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Development of the College Student Acute Stress Scale (CSASS)

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Abstract

Purpose: Develop and validate the College Student Acute Stress Scale (CSASS), a measure of acute stress specific to college students.

Design and Methods: A total sample of 440 young adults from a University in the northeast US, were surveyed across three separate research studies. Exploratory principal component analysis, internal consistency reliability, convergent and divergent validity, and test-retest reliability analyses were performed.

Findings: Evidence of convergent and divergent validity were obtained, and adequate internal consistency and test-retest reliability were identified.

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Data repository: Portions of the data from this research study has been deposited to the Common Data Repository of Nursing Science, the repository for the National Institute of Nursing. Research.

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The data that support the findings of this study are available from the corresponding author upon reasonable request.

Practice Implications: This study provides evidence for the validity and reliability of a self-report measure of college students' acute stress experiences.

Keywords

psychological stress; acute stress disorder; student; scales; nursing

Psychological stress during college has a significant influence on academic success and health. Psychological stress has been defined as environmental demands that are perceived to exceed the individual's capacity to adapt (Cohen et al., 2007). Perceived stress has significant negative effects on students' quality of life (Ribeiro et al., 2017), and academic success (Rickwood et al., 2016). In a national survey of 63,497 college students, the most frequently reported factor affecting academic performance was stress (30%), and 48% of students surveyed rated their stress level as "more than average" or "tremendous" (American College Health Association, 2017). Additionally, psychological stress has been associated with health among college students. Among first-year college students, depression, physical health symptoms (e.g. insomnia, gastrointestinal symptoms, headaches), and risky health behaviors (e.g. sexual behavior, cigarette use, alcohol use) were associated with increased levels of self-reported stress (Filipkowski et al., 2016; Pelletier et al., 2016). Stress has been associated with a myriad of health problems among college students, both physical (Leppink et al., 2016) and psychiatric (Karatekin, 2018; Leppink et al., 2016), however, the influence of acute (short term) stress among college students is not well understood, partly because researchers lack an appropriate self-report measures. Therefore, the purpose of this study was to develop and validate the College Student Acute Stress Scale (CSASS).

Purpose

Sources of psychological stress students may experience during college include a new social environment, academic pressures, and financial concerns (Britt et al., 2017; Britt et al., 2016). However, some students enter college having experienced significant psychologic stress in childhood as a result of childhood adversity (physical, psychological, sexual abuse, neglect, and household dysfunction). Childhood adversity has also been associated with greater perceived stress among college students (Coleman et al., 2016; Kalmakis et al., 2019). This is important, as 32% of nearly 3,000 college students queried reported at least two adverse childhood experiences (Windle et al., 2018).

Chronic, early-life exposure to stressors, such as adverse childhood experiences, modify neuroplasticity influencing short and long-term resiliency, ability to maintain allostasis, and eventually can result in disease if allostasis is not effectively managed (McEwen, 2016). The theory of allostatic load provides a framework for investigations of stress and health among college students. Stress experienced in the early stages of life disrupts the neurobiological response to stress (Smith & Pollak, 2020). This disruption results in chronic changes to the nervous, immune, and endocrine systems resulting in biological changes throughout the body associated with conditions such as hypertension (Mocayar Marón et al., 2019), obesity (Harnois et al., 2021), and diabetes (Doan, 2021).

In a study among nursing students, stress was associated with relationship issues (Zhang et al., 2017). In other experimental-design study in which students were exposed to a laboratory induced acute stressor, acute stress was associated with decision making (Wemm & Wulfert, 2017).These studies about the contributions of acute stress to allostasis further our understanding of the stress response and psychological determinants of individuals health and lifestyle (Guidi et al., 2021). Of concern is that individuals who have been chronically stressed may have altered responses when exposed to acute stress. Acute stress, or short term stress (< one week), may influence physiology differently in individuals who experience chronic stress compared to those who do not. Therefore, a self-report measure of acute stress, specific to college students, would allow for a full examination of the effects of acute stress on students' stress responses.

Stressors in college are unique to the environment, the social situation, and the student's developmental stage and often fluctuate (Archarya et al., 2018). Scientists need to assess stress with instruments sensitive to the unique stressors encountered in the college population. Current self-report stress measures are not intended to capture the acute stress experience. The Perceived Stress Scale (Cohen et al., 1983) has been used frequently across various populations. This scale includes general items representing possible stressors that occurred over the past month. Although there are available measures of stress specific to college students, they do not measure acute stress The Inventory of College Students' Recent Life Experiences (ICSRLE) includes items that are specific to the college population; however, this scale includes 49 items and again refers to stressors experienced in the last month. Similarly, the University Stress Scale (Stallman & Hurst, 2016) is college-centered is intended to measure stress over the past month and does not include specific acute stressors believed to affect college students. The Perception of Academic Stress Scale (Bedewy & Gabriel, 2015) is a scale to measure stress experienced during college, however the scale applies purely to academic stress such as academic progress, course load, and self-perceptions of academic standing.

Researchers studying the acute stress response have been unable to find an acute stress scale intended for use with college students. In particular, researchers using laboratory-based physical and social stressors to measure biological and repeated self-report measures found the current perceived stress scales to be inadequate to the task. Therefore, a self-report measure of acute stress specific to college students was needed. The purpose of this study was to develop and validate the College Student Acute Stress Scale (CSASS).

Design and Methods

Data from three different cross-sectional studies with college students were collected to evaluate the internal consistency reliability and validity of the CSASS. Each study had varying primary aims, but all included the CSASS as a secondary goal of measurement development. Inclusion criteria for all three study samples consisted of college students between 18 and 21 years of age from one large University in the northeast US. One of the samples (1) included students from specific courses with no additional exclusion criteria, however, there were additional exclusion criteria for samples 2 and 3. All students who met criteria were invited to participate. Specifics about each of the study samples, and

both inclusion and exclusion criteria, are described below. All three studies were reviewed by the Institutional Review Board (IRB) of a large northeastern tier 1 state university. As approved by the IRB, students were provided extra credit for participating, and emotional health resources were provided at the end of the surveys.

Samples

Sample I—Sample I included 168 nursing students (90.5% female) who responded to an online questionnaire. The mean age of this sample was 19.7 years (SD = 0.8). This sample was collected to investigate the relationships between adverse childhood experiences (ACEs), posttraumatic stress disorder symptoms (PTSD-S), and self-reported stress among college students. Participants were recruited from two nursing courses and provided with a web link. Online questionnaires were completed during the Spring and Fall 2015 semesters. Online consent was obtained prior to survey completion. There were no additional exclusion criteria.

Sample II—Sample II included 57 undergraduate college students (73.7% female) across all disciplines. The mean age of this sample was 19.9 years (SD = 1.1). This sample was recruited for a study examining the relationship between stress and fatigue among young adults. Students were recruited over a two-year period (2016 and 2017) using flyers posted across campus. Interested students contacted researchers via email to request further information. Those who met inclusion criteria were scheduled to come to a laboratory visit to complete study procedures. Students we excluded from this study if their hair was less than 3 cm in length, were taking prescribed steroidal medication, or were pregnant. Written consent was obtained at the start of the 2-hour lab visit. During the visit, participants completed self-report measures for adverse childhood experiences, perceived chronic and acute stress, posttraumatic stress disorder, fatigue, and demographic information.

Sample III—Sample III included 215 college students (69.8% female). The mean age of this sample was 19.0 years (SD = 0.4). This sample was collected to examine associations between health behaviors, such as diet, and mental and physical health among first year students. Recruitment of participants occurred through posters, flyers, emails, and Facebook posts during the spring of 2017. Students were screened prior to data collection and were excluded if they were; (a) not a first-semester freshman at the time of the study; (b) not living on campus, (c) not on a campus meal plan, (d) were pregnant or lactating, or (e) were diagnosed with diabetes, cardiovascular disease, cancer, eating disorders, or any other diseases or conditions that influenced dietary intake or physical activity. Participants were also excluded if they currently, or in the last three months, were on medications that altered their diet or ability to exercise. Written consent was obtained prior to data collection. Participants completed self-report questionnaires during the one-hour lab visit.

Measures

Various self-report measures were collected across the three samples (Table 1). The reliability and validity for all measures used in the studies are provided in Table 2. A description of each measure follows.

College Student Acute Stress Scale (CSASS)—The CSASS is a 14-item scale intended to evaluate acute stress among college students. The CSASS was developed to address the unique stressors of college student life and includes general items that are specific to college students. The items of the scale were established in a process of steps. In the first step, we performed a thorough literature review of existing stress measures using the terms stress and college. The search was limited to publications prior to 2015; The review provided four initial inventories to identify items: the Stanford Acute Stress Reaction Questionnaire, Recent Life Changes Questionnaire (Cardena et al., 1996), Inventory of College Students' Recent Life Experiences (Bodenhorn et al., 2007), and College Student's Stressful Events Checklist (Holmes & Rahe, 1967).

Once potential items were found, an iterative process of discussions occurred with five experts in stress and health, including a neuro-psychologist, biostatistician, advanced practice nurse with ten years of college health experience, and two graduate students to identify concepts that were consistent across inventories as well as content that was missing based on the literature as well as our experience with college students and stress. Formal content validity was not evaluated. Finally, to evaluate face validity, content evaluation, and item readability, preliminary trials among approximately 40 undergraduate college students. Students completed the questionnaire and provided comments and suggestions that were used to improve the scale. The CSASS is intended to measure student life stressors retrospectively over the past week. The measure, including instructions, has a Flesch-Kincaid grade level of 6.2. All stressors were measured using a 5-point scale (0= no stress, 1= a little stress, 2= some stress, 3= a lot of stress, 4= constant stress). The maximum score for any CSASS item is 4, with a maximum total score of 56. The higher the score, the greater the amount of stress.

Adverse Childhood Experiences (ACE)—The Adverse Childhood Experiences (ACE) questionnaire is intended to measure exposure to adverse childhood experiences. It consists of 19 yes/no items (Kalmakis et al., 2019), that were adapted from the 10-item ACE score (Dube et al., 2004). The questionnaire consists of items related to emotional, physical, or sexual abuse (6 items), neglect (4 items), and household dysfunction (9 items). ACE has adequate test-retest reliability ($r = .71$, $p < .001$; Zanotti et al., 2018).

The Perceived Stress Scale (PSS)—The Perceived Stress Scale (PSS) measures a person's perception of stress and is widely used in social/health research (Cohen et al., 1983). The 10-item measure uses a 5-point scale and yields a total stress score. Adequate reliability and validity have been reported in 12 studies with Chronbach's alpha >.70 (Lee, 2012). Adequate reliability was obtained for all samples (Table 2).

Inventory of College Students' Recent Life Experiences (ICSRLE)—Another measure of stress is the Inventory of College Students' Recent Life Experiences (ICSRLE), which consists of 49-items. The ICSRLE yields seven subscales (developmental challenge, time pressure, academic alienation, romantic problems, associated annoyances, general social mistreatment, and friendship problems) as well as a total score. Adequate reliability has been reported from $\alpha = 0.68$ to 0.89 (Kohn et al., 1990; Osman et al., 1994). Adequate reliability for both Sample I and Sample II was obtained. Cronbach's alpha ranged from

α=0.63 to 0.87 for six of the seven subscales. Less than adequate reliability for the subscale Romantic Problems was identified (Sample I α=0.67; Sample II α=0.31) in the study samples, and therefore, this subscale was not included in the analyses. Adequate total ISCRLE score reliability was obtained (Sample I α=.94; Sample II α=.95) (see Table 2).

Abbreviated Dysregulation Inventory (ADI)—The Abbreviated Dysregulation Inventory (ADI) is a 30-item questionnaire used to measure three aspects of dysregulation: emotional, behavioral, and cognitive (Mezzich et al., 2001). Items are rated on a 4-point scale ranging from 0 (never true) to 3 (always true). The ADI has good internal consistency across several samples (da Motta et al., 2018; Marsee et al., 2014). Adequate reliability for sample II, in this study, was obtained (see Table 2).

Millon Clinical Multiaxial Inventory (MCMI-III)—The Millon Clinical Multiaxial Inventory (MCMI-III) is a widely used instrument in clinical psychology (Hesse et al., 2012) to measure 24 different personality disorders to help with the distinction between Axis I and Axis II on the DSM-IV (Rossi & Derksen, 2015). The MCMI-III consists of 175 true-false, self-report items. Raw scores are transformed into base-rate scores, with a score of 85, or higher, suggesting a clinically significant disorder (Hesse et al., 2012). Along with the 24 different personality disorders, the MCMI-III includes four scales (validity, disclosure, desirability, and debasement) that are intended to identify invalid responses. Adequate reliability for sample II was obtained (see Table 2).

Three Factor Eating Questionnaire (TFEQ-18)—To measure emotional and restrained eating, the eighteen-item Three Factor Eating Questionnaire (TFEQ-R18) was used (Karlsson et al., 2000). The TFEQ-R18 is a shortened version of the original 51-item TFEQ (Stunkard & Mesick, 1985). The TFEQ-R18 is a self-reported scale measuring three different aspects of eating behavior; cognitive restraint, uncontrolled eating, and emotional eating (Karlsson et al., 2000). Questions are based on a 4-point scale where 1 refers to definitely false, and 4 refers to definitely true. A score between 1 and 4 is given to each of the 18 items and then summed for each of three factors: cognitive restrain, uncontrolled eating, and emotional eating. Next, the raw scale scores are transformed to a 0–100 scale where higher scores indicate greater cognitive restraint, uncontrolled eating, or emotional eating (Karlsson et al., 2000). TFEQ-R18 internal consistency for each of the three scales of TFEQ-R18 has been reported as α >.70 and < .90 in obese subjects (Karlsson et al., 2000), similar coefficients have been reported in general population subjects (De Lauzon et al., 2004). Adequate reliability for Sample III was obtained (see Table 2).

Statistical Method

All statistical analyses were performed using the Statistical Package for Social Science (SPSS version 26.0). Exploratory factor analysis was performed on the 14-item CSASS. A principal component analysis (PCA) with a varimax rotation was used to identify factors. A PCA was chosen so that all variance was included in the analysis as it was not clear that all of the items should be included in the analyses. The combined sample size was 440, thus we have at least 10 subjects per item. Adequacy of the sample was evaluated prior to analysis via Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity. Exploratory

factor analyses were performed on Sample I and II together, as they were obtained in the Nursing Laboratory, while a separate analysis was performed on Sample III, obtained in the Nutrition Assessment Laboratory. This method was used to allow for a comparison of sample loadings to provide evidence of both reliability and validity. Internal consistency reliability was measured using Cronbach's alpha. Validity of the CSASS was evaluated via correlation coefficient examination of constructs hypothesized to be more (convergent), or less (divergent), correlated with the CSASS (see Table 3).

Although this analysis is part of a larger study, the measures included in this analysis were chosen to have scales that could examine convergent validity(PSS & ICSRLE) or divergent validity (ADI & MCMI-III). The TFEQ was included since some of the subscales were hypothesized to be related to the ACUTE subscales (Uncontrolled and Emotional Eating) while the Cognitive Restraint subscale was hypothesized to not be related to the ACUTE subscales.

Findings

Demographics

The mean age for all samples combined was 19.3 years old (SD = 0.8; range = 18–21). Anova was used to examine age differences across samples. After a significant difference was found in age across the three samples (F=74.58, p<0.001), a Bonferroni post-hoc analysis was performed. Results identified significant differences between sample I and sample III (p<0.001), and sample II and sample III (p<0.001).

Chi-Square was used to examine differences across gender, race, ethnicity, and employment. There was a significant difference in gender across the study samples ($X^2 = 30.53$, $p < 0.001$), with the majority identifying as female (Sample I= 91.0%, Sample II= 73.7%, Sample III= 69.8%). There was a significant difference in race across study samples ($X^2 = 76.9$, $p < 0.001$), although the majority of participants in all samples identified as White/Caucasian (Sample I= 88.0%, Sample II= 73.2%, Sample III= 68.4%). Although there was a significant difference in ethnicity across the study samples ($X^2 = 6.3$, $p = 0.04$), almost all participants in each study sample were non-Hispanic. Over half of the total combined sample was employed (54.3%), and there was a significant difference in employment across the study samples ($X^2 = 29.1$, $p < 0.001$). Sample III had the lowest level of employment (Table 4).

Factor Analysis

Initial factorability analyses provided evidence of adequate factorability for the combined samples I and II (KMO=0.90, Bartlett's Test of Sphericity $\chi^2 = 1129.0$; p<0.001; MSA values range = 0.82 – 0.95). Using a Varimax rotation, a three-factor model was obtained that explained 56.1% of the variance (Table 5). After examination of this solution, one item, related to health problems, loaded poorly in all three factors (0.32, 0.25, and 0.48, respectively). Due to poor loading, the item was dropped. The analysis was performed a second time using the remaining thirteen items.

After removing the one item, adequate factorability for the combined sample I and II was still evident (KMO=0.88, Bartlett's Test of Sphericity χ^2 = 1055.3, p<0.001; MSA range = 0.81–0.94). In this second factor analysis, a two factor model was identified. The two factors explained 50.3% of the variance. The first factor was labeled 'Social' and explained 41.9% of the variance, while the second factor was labeled 'Non-Social' and explained 8.4% of the variance (see table 7).

Exploratory factor analysis was again performed solely using Sample III (Table 6). Results revealed that the data were also suitable for analysis (KMO=0.80; Bartlett's Test of Sphericity χ^2=719.3 p<0.001; MSA range 0.71–0.90). Instead of a two-factor model, sample III revealed a four-factor model, which explained 57.4% of the variance. Table 6 provides item loadings for all factors.

An examination of the item factor loading uncovered multiple items that cross-loaded on multiple factors, and one factor on only two items (Factor 4). For example, items 2 and 10 loaded on both Factors 1 and 3, Item 3 loaded on both Factors 1 and 2, and item 8 loaded on Factors 2 and 4. As a result, a second FA was completed that forced a two factor solution to allow for factor structure comparison across the samples. Results of the forced two-model solution are provided (Table 7). This solution explained 40.9% of the variance.

The two-factor solutions (Samples I/ II compared to the Sample III) were very similar. Three items (1, 5, 14) loaded differently across the two factors. Item 1 (schoolwork) and item 14 (time management) loaded on the Non-Social Factor for the Sample I/II solution, but on the social factor for Sample III. Item 5 (relationship with roommates) loaded on the Social Factor for Sample I/II solution, but on the Non-social solution for Sample III. To identify a final solution, schoolwork (Item 1) and time management (item 14) were kept on the Non-social factor, while relationship with roommates (Item 5) remained on the Social Factor; this was the original solution.

Reliability of the CSASS

Internal consistency reliability for the total score, and the individual subscales, were evaluated. Adequate internal consistency reliability was obtained with the CSASS for the total score, and for the Social and non-Social subscales for Sample I/II. Adequate reliability was also obtained for the total score and Social Subscale for sample III. Less than optimal reliability was obtained for the Non-Social subscale for Sample III (Table 8). Cronbach's alpha did not increase for the Non-Social Subscale with any item deletion.

In addition to internal consistency reliability, test-retest reliability was evaluated in one of the study samples (Sample II). For Sample II (N=69), data collection took place across two study dates, and participants responded to the CSASS on both testing dates. The average number of days between assessments was 7.6 (SD = 4.2). Adequate test-retest reliability for the CSASS was obtained (total: r = 0.70; social: r = 0.62, non-social: r = 0.69). Although acute stress is something that would be expected to change across time, given the short amount of time between assessments, the amount of acute stress, and participant responses appear to be reliable and stable.

Validity of the CASSS

As expected, both CSASS scales were related to almost all ICSRLE scales. Since the relationships are moderate in magnitude, this suggests that although they have overlapping variances, they also measure different constructs. The CSASS includes items that pertain to more acute stressors, while the ICSRLE includes many life-event items. Also, as anticipated, among the correlations between the CSASS and the ISCRLE, the ICSRLE subscale that is most strongly related to the Non-Social subscale, is the time pressure subscale, which is the subscale that is the least social. In contrast, the subscale friend problems was more strongly related to the social subscale of the CSASS. Correlations between CSASS and PSS, another measure of stress, yielded additional evidence of convergent validity. The total PSS was moderately and positively related to both the social and non-social CSASS.

Evidence of divergent validity was also obtained. As anticipated, weak to no relationship was identified for the following subscales ACE, SF-8, MCMI-III, ADI, and TEFQ. The Mental Systems subscale of the SF-8 was expected to be related to the CSASS, but no correlation was identified. However, the Physical Symptoms subscale had a significant, weak negative correlation with the Non-social subscale of the CSASS. Unexpectedly, the Emotional Dysregulation subscale of the ADI was not found to have a relationship with the CSASS.

The TFEQ emotional eating subscale was expected to be more strongly related to the CSASS than the other TEFQ scales. Both the emotional eating, and the uncontrolled eating, were moderately related to both CSASS scales, and as expected, cognitive restraint was unrelated. Finally, the relationships between the PSQI and the CSASS were weak to moderate, although interestingly, the magnitude of the correlations was a bit larger for the non-social subscale (See Table 9).

Discussion

The lack of a stress measure specific to the college student population, results in unreliable self-report of the unique stress experienced in this population, including social, academic, and financial stressors. Therefore, the purpose of this study was to develop and validate the CSASS. The CSASS was evaluated in participants across three distinct research studies. Fourteen items were originally included in the analysis of the CSASS; however, health problems did not load well in factor analyses of any individual or combined sample, and therefore, was dropped. This lack of factor loading for health problems is likely a result of participants age, as one would not expect to see a multitude of chronic health conditions at such an early age.

Analysis of the remaining 13 items resulted in a two-factor structure: Social and Non-social. Social stress included 6 factors (social life, recreation, and relationships with classmates, friends, professors, and roommates),and Non-social 7 factors (financial problems, time management, work outside of school, schoolwork, transportation problems, and relationships with significant other and family). This structure is consistent with the findings of previous research among college students. A qualitative study designed to understand sources of stress among college students, reported that social support and

managing an academic-life balance (Social) were sources of stresses for students, as were the non-social academic-related stressors, such as workload and exams (Non-social) (Pitt et al., 2018).

Based upon the data collected from 440 female and male college students, adequate CSASS reliability was demonstrated for the total score, for the Social and Non-social subscales for Sample I/II, and for the total score and social subscale for sample III. Less than optimal reliability was obtained for the Non-social subscale for Sample III. This may be a result of the participant pool, which in Sample III was restricted to first year college students. First year students may experience more stress surrounding their adjustment to college life, compared to those in later years. Issues of time management, transportation, and meeting academic expectations may be significantly different in the first year college student. Therefore, further study is needed to attain full confidence in the reliability of the Non-social subscale.

Validity of the CSASS as a measure of acute stress was obtained from multiple correlations with previously validated stress scales. The CSASS was moderately and positively related to the ICSRLE and PSS. Furthermore, TEFQ emotional eating and uncontrolled eating subscales were moderately related to CSASS, reflective of the link between stress and eating behavior (Hootman et al., 2018; Thomas et al., 2019).

Schoolwork, time management, financial management, relationship with friends, and social life were perceived to be most stressful using the CSASS. This is consistent with findings from previous research in which decision making and relationship behavior were negatively influenced by laboratory induced acute stressors among college students (Wemm & Wulfert, 2017; Wu et al., 2021). These findings support the validity of the CSASS, drawing similarities between the findings of laboratory induced acute stress and the self-report acute stress measure.

The current study has several key strengths. First, the use of participants from three separate research studies with various research purposes, provides an unbiased sample. Second, the sample size was sufficiently large to provided confidence that the CSASS is a reliable and valid measure of acute stress in this population.

Limitations of this study include the lack of formal qualitative methods to create and refine the CSASS items. Rather, we gathered data about college student stress from published studies and used current reliable measures of stress to create the CSASS. A second limitation of this study is the over representation of females across the three samples, this may be why we did not find gender differences. Academic stress (Wenjuan et al., 2020) and perceived stress (Infortuna et al., 2020),have been found to vary across gender, although female and male college students may have different acute stressors. Indeed, female college students reported higher levels of stress when compared to male students in a national survey (NCHA-II). Therefore, gender difference should be further examined using CSASS. Additionally, all three participant samples in this study came from one large University in the US, and are samples of convenience. In addition, all measures are self-report and thus

are subject to potential bias. Future reliability and validity verification should be obtained from global student samples.

Future research should focus on confirmatory analysis as the current study is limited solely to exploratory analysis. Additional statistical limitations include items that cross-load with magnitudes of .30 or greater. Lastly, we want to emphasize that all three research studies from which participant samples were drawn, were completed prior to the pandemic of 2020. Thus, the stress related to this key event in world history was not considered in this paper.

Implications for Nursing Practice

This study provides evidence for the validity and reliability of the 13-item self-report measure of college students' acute stress experiences. The results are relevant to nursing practice and research because an accurate measure of acute stress among college students is key to learning more about stress and health in this population. With 45% of college students reporting "more than average" stress, and 12% reporting "tremendous" stress (American College Health Association, 2017), stress is a health concern for this population. Furthermore, 30.6% of college students reported stress affected their academic performance. Psychological stress during college has a significant influence on academic success and life-long health. An acute stress measure, specific to the stressors of college life, will prove valuable to researchers who study college stress and its influence on health.

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Table 1

Scales Used Across Three Study Samples

Measure	Sample		
	I	II	III
College Student Acute Stress Scale (CSASS)	*	*	*
Adverse Childhood Experiences (ACE)	*	*	
Perceived Stress Scale (PSS)	*	*	*
Inventory of College Students' Recent Life Experiences (ICSRLE)	*	*	
Abbreviated Dysregulation Inventory (ADI)		*	
Millon Clinical Multiaxial Inventory (MCMI-III)		*	
Three Factor Eating Questionnaire (TFEQ)			*

* indicates the scale was measured with the sample.

Table 2

Reliabilities of Measures with Samples

Measure	Sample I	Sample II	Sample I/II	Sample III
PSS	0.83	0.80	0.80	0.86
ICSRLE total	0.94	0.95	0.94	
Developmental Changes	0.83	0.87	0.84	
Time Pressures	0.82	0.86	0.83	
Academic Alienation	0.66	0.75	0.68	
Assorted Annoyances	0.63	0.54	0.61	
Romantic Problems	0.67	0.31	0.61	
Social Mistreatment	0.86	0.84	0.86	
Friend Problems	0.78	0.77	0.78	
ADI		0.77		
Behavior		0.85		
Cognitive		0.85		
Emotional		0.85		
MCMI-III		0.94		
TFEQ-18				0.79
Uncontrolled Eating				0.80
Cognitive Restraint				0.78
Emotional Eating				0.80

*Cronbach Alpha given for measures and subscales.

ICSRLE = Inventory of College Students' Recent Life Experiences

PSS = Perceived Stress Scale

ACE = Adverse Childhood Experiences

ADI = Abbreviated Dysregulation Inventory

MCMI-III = Millon Clinical Multiaxial Inventory

TFEQ = Three Factor Eating Questionnaire

Table 3

Correlations Between Measures (N = 440)

Measure	Convergent validity	Divergent Validity
ICSRLE		
Developmental Changes	*	
Time Pressures	*	
Academic Alienation	*	
Romantic Problems	*	
Assorted Annoyances	*	
Social Mistreatment	*	
Friend Problems	*	
PSS	*	
ACE		*
ADI		*
Behavior Dysregulation		*
Cognitive Dysregulation		*
Emotional Dysregulation	*	*
MCMI-III		*
TFEQ		
Uncontrolled Eating	*	
Cognitive Restraint		*
Emotional Eating	*	

*ICSRLE = Inventory of College Students' Recent Life Experiences

PSS = Perceived Stress Scale

ACE = Adverse Childhood Experiences

ADI = Abbreviated Dysregulation Inventory

MCMI-III = Millon Clinical Multiaxial Inventory

TFEQ = Three Factor Eating Questionnaire

Table 4

Demographics

Variable	Mean	%	SD	Min	Max	F or χ^2
Age						
Sample I (N=158)	19.7		0.8	18	21	
Sample II (N=57)	19.9		1.1	18	21	
Sample III (N=215)	19.0		0.4	18	21	
Total Combined	19.3		0.8	18	21	74.6***
Gender (% female)						
Sample I (N=167)		91.0%				
Sample II (N=57)		73.7%				
Sample III (N=215)		69.8%				
Total Combined		78.4%				30.3***
Race (% white)						
Sample I (N=167)		88.0%				
Sample II (N=57)		73.2%				
Sample III (N=215)		68.4%				
Total Combined		76.5%				76.9***
Ethnicity (% not Hispanic)						
Sample I (N=167)		97.0%				
Sample II (N=57)		94.7%				
Sample III (N=215)		90.7%				
Total Combined		93.6%				6.3*
Employment (% work)						
Sample I (N=166)		66.9%				
Sample II (N=57)		66.7%				
Sample III (N=212)		40.5%				
Total Combined		54.3%				29.1***

*** p< 0.001

* p<0.05.

Table 5

Initial Factor Model from Principal Component Analysis with Varimax Rotation in Sample I and Sample II Using the College Student Acute Stress Scale (CSASS) (N= 440)

Items	Subscales		
	Factor 1	Factor 2	Factor 3
Eigenvalue	**5.79**	**1.10**	**1.00**
Percentage of Variance explained	**41.1**	**7.8**	**7.1**
10. Social life	**.783**	.212	.207
11. Relationships with classmates	**.773**	.339	.207
2. Relationships with friends	**.764**	.145	.245
9. Recreation activities	**.595**	.316	.030
4. Relationships with professors/teachers	**.557**	.266	.325
5. Relationships with roommates	**.543**	.032	.293
13. Transportation problems	.228	**.703**	.014
6. Work (unrelated to school)	.133	**.682**	.216
8. Relationship with significant other	.231	**.581**	.187
7. Financial problems	.056	**.548**	**.513**
3. Relationships with parents	.398	**.529**	.223
14. Time management	.204	.141	**.836**
1. Schoolwork	.323	.183	**.760**
12. Health Problems	.324	.249	**.482**

A cut-off score of items loading of 0.40 was used (Bolded items).

Table 6

Factor Model from Principal Component Analysis with Varimax Rotation in Sample III Using the College Student Acute Stress Scale (CSASS) (N 440)

Items	Subscales			
	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalue	**4.09**	**1.21**	**1.13**	**1.03**
Percentage of Variance explained	**31.5**	**9.4**	**8.7**	**7.9**
11. Relationships with classmates	**.803**	.113	.149	.048
4. Relationships with professors/teachers	**.672**	.300	−.044	.113
10. Social life	**.630**	.016	*.425*	*.384*
2. Relationships with friends	**.488**	.154	*.395*	*.368*
7. Financial problems	.075	**.719**	.096	.277
3. Relationships with parents	*.404*	**.679**	−.050	−.093
13. Transportation problems	.180	**.618**	.268	.042
8. Relationship with significant other	.009	**.556**	.200	*.353*
6. Work (unrelated to school)	−.108	.300	**.711**	−.067
9. Recreation activities	.201	−.083	**.636**	.178
5. Relationships with roommates	.206	.299	**.542**	.074
1. Schoolwork	.204	.116	−.066	**.759**
14. Time management	.054	.149	.197	**.721**

A cut-off score of items loading of 0.40 was used (Bolded items).

Table 7

Two Factor Model from Principal Component Analysis with Varimax Rotation in Sample I and II, and Sample III Using the College Student Acute Stress Scale (CSASS) (N = 440)

Items	Sample I/II		Sample III	
	Subscale		Subscale	
	Factor 1 College Relationships	Factor 2 Personal Factors	Factor 1 College Relationships	Factor 2 Personal Factors
Eigenvalue	**5.48**	**1.09**	**4.09**	**1.12**
Percentage of Variance explained	**41.9**	**8.4**	**31.5**	**9.4**
10. Social life	**.805**	.237	**.823**	.155
11. Relationships with classmates	**.795**	.310	**.639**	.179
2. Relationships with friends	**.784**	.219	**.686**	.273
9. Recreation activities	**.608**	.216	**.474**	.119
4. Relationships with professors/ teachers	**.577**	.398	**.499**	.291
5. Relationships with roommates	***.553***	.196	.340	***.457***
7. Financial problems	.105	**.748**	.171	**.674**
14. Time management	.252	***.654***	***.523***	.179
6. Work (unrelated to school)	.173	**.641**	.088	**.504**
1. Schoolwork	.365	***.634***	***.569***	.070
8. Relationship with significant other	.261	**.551**	.224	**.577**
3. Relationships with parents	.424	**.537**	.139	**.646**
13. Transportation problems	.267	**.496**	.174	**.674**

*A cut-off score of items loading of 0.40 was used (Bolded items).

Table 8

The College Student Acute Stress Scale (CSASS) Reliability

Measure	Sample I/II	Sample III
CSASS Total	0.88	0.81
Social	0.83	0.73
Non-Social	0.79	0.68

Table 9

Relationship Between CSASS and Other Sample Constructs (N = 440)

Measure	CSASS	
	Social	Non-social
ICSRLE (N=219 Sample I and II)		
Developmental Changes	0.45**	0.53**
Time Pressures	0.36**	0.54**
Academic Alienation	0.33**	0.37**
Assorted Annoyances	0.53**	0.40**
Social Mistreatment	0.47**	0.33**
Friend Problems	0.42**	0.23**
ICSRLE Total	0.52**	0.55**
PSS Total (N=434 Sample I, II, and III)	0.54**	0.56**
GAD Score (N=215 Sample III)	0.60**	0.60**
PCL Total (N=219 Sample I and II)	0.37**	0.35**
ACE Total Score (N=219 Sample I and II)	0.14*	0.22**
SF-8 (N=57 Sample II)		
Mental Symptoms	−0.03	0.04
Physical Symptoms	−0.21	−0.38**
ADI (N=57 Sample II)		
Behavior Dysregulation	−0.11	0.13
Cognitive Dysregulation	−0.29*	−0.05
Emotional Dysregulation	−0.05	0.12
MCMI-III Total (N=57 Sample II)	0.16	0.24
PSQI (N=215 Sample III)		
Subjective Sleep Quality	0.22**	0.32**
Sleep Disturbances	0.29**	0.37**
Daytime Disturbances	0.40**	0.41**
Global Score	0.39**	0.41**
TFEQ (N=215 Sample III)		
Uncontrolled Eating	0.31**	0.33**
Cognitive Restraint	0.09	0.11
Emotional Eating	0.35**	0.30**
Total Score	0.33**	0.36**

** p< 0.01

* p<0.05.