

Further Psychometric Support for the 10-Item Version of the Perceived Stress Scale

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Because of increased stress conditions in college students, updated psychometrics of the Perceived Stress Scale, 10-item version (PSS-10; S. Cohen & G. Williamson, 1988) are necessary. Participants were 281 undergraduates at 3 public universities. An exploratory factor analysis revealed a 2-factor structure measuring Perceived Helplessness and Perceived Self-Efficacy. Normative results, internal consistencies, and construct validity were supported. The current findings reveal that the PSS-10 is a reliable and valid instrument for assessment of perceived stress in college students.

College can be a highly stressful life transition with increased exposure to stressors and subsequent behavioral reactions. Increasing stress reactions among college students has become a widely recognized issue on college campuses (Misra & Castillo, 2004; Sax, 1997). Stressors permeate several facets of college life, including academics, socialization, family relations, independence/autonomy, intimate relationships, and responsibility (Dill & Henley, 1998). Increasing exposure to stressors can result in overtaxed physical and psychological resources leading to an increased probability of physical and psychological impairment (Lazarus & Folkman, 1994). Furthermore, acute and chronic exposure to various stressors (e.g., physical and psychological) can produce deleterious effects, including dysfunction of the hypothalamus-pituitary adrenal axis (Cohen, Kessler, & Underwood Gordon, 1995).

For an event or situation to be considered stressful, it must be perceived as stressful via perceptual processes (Lazarus, 1966; Lazarus & Folkman, 1994). The impact of stressors pivots on (a) the stressor being perceived as threatening or demanding and (b) a lack of appropriate resources to manage the stressor (Lazarus, 1966). Because college students are faced with myriad stressors, accurate measurement of perceived stress has implications for greater understanding of the susceptibility to and the etiology and treatment of pathological disorders. Within a clinical setting, for example, understanding the extent to which various stressors are related to symptom exacerbations may help the clinician and client develop strategies to assist in the management of such events. Stress assessment may also serve as an important predictor for treatment response and may aid in monitoring treatment progress. Finally, stress assessment in community samples of college students may also assist in the development of prevention programs that develop and/or enhance coping skills.

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A paucity of multiple-item instruments for assessing general stress limits the ability of clinicians and researchers to accurately measure perceived stress. Some objective measures use life-event scales to create a cumulative stress score, and “these scores are usually based on either the number of events that have occurred within the specified temporal framework or on a sum of event weights that are based on the judges’ rating of the difficulty of adjusting to these events” (Cohen, Kamarck, & Mermelstein, 1983, p. 386). These measures do not take into consideration the personal and contextual factors that influence the various degrees to which a person may view a stressful situation as stressful.

To address this concern, Cohen et al. (1983) developed the Perceived Stress Scale (PSS), which was based on Lazarus’s theory of stress appraisal (Lazarus, 1966; Lazarus & Folkman, 1994). The PSS is a 14-item self-report instrument designed to measure “the degree to which situations in one’s life are appraised as stressful” (Cohen et al., 1983). Initial psychometric data were collected in three samples (two college samples and one community sample). Internal consistency of the items was strong (r s ranging from .84 to .86). Test-retest reliability was .85 in the college sample after 2 days and .55 in the community sample after 6 weeks. Concurrent validity was also established with positive associations with the number and perceived impact of life stressors (r s ranging from .17 to .35) in the college samples. The PSS also predicted depressive symptomatology (r s ranging from .65 to .76), physical symptomatology (r s ranging from .52 to .65), and social anxiety (r s ranging from .37 and .48) in the college samples. Factor analytic findings with inpatients with psychiatric diagnoses suggest that the PSS-14 comprises two factors: Perceived Distress and Perceived Coping (Hewitt, Flett, & Mosher, 1992; Martin, Kazarian, & Breiter, 1995). The factorial structures of both the PSS-14 and the PSS-10 (the 10-item version of the PSS; Cohen & Williamson, 1988) have not been identified with nonclinical samples.

Cohen and Williamson (1988) developed the PSS-10, which measures the degree to which one perceives aspects of one’s life as uncontrollable, unpredictable, and overloading. The PSS-10 initially revealed a succinct measure of perceived stress that could be used with a broad range of populations. Yet, there has been no evaluation of the PSS-10 factor structure and construct validity. Further evaluation of the PSS-10 is warranted to develop and refine existing theoretical assumptions regarding perception of stress and prediction of risk for behavioral disorders associated with exposure to stressors in college students.

Therefore, the purpose of this study was to provide factorial analytic findings, construct validation, and normative data for the PSS-10 in a sample of U.S. college students from multiple sites. Measures of convergent validity were chosen on the basis of similarity of constructs and item content, and measures of divergent validity were chosen on the basis of construct differences and differing item content (Campbell & Stanley, 1963). Various past research findings reflect medium to large associations between perceived stress and anxiety, depression, and health locus of control, and small to medium associations between perceived stress and sensation seeking, religious faith, overt aggression, and relational aggression.

This study was designed with the following goals:

1. To examine the factor structure of the PSS-10 (Cohen & Williamson, 1988)
2. To examine the descriptive statistics, internal consistency, interscale correlations, and corrected item-total correlations of the PSS-10
3. To determine the convergent validity of the PSS-10 with measures of anxiety, depression, and health locus of control
4. To determine the divergent validity of the PSS-10 with measures of sensation seeking, religious faith, overt aggression, and relational aggression

Method

Participants

Data were collected from 285 undergraduate college students (225 women) enrolled in one of three public universities in the southeast United States. Participants ranged in age from 17 to 60 years ($M = 23.8$ years, median = 21.0 years, $SD = 7.9$ years). Of the students in the sample, 82.1% were Caucasian, 4.2% Hispanic, 4.2% African American, 2.1% Asian, 0.7% Native American, and 6.7% other. No demographic differences were found among participants as a function of the academic institutions attended.

Procedure

Respective institutional review boards for each of the three universities approved the study procedures, and arrangements were made with academic instructors for group completion of the questionnaires during scheduled class time. Data were collected simultaneously at three academic institutions, and the majority of courses from which participants were solicited were introductory courses in various academic disciplines. Either a trained research assistant or the principal author was present at each administration to provide instructions and collect consent forms from participants. Participants were informed about the content of the questionnaires and that participation was voluntary. No compensation was given for their involvement, and participants were permitted as much time as needed to complete the questionnaires. No identifying information was collected, and participants were assured of confidentiality.

Instruments

PSS-10 (Cohen & Williamson, 1988). The PSS-10 measures the degree to which one perceives aspects of one's life as uncontrollable, unpredictable, and overloading. Participants are asked to respond to each question on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*), indicating how often they have felt or thought a certain way within the past month. Scores range from 0 to 40,

with higher composite scores indicative of greater perceived stress. The PSS-10 possesses adequate internal reliability (Cohen & Williamson, 1988). Interested readers may view the PSS-10 items at <http://www.mindgarden.com/docs/PerceivedStressScale.pdf>.

Sensation Seeking Scale, Form V (SSS-V; Zuckerman, Eysenck, & Eysenck, 1978). The SSS-V is a 40-item, forced choice inventory developed to measure individual differences in stimulation and arousal needs (Roberti, Storch, & Bravata, 2003; Zuckerman, 1994). The SSS-V includes four 10-item subscales: Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility. The Thrill and Adventure Seeking subscale measures desires to engage in sports or activities involving some physical danger or risk. The Experience Seeking subscale contains items describing the desire to seek new experiences through travel and through the mind and senses by living in a nonconforming lifestyle with unconventional friends. The Disinhibition subscale measures the need to disinhibit behavior in the social sphere by drinking, partying, and seeking variety in sexual partners. Last, the Boredom Susceptibility subscale measures an aversion for repetitive experiences of any kind, routine work, or even dull or predictable people. Construct validity and divergent validity for this instrument are well established (Zuckerman, 1994). In the current study, Cronbach's alphas for each subscale in this sample were as follows: Total Score (.83), Thrill and Adventure Seeking (.78), Experience Seeking (.74), Disinhibition (.71), and Boredom Susceptibility (.62).

State-Trait Anxiety Inventory-Trait version (STAI-T). The STAI-T (Spielberger, 1983) is a 20-item scale, rated on a 4-point Likert scale, that measures the tendency of people to experience general anxiety and view stressful situations as threatening. Factor analytic results reveal that the STAI-T has two distinct factors assessing anxiety (STAI-Anxiety factor [STAI-A]) and depression (STAI-Depression factor [STAI-D]; Bieling, Antony, & Swinson, 1998). The STAI-T has been found to have sound psychometric properties (Spielberger, 1983, 1989). For the sample in the current study, Cronbach's alphas for the STAI-A and STAI-D factors were .82 and .88, respectively.

Multidimensional Health Locus of Control (MHLC Form A; Wallston, Wallston, & Devellis, 1978). The 18-item MHLC (Form A) comprises three subscales measuring health locus of control. The Internal Belief subscale measures perceived internal responsibility for health outcomes. The Chance subscale measures the extent to which health is based on chance factors, such as fate. The Powerful Others subscale measures beliefs that health is dependent on the actions of "powerful others," such as health professionals. Responses to the items range from 1 (*strongly disagree*) to 6 (*strongly agree*), and ratings for each subscale are summed with higher scores indicating greater agreement. The MHLC (Form A) has demonstrated good construct validity and reliability with a broad spectrum of populations and settings (Stein, Smith, & Wallston, 1984; Wallston, Wallston, Smith, & Dobbins, 1987). Cronbach's alphas for the current study were adequate: Internal Belief (.67), Chance (.65), and Powerful Others (.74).

Santa Clara Strength of Religious Faith Questionnaire–Short Form (SCSRFQ-SF; Plante, Vallaeys, Sherman, & Wallston, 2002). The SCSRQ-SF is a five-item self-report measure of religious faith. Items are anchored on a 4-point Likert scale (1 = *strongly disagree*, 4 = *strongly agree*) and are summed to derive a composite score. Psychometric data for the SCSRQ-SF are positive, with a one-factor structure that includes all items, good convergent validity, and good internal consistency (Storch, Roberti, Bravata, & Storch, 2004). The Cronbach’s alpha for the current sample was .93.

Adult Aggression Scale (Morales, Rub, & Werner, 2002). The 12-item Adult Aggression Scale was used to assess overt and relational aggression. The Overt Aggression (OA) subscale measures the frequency with which the respondent engages in forms of physical or verbal aggression (5 items; e.g., “when someone makes me really angry, I push or shove the person”). The Relational Aggression (RA) subscale measures the frequency with which the respondent attempts to harm or harms others through behaviors such as shunning, purposeful ignoring, and making them jealous (7 items; e.g., “When I am not invited to do something with a group of people, I will exclude those people from future activities”). Responses to the items range from 1 (*never*) to 7 (*all the time*), and ratings for each subscale are summed, with higher scores indicating greater aggressive behavior. Cronbach’s alphas were .83 for the OA subscale and .68 for the RA subscale.

Data Analytic Strategy

Exploratory factor analysis (EFA) using a maximum likelihood (ML) extraction with promax rotation was performed on the items from the PSS-10. Confirmatory factor analysis (CFA) and fit indices associated with ML extraction were used to evaluate the overall fit of the exploratory model and to determine the number of factors to retain. The internal consistency of the PSS-10 was evaluated using Cronbach’s coefficient (Cronbach, 1951). To examine convergent validity, Pearson product–moment correlations were computed between the PSS-10 and the MHLC Form A and between the STAI-A and the STAI-D factors. Divergent validity was assessed with Pearson product–moment correlations between the PSS-10 and the SSS-V, the SCSRQ-SF, and the OA and the RA subscales.

Results

EFA

To obtain meaningful and unambiguous factor analytic results, we followed recommendations by Fabrigar, Wegener, MacCallum, and Strahan (1999) and Preacher and MacCallum (2003). Prior to conducting the EFA, the sample data were screened, and we found that no assumptions were violated (e.g., multivariate normality and linearity). Sampling adequacy was excellent with

a Kaiser-Meyer-Olkin (KMO) value of .890 and individual item KMO values ranging from .87 to .92. Also, Bartlett's test of sphericity was significant ($p < .001$). Initial determination of the appropriate number of factors to retain was assessed with the Kaiser criterion (Kaiser, 1958) and the scree plot (Cattell, 1966). Both methods clearly suggested the presence of two factors that explained 61.9% of the variance.

To identify the factor structure, an EFA using a maximum likelihood (ML) method with promax (oblique) rotation was performed on the items. We used an oblique (promax) rotation to account for correlations between the two factors ($r = .65$). The two factors were labeled Perceived Helplessness (Factor 1; six items) and Perceived Self-Efficacy (Factor 2; four items). Descriptive statistics and factor analytic findings for the 10 items are presented in Table 1. Communality values (squared multiple correlations for the variable using the factors as predictors) reflect that each item is a reliable indicator, contributing well to each factor. Taken as a whole, these factor analytic findings met criteria for interpretation (Tabachnick & Fidell, 2001).

Confirmation of the Exploratory Model

We used CFA, using structural equation modeling (SEM), to determine the fit and number of factors to retain in the previously identified two-

TABLE 1
Perceived Stress Scale, 10-Item Version (PSS-10), Descriptive Statistics and Factor Analytic Findings

PSS-10 Item	Perceived Helplessness	Perceived Self-Efficacy	h^2	M	SD
1	.81	-.17	.46	2.01	0.93
2	.64	.17	.56	1.96	1.15
3	.71	-.01	.44	2.76	0.93
6	.63	.02	.40	1.82	1.08
9	.53	.15	.43	2.07	0.97
10	.67	.15	.58	1.56	1.14
4 (R)	-.05	.79	.49	1.40	0.61
5 (R)	-.04	.83	.54	1.52	0.69
7 (R)	.00	.70	.46	1.64	0.74
8 (R)	.21	.57	.52	1.56	0.72
Eigenvalue	5.07	1.12	Total		
% variance	50.66	11.23	61.9		
M	12.09	6.06			
SD	4.72	2.20			
Cronbach's α	0.85	0.82			

Note. The squared correlation between the two factors is .42. R = Item is reverse scored. The PSS-10 items can be viewed at <http://www.mindgarden.com/docs/PerceivedStressScale.pdf>.

factor model. AMOS 4.0 (Arbuckle, 1999) was used to compare the observed structure with the structure proposed in the theoretical model. The ML estimation method was used to test the covariance matrix to determine how well the model fit the sample data. Factor analysis can be considered a unique case of SEM, and fit indices associated with ML estimation can be used to determine the number of factors to retain (Preacher & MacCallum, 2003). Examination of several fit indices associated with ML estimation revealed that the two-factor solution was adequate, $\chi^2(34, N = 281) = 121.78, p < .001$; goodness-of-fit index = .926; root mean square residual = .039; comparative fit index = .931; root mean square error of approximation 90% confidence interval (CI) was .077 to .114; and expected cross-validation index, 90% CI was .471 to .709. Results from the CFA and ML fit indices suggest the presence and retention of a PSS-10 two-factor model, representing a reasonable approximation to the population.

Descriptive Statistics

Table 1 provides descriptive statistics for the PSS-10 individual items. Because of the unequal gender distribution, assumptions were assessed prior to conducting a one-way analysis of variance (ANOVA) on the PSS-10 Total Score. No violations of normality and homogeneity of variance (Levene Test, $p = .822$) were found. No significant difference was found between men ($M = 17.4, SD = 6.1$) and women ($M = 18.4, SD = 6.5$) on the PSS-10 Total Score, $F(1, 279) = 1.22, p = .269$.

Internal Consistency, Interscale Correlations, and Corrected Item–Total Correlations

The Cronbach's alpha reliability coefficients for the PSS-10 are as follows: PSS-10 Total Score (10 items; .89), Perceived Helplessness factor (6 items; .85), and Perceived Self-Efficacy (4 items; .82). The interscale correlation between Perceived Helplessness and Perceived Self-Efficacy was .65, indicating a large overlap. All PSS-10 items met criteria for inclusion with skew values less than $+/-2.0$ and corrected item–total correlations greater than .3 (Streiner & Norman, 1989). Corrected item–total correlations (the correlation between a specific item and the remaining items constituting the scale, excluding the specific item from the scale) ranged from .58 to .72. These values were greater than .20, indicating that each item is a direct measure of the latent factor (Nunnally, 1978).

Convergent and Divergent Validity

To assess the convergent validity of the PSS-10, Pearson product–moment correlations were computed between the PSS-10 and the following measures: STAI Total Score, STAI-A factor, STAI-D factor, and the MHLC (see Table 2). The PSS-10 had a high correlation with the STAI Total Score, STAI-A, and STAI-D factors and a low to moderate correlation with scores

TABLE 2
Pearson Product-Moment Correlations Between the Perceived Stress Scale, 10-Item Version (PSS-10), and Various Psychological Measures

Item	1	2	3	4	5	6	7	8	9	10	11	12	13
1. PSS-10 Total Score	—												
2. PSS-10: Perceived Helplessness Factor	.83**	—											
3. PSS-10: Perceived Self-Efficacy Factor	.97**	.65**	—										
4. STAI-T Total Score	.73**	.62**	.70**	—									
5. STAI-T: Anxiety Factor	.59**	.47**	.87**	.59**	—								
6. STAI-T: Depression Factor	.72**	.64**	.68**	.68**	.68**	—							
7. MHLC: Internal Belief Subscale	.16	-.16	-.14	-.14	-.14	-.25**	—						
8. MHLC: Chance Subscale	.20*	.19*	.18*	.28**	.28**	.29**	-.39**	—					
9. MHLC: Powerful Others Subscale	.18*	.10	.20*	.17	.17	.17	.39**	.12	—				
10. SSS-V	.18*	.10	.20*	.25**	.25**	.26**	.26**	.02	-.21**	—			
11. SCSRFQ-SF	-.04	.07	-.01	.01	.01	.02	-.02	.10	-.12	-.12	—		
12. OA	.02	.07	-.02	-.02	-.02	.02	-.12	.10	-.12	-.12	.09	—	
13. RA	.03	.07	-.02	-.02	-.02	.02	-.12	.10	-.12	-.12	.09	-.01	—
	.18*	.05	.23**	.29**	.37**	.21**	.14	-.11	.15	.03	.20*	-.03	.48**

Note. STAI-T = State-Trait Anxiety Inventory-Trait version; MHLC = Multidimensional Health Locus of Control, Form A; SSS-V = Sensation Seeking Scale, Form V; SCSRFQ-SF = Santa Clara Strength of Religious Faith Questionnaire-Short Form; OA = Adult Overt Aggression Scale from the Adult Aggression Scale; RA = Relational Aggression Scale from the Adult Aggression Scale.

* $p < .001$, two-tailed. ** $p < .0001$, two-tailed.

on the MHLC Chance subscale and the MHLC Powerful Others subscale. To assess divergent validity, Pearson product-moment correlations were calculated between the PSS-10 and the following measures: the SSS-V, the SCSRFAQ-SF, the OA subscale, and the RA subscale (see Table 2). No significant correlations exist between the PSS-10 and the SSS-V, the SCSRFAQ-SF, and the OA subscale. A small positive correlation exists between the PSS-10 and the RA subscale. Last, no meaningful differences existed between men and women when convergent and divergent validity were evaluated separately by gender.

Discussion

The purpose of this study was to extend further the psychometric properties by providing factorial analytic results, construct validation, and normative data in college students for the PSS-10. Our findings indicate that the PSS-10 is a reliable and valid self-report measure of perceived stress within a nonclinical, multisite sample of U.S. college students. To our knowledge, this is the first study providing factor analytic findings for the PSS-10 in a nonclinical sample. The current findings support a two-factor model and are consistent with prior findings using the PSS-14 (Hewitt et al., 1992; Martin et al., 1995). Because the PSS-14 included items not present in the PSS-10 factor structure, we updated the factor labels, Perceived Helplessness and Perceived Self-Efficacy, to reflect these changes. Internal consistency and interscale correlations between the two factors were excellent. Item-total correlations were strong, indicating direct contributions of individual items toward the total score on the PSS-10. Furthermore, this study provides updated PSS-10 normative findings (means and standard deviations) with college students.

Convergent validity was supported, with notable associations among the PSS-10 Total Score and the STAI Total Score, the STAI-A factor, and the STAI-D factor, and small to moderate correlations with the MHLC Chance and Powerful Others subscales. Because each measure is based on self-reports, correlations may be inflated because of shared method variance (Campbell & Stanley, 1963). Associations between the two subscales from the MHLC revealed less robust correlations, which can be explained by differences in item content. The MHLC items focus on locus of control relative to healthcare decisions, whereas the PSS-10 focuses on items broadly identifying perceived self-regulation regarding stress. Although conceptually similar, they are distinct concepts. Divergent validity was supported by weak correlations with indices measuring conceptually distinct constructs. It is interesting that a small correlation does exist between the PSS-10 Total Score and the RA subscale score. Keeping in mind the nature of relational aggression, this finding is not surprising. The small association may reflect greater perceived stress inherent in performing relationally aggressive behaviors or coping with relational conflict (Bagner, Storch, & Preston, in press).

Limitations

Limitations of this psychometric investigation should be delineated. First, the generalizability of the current findings may be limited given the large proportion of Caucasians. Furthermore, the demographics of this sample consisted of undergraduate college students, and the factorial structure may be different for various clinical populations. Generalizability may also be limited by the large number of women in the sample, even though multivariate analyses revealed no differences between men and women on the PSS-10 factor scores. Indeed, according to Cohen et al. (1983), "In general, the relationships between PSS and the validity criteria were unaffected by sex" (p. 393). We highlight this as an area for further psychometric study. Second, self-report measures, such as the PSS-10, may be susceptible to shared method variance and response bias. Future study using multimethod assessments would address this issue. Third, although various criteria suggest the presence of a two-factor structure, the possibility that these factors represent the directionality of item wording should be noted. Finally, no data on the temporal reliability of this measure were collected. It will be important to investigate the extent to which scores remain stable over time. Within these limitations, these findings provide additional psychometric information regarding the PSS-10 as a measure of perceived stress in undergraduate students.

Clinical Implications

These findings provide further support for the reliability and validity of the PSS-10 and provide updated findings regarding the factorial structure. Stress among college students is a major aspect of issues addressed by mental health services in college and university settings; for example, stress has been found to be associated with a variety of negative outcomes, such as suicide ideation, smoking, and drinking (Hudd et al., 2000). Furthermore, past exposure to psychosocial stressors and symptoms of psychological impairment may be associated with potentially risky behaviors, such as obtaining body modifications (Roberti & Storch, 2005; Roberti, Storch, & Bravata, 2004). Thus, it is essential to combat, through the use of a psychometrically sound assessment, the variety of negative effects produced by stress that college students endure..

The PSS-10, although not a measure of psychological symptomatology, may be used to determine those who are at risk for particular clinical psychiatric disorders (Cohen et al., 1983). For example, residential directors and college mental health professionals may be advised to conduct screenings on campus and/or residence halls. Students deemed at risk due to high perceived stress may then be linked to appropriate therapeutic resources. Although the PSS-10 is not intended to serve in isolation as a clinical tool, it is helpful for identifying and measuring both response to distress and coping with stressors. College counselors may find it helpful to use an assessment of personality characteristics (e.g., extraversion and sensation seeking) associated with stress resili-

iciency (Roberti, 2003). This information may be valuable within a clinical setting by facilitating treatment planning and assessing treatment response. Administering a measure that assesses clients' high levels of stress at the outset of therapy may provide clinically useful information regarding clients' life situations (e.g., finances and living situation) and resiliency to stress that needs to be initially addressed at the beginning of treatment. Ignoring such variables may result in premature dropout and/or prevent the development of a positive therapeutic relationship. Regarding treatment response, lowered stress scores during the course of counseling may suggest improved coping abilities. Similarly, this index may provide important information about the client's ability to negotiate objectively stressful situations over the duration of counseling.

The availability of a measure such as the PSS-10 for clinical and campus outreach screenings, including the National Anxiety Disorders Screening Day, can improve the identification of students who need assistance. Because of the self-report format and the ease of clinical utility and interpretation of scores, students may be more motivated to complete the PSS-10 during outreach programming. Immediate feedback from college counselors may increase the likelihood that students will consider psychoeducational and therapeutic options to gain greater understanding of their stress and to learn potential stress management strategies.

The development of campus outreach programming and therapy interventions focused on stress reduction strategies such as increasing social support and connectedness may mediate perceived stress (Lee, Keough, & Sexton, 2002). Proactive approaches to increasing resiliency to stress may reduce susceptibility to various immune system dysfunctions, such as the common cold. Furthermore, assisting students in developing various coping strategies on the basis of differing levels of perceived stress is warranted (Stowell, Kiecolt-Glaser, & Glaser, 2001). The potential benefits of using healthy coping strategies may have both short- and long-term impact on college campus environments.

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