomes—exist for AP/IB students that may offset the risk posed by stressors inherent to the rigorous curricular context. In the following sections we discuss these factors and identify those that may be malleable and amenable to interventions designed to improve student outcomes.

High School Educational Context

Program. As noted in the introduction, the AP and IB academic environments share some characteristics (e.g., increased academic demands) but have some unique features, such as curricular structure. We explored differences on student outcomes between the AP and IB environments and found no substantial differences on student mental health outcomes but did find that students in IB had lower GPAs (when controlling for other variables) but higher AP/IB test scores. Additionally, no substantial interaction effects were observed between curriculum type (IB vs. AP) and any of the other predictors we explored. This lack of robust moderation provides some support for the notion that associations between predictors and outcomes are relatively similar for students in accelerated programs whether it be AP or IB classes.

Stressors. Consistent with research indicating inverse links between stress and functioning, lower academic outcomes were observed among AP/IB students who experienced more stressors stemming from parent-child conflict and major life events. More frequent stressors associated with academic demands predicted greater academic burnout. This trend is consistent with other studies with AP/IB samples, which found stress due to academic

requirements posed greater risk to mental health (i.e., lower life satisfaction, greater psychopathology) than to grades (Suldo et al., 2009; Suldo, Dedrick, Shaunessy-Dedrick, Roth, & Ferron, 2015). The current study also uncovered relatively strong bivariate associations of stressors indicative of family financial problems and academic and social struggles with worse mental health among AP/IB students. These sources of stress that stem from children's environments may be important considerations when providing support to a struggling student, or to target through ecological interventions with parents or educators.

Intrapersonal, Environmental, and Demographic Factors Associated with AP/IB Student Outcomes

Engagement. Findings from this study support student engagement as a factor associated with success of AP/IB students. Specifically, academic motivation as well as cognitive and affective forms of engagement appeared promotive of mental health outcomes, and motivation and cognitive engagement also uniquely predicted superior academic outcomes. These findings are consistent with research with samples of first-year college students, in which indictors of motivation (e.g., academic self-efficacy; Krumrei-Mancuso, Newton, Kim, & Wilcox, 2013) and cognitive engagement (e.g., perseverance, self-regulated efforts towards high academic goals; Robbins, Allen, Casillas, Peterson, & Le, 2006) emerged as robust predictors of academic outcomes such as university GPA (Richardson, Abraham, & Bond, 2012), whereas indicators of behavioral and affective engagement predicted mental health (i.e., life satisfaction; Krumrei-Mancuso et al., 2013) and retention at 4-year universities (Robbins et al., 2006) but not GPA. Regarding the potential malleability of student engagement, improvements in adolescents' affective and cognitive engagement have followed experimental tests of school-based interventions intended to foster healthy relationships and positive emotions (Shoshani,

Steinmetz, & Kanat-Maymon, 2016).

Family. Among AP/IB students, student perceptions of authoritative parenting practices had a relatively strong association with mental health outcomes. The positive associations of authoritative parenting practices with student success extends research with general samples of youth (Blondal & Adalbjarnardottir, 2014) to AP/IB students in high school, and underscores the potential role of parental warmth and autonomy promotion in positive mental health. While parenting may be a more malleable target in the earlier years of childrearing before practices become habitual, experimental tests of programs that teach parents of adolescents positive parenting skills that are foundational to forming strong relationships and managing misbehavior effectively have demonstrated reductions in dysfunctional parenting practices, parent-adolescent conflict, and adolescent problem behavior (Chu et al., 2015). Just as home-based forms of parental involvement have predicted positive outcomes among general samples of adolescents (Hill & Tyson, 2009), greater perceptions of home support for learning predicted higher life satisfaction among AP/IB students although were unrelated to academic success.

Coping. Other studies have established student coping as related to success among high school students in college-level classes (Leonard et al., 2015; Shaunessy-Dedrick et al., 2015; Suldo et al., 2008). The coping styles observed in earlier studies of AP/IB students were reduced to five categories in the current sample. The largest category included six ways of coping that converged into a factor that we termed “approach.” Several coping styles in this approach factor had been classified by other researchers as adaptive, including responding to academic stress through time and task management strategies, seeking support from academic sources, seeking comfort from family and spiritual sources, self-encouragement and strengthening commitment through cognitive reappraisal (Skinner, Pitzer, & Steele, 2013). Accommodating stressors

through distractions such as temporary diversions and relaxation methods appears to also be applicable to managing uncontrollable stressors (Zimmer-Gembeck & Skinner, 2011), which include the intense academic demands that are intrinsic to the AP/IB curricula. We found that coping with academic demands through approaching the stressors using problem-focused or emotion-focused strategies had promotive effects across indicators of students' mental health. In contrast, coping with academic stressors through more frequent isolation or avoidance strategies appeared to pose risk to mental health and/or academic outcomes. Avoidance behaviors include responding to academic stress by skipping school, sleeping, using substances, giving up on or otherwise stop doing schoolwork, and taking shortcuts on schoolwork akin to cheating. Such inverse associations with desirable outcomes are consistent with other work deeming social isolation and escape strategies as maladaptive ways of coping (Skinner et al., 2013). Support for the malleability of student coping behaviors comes from experimental tests of school-based interventions targeting stress management that have shown improvements in adolescents' coping skills (Frank, Kohler, Peal, & Bose, 2017; Hampel, Meier, & Kummel, 2008).

Some categories of coping behaviors had mixed associations with outcomes. For instance, coping with academic stressors by seeking diversions (taking breaks to do athletic, social, or tech/media activities) predicted better mental health, but lower scores on AP/IB exams. It is possible that such breaks from schoolwork that may preserve mental health come at the cost of time on task in the event students do not readily return to academic demands. Focusing on negative features of the problem during times of stress, by co-ruminating with classmates and venting to other friends or by becoming emotional (i.e., reacting to the stressor by getting mad or annoyed, by yelling, or by panicking about the problem without trying to fix it) co-occurred with *worse* mental health, but predicted *better* grades and test scores in multivariate analyses. Such

associations are consistent with Skinner and colleagues' (2013) conceptualization of rumination as maladaptive because "it exacerbates distress and uses up mental resources needed for the task at hand" (p. 811) but nevertheless is associated only weakly with some potential assets (student engagement, persistence in the face of academic challenges) and only mildly associated with other maladaptive ways of coping.

Individuals who perceive adequate resources to navigate a situation (i.e., effective coping skills) are more likely to appraise stressors with a positive valence rather than as posing risk (McGowan et al., 2006). Nelson and Simmons (2011) posit that such experiences of eustress facilitate engagement with the stressor; in the case of AP/IB students' academic demands, this benefit would translate to student engagement. Accordingly, the current study found support for small but consistently positive associations of eustress with academic outcomes (GPA and test scores). Similar to findings with college students (O'Sullivan, 2011), the association between eustress and life satisfaction was positive in bivariate analyses, but weaker when motivational constructs were included in multivariate models. Prior support for eustress as a malleable intervention target is lacking; most extant literature on eustress is at the theoretical level or comes from studies of stress response in the workplace (occupational tasks demands).

Demographic features and educational history. In line with societal trends toward greater access to AP/IB for diverse populations, we were especially interested in uncovering factors that could ultimately be targeted in supports for AP/IB students. Nevertheless, we also examined the effects of relatively static demographic and prior educational factors that have been identified as relevant to student success. Achievement in middle school, as indicated by performance on a statewide test of reading, math, and science skills in 8th grade, was the strongest single predictor of AP/IB students' academic outcomes. The robust relationship

between academic skills in middle school and later academic success in AP/IB has important policy implications regarding the additional supports likely needed for high school students who pursue accelerated courses but fared less well on high-stakes tests in middle school. The demographic variables with the strongest associations with AP/IB student outcomes were SES and gender. Effects are largely consistent with trends seen in general samples, with greater academic performance predicted by higher family SES (Sirin, 2005), and girls earning better course grades whereas boys score higher on high-stakes end-of-course exams (O'Reilly & McNamara, 2007; Voyer & Voyer, 2014). However, our findings do not suggest that participation in AP/IB in high school by students with lower middle school achievement and/or fewer family economic resources would be responsible for harmful effects on student emotional well-being, as mental health outcomes were virtually unrelated to factors within students' prior educational histories and had small (if any) associations with SES level.

Factors with Less Robust Effects on Student Outcomes

Behavioral engagement. The small, positive associations between students' extracurricular activity involvement and their life satisfaction and academic outcomes that were apparent at the bivariate level were not practically meaningful in multivariate analyses. Given that participation in extracurricular activities provides a means of connecting to one's school (affective engagement), more research on school-based extracurricular activity participation and/or other forms of behavioral engagement (i.e., on-task classroom behavior) using potentially more reliable or focused measures is warranted prior to making conclusions about this predictor.

Student organizational skills. At the bivariate level, students who reported frequent use of time management behaviors were also more likely to earn better grades and had more positive mental health. However, such organizational skills yielded weak relationships when other

predictors were considered in multivariate models, including variables like approach coping and cognitive engagement that had large correlations with students' organizational skills. Research on predictors of success among first-year college students has also found small, significant correlations between student organizational skills and concurrent and later (end-of-year) GPA, but no effect on later GPA after accounting for prior GPA (Krumrei-Mancuso et al., 2013).

Many family and school factors. Unique associations between parents valuing achievement and student outcomes were weak, which contrasts findings among a typical high school sample in which academic socialization predicted better grades and less psychopathology (i.e., depressive symptoms; Wang & Sheikl-Khalil, 2014). Among AP/IB students, conveying high expectations for achievement including college enrollment (as reflected in our "parents value achievement" construct) is more likely to be the rule than the exception.

Potential environmental influences at school (i.e., classmate social support, schoolwide academic supports) yielded mixed or weak associations with outcomes once other salient factors were included in multivariate models. In bivariate analyses, higher levels of schoolwide academic supports (i.e., preparation for entry to AP/IB, as well as ongoing guidance and tutoring services for AP/IB students) co-occurred with better AP/IB exam scores but were unrelated to student mental health. In multivariate analyses, the schoolwide academic supports variable did not have a sizable association with mental health or academic outcomes, supporting the notion that greater differences in student outcomes are more likely to be seen within rather than between programs. Regarding the anticipated facilitative effect of peer relations, although the bivariate association between classmate support and GPA was positive, classmate support had small but consistently negative associations with grades and exam scores after controlling for the other predictors. It is plausible that students doing less well in school may seek more help from and

proximity to individuals in their support network. Taken together, the aspects of students' school environment examined in this study yielded weak negative associations with academic outcomes but some positive relationships with mental health in the case of classmate support.

Prior education. Regarding rigor of middle school coursework, more courses taken for high school credit and gifted education co-occurred with better grades and test scores at the bivariate level, but were not unique predictors in multivariate analyses perhaps due in part to the moderate to large overlap among these predictors (i.e., based on the imputed samples, 8th grade academic skills correlate .39 with rigor of middle school courses and .45 with gifted identification; r = .35 between rigor and gifted).

Study Limitations and Directions for Future Research

The dataset collected and analyzed for this study featured a large sample of high school students from all grade levels, purposely sampled from 20 academic programs in five diverse districts. Further, a multimethod, multisource approach to data collection yielded psychometrically sound variables of a wide range of constructs relevant to high school students' success. Nevertheless, conclusions from this study are limited by the exploratory nature of the study and the cross-sectional nature of the data. Variables conceptualized as predictors based on extant research were measured at the same time as the mental health outcomes and during the same semester as the academic outcomes. Additional studies with longitudinal designs are needed to more fully explore the academic and social-emotional development of students pursuing AP and IB courses, and to test hypotheses about the relationships that emerged in our study. Also, because of our interest in individual (student) variables, as opposed to organizational variables, we sampled 2379 students from just 20 programs, which limited us to considering only two program-level variables (i.e., schoolwide academic supports and whether the academic

program was AP or IB). Future research could sample a larger number of schools to look more completely at the links between student success and organizational level factors, such as school composition based on students' SES, race/ethnicity, and number of office discipline referrals. Further, we did not collect data from a comparison sample of general education students. Thus, it is unknown if predictors of student success for AP/IB students are truly unique from predictors among general samples of adolescents; a comparable study with the same set of predictors in relation to the same broad set of mental health and academic outcomes has yet to be published.

Summary of Key Findings

Numerous intrapersonal and environmental factors predicted AP and IB student success, particularly indicators of mental health. Promotive factors (assets) for mental health include students' ways of coping with academic demands (i.e., through an approach/problem-focused coping style), motivation to achieve, affective and cognitive forms of student engagement, and authoritative parenting practices. On the other hand, worse mental health was associated with the following risk factors: stressors that stem from home (e.g., parent-child conflict, financial problems) and school (e.g., academic and social struggles, academic requirements), as well as responding to academic stressors through coping styles marked by avoidance and social withdrawal. AP/IB students' academic outcomes were most strongly associated with their educational histories, especially academic skills in 8th grade. In addition to family SES, other promotive factors of academic outcomes include students' achievement motivation and cognitive engagement, and to a lesser extent the frequency they experienced eustress. Risk factors for worse academic outcomes included higher levels of parent-child stressors and greater tendencies to respond to school-related stress through avoidance. Taken together, these findings with AP/IB students add to the literature that demonstrates that success in high school (Casillas et al., 2012;

Wang & Sheikh-Khalil, 2014) and college (Krumrei-Mancuso et al., 2013; Richardson et al., 2012; Robbins et al., 2006) is predicted by a combination of prior academic achievement, demographic, psychosocial (e.g., motivation, behaviors that reflect student engagement, connectedness to school, parenting practices), and school context factors.

Implications for Targets of Intervention Development

Research findings pertinent to the malleable factors that may function as promotive or risk factors can inform subsequent intervention development and research efforts. Supports for students who are achieving academically but whose emotional health is unknown are relatively unaddressed. This omission is critical given the stress elevations in AP/IB students (Suldo & Shaunessy-Dedrick, 2013a), and links between stress and diminished emotional and academic outcomes (Suldo et al., 2009). Though interventions have been developed to support historically underrepresented college students (e.g., AVID, Upward Bound), we identified no programs that focused exclusively on the social-emotional needs or resiliency factors for AP/IB students, assessed impact on student stress or mental health outcomes, or included components to support students' emotional well-being. In short, there is an unmet need for educational supports specific to the growing population of AP/IB students.

The process of developing any educational intervention generally starts with foundational research to inform the design and developmental of a theory-driven intervention, which can then be assessed for impact on the intended outcomes via efficacy trials (Institute of Education Sciences and the National Science Foundation, 2013). This study exemplifies an early-stage process, namely exploratory research that identified correlates of desirable student outcomes with an emphasis on potentially malleable factors. Subsequent ideas for intervention development are offered tentatively, given the aforementioned limitations of the current study,

the need for research to determine the degree to which presumed malleable factors are indeed malleable, and the relatively small body of literature specific to students in AP and IB.

Key findings from this study suggest plausible intervention targets include: 1) ways of coping with academic stressors, specifically teaching students to use more approach based strategies in place of strategies rooted in avoidance or handling stress alone, 2) student engagement, specifically interventions designed to increase cognitive and affective engagement as well as motivation, and 3) authoritative parenting, where the intervention could facilitate parents learning strategies to increase parental warmth and autonomy promotion. Interventions may be considered that consist of preventative (universal) and tertiary (selective) social-emotional and academic supports for the growing population of AP/IB students. Conley, Durlak, and Dickson (2013) found that students in college-level courses benefit most from social-emotional interventions that (a) are skill-oriented and provide ample opportunities for practice, (b) use cognitive-behavioral and mindfulness strategies, and (c) are implemented as a class, as compared to small group or individual modalities. The especially positive outcomes from skill-oriented interventions suggests that psychoeducation (e.g., teaching AP/IB students that their coping behaviors, and affective connections to teachers, school, and parents appear to matter with respect to their emotional and academic functioning) may be a reasonable first step to supporting AP/IB students, but unlikely to be sufficient to improve outcomes. Involving key stakeholders in interventions may help facilitate student application of key points to classroom and home settings. Future research is needed to test the efficacy of any resulting multicomponent interventions for impacting the mental health and academic outcomes of high-achieving students in AP classes and IB programs.

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Table 1
Indicators of Constructs Examined through Student Self-Report and School Records

Construct	Description of Source Indicators (Measure, Number of Items, Sample Item, Response Metric)	α
	Predictors	
Achievement Motivation	Average score of two scales that assess psychological processes that create a drive to learn and achieve per self-determination theory, namely competence beliefs and autonomy in learning: *Academic Self-Perceptions*[1], reflecting perceived academic capabilities and skills (7 items; I can learn new ideas quickly in school), and *Flow*[2], reflecting perceived control, automaticity, and absorption when taking part in AP/IB classes (9 items, copyrighted). All items on the SAAS-R[1] rated from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). Item about flow in AP/IB classes rated from 1 (*Never*) to 5 (*Always*).	.87
Engagement: Cognitive	Average score of three scales that assess academic goal setting, self-regulation, and strategizing: *High Standards*[3], reflecting student expectations for personal performance or adaptive perfectionism (7 items; I expect the best from myself), *Grit*[4], reflecting perseverance and passion for long-term goals (8 items; I finish whatever I begin) and *Self-Regulation*[1], reflecting personal efforts to maintain goal-directed academic behavior (10 items; I check my assignments before I turn them in). Items about standards rated from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). Item about grit rated from 1 (*Not Like Me At All*) to 5 (*Very Much Like Me*).	.92
Engagement: Behavioral	Average score of two standardized scales developed[5] to assess *breadth* and *intensity* of participation in extracurricular activities. Modeled after a 2-indicator approach capturing diversity and frequency of extracurricular involvement (Bryan et al., 2012). Breadth reflects total number of types (range = 0 to 8+) of extracurricular activities in which student takes part (14 items; yes/no involvement this school year in… Sports and athletic teams? Performing arts and music? Art and hobby clubs? Academic teams and honor societies? Career-related clubs? Community youth clubs like Scouts? Religious or spiritual activities at school or in community? Publications? Student government? Service/volunteering? Special interest or diversity clubs? ROTC? Other activity [specify up to 2]?). *Intensity* reflects total hours spent weekly in extracurricular activity (1 item; on average, in a typical week during this school year, how much time do you spend in all extracurricular activities (including ones at school and those in the community)? Response options: none/0, up to 1 hour, 1-4 hours, 5-9 hours, 10-19 hours, 20+ hours).	.59
Engagement: Affective	Average score of three scales that assess students connectedness and belongingness, as indexed by positive appraisals of three aspects of school: *Attitudes towards Teachers*[1], reflecting perceiving AP/IB teachers as supportive and effective (7 items; My AP/IB teacher(s) care about me), *Attitudes towards School*[1], reflecting pride in one's school (5 items; I am glad that I go to this school), and (c) *Program Satisfaction*[6], reflecting a positive global appraisal of one's academic program (1 item; I am satisfied	.93

	with my AP classes [IB program]; rated from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*)).	
School: Classmate Support	Mean of 12 items that reflect *Social Support from AP/IB Classmates*[7], as evidenced in four types of support: emotional, informational, appraisal, and instrumental (My AP/IB classmates… treat me nicely; … give me good advice). Items rated from 1 (*Never*) to 6 (*Always*).	.93
School: Schoolwide Academic Supports	From school administrators' coded responses to a semi-structured questionnaire about organizational features of the school at its AP/IB program, sum of level of *Schoolwide Academic Supports*[8] (range 0 – 8) offered at the high school to supplement students in-class instruction, through three paths: tutoring (0 = no tutoring; 1 = up to 1/3 of teachers offer tutoring before, during, or after school; 2 = approximately 1/3 to 2/3 of teachers tutor; 3 = 2/3 to all teachers offer tutoring), support personnel (0 = no student support services for AP/IB students beyond services offered to all students at school; 1 = guidance counseling tailored to AP/IB; 2 = counselor or other support person dedicated to AP/IB program), and universal supports for transitions or stress management (0 = no preventative programs or support strategies;1 to 3 points corresponding to number of developmental points when supports are offered to all students via workshops, assemblies, course content, etc., specifically (a) before they begin AP/IB classes, (b) during the AP/IB program, and/or (c) other transition points such as before 12th grade).	
Family: Authoritative Parenting	Average score of two scales that assess dimensions of authoritative parenting: *Responsiveness*[9], reflecting perceived emotional support, availability, and warmth provided by parents (5 items; My parent(s) spends time just talking to me), and *Autonomy Granting*[9], reflecting perceived freedom and respect for privacy permitted by parents (5 items; My parent(s) believes I have a right to my own point of view). Items rated from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*).	.86
Family: Home Environment is Conducive to Learning	Mean of 11 items developed[10] to assess characteristics of one's home that parents, teachers, and youth feel influence students' success, specifically family routines (I go to bed the same time on school nights; My family eats meals together regularly; I have a routine or a set time for completing my homework on school days), tech supplies (I can access a computer for schoolwork when needed; I can access the Internet for schoolwork when needed), valuing homework (My parent(s) give me fewer chores (or responsibilities) so that I can focus on schoolwork; I typically have a specific place in my home to do homework; Distractions beyond my control are minimized while I am doing my homework, e.g., the home is quiet, few interruptions), and proximity to adults (My parent(s) or other adult family member(s) are typically home when I'm home; My parent(s) or other family member(s) check to make sure I am completing my homework; My family can provide me transportation to before and after school activities). An EFA suggests the measure is not strictly unidimensional (eigenvalues=2.8, 1.7, 1.0) but the minor factors did not have sufficient reliability to warrant separate factors and all items load >.45 on the primary factor. Items rated from 1 (*Never*) to 5 (*Almost Always).*	.73

Family: Parents Value Achievement	Mean of 9 items assessing parental involvement in school through expressed *Achievement Values*[11], reflecting students' perceptions that their parent(s) view education as a central focus of youth, hold high expectations for their child's academic achievement during high school and beyond (My parent(s) thinks I should go to college), and espouse a strong work ethic (My parent(s) think that getting ahead in life is very important). Items rated from 1 (*Very Unlike*) to 5 (*Very Like).*	.83
Student Coping: Approach and Problem-Focused	Average score of six scales that assess the frequency with which students respond to academic demands through six strategies: *Time and Task Management*[12] (6 items; Use a planner to keep track of activities and assignments due), *Cognitive Reappraisal*[12] (4 items; Adopt an optimistic or positive attitude), *Turn to Family*[12] (3 items; Talk to parent(s) about what's bothering you), *Seek Academic Support*[12] (3 items; Get extra help for class from tutors), *Spirituality*[12] (3 items; Pray), and *Relaxation*[12] (2 items; Take deep breaths). All items on the CADS[1] rated from 1 (*Never*) to 5 (*Almost Always*).	.85
Student Coping: Diversions	Average score of three scales that assess the frequency with which students respond to academic demands through seeking temporary diversions, through three strategies: *Athletic Diversions*[12] (3 items; Exercise [run, go to the gym, swim, dance, etc.]), *Social Diversions*[12] (3 items; Hang out with friends), and *Technology Diversions*[12] (3 items; Watch TV or videos).	.67
Student Coping: Avoidance	Average score of five scales that assess the frequency with which students respond to academic demands through five strategies: *Skip School*[12] (3 items; Take a day off from school to get work done), *Sleep*[1] (3 items; Take naps), *Reduce Effort on Schoolwork*[12] (4 items; Stop trying [give up]), *Reduce Academic Demands*[12] (3 items; Share [split-up] assignments with classmates) and *Substance Use*[12] (3 items; Drink alcoholic beverages, such as beer, wine, liquor, etc.).	.81
Student Coping: Alone	Mean of the 4 items on the *Handle Problems Alone*[12] (Keep problems to yourself) scale that assesses the frequency with which students respond to academic demands through strategies involving social withdrawal and independence.	.63
Student Coping: Rumination	Average score of two scales that assess the frequency with which students respond to academic demands through two strategies: *Deterioration*[12] (6 items; Panic or "freak out" about the problem without trying to fix it) and *Talk with Classmates and Friends*[12] (4 items; Talk to classmates [friends in your school program] about what's bothering you).	.78
Student Organizational Skills	Mean of 10 items that reflect general *Time Management Behaviors*[13], specifically setting goals and priorities (I set deadlines for myself when I set out to accomplish a task; I set short-term goals for what I want to accomplish in a few days or weeks; I break complex difficult projects into smaller manageable tasks; I review my daily activities to see where I am wasting time; I finish top priority tasks before going on to less important ones), mechanics of time management (If I know I will have to spend time waiting, I bring along something I can work on; I make a list of things to do each day [keep "to do"	.79

	lists]; I carry a planner or electronic scheduler (e.g., calendar setting in a phone or an iPad) with me; I find places to work that will allow me to avoid interruptions and distractions), and preference for organization (While doing homework, I keep a well-organized workspace). We administered 15 items from the original measure used with adults, with 3-5 items for each of four conceptual components of time and task management (3 aforementioned categories + perceived control of time). Our EFA indicted a primary factor; we retained the 10 items with positive, satisfactory item loadings (>.35) on the primary factor. Items rated from 1 (*Rarely True*) to 5 (*Very Often True*).	
Student Eustress	Mean of 5 items that reflect *Eustress*[14], the frequency that students respond positively to stress and consider stress facilitative. The original measure used with college students included 10 eustress items. We retained those most applicable and understandable to high school students, specifically: How often to you feel…that stress for an exam has a positive effect on the results of your exam? …that stress positively contributes to your ability to handle your academic problems?…that you perform better on an assignment when under academic pressure? In general, how often do you feel motivated by your stress? When faced with academic stress, how often do you find that the pressure makes you more productive? Our EFA suggested a single factor; all items load >.65. Items rated from 1 (*Never*) to 6 (*Always*).	.85
Stressors: Academic Requirements	Mean of 13 items pertinent to *Academic Requirements*[15], the frequency that students experienced stressors related to school demands, intensity of workload, and competing priorities (Multiple tests and/or assignments due on the same day). All items on the StRESS[1] rated from 1 (*Never*) to 5 (*Almost Always*).	.87
Stressors: Parent-Child Conflict	Mean of 6 items that represent *Parent-Child Conflict*[15], the frequency that students experienced stressors at home such as pressure to achieve and parental over-involvement with schooling (Disagreements between you and your parent(s)).	.81
Stressors: Academic and Social Struggles	Mean of 7 items that reflect *Academic and Social Struggles*[15], the frequency that students experienced problems in relationships with friends, romantic partners, or teachers, or with the school environment (Pressure from peers to do risky behaviors, such as drinking, drugs, sex, etc.).	.67
Stressors: Financial Problems	Mean of 4 items that reflect *Financial Problems*[15], the frequency that students experienced problems related to insufficient money to cover costs associated with high school or elsewhere (Not enough money to do or buy the things that you want).	.77
Stressors: Cultural Issues	Mean of 3 items that reflect *Cultural Issues*[15], the frequency that students experienced problems at school involving cultural insensitivity (Having classmates who do not understand your culture or ethnic/racial group).	.78
Stressors: Major Life Events	Mean of 8 items that reflect 5 relatively low incidence but disruptive discrete *Major Life Events*[15], such as health problems or household changes like a move or divorce (Family member's death or serious illness), and up to 3 additional events (e.g., death of friend, homelessness, arrest) described in open-	n/a

	ended items for "other large stressors." No alpha calculated because the items in this composite are not expected to co-occur.	
Student Demographic Features	Students reported[16] gender, race (yes/no: Hispanic, Latino, or Spanish origin?), ethnicity (check all that apply: White, Black or African American, Asian, American Indian or Alaska Native, Native Hawaiian and other Pacific Islander, other [specify__]), and mother's and father's educational attainment from 1 (*8th grade or less*) to 7 (*degree beyond Master's level*). Student ethnic group = White, Black, Asian, Hispanic, multiracial, or other identity. District records[17] used to identify students as an English Language Learner (ELL; student qualified for ESOL program currently or previously), gifted (eligible for gifted education based on IQ score ≥130 or other district-approved means), eligible for free or reduced-price lunch, current academic program (IB or AP), and grade level. Composite SES = mean of standardized scores for highest education level of mother, of father, and eligibility for discounted lunch.	.65 (SES)
Educational History: Academic Rigor	Sum of *high school credits earned during middle school*[17] (range = 0-7); most common courses were Algebra 1 or a foreign language (Spanish, French, Chinese, Latin).	
Educational History: Academic Skills	From district records[17], *8th grade academic skills* as indicated by performance on three sections (math, reading, science) of the statewide high stakes achievement test (the Florida Comprehensive Assessment Test [FCAT]) used to assess student mastery of the Sunshine State Standards.	.81
	Outcomes	
Life Satisfaction	Mean of 7 items that reflect *Global Life Satisfaction*[18] (e.g., My life is going well), the cognitive aspect of subjective well-being (i.e., happiness). Items rated from 1 (*Strongly Disagree*) to 6 (*Strongly Agree*).	.87
Psychopathology	Sum of 30 items that reflect total level of *Emotional and Behavioral Distress*[19], a normed screening measure of frequency of symptoms of internalizing problems, inattention/hyperactivity, social problems, and school problems. Copyrighted items rated from 1 (*Never*) to 4 (*Almost Always*).	.89
Academic Burnout	Mean of 9 items that reflect *School Burnout*[20], specifically cynicism toward the meaning of school, sense of inadequacy at school, and feelings of exhaustion at schoolwork (e.g., I feel overwhelmed by my schoolwork). Items rated from 1 (*Completely Disagree*) to 6 (*Completely Agree*).	.88
GPA	Sum of numerical values, from 0 (F) to 4.0 (A), assigned to letter grades[17] earned during the semester self-report data were collected (spring 2012), divided by the total number of classes attempted.	n/a
Exam Performance	Mean score on end-of-course AP and IB exams[17] taken in 2012. For AP exams, 1 (*low*) to 5 (*high*); For IB exams, 1 (*low*) to 7 (*high*). For participants that had taken both AP and IB exams, linear equating was used to predict the average AP test score from the average IB test score. The resulting equation was then used to put all IB scores on the AP scale.	n/a

Note. Data source: [1]School Attitude Assessment Survey-Revised (SAAS-R; McCoach & Siegle, 2003b), [2]Short Dispositional Flow Scale-2 (SDFS-2; Jackson, Martin, & Eklund, 2008), [3]Almost Perfect Scale- Revised (APS-R; Slaney, Mobley, Trippi, Ashby, &

Johnson, 1996), [4]Short Grit Scale (Grit-S; Duckworth & Quinn, 2009), [5]Extracurricular Activity Scale (developed and piloted by authors), [6] Modeled after 1-item global indicator of domain-specific life satisfaction advanced by Seligson, Huebner, and Valois (2003), [7]Child and Adolescent Social Support Scale (CASSS; Malecki & Demaray, 2002), [8]School information interview protocol (developed and piloted by authors), [9]Parenting Style Inventory-II (PSI-II; Darling & Toyokawa, 1997), [10]Home Environment Scale (developed and piloted by authors), [11]Commitment to Achievement Measure (CAM; Paulson, 1994), [12]Coping with Academic Demands Scale (CADS; Suldo, Dedrick, Shaunessy-Dedrick, Fefer, & Ferron, 2015), [13]Time Management Behavioral Scale (TMBS; Mudrack, 1997),[14]Eustress Scale (ES; O'Sullivan, 2011),[15]Student Rating of Environmental Stressors Scale (StRESS; Suldo, Dedrick, Shaunessy-Dedrick, Roth, & Ferron, 2015), [16]Demographics form (developed and piloted by authors), [17]District records (student transcripts provided electronically to authors by five participating districts), [18]Students' Life Satisfaction Scale (SLSS; Huebner, 1991), [19]Behavioral and Emotional Screening System (BESS; Kamphaus & Reynolds, 2007), [20]School Burnout Inventory (SBI; Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009).

Table 2

Correlations Between Predictors and Outcomes (N = 2379)

	Mental Health			Academic Achievement	
	Life Satisfaction	Psycho-pathology	School Burnout	GPA	AP/IB Exam Scores
Outcomes					
Psychopathology	-.60				
School Burnout	-.43	.62			
GPA	.19	-.19	-.22		
AP/IB Exam Scores	.08	-.09	-.09	.42	
Student Engagement and Motivation					
Motivation	.38	-.53	-.48	.28	.24
Cognitive Engagement	.33	-.47	-.35	.37	.13
Behavioral Engagement	.14	-.07	-.03	.15	.12
Affective Engagement	.34	-.46	-.38	.15	.19
Environmental Influences: School					
Classmate Support	.30	-.41	-.23	.06	.01
Schoolwide Academic Supports	.02	-.01	.01	.09	.27
Environmental Influences: Family					
Authoritative Parenting	.52	-.52	-.33	.17	.12
Home Support for Learning	.41	-.37	-.25	.20	.14
Parents Value Achievement	.16	-.15	-.08	.09	.05
Student Coping Strategies					
Approach/Problem-Focused	.29	-.31	-.17	.13	-.06
Diversions	.16	-.08	-.03	-.07	-.15
Avoidance	-.22	.39	.43	-.31	-.22
Alone	-.33	.31	.27	-.13	-.01
Rumination	-.22	.40	.45	-.04	-.04
Student Organizational Skills	.18	-.22	-.14	.18	.06
Student Eustress	.12	-.16	-.15	.15	.18
Stressors					
Academic Requirements	-.21	.31	.49	.01	.14
Parent-Child Conflict	-.38	.47	.41	-.19	-.11
Academic and Social Struggles	-.29	.48	.40	-.13	-.13
Family Financial Problems	-.40	.33	.30	-.12	-.09
Cultural Issues	-.18	.21	.18	-.01	-.04
Major Life Events	-.27	.25	.21	-.16	-.14
Curriculum (IB)	-.04	.02	.08	.04	.31
Demographic Factors					
Grade level (9 – 12)	.02	-.01	.09	-.03	-.02
Gender (female)	-.05	.10	.16	.06	-.11
Higher SES	.16	-.04	-.04	.22	.31
African-American	-.08	.03	.04	-.14	-.20
Asian	-.04	.01	.02	.14	.11
Hispanic	.02	.01	.01	-.02	-.03
Multiracial or other	-.04	.02	-.01	-.03	-.06
ELL designation	-.06	.00	.01	.02	-.04
Educational History					
Academic skills 8th grade	.02	-.05	-.01	.34	.62
Rigor of middle school courses	.02	-.02	-.02	.21	.25
Gifted education	.03	-.02	-.03	.15	.35

Note. High scores on life satisfaction, and low scores on psychopathology and school burnout, indicate better mental health. If tested for significance, correlations ≥.05 significant at an alpha of .05, and correlations ≥.08 significant at a Bonferroni adjusted alpha of .00028 (.05/180).

Table 3
Lower and Upper Limits of Parameter Estimates of the Multi-Level Models (N = 2379)

	Mental Health			Academic Achievement	
	Life Satisfaction	Psycho-pathology	School Burnout	GPA	AP/IB Exam Scores
			Fixed Effects		
Intercept	4.237, 4.379	25.14, 26.60	3.64, 3.81	3.18, 3.38	2.34, 2.85
Student Engagement and Motivation					
Motivation	0.104, 0.221	-3.28, -2.12	-0.37, -0.25	0.00, 0.09	0.15, 0.28
Cognitive Engagement	-0.055, 0.070	-2.88, -1.63	-0.26, -0.13	0.18, 0.27	-0.04, 0.10
Behavioral Engagement	0.008, 0.087	-0.22, 0.57	-0.08, 0.00	-0.01, 0.05	-0.03, 0.06
Affective Engagement	0.055, 0.142	-1.71, -0.84	-0.15, -0.06	-0.05, 0.01	-0.05, 0.06
Environmental Influences: School					
Classmate Support	0.012, 0.081	-2.22, -1.54	-0.04, 0.03	-0.07, -0.02	-0.11, -0.03
Schoolwide Academic Supports	-0.042, 0.003	-0.01, 0.48	-0.02, 0.04	-0.05, 0.04	-0.05, 0.19
Environmental Influences: Family					
Authoritative Parenting	0.221, 0.328	-3.36, -2.30	-0.13, -0.02	-0.05, 0.03	-0.04, 0.08
Home Support for Learning	0.091, 0.217	-0.52, 0.73	0.02, 0.15	-0.01, 0.08	-0.09, 0.05
Parents Value Achievement	-0.035, 0.092	-0.49, 0.76	-0.03, 0.10	-0.06, 0.03	-0.04, 0.11
Student Coping Strategies					
Approach/Problem-Focused	0.074, 0.213	-2.45, -1.06	-0.18, -0.03	-0.05, 0.05	-0.11, 0.05
Diversions	0.086, 0.191	-1.94, -0.89	-0.17, -0.06	-0.05, 0.02	-0.22, -0.10
Avoidance	-0.107, 0.044	1.36, 2.86	0.24, 0.39	-0.22, -0.11	-0.13, 0.04
Alone	-0.206, -0.127	1.19, 1.99	0.10, 0.18	-0.07, -0.01	-0.04, 0.05
Rumination	-0.270, -0.162	3.52, 4.60	0.30, 0.41	0.03, 0.10	0.02, 0.15
Student Organizational Skills	-0.087, 0.014	0.28, 1.28	-0.03, 0.07	-0.06, 0.02	-0.07, 0.04
Student Eustress	-0.026, 0.032	-0.36, 0.21	-0.08, -0.02	0.03, 0.07	0.05, 0.12
Stressors					
Academic Requirements	-0.003, 0.108	-0.08, 1.03	0.39, 0.50	-0.01, 0.07	0.02, 0.15
Parent-Child Conflict	-0.097, -0.006	0.12, 1.03	-0.02, 0.08	-0.11, -0.04	-0.15, -0.05
Academic and Social Struggles	-0.042, 0.083	1.44, 2.68	-0.06, 0.07	-0.04, 0.05	-0.11, 0.04
Family Financial Problems	-0.202, -0.136	0.19, 0.85	-0.03, 0.04	-0.02, 0.05	0.02, 0.09
Cultural Issues	-0.048, 0.039	-0.06, 0.81	-0.01, 0.08	-0.00, 0.06	-0.06, 0.04
Major Life Events	-0.228, -0.114	0.42, 1.55	0.02, 0.14	-0.15, -0.07	-0.12, 0.01
Curriculum (IB)	-0.187, -0.043	-0.77, 0.77	-0.18, 0.00	-0.35, -0.08	-0.19, 0.54
Demographic Factors					
Grade level (9 – 12)	0.020, 0.077	-1.06, -0.48	-0.01, 0.05	-0.03, 0.02	-0.05, 0.02
Gender (female)	0.043, 0.176	-1.11, 0.21	-0.08, 0.06	0.09, 0.19	-0.19, -0.04
Higher SES	-0.022, 0.062	0.18, 1.03	-0.05, 0.04	0.06, 0.13	0.08, 0.18
African-American[1]	-0.198, -0.000	-1.87, 0.12	-0.11, 0.10	-0.12, 0.03	-0.28, -0.04
Asian[1]	-0.252, -0.061	0.09, 2.00	-0.01, 0.19	0.10, 0.24	-0.08, 0.14
Hispanic[1]	-0.074, 0.112	-1.41, 0.45	-0.15, 0.05	-0.06, 0.08	-0.11, 0.10
Multiracial or other[1]	-0.115, 0.064	-1.56, 0.22	-0.17, 0.02	-0.05, 0.08	-0.16, 0.05
ELL designation	-0.289, -0.091	-0.16, 1.81	-0.07, 0.13	0.03, 0.17	-0.00, 0.22
Educational History					
Academic skills 8th grade	-0.531, 0.041	-0.99, -0.03	-0.02, 0.08	0.21, 0.28	0.47, 0.58
Rigor of middle school courses	-0.036, 0.016	-0.12, 0.40	-0.01, 0.04	-0.01, 0.03	-0.01, 0.05
Gifted education	-0.088, 0.056	-0.43, 1.01	-0.12, 0.03	-0.04, 0.07	-0.00, 0.16
Cognitive Engagement *Motivation	n/a	n/a	-0.22, -0.13	n/a	n/a
Alone*Rumination	n/a	n/a	-0.16, -0.06	n/a	n/a
Eustress*Gifted education	n/a	n/a	n/a	-0.13, -0.04	n/a
			Variance Components		
Between School	0	0.08	0.003	0.02	0.14
Within School	0.48	47.42	0.51	0.25	0.53

Note. [1]Reference race group is non-Hispanic, White students. High scores on life satisfaction, and low scores on psychopathology and school burnout, indicate better mental health. Limits based on 95% confidence intervals; If tested for significance $p < .05$ for all interval estimates that do not include 0. Parameter estimate is exactly half way between lower and upper limit.

Table 4

Standardized Estimates for the Predictors Included in Multi-Level Models (N = 2379)

	Mental Health			Academic Achievement	
	Life Satisfaction	Psycho-pathology	School Burnout	GPA	AP/IB Exam Scores
Student Engagement and Motivation					
Motivation	.12	-.16	-.20	.05	.13
Cognitive Engagement	.01	-.14	-.13	.26	.02
Behavioral Engagement	.04	.01	-.03	-.03	.01
Affective Engagement	.08	-.09	-.08	-.03	.00
Environmental Influences: School					
Classmate Support	.05	-.16	-.00	-.07	-.06
Schoolwide Academic Supports	-.03	.03	.01	-.01	.09
Environmental Influences: Family					
Authoritative Parenting	.22	-.19	-.06	-.01	.02
Home Support for Learning	.09	.01	.05	.03	-.01
Parents Value Achievement	.02	.01	.02	-.02	.02
Student Coping Strategies					
Approach/Problem-Focused	.09	-.09	-.06	-.00	-.01
Diversions	.09	-.08	-.07	-.02	-.09
Avoidance	-.02	.09	.15	-.13	-.02
Alone	-.13	.11	.10	-.05	.01
Rumination	-.15	.23	.22	.07	.05
Student Organizational Skills	-.03	.05	.01	-.02	-.01
Student Eustress	.00	-.01	-.05	.08	.08
Stressors					
Academic Requirements	.04	.03	.30	.03	.06
Parent-Child Conflict	-.05	.05	.03	-.11	-.08
Academic and Social Struggles	.01	.11	.00	.01	-.02
Family Financial Problems	-.19	.05	.01	.04	.05
Cultural Issues	-.00	.02	.02	.03	-.00
Major Life Events	-.10	.05	.04	-.10	-.03
Curriculum (IB)	-.06	-.00	-.04	-.18	.08
Demographic Factors					
Grade level (9 – 12)	.06	-.07	.02	-.01	-.01
Gender (female)	.06	-.02	-.01	.11	-.05
Higher SES	.02	.04	-.00	.12	.09
African-American[1]	-.03	-.02	-.00	-.02	-.05
Asian[1]	-.06	.03	.03	.09	.01
Hispanic[1]	.01	-.01	-.02	.00	-.00
Multiracial or other[1]	-.01	-.02	-.02	.01	-.02
ELL designation	-.06	.02	.01	.05	.03
Educational History					
Academic skills 8th grade	-.01	-.04	.03	.34	.40
Rigor of middle school courses	-.01	.02	.02	.02	.02
Gifted education	-.01	.01	-.02	.01	.03
Significant Interactions between Variables					
Cognitive Engagement*Motivation	n/a	n/a	-.10	n/a	n/a
Alone*Rumination	n/a	n/a	-.06	n/a	n/a
Eustress*Gifted Education	n/a	n/a	n/a	-.07	n/a

Note. [1]Reference race group is non-Hispanic, White students. High scores on life satisfaction, and low scores on psychopathology and school burnout, indicate better mental health. Beta weights were calculated by multiplying the parameter estimates by the ratio of the standard deviations (s_x/s_y) where the standard deviations were estimated from the variance components obtained from unconditional multilevel models (i.e., s = SQRT($\sigma_e^2 + \sigma_u^2$)). If tested for significance, student-level variables with beta weights ≥.08 significant at a Bonferroni adjusted alpha of .00029 (.05/173); neither school program-level variables (curriculum, schoolwide academic supports) significant at .00029 level.