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Stress overload as a red flag for freshman failure and attrition

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ABSTRACT

Freshman attrition is a major concern for universities, prompting research to identify red flags for academic failure. Stress might be one such signal, but universities have not incorporated it into predictive algorithms. It was hypothesized that "stress overload", the destructive form of stress described in theories, would (1) predict grades and attrition as well as traditional algorithm variables, and (2) explain minority disparities in grades and attrition. The Stress Overload Scale (SOS) was tested for the first time as a predictor in two studies using different samples from the same cohort of freshmen entering a large public university. The first study (n = 569), conducted during the first semester, showed stress overload to predict term GPA better than most traditional predictors. Also, because SOS means differed and the SOS-GPA correlation was invariant across minority and white students, stress overload partially accounted for grade disparities. A second study (n = 584) in the second semester showed stress overload to remain among the best predictors of term GPA. However, no variable except GPA predicted attrition. Moreover, SOS means were now comparable for minority and white students, and because its association with GPA remained invariant, the SOS could no longer explain grade disparities. Together, results indicated that stress overload is a red flag for poor grades for all freshmen (minority and white) across their first year, but by the second semester, those grades become more proximal predictors of attrition. Possible reasons for these findings, and their implications for using the SOS in predictive algorithms, are discussed.

1. Introduction

Despite the efforts of universities to reverse the trend, student attrition continues to be a concern (Noble, Flynn, Lee & Hilton, 2007). An alarming number of students, reported to be one in three (U.S. News & World Report, 2015), drop out of college within the first year. And the loss is even more dramatic among minority students (U.S. Department of Education, 2013). One proposed solution was to develop an "early warning system" to better identify at-risk students (Beck & Davidson, 2001), and much research has been directed at determining which characteristics are most predictive of failure and attrition (Richardson, Abraham & Bond, 2012).

Stress has been identified as one red flag for academic failure (Daugherty & Lane, 1999; Vaez & Laflamme, 2008). Yet, despite calls for the inclusion of more psychosocial variables in predictive algorithms (Kahn, Nauta, Gailbreath, Tipps & Chartrand, 2002), few universities include stress in their student assessments (Peterson & Augustine, 2000). This may be due to problems in obtaining accurate readings of stress, which is more difficult to assess than traditional predictors like high-school GPA. In fact, most popular stress measures are detached from theory and psychometrically limited (Amirkhan, 2012). The current research utilizes a new measure of "stress overload", the destructive form of stress identified by stress theories, which has demonstrated validity in predicting health problems (Amirkhan, Urizar & Clark, 2015). Here, its utility as a predictor of academic problems in freshmen at a large public university is tested vis-à-vis the variables typically used in university algorithms.

2. Literature review

2.1. Predicting student failure

There is a large literature devoted to the identification of warning signs for student failure (see Reason, 2009; Richardson, et al., 2012). For the most part, this research has focused on demographic (e.g., gender) and background variables, both historical (e.g., parents' education) and contemporary (e.g., unit load). Of these "traditional" predictors, Murtaugh, Burns and Schuster (1999) identified age, ethnicity, resident status, high-school GPA (HS GPA) and first-term GPA as having predictive value, and offered a multi-variable algorithm for assessing a student's likelihood of dropping out. Other researchers proposed formulae of their own; for example, Fike and Fike (2008) presented a

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multivariate model for predicting community college attrition that included factors such as unit load, parent education level, and financial aid.

Among the traditional predictors, it would seem that ethnicity should be particularly useful, given the persistently disproportionate attrition rate of minority students (Seidman, 2005; U.S. Department of Education, 2013). Yet ethnicity variables have been inconsistent in the prediction of academic performance. As a component of algorithms, researchers have found them to sometimes predict grades and attrition (Fike & Fike, 2008; Noble et al., 2007; Toven-Lindsey, Levis-Fitzgerald, Barber & Hasson, 2015), and sometimes not (D'Amico & Dika, 2013; Friedman & Mandel, 2009). As moderator variables, researchers have found them to sometimes affect the predictive power of algorithms (Schmitt et al., 2009), and sometimes not (Wei, Ku, & Liao, 2011). Moreover, when moderators, they sometimes show algorithms to work better among minority students (Zea, Reisen, Beil & Caplan, 1997; Young, Johnson, Hawthorne & Pugh, 2011), and other times worse (Alkhasawneh & Hargraves, 2014). It may be that such variables, which typically dichotomize students according to minority vs. non-minority status, collapse the variability across and within ethnic groups (Decuir-Gunby & Schutz, 2014). It may be, too, that ethnicity is complexly intertwined with other demographics, and whether it emerges as statistically significant depends upon the other variables in the model (Reason, 2009).

Even an algorithm comprised of the best traditional predictors, however, would likely be enhanced by the addition of psychosocial variables (Robbins et al., 2004). Several researchers have shown psychosocial variables to match traditional variables in predictive power (Friedman & Mandel, 2009; Richardson et al., 2012). Psychological test scores, for example, were found to predict freshman grades and retention even after controlling for traditional predictors (Kahn et al., 2002). Others have shown psychosocial variables to exceed traditional variables in predictive ability. Among freshmen, an algorithm incorporating predictors such as social support and coping style explained more than twice the variance in grades than one using traditional variables alone (DeBerard, Spielmans & Julka, 2004). And in a largely freshman sample of college students, traditional variables proved to have *no* statistically significant association with academic performance, while emotional and social factors did (Pritchard & Wilson, 2003).

Of the psychosocial variables, there are indications that stress may be particularly important. Pritchard and Wilson (2003) found it to be a strong correlate of college grades; and although its association with attrition was not statistically significant, they nevertheless concluded, "The ability to deal successfully with the multitude of emotional stresses encountered in college life appeared to be an important factor in student retention" (p. 25). Moreover, there is evidence that minority students bear an additional burden of stress (Cokley, McClain, Enciso & Martinez, 2013), which has been proffered as an explanation for their lower grades (Smedley, Myers & Harrell, 1993). The premise of the current study was that stress, if properly conceptualized and measured, could prove a powerful predictor of poor grades and attrition for all freshmen. In so doing, being a more proximal predictor than ethnicity itself, it could also explain the disparities in those academic outcomes.

2.2. Stress and student failure

The college years in general (Hales, 2009), and the freshman year in particular (Dyson & Renk, 2006; Hicks & Heastie, 2008), are widely considered among the most stressful periods in life. College students report stress to be the primary impediment to academic success (American College Health Association, 2008). And there is evidence that stress negatively impacts grades (Chow, 2007; Leppink, Odlaug, Lust, Christenson, & Grant, 2016) and retention (Vaez & Laflamme, 2008) in college students, and in freshmen specifically (Perrine, 1999; Struthers, Perry & Menec, 2000).

Yet, surprisingly, this evidence is not overwhelming. First, the number of studies investigating the association between stress and academic performance is limited (Schraml, Perski, Grossi & Makower, 2012), perhaps because the link is seen as a truism. Second, among the studies that have been conducted, some have failed to show any association at all (e.g., Baker, 2003). Third, among the studies that did show an association, there has been ambiguity about the direction of causality, that is, whether stress caused poor grades or vice versa (Schraml et al., 2012). Fourth, it is argued here that past studies have been stymied by incomplete measures of stress, which fail to assess all facets of the theoretical construct of stress overload. A measure specific to stress overload has outperformed other stress scales in predicting health-related dysfunction (Amirkhan, 2012). The purpose of the present study was to determine if it could also improve the prediction of academic "dysfunction", as well as explain ethnic disparities.

2.3. Stress vs. stress overload

Exposure to the demands of college can produce stress in students, just as exposure to life's demands can evoke stress reactions in any person (Holmes & Rahe, 1967). But according to stress theories, such reactions do not necessarily lead to dysfunction. Selye (1956) first proposed that while any demand can disrupt homeostasis and induce feelings of distress, resources are typically rallied to counter the demand, so that homeostasis is restored and distress dissipates. It is only when one's resources are exhausted that demands become destructive. Subsequent theories differed in focus, but retained this same basic mechanism. For example, McEwen (2000) posited that it is the allostatic, not homeostatic, mechanism that prepares the body to deal with impinging demands; it is when this system is overloaded that disruptions in normal functioning occur. Even theorists who see stress as a psychological rather than physiological phenomenon agree. Lazarus and Folkman (1984) stated that a demand may elicit unpleasant feelings upon recognition, but it is only when that demand is subsequently appraised as exceeding coping resources that it assumes the dimensions of a "threat". Threat appraisals lead to stress and pathology. Hobfoll (1989), too, argued that demands may feel stressful, but pathogenic stress is typically held at bay by the belief that there are adequate resources. However, when demands are numerous or incessant, resource expenditure may be seen as spiraling out of control, and this perception induces dysfunction.

In sum, theories indicate that stress is neither a unitary nor simple phenomenon. First, there are different forms of stress: Initial feelings of distress vs. an end state disruptive to functioning. Second, the latter form is complexly determined, requiring that a surfeit of demands coincide with a dearth of resources (Cohen, Kessler, & Gordon, 1995). The label "stress overload" has been used to distinguish the destructive from more transitory and benign forms of stress (Amirkhan, 2012; Lunney, 2006). The assumption here was that true stress overload, rather than fleeting stress feelings, would be most predictive of academic dysfunction.

2.4. Stress overload in students

"The literature suggests that stress is a common theme among college students, and when stressful experiences are greater than the coping resources, multiple problems often arise" (Murff, 2005, p. 103). In other words, there appears to be an implicit recognition in the literature that stress overload is a source of student problems, and that both demands and resources must be considered in its calculation. Each of these has been well documented for college students.

2.4.1. Demands

There are new demands experienced during the transition to college by all students, whether in the United States (Ross, Niebling & Heckert, 1999) or other countries (Ji & Zhang, 2011; Vaez & Laflamme, 2008). In a meta-analysis of 40 qualitative studies from around the world, these

demands were found to group into thematic categories including relationships, academics, expectations, and campus environment, among others (Hurst, Baranik & Daniel, 2013). Relationship stressors were the most often reported, including demands arising from family (e.g., parental pressure), romantic partners (e.g., concerns about finding love), classmates and faculty (e.g., being judged). Academic stressors (e.g., concerns over coursework and exams) were cited frequently, as were expectations from self and others (e.g., perfectionism and multiple roles). The campus climate was also mentioned in over half the studies, with comments about hostile, highly competitive, or unfamiliar environments.

The transition is even harder for minority students, who face the same demands to a greater degree, plus other demands unique to minorities. In terms of relationships, they report pressure to remain loyal to their culture, and family conflict over abandoning their traditional responsibilities (Castillo, Cano, Chen, Blucker, & Olds, 2008; Jackson, Smith & Hill, 2003; Smedley, et al.,1993). Among their new peers, they have problems with those who do not understand their culture (Loftin, Newman, Dumas, Gilden, & Bond, 2012; Gloria, Castellanos, Lopez & Rosales, 2005), and even with those of their own culture who berate them for assimilating ("brown on the outside, white on the inside"; Castillo et al., 2008). In regard to academics, they are more concerned than their white counterparts about approaching professors, taking exams, writing papers, and producing quality work (Quintana, Vogel & Ybarra, 1991). As for expectations, they are more worried about meeting the standards of their professors (Quintana et al., 1991), and pressure themselves to perform well to repay their parents for sacrifices made (Ong, Phinney & Dennis, 2006). In terms of campus climate, minority students ubiquitously report institutional discrimination, racist behaviors by faculty and staff, and negative interactions with peers of different backgrounds (Allen, 1992: Jackson et al., 2003; Nora & Cabrera, 1996; Smedley et al., 1993). In regard to minority-specific demands, many have problems adapting to the norms and language of the dominant campus culture, especially at predominantly white institutions (Cokley et al., 2013; Crockett et al., 2007; Jackson et al., 2003). And most experience "stereotype threat", a pressure to disprove negative stereotypes (Jones, Castellanos & Cole, 2002) that is exacerbated by its deleterious effect on academic task performance (Nadler & Clark, 2011).

2.4.2. Resources

The new demands of college unfortunately coincide with a scarcity of resources. In moving away from home, financial and concomitant difficulties (such as poor housing and having to work), are widely experienced. In fact, these rank as major concerns for college students in the United States (Ross et al., 1999) and across the world (Ji & Zhang, 2011; Vaez & Laflamme, 2008). But it is not only monetary resources that are impacted by the transition to college. In their meta-analysis of qualitative data, Hurst, et al. (2013) found students to list shortages that included time, support, skills, technology, and sleep. Other non-material losses, in social networks and health (DeBerard et al., 2004), and in self-efficacy (Beck & Davidson, 2001), are also reported.

The resources of minority students are even more challenged. They suffer disproportionate financial hardships, reporting the cost of tuition as a major obstacle to graduation (Fry, 2004; Guillory & Wolverton, 2008). They expect less financial help from their families, and often feel the need provide support *to* their parents (Guillory & Wolverton, 2008; Loftin et al., 2012; Quintana et al., 1991). They are less willing than their white classmates to go into debt to finance their education (Nora & Cabrera, 1996). Even among those receiving financial aid, there are ubiquitous reports regarding the inadequacy of packages (Allen, 1992; Guillory & Wolverton, 2008; Quintana et al., 1991). In addition, minority students often experience profound reductions in social support. Owing to their smaller numbers on campus, they experience loneliness, isolation, and even active alienation by other students (Allen, 1992: Guillory & Wolverton, 2008; Jones et al., 2002; Loftin et al., 2012). Moreover, they report inadequate institutional support, both in terms of tangible services like advising, tutoring and mentoring (Cole, Matheson & Anisman, 2007), and also in terms of intangibles such as an appreciation of diversity (Jackson et al., 2003; Loftin et al., 2012; Odom, Roberts, Johnson & Cooper, 2007). Finally, many minority students believe they did not receive adequate academic preparation for college (Allen, 1992; Guillory & Wolverton, 2008). Perhaps relatedly, many feel their academic abilities are lacking (Odom et al., 2007; Zajacova, Lynch & Espenshade, 2005), and experience the "imposter" syndrome (Cokley et al., 2013).

2.4.3. Stress overload and academic performance

There is, then, plentiful evidence that freshmen experience the two components of stress overload, new demands and resource shortages, and that the transition is even harder for minority students. To determine the influence of this stress overload on their academic performance requires that both components be assessed. Although no such study has yet been conducted, there are a few that are informative. In identifying the symptoms of stress overload, researchers found it to be associated with cognitive disturbances, including difficulties in focusing, remembering, and completing tasks (Amirkhan, Landa & Huff, 2017; Lunney, 2006). Thus, stress overload could certainly interfere with academic functioning, and might well result in poor grades and attrition. Another finding supports this reasoning: Assessing a single type of demand (academic tasks) and a single resource (academic self-efficacy), researchers found their amalgam to predict GPA and attrition in freshmen (Zajacova et al., 2005). Such findings buttress the current premise that a measure specific to stress overload, reflecting the totality of both a student's perceived demands and resources, would be most effective in predicting his or her college performance. It is likely that such a measure would assign higher scores to minority students, owing to their greater demands and lesser resources.

2.5. Measuring stress overload

A variety of stress measures have been employed in studies of college students. Some researchers (e.g., Ross et al., 1999; Vaez & Laflamme, 2008) measured demands on students, but neglected to consider a student's resources to counter those demands. Summing stressors without subtracting the negating effects of resources could produce overestimates of student stress levels. Other researchers assessed student resources (e.g., Beck & Davidson, 2001; DeBerard et al., 2004; Reason, 2009), but failed to tabulate the demands weighing on those students. Inventorying reserves without considering the extent of their expenditure could yield underestimates of student stress. Again, stress theories indicate that both demands and resources must be measured to obtain accurate readings of stress overload, the destructive form of stress posited here to be most detrimental to academic performance.

The Stress Overload Scale (SOS; Amirkhan, 2012) was constructed specifically to assess this destructive state of stress. Beginning with the theories that associate this state with being exhausted, overwhelmed, or overburdened by demands, a large pool of items describing such feelings and thoughts was compiled. These items were administered to large and diverse community samples in a series of psychometric studies. Initial analyses of their responses indeed revealed two underlying factors that corresponded to the theoretical constructs of demands and resources. These were labeled Event Load, reflecting the perceived burden of impinging demands, and Personal Vulnerability, reflecting the perceived paucity of coping resources. Subsequent analyses were used to identify the best of the items, in terms of being the strongest factor markers, the most reliable and valid, and the most widely understood across a demographic spectrum. Only items that survived this evolutionary process were used to construct the SOS. The success of this endeavor was shown in another set of studies (Amirkhan et al., 2015), in which the ability of the SOS to predict pathology (symptoms,

illnesses, and abnormal cortisol levels) in a variety of populations (students, community residents, and pregnant women) was validated. It was believed that this measure, being congruent with stress theories and accurate in detecting other types of dysfunction, would be the best for predicting academic failure and attrition in the current research.

2.6. The current studies

Two studies were conducted to examine the ability of stress overload to predict the academic performance of freshmen at a large public university. The first was to determine whether stress overload indeed related to grades at the end of the first semester. Owing to encouraging results, a second study was to determine if stress overload predicted both grades and attrition at the end of the first year.

The primary hypothesis guiding this research was (a) that the stress overload construct would be associated with freshman grades and attrition, and (b) that SOS scores would approximate the best of the traditional variables as predictors of these academic outcomes. The secondary hypothesis was that SOS scores would be higher for minority than white students, and help explain the well-documented disparities in academic outcomes (U.S. Department of Education, 2013). It should be noted that in pursuing the latter hypothesis, a dichotomous ethnicity variable was used. While knowingly oversimplifying ethnic diversity (Decuir-Gunby & Schutz, 2014), this was felt necessary for reasons of precedent, allowing evaluation of this variable as a predictor (as per D'Amico & Dika, 2013) and a moderator (as per Zea et al., 1997) vis-à-vis the SOS.

3. Study 1

For the first test of stress overload's applicability to academic prediction, a large sample of freshmen was surveyed during their incoming semester at a major public university. They completed the SOS mid-semester, and consented to release their official grades at the semester's end. Thus, although lacking the multiple assessment points of a true time-series design, the study was longitudinal in that mid-term stress overload was used to predict term-end outcomes.

3.1. Participants

Initially, 600 freshmen were surveyed in class, and 569 (95%) responded in sufficient detail (i.e., no missing data other than demographic) to permit analysis. As expected of students entering a public university, the sample was diverse in every aspect (see Table 1) but age (M = 18.09). Females outnumbered males, but there were an adequate number of men. Ethnicities were generally well represented, except that the number of African Americans and Native Americans was small. There was a good range of SES levels, as indicated by parental income and education levels. A series of chi-square analyses revealed no statistically significant demographic differences between the sample and the University freshman census.

Table 1
Demographic composition of study samples.

	Study 1	Study 2	University Census
Sample Type	Freshmen 1st Semester	Freshmen 2nd Semester	Incoming Freshmen
Size *(n)*	569	584	4291
Gender			
Male	198 (35%)	199 (34%)	40.9%
Female	367 (65%)	385 (66%)	58.9%
Age			
18 yrs.	499 (88%)	305 (52%)	80.6%
19 yrs.	50 (9%)	262 (45%)	16.8%
20 yrs.	6 (1%)	11 (2%)	0.5%
> 20 yrs.	4 (1%)	6 (1%)	0.1%
Ethnicity			
African American	16 (3%)	21 (4%)	3.8%
Asian	189 (33%)	151 (26%)	23.4%
Latino	210 (37%)	249 (43%)	39.0%
Caucasian	99 (17%)	104 (18%)	18.7%
Other/Mixed	48 (8%)	54 (9%)	8.6%
Parents' Education			
High School or Less	241 (42%)	277 (47%)	40.8%
Some College	110 (19%)	103 (18%)	21.8%
College Degree	151 (27%)	141 (24%)	23.9%
Advanced Degree	61 (11%)	55 (10%)	13.5%
Parents' Income			
< $25,000	134 (23%)	149 (28%)	23.7%
$25,000-49,999	133 (23%)	161 (30%)	22.6%
$50,000-$99,999	166 (29%)	153 (28%)	29.6%
> $100,000	95 (17%)	73 (14%)	24.1%

Note: The "Other" ethnic group includes Native Americans.

3.2. Measures

3.2.1. Stress overload

As explained earlier, the Stress Overload Scale (SOS; Amirkhan, 2012) was used to assess stress levels, owing to the fact that it was theory-based and empirically constructed. Its two subscales were derived from factors that reflect the demands vs. resources components of stress overload. These scales are correlated, mirroring an oblique factor structure, but still distinct: Event Load (EL) taps the perceived burden of demands (e.g., "have you felt overcommitted") and Personal Vulnerability (PV) taps perceived insufficiencies in resources (e.g., "have you felt powerless"). Each subscale contains 12 items that ask about specific thoughts or feelings in the prior week, and each item is paired with a response scale ranging from 1 (*not at all*) and 5 (*a lot*). In addition to these 24, there are six filler items, as well as an ambiguous title ("A Measure of Day-to-Day Feelings"), meant to disguise the scale's purpose and thereby discourage response biases. In fact, while other stress measures have shown susceptibility to social desirability influences, the SOS has not (Amirkhan, 2012).

To score the SOS, its subscales are simply summed because more demands coupled with more inadequacies are indicative of a greater likelihood of stress overload. Total SOS scores have demonstrated good internal (α = .96) and test-retest (r = .75 over one week) reliability, and they have exhibited criterion validity in terms of predicting health-related outcomes in college and general populations (Amirkhan et al., 2015).

3.2.2. Demographics

A 14-item background questionnaire was also created for the survey. It assessed the traditional variables used to predict college performance. These included the demographics of age, gender, ethnicity, and HS GPA (Murtaugh et al., 1999). They also included the background factors of course load, hours per week spent on campus and at work, parents' education level (the highest attained by either), and parents' income bracket (Reason, 2009).

3.2.3. Academic performance

First-semester grades (Term GPA) were obtained from the University. Because in similar universities (Ohio University, 2015) most freshmen do not withdraw until the end of the first year, official records pertaining to attrition were not acquired.

3.3. Procedure

Participants were recruited from a variety of math and liberal-arts classes required of all freshman students at a large public university in Southern California. To be eligible for the study, students had to be (1) first-semester, (2) full-time, and (3) at least 18 years old. Instructors of freshman "foundation" courses were approached to request access to

their classes for 20 min; of 60 professors, 55 (91%) complied. Mid-semester was chosen as the best time for the survey, because it was late enough to allow freshmen to have experienced the pressures and deprivations of college life, yet early enough that grades on major tests and projects had not yet been received, minimizing the likelihood of a reverse causality in which failures induced stress overload. Around the time of midterm exams, then, research assistants visited classes, where they described the survey as one of "freshman voices" (avoiding mention of "stress" or the study's true purpose) in recruiting students. Recruits completed consent forms, agreeing to take the survey that day in class, and giving permission to access their official GPAs at the semester's end. They were then handed a survey that included the SOS and then the Demographics questionnaire (in fixed order to avoid "priming" effects; Steele, 1997). They also completed a Contact form, providing their student ID and a phone number or email address. Responses were therefore confidential, but not fully anonymous. At the end of the semester, the Contact information was used to raffle the study incentives (two $25, one $50, and one $100 campus gift card). Note that in this procedure, multiple steps were taken to minimize demand characteristics and encourage honest responding: Students were kept blind as to study's intent, assured of confidentiality, and offered incentives unrelated to course credit.

3.4. Results

3.4.1. Sample characteristics

Students who self-identified as Asian, African American, Latino, or Other (including Native American and mixed ethnicity) were combined into a Minority group ($n = 463$). Students who self-identified as Caucasian formed a White group ($n = 99$). A Minority Status variable was created, dummy coded as 1 (*White*) or 2 (*Minority*). This duplicated the ethnicity variable used in previous studies of college attrition (e.g., D'Amico & Dika, 2013). And, replicating prior methods, it was used both as a predictor (e.g., Friedman & Mandel, 2009) and a moderator of predictions (e.g., Zea et al., 1997) in the ensuing analyses.

Minority and White groups were tested for demographic similarity. Tests of the categorical variables revealed no statistically significant difference in gender; however, there were disparities in Parent Education, χ^2 (5) = 50.01, $p < .001$, and Parent Income, χ^2 (6) = 52.82, $p < .001$, with Minority students reporting lower levels of each. Tests of the continuous variables revealed no dissimilarities in Age, Unit Load, Hours on Campus, or Hours at Work. Because the only statistically significant differences were in variables related to the resources component of stress overload, they were not considered potential confounds in subsequent tests of group differences.

3.4.2. Scale characteristics

As seen in Table 2, the SOS demonstrated good internal consistency in this student population, with alpha levels approximating those obtained in the community (Amirkhan, 2012). It exhibited good variability of response, with scores ranging across almost all possible values, a mean near the middle of this range, and a large standard deviation. There was no ceiling or basement effect to compromise correlational analyses. As expected, its EL and PV subscales were strongly intercorrelated. To verify that the subscales reflected a unitary underlying construct (stress overload) in a freshman population, confirmatory factor analysis was used. By multiple recommended criteria (Hooper, Coughlan & Mullen, 2008), a model with a single latent factor shared by EL and PV scores fit the data well: The chi-square value for the model was not statistically significant, $\chi^2(2) = 5.22$, $p = .07$, the fit indices were excellent, *GFI* = .991 and *CFI* = .994, and the residual variance was reasonable, *RMSEA* = .07 and *SRMR* = .02. Moreover, it fit much better than a two-factor model, $\chi^2(1) = 530.10$, $p < .0001$, *GFI* = .618, *CFI* = .001, *RMSEA* = .69, *SRMR* = .45.

Because subsequent tests would examine the construct of stress overload in minority vs. white students, a test of measurement invariance was performed across Minority Status groups. With no constraints on EL and PV loadings, the single-factor model fit both groups well: $\chi^2(4) = 7.20$, $p = .13$, *GFI* = .991, *CFI* = .994, *RMSEA* = .04, *SRMR* = .03. Constraining the loadings to be equal across groups had little effect on the fit: $\chi^2(2) = 6.75$, $p = .03$, *GFI* = .988, *CFI* = .991, *RMSEA* = .05, *SRMR* = .05. Comparing the constrained and unconstrained models showed no statistically significant difference, $\Delta\chi^2(2) = 0.45$, $p = .79$, indicating that the SOS scales reflected the same latent construct across groups.

3.4.3. Tests of primary hypothesis

A first step in testing the primary hypothesis was to determine if there was any relationship between stress overload and academic failure. To do so, structural equation modeling (SEM), a technique with a long history in the college attrition literature (e.g., Cabrera, Nora & Castaneda, 1993), was used. The latent variable derived from SOS subscales was chosen as a "purer" (i.e., more error-free) indicator of stress overload than observed SOS totals, and was linked to the observed term grades (see Fig. 1). This model showed a good fit to the data by most criteria, $\chi^2(1) = 5.53$, $p = .02$, *GFI* = .993, *CFI* = .992, *RMSEA* = .08, *SRMR* = .02, and the association between stress overload and Term GPA was statistically significant and in the expected direction, $\beta = -.29$, $p < .0001$.

The next step was to determine the predictive power of the observed (i.e., non-latent) SOS scores, more likely to be used in university algorithms, relative to traditional measures. Path analysis was used, for reasons of precedent (Wei et al., 2011) and the considerable intercorrelation among predictors. A path model was constructed using the statistically significant zero-order correlations shown in Table 2 as a guide. This initial model had the SOS and six traditional variables linked to Term GPA, with 20 intercorrelations among these predictors. Modification indices were used to improve model fit by eliminating three pathways to grades, dropping one and adding three intercorrelations. The final model (Fig. 2) fit the data very well, $\chi^2(27) = 20.52$, $p = .81$, *GFI* = .993, *CFI* = .999; *RMSEA* = .01, *SRMR* = .03, and showed the statistically significant predictors to be (in descending order): HS GPA ($\beta = .31$, $p < .0001$), SOS scores ($\beta = -.25$, $p < .0001$), Gender ($\beta = .15$, $p < .0001$), and Parent Education ($\beta = .11$, $p = .004$). It is noteworthy that (1) the association of measured SOS values to grades approximated that of the latent construct, and (2) the SOS placed among the strongest of the traditional predictors, while (3) Minority Status did not. Although Minority Status had exhibited a significant zero-order correlation with GPA, controlling its covariance with other predictors such as the SOS reduced that relationship to statistical non-significance.

3.4.4. Tests of secondary hypothesis

The finding that there was no link between Minority Status and GPA in the path model begged the question of whether grade disparities existed in the present sample. ANOVA was used to test for such differences, and because minority and white groups were not equal in size, the general linear model (GLM) method was used. This method is robust to unbalanced designs if certain assumptions are met, including normality of residuals and homogeneity of variance (Hoekstra, Kiers & Johnson, 2012). In regard to Term GPA, Q-Q plots revealed a good approximation of normality, with no outliers, in both groups, and Levene's test indicated no statistically significant difference in group variances, $F(1,549) = 1.64$, $p = .20$. Minority grades ($M = 2.91$) were lower than white grades ($M = 3.17$), and the difference was statistically significant, $F(1,549) = 10.81$, $p = .001$ (*partial* $\eta^2 = .02$).

The conundrum presented was that Minority Status was not a predictor of GPA in the path model, and yet Minority Status groups differed significantly in GPA in the ANOVA test. This might be explained by mediation: It was possible that the SOS, as a covariate of Minority Status and a predictor of GPA in its own right, wholly mediated the minority-white main effect on GPA. In other words, group differences in

Table 2
Descriptive statistics and zero-order correlations for Study 1 variables.

	Descriptives				Correlations											
Variable	*M*	*SD*	Range	α	2	3	4	5	6	7	8	9	10	11	12	13
Demographics																
1. Age	18.09	0.38	18–20		−.02	−.09	−.04	−.11*	.04	.06	.04	.02	.02	−.04	−.01	−.02
2. Gender						−.02	−.04	−.11*	.15**	.09	.01	.03	.20**	.17**	.19**	.13*
3. Minority Status							−.26**	−.30**	−.15*	−.04	−.15*	−.02	.07	.14*	.11*	−.14*
Background																
4. Parent Education								.50**	.08	.00	.08	−.14*	−.19**	−.16**	−.19**	.17**
5. Parent Income									.13*	.02	.00	−.09	−.14*	−.13*	−.14*	.11*
6. HS GPA	3.64	0.34	2.3–4.7							.03	.10	−.07	−.13*	−.12*	−.13*	.38**
7. Units Enrolled	13.89	1.50	9–18								.08	−.08	.03	−.04	−.01	.03
8. Hours on Campus	28.09	30.14	1–168									−.04	−.03	−.05	−.03	.05
9. Hours at Work	5.42	8.95	0–44										.15*	.08	.12*	−.13*
Stress Overload																
10. EL Subscale	40.94	10.20	12–60	.91										.78**	.94**	−.24**
11. PV Subscale	32.55	10.98	12–58	.92											.95**	−.29**
12. SOS Total Score	73.41	19.88	24–116	.95												−.28**
Academic Performance																
13. Fall Term GPA	2.96	0.69	0.0–4.0													

Note: Higher Gender indicates female; higher Minority Status indicates minority member.
* $p < .01$.
** $p < .0001$.

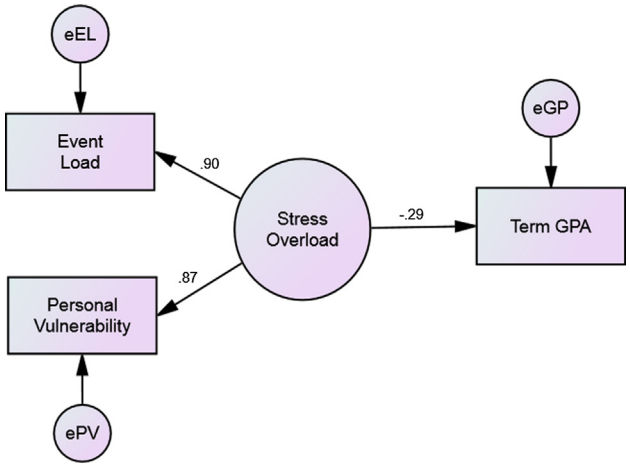

Fig. 1. Study 1 latent-variable model linking stress overload to grades, showing standardized regression weight ($p < .0001$).

stress overload could explain the group differences in subsequent grades. For this to be true, Minority Status groups would have to differ in SOS scores. The GLM ANOVA procedure was used to test this possibility. Group distributions of SOS scores exhibited normality and Levene's test showed homogeneity of variance, $F(1,562) = 0.86$, $p = .36$. Scores for minority students ($M = 75.09$) were indeed higher than those for white students ($M = 69.09$), and the difference was statistically significant, $F(1,562) = 7.55$, $p = .01$ (*partial* $\eta^2 = .02$). This pattern of results was consistent with a mediation effect, and a Sobel test confirmed that the SOS mediated between Minority Status and Term GPA, $z = -2.14$, $SE = .02$, $p = .032$. However, the SOS alone did not totally account for grade disparities; similar mediation effects were found for two other covariates of Minority Status: HS GPA, $z = -3.10$, $SE = .03$, $p = .002$, and Parent Education, $z = -2.93$, $SE = .03$, $p = .003$.

An additional explanation for the conundrum was that Minority Status moderated the SOS's relationship to grades, amplifying or dampening that association across groups. If stress overload had a stronger connection to (i.e., a greater influence on) the performance of minority than white students, this too could explain the grade disparity.

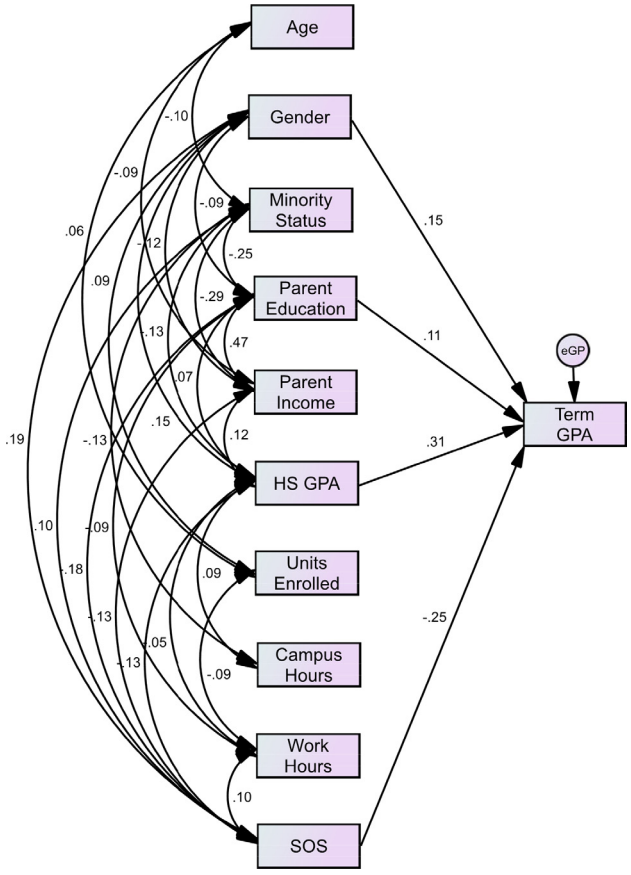

Fig. 2. Study 1 path model linking observed predictors to grades and attrition, showing statistically significant standardized regression coefficients ($ps < .01$).

To examine the possibility of such moderation, the path model with the SOS and traditional predictors (Fig. 2) was tested for structural invariance. This model was slightly modified by removing Minority Status as a predictor, since it would be used as the moderator. The other observed variables, the intercorrelations among them, and the statistically

significant pathways linking some to Term GPA were retained. With no constraints on these paths, the model fit the two groups very well, $\chi^2(46) = 38.04$, $p = .79$, *GFI* = .987, *CFI* = .999, *RMSEA* = .01, *SRMR* = .07. Constraining the paths to be equal across the groups did not greatly diminish the fit, $\chi^2(50) = 44.49$, $p = .69$, *GFI* = .984, *CFI* = .999, *RMSEA* = .01, *SRMR* = .07. Comparing the unconstrained to the constrained model in fact showed no statistically significant difference, $\Delta\chi^2(4) = 6.45$, $p = .83$. In short, Minority Status did not moderate the association of the SOS or other predictors to grades.

3.5. Discussion

This was the first investigation of the stress overload construct, and the SOS measure, as predictors of academic outcomes. In support of the first hypothesis, it was found that stress overload assessed during the college-entry term did predict GPA at the term's end. SOS scores worked as well as the latent construct, and better than nearly all of the measures traditionally used by universities to forecast student performance (Reason, 2009). In fact, it was one of only four variables (including HS GPA, gender, and parent's education) that showed statistically significant links to first-semester GPA. And it rivaled HS GPA, which proved the strongest predictor as it has in previous studies (e.g., Friedman & Mandel, 2009; Murtaugh et al., 1999).

Like prior studies, too, minority status was not among the statistically significant predictors of grades once its multicolinearity with other variables was controlled (D'Amico & Dika, 2013; Friedman & Mandel, 2009). However, minority and white groups did differ in grades, replicating disparities also reported in the literature (e.g., Noble et al., 2007). In support of the second hypothesis, present results showed that the groups also differed in mean SOS scores, and that this difference helped explain the grade disparity. That is, the SOS was one of three variables found to mediate between minority status and first-semester GPA. The possibility of minority status moderating the relationships of predictors to grades, which could also explain the disparity, was tested as well. No such moderation was found: The strength of the association between the SOS and GPA was no different for minority than for white students. The implications of these findings are ironic–they suggest both that the stress overload construct is relevant to explaining ethnic disparities in student grades, and that predictive algorithms incorporating the stress overload measure can ignore the ethnicity of students. Whether the SOS and the other predictors would demonstrate similar and invariant relationships with attrition had yet to be seen.

4. Study 2

The second study examined whether stress overload was still present in a group of freshman well past their initial entry into college, as well as the extent of its links to academic outcomes. This study mirrored the first in design, but with certain differences: A new sample of students from the same freshman cohort was surveyed in their second semester, and enrollment status at the start of the following (sophomore) year was obtained as an index of attrition.

4.1. Participants

Again, 600 freshmen were surveyed in their classes; this time 584 (97%) completed questionnaires in sufficient detail (i.e., no missing data on the primary study variables) to permit analysis. This sample was diverse, closely mirroring both the Study 1 sample and the University census (see Table 1). Chi-square tests revealed only one statistically significant divergence from the prior study: Study 2 students were older, $\chi^2(3) = 192.28$, $p < .0001$, as to be expected from samples drawn six months apart.

4.2. Measures

4.2.1. Stress overload and demographics

The SOS and Demographics questionnaires, as previously described, were re-employed.

4.2.2. Academic performance

Both second-semester grades (Term GPA) and cumulative grades (Year GPA) were obtained from University records. At the beginning of their sophomore year, the enrollment status of all participants was also obtained from the University. From these data, an Attrition variable was created, coded as 1 *(Re-enrolled)* and 2 (*Dropped*).

4.3. Procedure

Participants were again recruited from a variety of freshman "foundation courses" at the same university. Eligibility criteria included being (1) enrolled full-time for the second Freshman semester, (2) at least 18 years old, and (3) a non-participant in the previous study. The 55 instructors who had cooperated in the first study were re-contacted for permission to visit their courses. Of these, 52 (95%) were still teaching freshman classes, and permitted access to them. Again, near the middle of the semester, research assistants visited these classes, described the study only in general terms (to avoid demand characteristics), and obtained informed consent from interested students. This time, the participants consented to have the University release official records of not only their semester GPA, but also their cumulative freshman-year GPA and their sophomore-year enrollment status. Consent and Contact Information forms were collected before distributing the survey packets, which again contained the SOS followed by the Demographics questionnaire. Students were instructed to not write their names on the survey (documents were matched by code numbers alone), to keep their responses private, and to deposit their packets into locked collection boxes when finished. The study incentives (two $25, one $50, and one $100 campus gift card) were awarded by means of a lottery.

4.4. Results

4.4.1. Sample characteristics

Students were grouped by self-reported ethnicity into Minority ($n = 475$) vs. White groups ($n = 104$). As before, group membership was dummy coded into a Minority Status variable, with 1 (*White*) and 2 (*Minority*). Comparisons of the groups again showed statistically significant differences in Parent Education, $\chi^2(4) = 96.33$, $p < .0001$, and Parent Income, $\chi^2(6) = 70.75$, $p < .0001$, with minority students reporting lower levels of each. There were no dissimilarities in any other demographic or background characteristic. Because the only differences were in resources germane to stress overload, they were not treated as confounds in subsequent group comparisons.

4.4.2. Scale characteristics

As may be seen in Table 3, the SOS and its subscales again demonstrated good internal consistency, with alpha levels paralleling those obtained in the first sample. There was also good variability of response, with scores covering nearly the full range, a mid-range mean, and a large standard deviation. The SOS factor structure was reconfirmed in the present sample. By multiple indices (Hooper et al., 2008), a model showing a single latent factor to underlie the two subscales fit the data well, $\chi^2(2) = 3.57$, $p = .17$, *GFI* = .993, *CFI* = .996, *RMSEA* = .07, *SRMR* = .02, and much better than a two-factor model, $\chi^2(1) = 438.37$, $p < .0001$, *GFI* = .652, *CFI* = .001, *RMSEA* = .87, *SRMR* = .42. The single-factor model exhibited measurement invariance across Minority Status groups. A model constraining factor loadings to be equal for minority and white groups, $\chi^2(2) = 6.27$, $p = .04$, *GFI* = .990, *CFI* = .990, *RMSEA* = .06,

Table 3
Descriptive statistics and zero-order correlations for Study 2 variables.

Variable	Descriptives				Correlations													
	M	*SD*	Range	α	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Demographics																		
1. Age	18.53	0.64	18–23		−.08	−.01	−.03	−.05	.06	−.14*	−.08	.10	−.04	−.03	−.04	−.03	−.03	.07
2. Gender						.01	−.04	−.03	.12*	−.04	.04	.01	.17**	.10	.15**	.20**	.14*	−.08
3. Minority Status							−.39**	−.34**	−.08	−.07	−.10	−.00	.03	.09	.07	−.15**	−.18**	.03
Background																		
4. Parent Education								.47**	.13*	.14**	.12*	−.02	−.07	−.08	−.08	.17**	.14*	−.05
5. Parent Income									.05	.08	.11*	−.06	−.10	−.11*	−.11*	.10	.11*	−.03
6. HS GPA	3.56	0.36	2.0–4.6							.08	.11*	−.13*	−.03	−.09	−.07	.38**	.32**	−.04
7. Units Enrolled	13.68	1.86	1–18								.09	−.11*	.05	−.01	.02	.19**	.14*	−.08
8. Hours on Campus	25.05	28.47	1–168									−.03	−.03	−.08	−.06	.06	.06	.02
9. Hours at Work	7.43	10.75	0–96										.18**	.11*	.16**	−.20**	−.19**	.01
Stress Overload																		
10. EL Subscale	41.51	9.79	12–60	.90										.73**	.93**	−.07	−.14*	.02
11. PV Subscale	33.37	10.72	12–59	.91											.94**	−.25**	−.30**	.11*
12. SOS Total Score	74.89	19.09	26–114	.94												−.18**	−.24**	−.07
Academic Performance																		
13. Spring Term GPA	2.92	0.61	0.2–4.0														.87**	−.30**
14. Cumulative GPA	2.89	0.72	0.0–4.0															−.27**
15. Attrition Status																		

Note: Higher Gender indicates female; higher Minority Status indicates minority member; higher Attrition Status indicates dropout.
* $p < .01$.
** $p < .0001$.

SRMR = .04, fit the data nearly as well as a model with no constraints, $\chi^2(4) = 8.27$, $p = .08$, *GFI* = .986, *CFI* = .990, *RMSEA* = .04, *SRMR* = .02. The difference between these models was, in fact, not statistically significant, $\Delta\chi^2(2) = 2.00$, $p = .70$.

Descriptive statistics for the academic outcomes are also shown in Table 3. It may be seen that there was evidence of good variability for Term GPA and Year GPA. It is also evident that both showed identical patterns of relationships to other study variables, including SOS scores. For this reason, and to allow direct comparison of Study 1 and Study 2 findings, only Term GPA was used in subsequent analyses. In regard to Attrition, only 46 students (8% of the sample) did not return for a sophomore year. In sum, there was a possibility of a basement effect on the Attrition variable, while Term GPA showed neither basement nor ceiling problems.

4.4.3. Tests of primary hypothesis

To affirm the relationship of stress overload to academic outcomes, SEM was again used. A latent variable, derived from the SOS subscales, was used to reflect the stress overload construct; it was linked to both the observed variables of Term GPA and Attrition. Attrition was identified as a dichotomous variable, and Term GPA was standardized. Modification indices showed fit could be improved by eliminating the direct pathway between stress overload and attrition (see Fig. 3). The resulting model fit the data very well, $\chi^2(2) = 2.24$, $p = .33$, *GFI* = .998, *CFI* = .999, *RMSEA* = .02, *SRMR* = .01. It showed statistically significant associations between stress overload and semester grades, $\beta = -.20$, $p < .0001$, and between those grades and subsequent attrition, *Wald*(1) = 34.80, *OR* = .16, *95% CI* (.09, .29), $p < .0001$. In short, this model indicated that grades wholly mediated the relationship of stress overload to attrition, an indication supported by a statistically significant Sobel test result, $z = -3.77$, *SE* = .002, $p = .0001$.

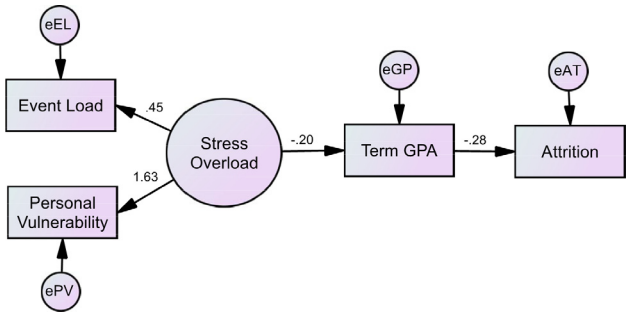

Fig. 3. Study 2 latent-variable model linking stress overload to grades and attrition, showing standardized regression coefficients (*ps* < .0001).

The difference between SOS scores in the second semester ($M = 74.89$) and those in the first ($M = 73.41$) was not statistically significant, $t(1151) = 1.29$, $p = .20$ (Cohen's $d = .08$), which suggests that stress overload did not dissipate in the latter part of the freshman year. To examine how well SOS scores predicted academic outcomes relative to other measures, a path model was constructed. Based on the statistically significant zero-order correlations shown in Table 3, this model had only Term GPA linked to Attrition, eight predictors linked to Term GPA, and 18 correlations among the predictors. Attrition was identified as a binary variable, and all predictors were standardized. Modification indices were used to improve model fit, leading to the elimination of two pathways and two correlations, and the addition of five new correlations. The resulting model (Fig. 4) fit the data well, $\chi^2(38) = 42.66$, $p = .28$, *GFI* = .988, *CFI* = .991, *RMSEA* = .02, *SRMR* = .04. It showed no statistically significant paths between the predictors and Attrition, and six paths to Term GPA. The significant predictors of grades, in order of strength of association, were HS GPA ($\beta = .28$, $p < .0001$), SOS ($\beta = -.20$, $p < .0001$), Gender ($\beta = .19$, $p < .0001$), Unit Load ($\beta = .15$, $p < .0001$), Hours at Work ($\beta = -.13$, $p < .0001$), and Minority Status ($\beta = -.11$, $p = .004$). The only statistically significant predictor of Attrition was Term GPA, *Wald* (1) = 39.80, *OR* = .15, *95% CI* (.08, .27), $p < .0001$. Thus, these findings indicated that the SOS remained among the best predictors of semester grades, including several from Study 1 (HS GPA, SOS, Gender) and some additional ones (Minority Status, Unit Load, Hours at Work). The fact that none of these variables directly predicted attrition suggests that their only link, like that of the SOS, was through their association with grades. And that Minority Status emerged as a predictor of grades in its own right, independent of the SOS, was a portent that stress overload might not help explain second-semester grade disparities.

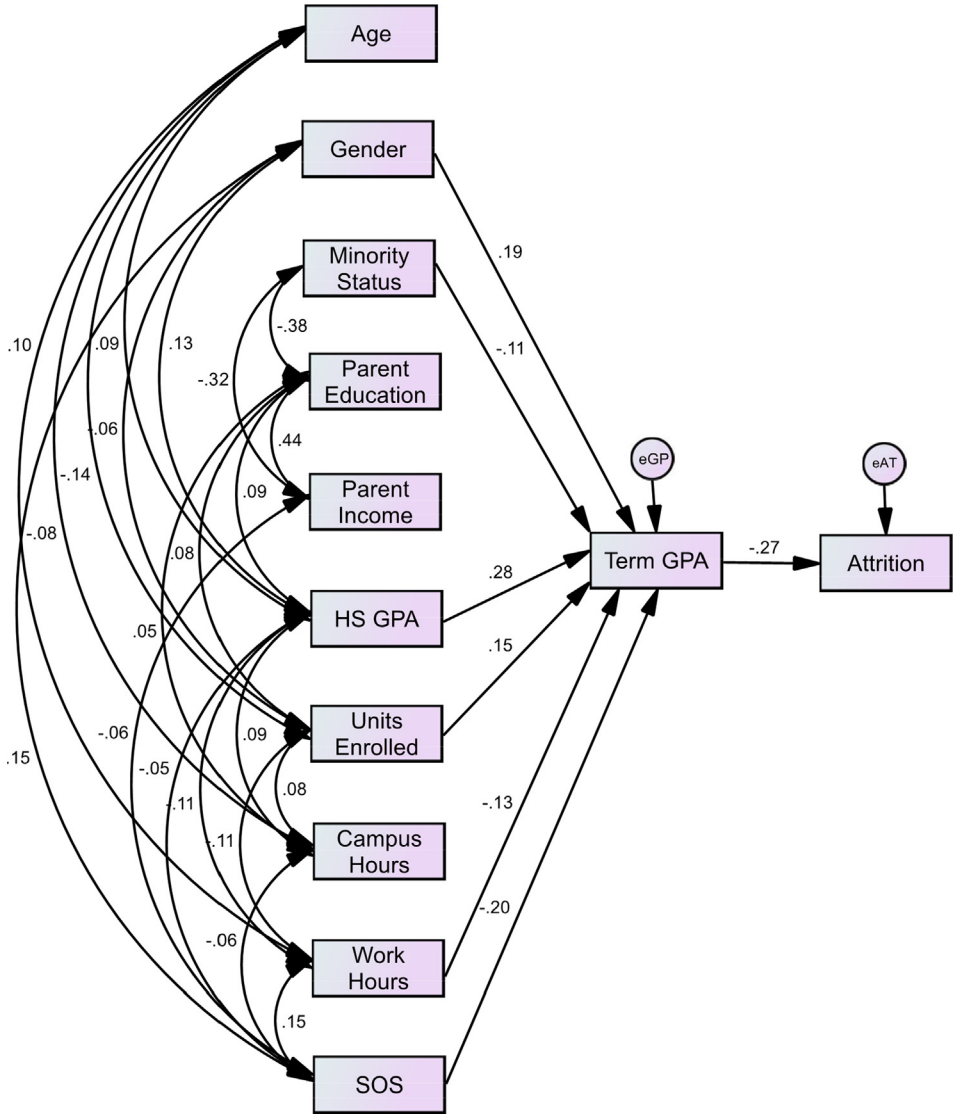

Fig. 4. Study 2 path model linking observed predictors to grades and attrition, showing statistically significant standardized regression coefficients (*ps* < .01).

4.4.4. Tests of secondary hypothesis

To determine if there were disparities in the second half of the freshman year, Minority Status groups were compared in academic performance. Term GPAs demonstrated normality and homogeneity of variance (Levene's test, $p = .10$) across groups. As before, minority students had lower semester grades ($M = 2.88$) than white students ($M = 3.12$), and ANOVA showed this difference to be statistically significant, $F(1,572) = 13.31$, $p < .0001$ (*partial* $\eta^2 = .02$). In regard to attrition, a higher percentage of minority students (10%) than white students (5%) dropped out. However, a binary logistic regression showed that Minority Status and Attrition rate were not associated, *Wald*(1) = 0.33, *OR* = .75, *95% CI* (.28, 1.99), $p = .56$. In short, group differences in grades were found across the freshman year, but no differences in attrition emerged by the sophomore year.

Next, Minority Status groups were compared in stress overload levels. SOS scores showed normality and equivalent variances (Levene's test, $p = .23$), and were again higher for minorities ($M = 75.48$) than for whites ($M = 72.19$). However, in contrast to prior findings, a GLM ANOVA found no statistically significant difference between groups, $F(1,572) = 2.50$, $p = .11$ (*partial* $\eta^2 = .01$). This appeared due to a rise in white scores ($\Delta M = +3.10$) rather than a change in minority scores ($\Delta M = +0.39$) after the first semester, but the difference in white means across studies did not achieve statistical significance, $t(1\,9\,4) = 1.21$, $p = .11$ (Cohen's $d = .17$).

The fact that grade disparities were again present while stress overload disparities were not seems prima facie evidence against the second hypothesis. In fact, a Sobel test indicated that the SOS no longer mediated between Minority Status and GPA, $z = -1.36$, $SE = .011$, $p = .173$. However, there remained the possibility that stress overload–even if equivalent across groups–had become a stronger influence on the grades of minority than white students. To examine possible moderation, the predictive path model (Fig. 4) was tested for structural invariance across minority and white groups. The model was slightly altered to eliminate Minority Status as a predictor, since it would be used as the moderator, leaving one pathway to Attrition, five pathways to Term GPA, and 19 correlations among the predictors. With no constraints, this model fit both groups well, $\chi^2(58) = 67.69$, $p = .18$, *GFI* = .979, *CFI* = .973, *RMSEA* = .02, *SRMR* = .07. With constraints that the paths be equal across groups, the model still fit well, $\chi^2(64) = 79.02$, $p = .10$, *GFI* = .976, *CFI* = .968, *RMSEA* = .002, *SRMR* = .08. The difference between the unconstrained and constrained models was not statistically significant, *S-B Scaled* $\Delta\chi^2(6) = 5.87$, $p = .44$, indicating invariance. In regard to the SOS specifically, this shows its correlation with grades was again equivalent across students. Thus, being that both SOS scores and their strength of association with academic outcomes were comparable across minority

and white students, there was no evidence to support the second hypothesis in the second semester.

4.5. Discussion

The primary hypothesis, that stress overload would predict academic outcomes, was only partially supported by this study's results. Considering grades alone, findings indeed showed that both latent and observed indicators of stress overload were predictive of second semester GPAs, replicating Study 1 results. As before, too, SOS scores were found as strong as the best predictors traditionally used by universities (Reason, 2009). These included some variables that had predicted first-semester grades (HS GPA, SOS, Gender) as well as some new ones (Unit Load, Hours at Work, Minority Status). Considering attrition as an outcome, however, there was no support for the hypothesis; results indicated that stress overload had no direct relationship to the decision to withdraw. This was true of all the traditional predictors as well, prompting two possible explanations. The first is statistical: Because only a small number of students failed to re-enroll, there was a basement effect on the Attrition index, perhaps dampening covariance with this outcome. Challenging this explanation is the finding that there was sufficient variability to allow at least one predictor (second-semester GPA) to achieve significance. The second explanation is substantive: Perhaps most causes of attrition *are* indirect, first undermining grades, with poor grades then becoming one factor in the decision to drop out. Low grades are likely not the only factor in such decisions, given that the correlation found between GPA and attrition was statistically significant but considerably less than perfect.

The second hypothesis, that academic disparities would be present and linked to differential stress overload, was not supported. First, although minority-white differences in grades were found again, there was no statistically significant difference in attrition rate. Second, there was no minority-white difference in SOS scores the second semester, and hence no mediation effect to explain the grade disparity. In fact, Minority Status was now linked directly to GPA, meaning that even other predictors in the model could not fully account for the disparity. Third, the relationship of SOS scores to academic outcomes was again invariant across minorities and whites, and thus there was no moderation effect to explain the disparity either. These findings portray a democratization of at least one aspect of freshman life by the end of the year: Students of different backgrounds came to experience similar stress overload. They also indicate that ethnicity-related factors other than those measured here must emerge over the course of the freshman year to explain persistent performance disparities. Finally, they support earlier indications that the SOS, and algorithms incorporating it, would work equally well for predicting minority and white performance.

5. General discussion

5.1. Summary

Stress overload, the destructive form of stress, has two components according to stress theories: (1) a surfeit of impinging demands, and (2) a dearth of resistive resources (Cohen et al., 1995). Beginning college is a time when these components are very likely to converge: Freshmen face an array of new challenges at a time when they are distant from support, short of funds, and unsure of their abilities (Beck & Davidson, 2001; DeBerard et al., 2004; Zajacova et al., 2005). There is prior research to show that stress is detrimental to academic performance, but the true extent of its impact is undetermined because previous stress measures have assessed only demands (e.g., Pritchard & Wilson, 2003) or resources (e.g., Bong, 2001). The present research was the first to purposefully assess the totality of stress overload in examining its relationship to academic performance. Moreover, it did so in a stringent manner, controlling for multicollinearity with other predictors, minimizing the possibility of reverse-causality explanations, and using official rather than self-reported indicators of academic performance.

Two studies were conducted using separate samples from the same cohort of freshmen, drawn during the first semester and second semester of their incoming year at a large public university. The primary goal was to determine if stress overload is as accurate in predicting academic outcomes as it has proven in predicting health outcomes (Amirkhan et al., 2015). During the entry semester, stress overload assessed mid-term was found to have a statistically significant and negative relationship with term-end grades. In fact, it ranked among the strongest of traditional predictors of freshman performance. In the following semester, stress overload was again found to predict grades, again as well as the best algorithm variables. In fact, it was one of only few predictors that did not wax or wane, but showed a consistent association with grades across the academic year. However, stress overload was not found to predict attrition–its only tie to the decision to withdraw was indirect, wholly mediated by grades.

A secondary goal was to determine if differences in stress overload might explain the well-documented ethnic disparities in college performance (U.S. Department of Education, 2013). During the entry semester, there was evidence to support this premise: Minority students experienced more stress overload, which was one factor contributing to their poorer grades. However, in the second semester, evidence for the role of stress overload had evaporated. Minority students again earned lower grades, but their stress overload level no longer differed from that of white students. And because stress overload did not relate differentially to performance across students, it could no longer explain the continuing grade disparity.

5.2. Implications

The present findings hold implications for both better understanding freshman attrition and for the mechanics of predicting who is most at risk. First, contrary to expectations, stress overload did not directly influence withdrawal from the university. This is not an entirely new finding: In a study conducted under somewhat different circumstances (all levels of undergraduates at a small private university), researchers also found stress to be related to poor grades but not attrition (Pritchard & Wilson, 2003). And in the present results, that pattern was also found for traditional predictors, with even the strongest among them linked to grades but not attrition. The emerging picture is that attrition is a complexly determined decision. Stress overload and other variables likely affect grades directly–stress, for example, is well known to interfere with cognitive functioning (Lupien, McEwen, Gunnar & Heim, 2009) and successful task performance (Staal, 2004). However, it appears that grades are only one of the factors considered in the decision to drop out. This is consistent with past findings that most students withdraw voluntarily, some with good grades (Bernold, Spurlin & Anson, 2007). And it fits current results, which showed the association between GPA and attrition to be, in absolute terms, a small effect. In short, the SOS and other predictors may be proximal determinants of grades but distal influences on attrition, contributing to one of multiple determinants of withdrawal.

In terms of prediction, current findings indicate that SOS scores would be a useful addition to university algorithms, with certain provisos. If the goal is to predict failing grades, the SOS could be administered at any time during the freshman year, since it showed statistically significant associations with both first- and second-semester GPA. However, if the desire is to anticipate attrition, it seems that SOS scores would be most useful during the first semester. That is, they would serve as an early warning for failing grades, which in turn signal likely withdrawal. But once grades are recorded, college GPA becomes the more proximal predictor, and would better identify high-risk freshmen. There is, in fact, prior evidence showing that college GPA is the strongest of the traditional predictors of attrition (Reason, 2009). In short, it seems that university algorithms must be adjusted according to the goal and point in the academic year to maximize their predictive

ability.

Second, stress overload helped explained minority-white differences in grades the first semester but not the second. Again, this was attributed to an initial difference in stress overload levels that appeared to equalize over the year, rather than to a difference in stress overload's association with GPA which remained invariant across the year. That minorities and whites came to experience comparable stress overload, and that minority status predicted grades directly in the latter part of the freshman year, indicates that minority-related factors other than stress must have arisen to explain grade disparities. There has been considerable research aimed at identifying such factors (e.g., Jones et al., 2002), but one example would be "identification with the university", which is lower among minority students and predictive of academic commitment (Zea et al., 1997).

In regard to prediction, current results show the SOS to be a non-discriminatory predictor, and support the possibility of a universal algorithm for predicting freshman performance. Such an equation would have to be tailored to the academic outcome (grades vs. attrition) and to time (first vs. second semester) as argued earlier, but not necessarily to the ethnicity of the students. This conclusion is consistent with some past findings, which showed no (Wei et al., 2011) or only minor variations (Alkhasawneh & Hargraves, 2014) in the effectiveness of predictive models across student ethnic groups.

5.3. Limitations

Current findings, and their implications, must be tempered by acknowledging the shortcomings of this research. First, in regard to minority differences, a binary variable was used despite strong arguments against this practice (Decuir-Gunby & Schutz, 2014). The diversity of stress overload experiences, both across and within ethnic groups, warrants further and closer examination. In so doing, pains should be taken to ensure adequate representation of each ethnicity, which was not done here for African American and Native American students.

Second, the sample was drawn from a university population in which one minority (Latino) was actually the majority. There is evidence that Latinos suffer less minority-related stress on campuses where this is the case (Rodriguez, Myers, Morris & Cardoza, 2000). Thus, present findings may have underestimated the true stress overload differential between minority and white students. Moreover, the atypical ethnic composition of the present sample may limit generalization of these findings to differently composed student bodies. Third, the research site was also unique in that the university has been recognized for its success in retaining freshmen (U.S. News & World Report, 2015). Insufficient variation on the attrition variable could have impacted results, allowing only the strongest covariate to achieve statistical significance, and underestimating the strength of association for all predictors. This, too, raises questions about the generalizability of current results to other universities, particularly "elite" institutions with high dropout rates (Chang, Cerna, Han & Sáenz, 2008).

Finally, present recommendations regarding the timing of predictions were based on a limited longitudinal study design. Had multiple assessments been used over the course of both the first and second semester, a clearer picture of fluctuations in stress overload would likely have emerged. Such an effort could help pinpoint the critical windows for its impact on performance, as well as the point at which it equalizes across minority and white freshmen.

6. Conclusion

The present research was the first to indicate that stress overload is relevant to academic outcomes, showing its proximal relationship to grades, distal relationship to attrition, and invariant relationship to these outcomes across college freshmen. However, the studies were exploratory, with methodological limitations, and more actuarial than explanatory in nature. Further research efforts seem well worthwhile, given the implications for university retention programs. Stress-overload scores captured the latent construct, and proved better than most predictors typically used to forecast college performance. Exploring the reasons for this could enhance understanding of student stress, and how it affects performance, thus informing counseling interventions. Using the findings to build better algorithms, adjusted to academic outcome and time in the academic year, could help more accurately identify at-risk students. In either manner, by improving interventions or their targeting, stress-overload research promises to help curtail an epidemic of freshman failure and attrition.

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References

Alkhasawneh, R., & Hargraves, R. (2014). Developing a hybrid model to predict student first year retention in STEM disciplines using machine learning techniques. *Journal of STEM Education, 15*, 35–42.

Allen, W. (1992). The color of success: African-American college student outcomes as predominantly white and historically black public colleges and universities. *Harvard Educational Review, 62*, 26–44. https://doi.org/10.17763/haer.62.1.wv5627665007v701.

American College Health Association (2008). American College Health Association: National college health assessment Spring 2007 reference group data report (abridged). *Journal of American College Health, 56*, 469–479.

Amirkhan, J. (2012). Stress overload: A new approach to the assessment of stress. *American Journal of Community Psychology, 49*, 55–71. https://doi.org/10.1007/s10464-011-9438-x.

Amirkhan, J., Landa, I., & Huff, S. (2017). Seeking signs of stress overload: Symptoms and behaviors. *International Journal of Stress Management.*. https://doi.org/10.1037/str0000066.

Amirkhan, J., Urizar, G., & Clark, S. (2015). Criterion validation of a stress measure: The Stress Overload Scale. *Psychological Assessment*. https://doi.org/10.1037/pas0000081.

Baker, S. (2003). A prospective longitudinal investigation of social problem-solving appraisals on adjustment to university, stress, health, and academic motivation and performance. *Personality and Individual Differences, 35*, 569–591. https://doi.org/10.1016/S0191-8869(02)00220-9.

Beck, H., & Davidson, W. (2001). Establishing an early warning system: Predicting low grades in college students from survey of academic orientations scores. *Research in Higher Education, 42*, 709–723. https://doi.org/10.1023/A:1012253527960.

Bernold, L., Spurlin, J., & Anson, C. (2007). Understanding our students: A longitudinal study of success and failure in engineering with implications for increased retention. *Journal of Engineering Education, 96*, 263–274. https://doi.org/10.1002/j.2168-9830.2007.tb00935.x.

Bong, M. (2001). Role of self-efficacy and task-value in predicting college students' course performance and future enrollment intentions. *Contemporary Educational Psychology, 26*, 553–570. https://doi.org/10.1006/ceps.2000.1048.

Cabrera, A., Nora, A., & Castañeda, M. (1993). College Persistence: Structural equations modeling test of an integrated model of student retention. *Journal of Higher Education, 64*, 123–139. https://doi.org/10.1080/00221546.1993.11778419.

Castillo, L., Cano, M., Chen, S., Blucker, R., & Olds, T. (2008). Family conflict and intragroup marginalization as predictors of acculturative stress in Latino college students. *International Journal of Stress Management, 15*(1), 43–52. https://doi.org/10.1037/1072-5245.14.1.43.

Chang, M., Cerna, O., Han, J., & Sáenz, V. (2008). The contradictory roles of institutional status in retaining underrepresented minorities in biomedical and behavioral science majors. *Review of Higher Education, 31*, 433–464. https://doi.org/10.1353/rhe.0.0011.

Chow, H. (2007). Psychological well-being and scholastic achievement among university students in a Canadian prairie city. *Social Psychology of Education, 10*, 483–493. https://doi.org/10.1007/s11218-007-9026-y.

Cohen, S., Kessler, R., & Gordon, L. (1995). Strategies for measuring stress in studies of psychiatric and physical disorders. In S. Cohen, R. Kessler, & L. Gordon (Eds.). *Measuring stress* (pp. 148–171). New York: Oxford University Press.

Cokley, K., McClain, S., Enciso, A., & Martinez, M. (2013). An examination of the impact of minority status stress and impostor feelings on the mental health of diverse ethnic minority college students. *Journal of Multicultural Counseling and Development, 41*, 82–95. https://doi.org/10.1002/j.2161-1912.2013.00029.x.

Cole, B., Matheson, K., & Anisman, H. (2007). The moderating role of ethnic identity and social support on relations between well-being and academic performance. *Journal of Applied Social Psychology, 37*, 592–615. https://doi.org/10.1111/j.1559-1816.2007.00176.x.

Crockett, L., Iturbide, M., Torres Stone, R., McGinley, M., Raffaelli, M., & Carlo, G. (2007). Acculturative stress, social support, and coping: Relations to psychological adjustment among Mexican American college students. *Cultural Diversity and Ethnic Minority Psychology, 13*, 347–355. https://doi.org/10.1037/1099-9809.13.4.347.

D'Amico, M., & Dika, S. (2013). Using data known at the time of admission to predict first-generation college student success. *Journal of College Student Retention, 15*, 173–192.

https://doi.org/10.2190/CS.15.2.c.
Daugherty, T., & Lane, E. (1999). A longitudinal study of academic and social predictors of college attrition. *Social Behavior and Personality: An International Journal, 27*, 355–361. https://doi.org/10.2224/sbp.1999.27.4.355.
DeBerard, M., Spielmans, G., & Julka, D. (2004). Predictors of academic achievement and retention among college freshmen: A longitudinal study. *College Student Journal, 38*, 66–80 ISSN: 0146-3934.
Decuir-Gunby, J., & Schutz, P. (2014). Researching race within educational psychology contexts. *Educational Psychologist, 49*, 244–260. https://doi.org/10.1080/00461520.2014.957828.
Dyson, R., & Renk, K. (2006). Freshmen adaptation to university life: Depressive symptoms, stress, and coping. *Journal of Clinical Psychology, 62*, 1231–1244. https://doi.org/10.1002/jclp.20295.
Fike, D., & Fike, R. (2008). Predictors of first-year student retention in the community college. *Community College Review, 36*, 68–88. https://doi.org/10.1177/0091552108320222.
Friedman, B., & Mandel, R. (2009). The prediction of college student academic performance and retention: Application of expectancy and goal setting theories. *Journal of College Student Retention, 11*, 227–246. https://doi.org/10.2190/CS.11.2.d.
Fry, R. (2004). *Latino youth finishing college: The role of selective pathways.* Washington, DC: Pew Hispanic Center1–40.
Gloria, A., Castellanos, J., Lopez, A., & Rosales, R. (2005). An examination of academic nonpersistence decisions of Latino undergraduates. *Hispanic Journal of Behavioral Sciences, 27*, 202–223. https://doi.org/10.1177/0739986305275098.
Guillory, R., & Wolverton, M. (2008). It's about the family: Native American student persistence in higher education. *Journal of Higher Education, 79*, 58–87. https://doi.org/10.1080/00221546.2008.11772086.
Hales, D. (2009). *An invitation to health* (13th ed.). Belmont, CA: Wadsworth/Cengage Learning.
Hicks, T., & Heastie, S. (2008). High school to college transition: A profile of the stressors, physical and psychological health issues that affect the first year on-campus college student. *Journal of Cultural Diversity, 15*, 143–146 PMID: 19025202.
Hobfoll, S. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*, 513–524. https://doi.org/10.1037/0003-066X.44.3.513.
Hoekstra, R., Kiers, H., & Johnson, A. (2012). Are assumptions of well-known statistical techniques checked, and why (not)? *Frontiers in Psychology, 3*, 1–9. https://doi.org/10.3389/fpsyg.2012.00137.
Holmes, T., & Rahe, R. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research, 11*, 213–218. https://doi.org/10.1016/0022-3999(67)90010-4.
Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modeling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*, 53–60.
Hurst, C., Baranik, L., & Daniel, F. (2013). College student stressors: A review of the qualitative research. *Stress and Health, 29*, 275–285. https://doi.org/10.1002/smi.2465.
Jackson, A., Smith, S., & Hill, C. (2003). Academic persistence among Native American college students. *Journal of College Student Development, 44*, 548–565. https://doi.org/10.1353/csd.2003.0039.
Ji, H., & Zhang, L. (2011). Research on students' stresses and coping strategies. *Asian Social Science, 7*, 30–34. https://doi.org/10.5539/ass.v7n10p30.
Jones, L., Castellanos, J., & Cole, D. (2002). Examining the ethnic minority student experience at predominantly white institutions: A case study. *Journal of Hispanic Higher Education, 1*, 19–39. https://doi.org/10.1177/1538192702001001003.
Kahn, J., Nauta, M., Gailbreath, R., Tipps, J., & Chartrand, J. (2002). The utility of career and personality assessment in predicting academic progress. *Journal of Career Assessment, 10*, 3–23. https://doi.org/10.1177/1069072702010001001.
Lazarus, R., & Folkman, S. (1984). *Stress, appraisal, and coping.* New York, NY: Springer.
Leppink, E., Odlaug, B., Lust, K., Christenson, G., & Grant, J. (2016). The young and the stressed: Stress, impulse control, and health in college students. *Journal of Nervous and Mental Disease, 204*, 931–938. https://doi.org/10.1097/NMD.0000000000000586.
Loftin, C., Newman, S., Dumas, B., Gilden, G., & Bond, M. (2012). Perceived barriers to success for minority nursing students: An integrative review. *ISRN Nursing, 2012*, 1–9. https://doi.org/10.5042/2012/806543.
Lunney, M. (2006). Stress overload: A new diagnosis. *International Journal of Nursing Terminologies and Classifications, 17*, 165–175. https://doi.org/10.1111/j.1744-618X.2006.00035.x.
Lupien, S., McEwen, B., Gunnar, M., & Heim, C. (2009). Effects of stress throughout the lifetime on the brain, behavior and cognition. *Nature Reviews Neuroscience, 10*, 434–445. https://doi.org/10.1038/nrn2639.
McEwen, B. (2000). The neurobiology of stress: From serendipity to clinical relevance. *Brain Research, 886*, 172–189. https://doi.org/10.1016/S0006-8993(00)02950-4.
Murtaugh, P., Burns, L., & Schuster, J. (1999). Predicting the retention of university students. *Research in Higher Education, 40*, 355–371. https://doi.org/10.1023/A:1018755201899.
Murff, S. (2005). The impact of stress on academic success in college students. PMID: 16268204 *ABNF Journal, 16*, 102–104.
Nadler, J., & Clark, M. (2011). Stereotype threat: A meta-analysis comparing African Americans to Hispanic Americans. *Journal of Applied Social Psychology, 41*, 872–890. https://doi.org/10.1111/j.1559-1816.2011.00739.x.
Noble, K., Flynn, N., Lee, J., & Hilton, D. (2007). Predicting successful college experiences: Evidence from a first-year retention program. *Journal of College Student Retention, 9*, 39–60. https://doi.org/10.2190/6841-42JX-X170-8177.
Nora, A., & Cabrera, A. (1996). The role of perceptions of prejudice and discrimination on the adjustment of minority students to college. *Journal of Higher Education, 67*, 119–148. https://doi.org/10.1080/00221546.1996.11780253.
Odom, K., Roberts, L., Johnson, R., & Cooper, L. (2007). Exploring obstacles to and opportunities for professional success among ethnic minority medical students. *Academic Medicine, 82*, 146–153. https://doi.org/10.1097/ACM.0b013e31802d8f2c.
Ohio University, 2015. *Factors associated with first-year student attrition and retention*. Retrieved from < https://www.ohio.edu/instres/retention/ RetenAthens.pdf > .
Ong, A., Phinney, J., & Dennis, J. (2006). Competence under challenge: Exploring the protective influence of parental support and ethnic identity in Latino college students. *Journal of Adolescence, 29*, 961–979. https://doi.org/10.1016/j.adolescence.2006.04.010.
Perrine, R. M. (1999). Stress and college persistence as a function of attachment style. *Journal of the First Year Experience and Students in Transition, 11*, 25–38.
Peterson, M., & Augustine, C. (2000). External and internal influences on institutional approaches to student assessment: Accountability or improvement? *Research in Higher Education, 41*, 443–479. https://doi.org/10.1023/A:1007080408692.
Pritchard, M., & Wilson, G. (2003). Using emotional and social factors to predict student success. *Journal of College Student Development, 44*, 19–28. https://doi.org/10.1353/csd.2003.0008.
Quintana, S., Vogel, M., & Ybarra, V. (1991). Meta-analysis of Latino students' adjustment in higher education. *Hispanic Journal of Behavioral Sciences, 13*(2), 155–168. https://doi.org/10.1177/07399863910132003.
Reason, R. (2009). Student variables that predict retention: Recent research and new developments. *NASPA Journal, 46*, 482–501. https://doi.org/10.2202/1949-6605.5022.
Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin, 138*, 353–387. https://doi.org/10.1037/a0026838.
Robbins, S., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin, 130*, 261–288. https://doi.org/10.1037/0033-2909.130.2.261.
Rodriguez, N., Myers, H. F., Morris, J. K., & Cardoza, D. (2000). Latino college student adjustment: Does an increased presence offset minority-status and acculturative stresses? *Journal of Applied Social Psychology, 30*(7), 1523–1550. https://doi.org/10.1111/j.1559-1816.2000.tb02534.x.
Ross, S., Niebling, B., & Heckert, T. (1999). Sources of stress among college students. *College Student Journal, 33*, 312–317 ISSN: 01463934.
Schmitt, N., Keeney, J., Oswald, F., Pleskac, T., Billington, A., Sinha, R., & Zorzie, M. (2009). Prediction of 4-year college student performance using cognitive and noncognitive predictors and the impact on demographic status of admitted students. *Journal of Applied Psychology, 94*, 1479–1497. https://doi.org/10.1037/a0016810.
Schraml, K., Perski, A., Grossi, G., & Makower, I. (2012). Chronic stress and its consequences on subsequent academic achievement among adolescents. *Journal of Educational and Developmental Psychology, 2*, 69–79. https://doi.org/10.5539/jedp.v2n1p69.
Seidman, A. (2005). Minority student retention: Resources for practitioners. *New Directions for Institutional Research, 2005*, 7–24.
Selye, H. (1956). *The stress of life.* New York: McGraw-Hill.
Smedley, B., Myers, H., & Harrell, S. (1993). Minority-status stresses and the college adjustment of ethnic minority freshmen. *Journal of Higher Education, 64*(4), 434–452. https://doi.org/10.2307/2960051.
Staal, M., 2004. Stress, cognition, and human performance: A literature review and conceptual framework. *NASA TM-2004-212824*. < https://ntrs.nasa.gov/search.jsp?R=20060017835 2018-01-20T01:15:29+00:00Z > .
Steele, C. (1997). A threat in the air. How stereotypes shape intellectual identity and performance. *American Psychologist, 52*, 613–629. https://doi.org/10.1037/0003-066X.52.6.613.
Struthers, C., Perry, R., & Menec, V. (2000). An examination of the relationship among academic stress, coping, motivation, and performance in college. *Research in Higher Education, 41*, 581–592. http://www.jstor.org/stable/40196403.
Toven-Lindsey, Levis-Fitzgerald, M., Barber, P., & Hasson, T. (2015). Increasing persistence in undergraduate science majors: A model for institutional support of underrepresented students. *CBE Life Sciences Education, 14*, 1–12. https://doi.org/10.1187/cbe.14-05-0082.
U.S. Department of Education, 2013. *Digest of education statistics*. Retrieved from < http://nces.ed.gov/programs/digest/d13/tables/dt13_326.10.asp > .
U.S. News & World Report, 2015. *Freshman retention rate*. Retrieved from < http://colleges.usnews.rankingsandreviews.com/best-colleges/rankings/national-universities/freshmen-least-most-likely-return > .
Vaez, M., & Laflamme, L. (2008). Experienced stress, psychological symptoms, self-rated health and academic achievement: A longitudinal study of Swedish university students. *Social Behavior and Personality: An International Journal, 36*, 183–196. https://doi.org/10.2224/sbp.2008.36.2.183.
Wei, M., Ku, T., & Liao, K. (2011). Minority stress and college persistence attitudes among African American, Asian American, and Latino students: Perception of university environment as a mediator. *Cultural Diversity & Ethnic Minority Psychology, 17*, 195–203. https://doi.org/10.1037/a0023359.
Young, A., Johnson, G., Hawthorne, M., & Pugh, J. (2011). Cultural predictors of academic motivation and achievement: A self-deterministic approach. *College Student Journal, 45*, 151–183.
Zajacova, A., Lynch, S., & Espenshade, T. (2005). Self-efficacy, stress, and academic success in college. *Research in Higher Education, 46*, 677–706. https://doi.org/10.1007/s11162-004-4139-z.
Zea, M., Reisen, C., Beil, C., & Caplan, R. (1997). Predicting intention to remain in college among ethnic minority and nonminority students. *Journal of Social Psychology, 137*, 149–160. https://doi.org/10.1080/00224549709595426.