An Assessment of the Psychometric Properties of the Perceived Stress Scale-10 (PSS10) with Business and Accounting Students*

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ABSTRACT

Using a sample of 557 undergraduate business students from three U.S. comprehensive universities, this study examined: (a) the factor structure of the Perceived Stress Scale-10 (PSS10; Cohen and Williamson, 1988); (b) the invariance of its factor structure; (c) the scale's reliability; and (d) its convergent and divergent validity. Confirmatory factor analyses supported a structure with two primary factors, General Distress and Ability-to-Cope, loading on a single second-order factor, Perceived Stress. Furthermore, this model was confirmed for designated subpopulations including the 264 accounting majors who participated in the study. Notably absent in prior research, this study found two items, numbers 2 and 9, to load significantly on both the General Distress and Ability-to-Cope factors with men and the full sample, respectively. Item–total correlations, coefficient alphas, and Spearman-Brown reliability coefficients supported the reliability of the items loading on the full scale as well as on each of the two primary factors. Combined, these findings provide compelling evidence in support of the PSS10 as a stress assessment measure for business students in general, and accounting students in particular. In fact, given its practical expediency in terms of administration and scoring, the PSS10 appears to be a tool that could be used by university administrators and potentially by human resource personnel at accounting and business organizations to assess student/employee perceived stress levels before the onset of burnout tendencies, thus facilitating more timely and cost-effective intervention strategies.

Keywords Perceived Stress Scale-10 (PSS10); Validity and reliability; Accounting and business students

UNE ÉVALUATION DES PROPRIÉTÉS PSYCHOMÉTRIQUES DE L'ÉCHELLE DE STRESS PERÇU À 10 ITEMS AUPRÈS DES ÉTUDIANTS EN GESTION ET EN COMPTABILITÉ

RÉSUMÉ

Dans l'analyse d'un échantillon de 557 étudiants de premier cycle en gestion, provenant de trois universités polyvalentes des États-Unis, les auteurs étudient

a) la structure factorielle de l'échelle de stress perçu à 10 items (*Perceived Stress Scale-10* — PSS10, Cohen et Williamson, 1988) ; b) l'invariance de sa structure factorielle ; c) la fiabilité de l'échelle ; et d) sa validité convergente et divergente. Les analyses factorielles confirmatoires accréditent une structure comportant deux facteurs essentiels, l'anxiété générale et la capacité de faire face, avec saturation d'un seul facteur de second ordre, le stress perçu. En outre, ce modèle est confirmé pour des sous-populations définies regroupant les 264 étudiants de majeure en comptabilité ayant participé à l'étude. Les observations des auteurs révèlent que les items 2 et 9, dont l'absence est notable dans les études précédentes, saturent sensiblement les facteurs d'anxiété générale et de capacité de faire face chez les répondants masculins et l'ensemble de l'échantillon respectivement. Les corrélations item-total, les coefficients alpha et les coefficients de fiabilité Spearman-Brown confirment la fiabilité de la conclusion selon laquelle ces items saturent l'ensemble de l'échelle ainsi que les deux facteurs essentiels. Ces observations réunies démontrent claire-ment que la PSS10 est une mesure valable d'évaluation du stress chez les étudiants en gestion de façon générale, et chez les étudiants en comptabilité en particulier. En fait, compte tenu de son efficacité sur le plan de l'administration et de la notation, la PSS10 est un instrument qui, semble-t-il, pourrait être utilisé par les gestionnaires des universités et le personnel des services des ressources humaines des organismes de comptabilité et de gestion pour évaluer les degrés de stress perçu chez les étudiants ou les employés avant que ne survienne l'épuisement professionnel, ce qui faciliterait l'élaboration plus rapide de stratégies d'intervention plus économiques.

Mots clés : échelle de stress perçu à 10 items (*Perceived Stress Scale-10*– PSS10), étudiants en comptabilité et en gestion, validité et fiabilité

The accounting profession's concern over job-related and personal stress among its members can be traced back to the pioneering work of Friedman, Rosenman, and Carroll (1958), which measured serum cholesterol levels and blood clotting times of tax accountants during and after the peak tax season. However, Weick's (1983) proposition that "stress" represents a unifying construct for exploring issues relat-ing to performance and individual well-being among accountants in the workplace arguably motivated a large body of research over the subsequent three decades into the antecedents and consequences of stress among accountants (Smith, Derrick, and Koval, 2010: 114). Commenting on Weick's above-referenced propo-sition, Libby (1983) stated that "the importance of this statement was not completely apparent until I realized that such a diverse group of important accounting issues could be encompassed under a single unifying concept—stress" (370). Libby (1983: 372) proceeded to illustrate his interpretation of Weick's propositions in the form of a model of the antecedents and consequences of stress in which: (1) the quantity and quality of task demands (i.e., work-related stres-sors), mediated by predictability and control, cause stress; (2) in turn, stress causes short-term increases or decreases in cognitive performance, in addition to long-run physiological, behavioral, and health effects. This model has served as the founda-tion for a substantial body of accounting "stress" research.

Noteworthy in Weick's (1983: 354) and Libby's (1983: 371–72) treatises are their conclusions based on prior organizational research that not all stress is bad.

In fact, both presented the argument that the relationship between stress and performance is curvilinear (i.e., represented by an inverted U-shaped function). That is, increases in stress lead to increased performance up to a point (often termed "eustress"), followed by decreases in performance as stress continues to increase. This is referred to as the Yerkes-Dodson law, dating back to the work of psychologists Robert M. Yerkes and John Dillingham Dodson in 1908 (Yerkes and Dodson, 1908). Choo (1986) provided empirical support for this curvilinear relationship between stress and performance within accounting work settings. However, Weick's (1983) statements that "accounting has so much potential to raise arousal that people should suspect that poor performance results from too much arousal, not too little" (358) and "Accounting seems more likely to raise arousal than lower it" (362) reflect the concern that the accounting work environment is one where individuals are likely to find themselves on the right-hand side of the curve (i.e., the side where stress levels have become excessive). Moreover, the accounting literature documents a number of additional potentially deleterious organizational and personal consequences associated with excessive stress (for a review, see Smith, Derrick, and Koval, 2010).

Concerns over stress have not been restricted to the workplace. The stress syndrome has been linked to university students in general (see Vaez and LaFlamme, 2008: 183–84 for a review), and to business students in particular (Law, 2010; Trine and Schellenger, 1999). Factors cited as contributing to student stress in recent years include the rise in college tuition and mounting student debt, the difficulty students face finding jobs after graduation due to the slow economy, and the ever-increasing competitiveness of the labor market (Di Meglio, 2012). Among the negative consequences that have been linked to excessive student stress are violent behavior, depression, suicide, various illnesses (e.g., heart disease), poor academic performance, neuroticism and other mental health issues, and early dropout from school (for reviews, see Dembroski and MacDougall, 1982; Andersson, Johnsson, Burgland, and Ojehagen, 2009; Hamaideh, 2011; Di Meglio, 2012). In making his case for studying stress issues among business students in particular, Law (2010: 195) argues that (1) students enrolled in university business programs who experience prolonged high levels of stress in school may not be able to handle the additional stressors they face in the workplace; (2) the rigorous nature of business school coursework is an occupation in and of itself for full-time business students (exacerbated for those with outside employment); and (3) similar to their workplace counterparts, business students continually face assignments, deadlines, and potentially long hours.

There is evidence to suggest that the concern over the potential carryover effects of excessive stress to the workplace has particular relevance to accounting majors. Jelinek and Jelinek's (2008: 225) research into workplace deviance at Big Four public accounting firms prompted them to put forth a model that illustrates how the market shortage of auditors, the Sarbanes-Oxley Act auditing compliance procedures, and the cloud cast over the accounting profession from the high-profile accounting and financial scandals over the past decade have collectively increased job stress. In turn, they predict job stress to precipitate various forms of deviant

auditor behavior that detrimentally impact organizational efficiency and effectiveness. As the authors conclude, "Unfortunately for the accounting profession, recent developments in the field have ramped up a known driver of deviance—*workplace stress* (emphasis added) —and audit managers and partners must respond" (232).

A number of studies document the impact of one source of job stress (i.e., time budget pressure) on reduced audit quality practices in the public accounting work environment (see Gundry and Liyanarachchi, 2007: 129–30 for a review). McNamara and Liyanarachchi (2008: 3) also note that time budget pressure can have additional negative consequences including health issues to the individual, staff turnover, additional health costs, and gender bias in audit staff. Furthermore, Nohr (2011) provides evidence that additional organizational stressors (i.e., excessive workload, role ambiguity, role conflict, and structure leadership) are associated with increased job stress, which in turn is associated with reduced audit quality practices.

It is important to distinguish between stress and its antecedents and consequences. Smith, Davy, and Everly (2007: 128–29) note that the majority of published academic and professional research studies into the "stress" phenomenon with accounting populations have either (1) focused directly on organizational stressors (e.g., time budget pressure, role conflict, etc.) as direct antecedents to key outcomes (e.g., job satisfaction, performance); or (2) limited the examination of mediating factors in the relations between job stressors and job outcomes to surrogate "stress" measures such as burnout. With respect to the former issue, Fogarty et al. (2000: 37) state that the inconsistent finds reported in prior studies that examined the unmediated effects of organizational stressors on job outcomes may be reflective of misspecification bias (i.e., the omission of key variables that might be key links in the stressor–outcome dynamic). With respect to the latter issue, Smith, Davy, and Everly (2006) provide evidence of the construct distinctiveness between stress and burnout and discuss the importance of this distinction in terms of the potential of future research to add "to the explanatory power of existing stressor-to-outcome models, . . . and lead to more effective ways to manage stress that result in positive returns to organizations and enhanced individual well being" (404).

The next section defines the exact nature of stress and how it is distinguished from its environmental antecedents and consequences, followed by a detailed description of the Perceived Stress Scale (PSS) (Cohen, Kamarck, and Mermelstein, 1983), which is one of the most, if not the most, used measures of perceived stress. The following sections discuss the primary motivations for the study, the methods used to evaluate the psychometric properties of the PSS, and the results of these evaluations. The final section contains a discussion of the significance of the results as well as the study's limitations and conclusions that are drawn from the findings.

THE NATURE OF STRESS

Stress, which can be defined as "a fairly predictable arousal of mind-body systems in response to environmental stressors, is considered the initial step in a

process that if prolonged may fatigue or damage an individual to the point of malfunction or disease" (Giordano and Everly, 1986: 5). Smith et al. (2007: 129) emphasize the importance of distinguishing stress from organizational and other environmental antecedents (e.g., role conflict, role ambiguity, work–home conflict) as well as from job-related (e.g., dissatisfaction, performance, etc.) and personal (physical and psychological health issues, etc.) consequences. The organizational behavior literature is replete with studies that document individual differences in stress susceptibility (i.e., environmental factors that cause excessive stress for one person may be of inconsequential significance to another). Regardless, for those affected, it is this "arousal" that results from interpreting and assigning meaning to environmental stressors that evokes the stress process (Everly and Sobelman, 1987: 16). In turn, emotional arousal is a precursor to actual physical stress manifestations. Excessive stress activation in duration and/or intensity can manifest in both physical and psychological symptoms and impair normal functioning.

Again, the distinction between stress arousal and other popular stress correlates is also noteworthy.[1] For example, burnout, defined as a negative psychological response to work demands and/or interpersonal stressors, has received considerable attention by researchers as a viable "stress" measure (Almer and Kaplan, 2002; Cordes and Dougherty, 1993; Maslach, 1982). Indeed, both burnout and stress arousal have been defined as responses to environmental stressors and antecedents to key personal and organizational outcomes. However, stress arousal represents an immediate response to environmental stressors (Smith, Davy, and Stewart, 1998) whereas burnout represents the consequence of prolonged exposures to those same stressors (Maslach and Schaufeli, 1993; LePine et al., 2005). This distinction prompted Smith et al. (2006) to suggest "that stress arousal may directly be related to deleterious job outcomes before burnout tendencies manifest themselves, or may have a direct influence on burnout as well as a mediating influence between sources of job stress and burnout" (398). Smith et al. (2007) provide empirical evidence to support these assertions with a sample of public accountants. This discussion's relevance to the present study lies in the fact that the PSS has been categorized as a stress appraisal instrument based on Lazarus and Folkman's (1984) concept of appraisal (Örücü and Demir, 2009: 104; Reis, Hino, and Añez, 2010: 109).

THE PERCEIVED STRESS SCALE

The PSS is a self-report psychometric instrument designed to measure one's level of perceived stress in terms of unpredictability, lack of control, and overload.[2] Cohen (2012) states that the PSS is the most widely used psychological instrument

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1. Law (2010: 195) alludes to inconsistencies in higher education regarding the measurement and modeling of stress.

2. For citations to several studies that support unpredictability, lack of control, and overload as the central components of the perceived stress experience see Remor (2006: 87).

for measuring the perception of stress, an assertion that is supported by the 6,926 citations (as of mid-February 2014) to the above-referenced article that describes its development and by the 1,776 citations to a follow-up study of alternative versions of the scale (Cohen and Williamson, 1988).

The PSS has been utilized in numerous studies as a self-report measure of perceived stress in a variety of fields since its development (see Gitchel, Roessler, and Turner, 2011: 22 for a review). It has been used in a wide range of settings with general and clinical populations to demonstrate acceptable psychometric properties for evaluating perceived stress (see Remor, 2006: 87 for a review), associations with established measures of anxiety, stress, coping, depression, and other physiological responses (for reviews, see Örücü and Demir, 2009: 104; Mimura and Griffiths, 2004: 380). In fact, as Mimura and Griffiths (2004: 380) note, the PSS has also been utilized in studies to evaluate the efficacy of stress-reduction interventions and as a benchmark for examining the validity of other stress measures. Utilization of the PSS as a research tool in these studies speaks to its inherent appeal as a measure of perceived stress.

The original PSS contains 14 items, but Cohen and Williamson (1988) examined 10-item and 4-item versions of the scale. While they found all three versions to be valid, reliable, and related to expected consequences as predicted, they endorsed the 10-item (i.e., the PSS10) version as relatively superior in terms of its internal consistency and factor structure. Based on their endorsement, this study examines the 10-item version of the scale (PSS10).

The PSS10 queries respondents as to how often over the past month they have felt or thought about each of the 10 items on a 5-point Likert scale (0 = *never*, 1 = *almost never*, 2 = *sometimes*, 3 = *fairly often*, and 4 = *very often*). Six of the items are negatively worded (e.g., "How often have you been upset because of something that happened unexpectedly?") and four are positively worded (e.g., "How often have you felt that you were on top of things?"). A total PSS10 score is obtained by reverse scoring the four positively worded items, then adding the scores for all 10 items. A higher total score indicates a higher level of perceived stress.

The PSS10 has recently been utilized in studies that have examined issues related to perceived stress among accounting students. Gabre and Kumar (2012) used a modified version of the PSS10 to examine relationships between perceived stress, academic performance, and Facebook use among 95 undergraduate accounting students at two universities.[3] The authors found that female students reported higher perceived stress scores than did their male counterparts. However,

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3. The authors' modification of the PSS10 entailed changing the preface of each question from "In the last month" to "In the last semester." As PSS10 codeveloper Dr. Sheldon Cohen notes with respect to extending the recall period: "We have not collected psychometrics on other time periods." Our guess is that the longer the retrospective period becomes, the less accurate the measure will be (http://www.psy.cmu.edu/˜scohen/scales.html).

they failed to find a significant relationship between perceived stress and academic performance, leading them to conjecture that their result might be reflective of a curvilinear relationship between the two constructs. Lim, Tam, and Lee (2013) examined relationships between perceived stress, coping, and general health among 1,785 accounting students from three public and two private Malaysian universities. Using the summated scores on all PSS10 items as their perceived stress measure, they found, using a series of Pearson correlation analyses, that PSS10 scores correlated positively with a lower level of general health and a higher level of coping strategy. The latter finding was at variance with that of Smith, Everly, and Johns (1993: 443) who reported a negative relationship between stress and adaptive coping strategies among a sample of AICPA members in public accounting, industry, education, and government.

The conceptual appeal of the PSS10 notwithstanding, prior research documents two issues that appear to warrant further investigation prior to endorsing the use of the PSS10 to evaluate perceived stress among business and accounting students. One issue relates to the scale's factor structure. Gitchel et al. (2011: 21) note that multiple studies using disparate sample populations have consistently shown that the PSS items load on two factors: the negatively worded items loading on one and the positively worded items on the other.[4] Previous researchers have attached various labels to these factors such as General Distress and Ability to Cope (Hewitt, Fleck, and Mosher, 1992), and Perceived Helplessness and Perceived Self-Efficacy (Roberti, Harrington, and Storch, 2006). In fact, Cohen and Williamson (1988) report the same two-factor solution with both the 14- and the 10-item versions of the scale, yet they state (45) that the distinction between the two factors based on item directionality is irrelevant and that perceived stress as measured by the PSS should be considered a unidimensional construct. However, Golden-Kreutz, Browne, Frierson, and Andersen (2004: 219) argue that with respect to the four positively worded items that

> …only one of the items (i.e., "able to control the irritations in your life") has a similar content to that of a negatively worded item ("…unable to control the important things in your life"). The remaining items…do not share similar content with any of the Factor 1 items. Indeed, the content of the Factor 2 items appear to tap positive emotions, feelings of confidence, things are "going your way" and being "on top of things." Thus, keying (i.e., reverse-scoring) is confounded with content for three of the four Factor 2 items.

The authors (219–20) go on to suggest that positive feelings measured by Factor 2 might be incompatible with the negative feelings sampled in Factor 1, a supposition that they posit is consistent with the high negative correlation coefficient that they measured between the two factors. These positive and negative distinctions prompt the authors to suggest that a more complex hierarchical factor

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4. This two-factor solution pattern of item loadings has been consistently found for both the 14- and the 10-item versions of the scale.

structure may better explain the relations among the measured variables that comprise the PSS.[5]

The second unresolved issue involves gender differences in PSS scores. Gitchel et al. (2011: 21) note that in multiple studies using diverse populations, women have reported consistently higher overall PSS scores than men on negatively worded items. However, no consistent gender differences have emerged for the scores on the positively worded items. These findings prompted the authors to express a concern that, if differing responses by group based on response format are due to some independent factor that is intended to be measured (e.g., social desirability), the construct validity of the PSS might be in question and in need of further assessment (21).

PURPOSE

Our context is somewhat different from the above-referenced studies that utilized the PSS10 to study perceived stress among accounting students. Despite the PSS10's popularity, as noted at the outset, its validity for use with business and accounting student populations has not yet been established. Given this and the two unresolved measurement issues noted above, a primary focus of this study is to test the factorial validity of the PSS10 for these student samples and the equivalence of PSS10 measurement structure across the samples. In doing so, we will address Gitchel et al.'s (2011) suggestion "that the construct validity of the PSS as a unidimensional measure of perceived stress needs to be further investigated" (24). Specifically, this study examines (1) the factor structure of the PSS10; (2) the invariance of its factor structure between students categorized by institution (as described below) and gender;[6] and (3) the scale's convergent and divergent validity. This initial effort to assess these properties of the PSS10 with accounting and business students should provide evidence of the scale's appropriateness for use with these groups and its viability for use by university faculty and administrators in

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5. Gorsuch (1983: 239–40) discusses how the factoring of correlations among primary factors can give rise to second-order factors. When factoring a set of redundant variables, multiple factors of narrow scope may emerge. These narrow factors may correlate with each other resulting in a higher order factor that is broader in scope. Predicated on this theory, an alternative second-order factor model in which a single second-order "perceived stress" factor is posited to account for the substantial negative correlation between the two above-referenced first-order factors is illustrated and tested in Golden-Kreutz et al. (2004: 220). Their findings motivate the testing of a similar second-order factor model in this study as described in the Procedures section below.

6. This study's gender analyses are intended to address the above-referenced concern about differential response patterning between women and men on the negatively and positively worded PSS10 items as expressed in Gitchel, Roessler, and Turner (2011) and to assess whether there are any significant differences in the factor structure of the PSS10 between female and male students.

interventions designed to mitigate the deleterious impact of excessive stress on individual health and well-being and to enhance student productivity.

We do not suggest that accounting and business students are inherently more susceptible to stress than are other majors. Rather, we concur with Law's (2010: 195) above-referenced suggestion that the rigorous nature of the coursework facing many accounting and business students may exacerbate their stress levels, with numerous potentially deleterious consequences that may ultimately carry over to the workplace. In this context, the current study represents a critical first step in the process of ultimately attempting to mitigate these potential consequences.

METHODS

Subjects

The full sample consisted of 557 students enrolled in various business courses at three AACSB-accredited regional comprehensive universities, two on the East Coast (Schools 1 and 2) and one on the West Coast (School 3). Questionnaire packages were evaluated and approved by the human subjects committees at each institution and then administered in classes. The instructors were not present and the students were assured of anonymity. The breakdown of this convenience sample was as follows: 409 (73 percent) of the respondents came from the East Coast universities and 148 (27 percent) came from the West Coast university. Analyses to assess whether there were any significant differences across the three samples indicated that at School 2, the average age, percentage of female respondents, and mean PSS10 scores were higher than the respective figures from the other two institutions.[7,8] Based on these findings, the data for Schools 1 and 3 were combined and treated as the calibration sample, and School 2 was treated as the validation sample for the initial factor structure analyses.

Procedures

To reassess the factor structure of the PSS10 with the calibration and validation samples and female and male subsamples, we examined three alternative models. The one factor model (Model 1) assumes that all 10 scale items load on one underlying perceived stress dimension, an assumption recently examined by Gitchel et al. (2011: 23) and Leung, Lam, and Chan (2010). The two-factor model (Model 2), reported extensively in previous research as noted above, assumes that the six

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7. No significant PSS10 score or demographic differences were measured between respondents from Schools 1 and 3.

8. While the age and gender composition differences were simply a function of the available students in the classes selected for participation in the study, the significant PSS10 score difference may have been due to the fact that the instrument package was administered just before final exams at School 2, whereas at the other two schools the packages were completed earlier in the semester.

negatively worded PSS10 items load on a General Distress factor, and the four positively worded items load on an Ability-to-Cope factor. The second-order factor model (Model 3), illustrated by Golden-Kreutz et al. (2004), assumes the same two factors as described for the two-factor model; however, it explicitly includes a second-order factor to account for the predicted significant negative correlation between the two first-order factors.

The factor structure assessments consisted of a series of confirmatory factor analyses (CFA) using maximum likelihood (ML) estimation procedures in EQS Version 6.2 with Satorra and Bentler's (2001) scaling corrections, which facilitated the calculation of the Satorra-Bentler chi-square value (SBχ^2). Byrne (2006) states that CFA analysis of a measurement instrument is most appropriately applied to scales "that have been fully developed and their factor structures validated" (118).[9] We selected the Satorra-Bentler rescaled estimate because of the high Mardia's normalized estimate values measured in preliminary ML analyses indicating that the data were not normally distributed. Bentler and Wu (2002: 250) note that the Satorra-Bentler scaled χ^2 "is the most widely studied and generally accepted best alternative test statistic for model evaluation under nonnormality." To measure overall fit of competing models, we used the SBχ^2 statistic, Wheaton, Muthen, Alwin, and Summers' (1977) relative/normed chi-square (χ^2/df),[10] the robust normed and nonnormed fit indices (NFI and NNFI), the robust comparative fit index (CFI), and the adjusted root mean squared error of approximation (RMSEA) for nonnormal conditions.[11] Bentler (1992) originally considered fit index values of greater than 0.90 as indicative of good model fit. However, Hu and Bentler (1999: 27) revised the cutoff value to close to 0.95, and for the RMSEA prescribed a cutoff of close to 0.06 or less for relatively good fit.

Additional reliability and validity assessments of the PSS10 (based on the groups for which there were available data) were as follows. To assess internal consistency, Cronbach's alpha coefficients were calculated with the data from the calibration and validation samples for the full scale and the General-Distress and Ability-to-Cope subscales. To assess convergent validity, we conducted correlation

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9. This study's justification for analyzing the aforementioned PSS10 measurement models using CFA analysis rests on (1) its availability since 1988; (2) its arguable status as the most popular self-report stress measure; (3) the extensive testing of its factor structure over the past 25 years; and (4) the consistent finding of two underlying factors, General Distress and Ability-to-Cope, in numerous studies using disparate samples. Our assessment of the one-factor and second-order factor solutions are intended to address Gitchel' et al.'s (2011: 24) above-referenced suggestion regarding the construct validity of the PSS as a unidimensional measure of perceived stress, not to question the scale's established factor structure.

10. Hooper, Coughlan, and Mullen (2008: 54) state that the relative/normed chi-square (χ^2/df) minimizes the impact of sample size on the Model Chi-Square. They also note that there is no consensus regarding an acceptable ratio for this statistic, with recommendations ranging from as high as 5.0 (Wheaton et al., 1977) to as low as 2.0 (Tabachnick and Fidell, 2007).

11. Fogarty et al. (2000: 44) prescribe numerous measures to assess model fit as no one measure is definitive.

analyses of PSS10 scores with those on the Stress Arousal Scale 4 (SAS4: Smith, Everly, and Haight, 2012) using data available for the full sample. The SAS4, a newly validated measure of worry and rumination based on the Perseverative Cognition Hypothesis (Brosschot, Gerin, and Thayer, 2006), is a four-item scale designed to measure how often (i.e., within the past few weeks) respondents have experienced various cognitive-affective conditions from among the following response options: (1) seldom or never; (2) sometimes; (3) often; (4) almost always. Smith et al. (2012: 118) reported Cronbach's alpha scores for the SAS4 ranging from 0.854 to 0.872 for four independent samples of undergraduate business students and 0.882 for a sample of AICPA members employed in public accounting.

The School 2 business student data were used to assess convergence between PSS10 scores and those on the General Health Questionnaire-12 (GHQ-12) (Goldberg and Williams, 1988). Jackson (2007: 79) describes the GHQ-12 as a measure of anxiety, somatic symptoms, and social withdrawal. Graetz (1991) and Gao et al. (2004) provide empirical evidence that the GHQ-l2 consists of three factors: Anxiety and Depression, Social Dysfunction, and Loss of Confidence. We predicted these factors to overlap with perceived stress as measured on the PSS10, thus motivating these comparisons.

The School 1 and School 3 business student sample data were used to assess divergent validity by correlating the PSS10 scores with those on the Connor-Davidson Resilience Scale2 (CD-RISC2) (Vaishnavi, Connor, and Davidson, 2007). Resilience as measured by the CD-RISC2 is defined "as the personal qualities that enable one to thrive in the face of adversity" (Connor and Davidson, 2003). We therefore predicted a weak or negative relationship between the CD-RISC2 scores and those on the PSS10.[12]

Spearman rank correlations were calculated to corroborate reported Pearson correlations, as the data were not normally distributed and nonparametric tests provide statistically more conservative results. Bonferroni adjusted probabilities were also computed to assess the significance of the Pearson correlations. This method is appropriate when multiple significance tests are simultaneously conducted (Wilkinson, 1999: 1–138).

RESULTS

Descriptive Statistics

More than 47 percent of the full sample ($n = 264$) were accounting majors, followed by uncommitted business majors ($n = 145$; 26 percent) and management

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12. Ferketich, Figuerdo, and Knapp (1991: 315–20) interpret the basic tenets of the multitrait-multimethod matrix (MTMM matrix) approach to examining construct validity developed by Campbell and Fiske (1959: 81–105) as (a) tests designed to measure the same construct should correlate highly among themselves and (b) tests measuring one construct should not correlate with tests measuring other constructs (315). The first tenet applies to convergent validity and the second to discriminant (i.e., divergent) validity.

majors ($n = 54$; 10 percent). Of the 486 students who reported their academic standing, over 90 percent were either juniors or seniors. Out of the 547 full-sample respondents reporting gender, 308 (55 percent) were men. More than 82 percent ($n = 452$) of the 551 respondents who reported their age were between 18 and 22 years old, and of these 68 percent ($n = 307$) were 20 and 21 years old; the mean age of the full sample was 21.75 ($\sigma = 4.07$).

Table 1 presents a series of mean PSS10 score comparisons between the present sample of accounting and business majors and those recorded by a sample of 2,000 individuals selected from the online segment of Synovate's Consumer Opinion Panel (SCOP) in a 2009 *eNation Survey* as reported by Cohen and Janicki-Deverts (2012: 1324–25). The purpose of these comparisons was to determine if the mean PSS10 scores of our sample appeared to be generally representative of those for the underlying U.S. population. Two significant mean differences emerged from these analyses. First, the mean PSS10 score for women accounting majors (18.36) was significantly higher than the overall mean reported by women respondents in the *eNation Survey* (16.14). However, Cohen and Janicki-Deverts (2012: 1325) did not report a breakdown of mean PSS10 scores by gender and age group. Moreover, the authors reported that mean PSS10 scores decreased with age for both men and women (1324), and more than half ($n = 1058$) of their sample was age 25 or older (1325). Given that 96 percent of our sample reporting age (530 out of 551) was under age 25, and the fact that the reported *eNation Survey* data did not allow a comparison of gender scores by age group, any conclusions drawn regarding this measured difference would appear to be premature. The only other significant finding was that the mean PSS10 score for our full sample respondents possessing a bachelor's degree (20.86) was significantly higher than that reported by their *eNation Survey* counterparts (15.17). Again, however, the age disparity between samples (as well as the outlier score of 31.00 reported by the lone business major with a bachelor's degree in our sample), call into question the true significance of this finding. Taking these circumstances into account, there appears to be no reason to suspect that the mean PSS10 scores of our sample significantly vary with those of the underlying U.S. population as represented by the 2009 *eNation Survey* data.

Additional demographic analyses of the present sample data revealed that at School 2, 110 (51 percent) of the respondents from the validation sample were women, whereas 203 (59 percent) of the 342 respondents from the calibration sample were men (Pearson $\chi^2 = 5.91$, $df = 1$, $p = .015$). In addition, the mean age for the validation sample was 22.61 ($\sigma = 5.31$) as opposed to 21.19 ($\sigma = 2.93$) for the calibration sample ($t = -3.498$, $p = .001$).

The mean PSS10 scores for the full sample were 16.90 ($\sigma = 6.45$) for the total score, 10.90 ($\sigma = 4.65$) for the General Distress factor, and 6.04 ($\sigma = 2.74$) for the Ability-to-Cope factor. However, the respective scores for the validation sample were 18.22 ($\sigma = 6.45$), 11.74 ($\sigma = 4.69$), and 6.47 ($\sigma = 2.70$). Separate variance *t*-tests with Bonferroni-adjusted probabilities (not reported) indicated that all

TABLE 1
PSS10 mean score comparisons[1]

	2009 *eNation* survey			Full sample			Business majors			Accounting majors				
	n	μ	σ	n	μ	σ	n	μ	σ	n	μ	σ	F-value	Prob.
Sex														
Men	968	15.52	7.44	302	15.83	6.53	173	15.71	6.41	129	15.98	6.73	0.257	0.774
Women	1032	*16.14*$_L$	7.56	244	18.17	6.13	117	17.96	5.97	127	*18.36*$_H$	6.30	*7.683*	*< 0.001*
Age[2]														
Under 25	223	16.78	6.86	487	16.73	6.40	280	16.63	6.25	207	16.86	6.60	0.078	0.925
25–34	433	17.46	7.31	43	18.00	6.59	7	17.43	8.23	36	18.11	6.36	0.134	0.875
Education														
Some College	784	16.00	7.54	542	16.85	6.44	291	16.62	6.28	251	17.12	6.63	2.629	0.073
Bachelor's Degree	513	*15.17*$_L$	7.22	7	*20.86*$_H$	6.91	1	31.00	NA	6	19.17	5.78	*2.072*[3]	*0.038*

Notes:

[1] With the exception noted in footnote 3 below, *F*-Values and associated probabilities represent those calculated for comparisons between 2009 *eNation* Survey values and those of business and accounting majors (i.e., full sample values were excluded from these analyses).

[2] The *eNation* survey contained PSS10 data for an additional four age groups, but 96 percent of the present study respondents reporting age (530 out of 551) indicated that they were under age 35, thus limiting meaningful comparisons to the two groups reported.

[3] This represents the *t*-value for a comparison between the *eNation* Survey value and that for the full sample, as an inter-major comparison was precluded by the representation of only one individual with a bachelor's degree among the business majors.

TABLE 2

PSS10 scale item correlations (n = 557)

ITEM	PSS1	PSS2	PSS3	PSS4	PSS5	PSS6	PSS7	PSS8	PSS9	PSS10
PSS1	1.000									
PSS2	0.472	1.000								
PSS3	0.372	0.443	1.000							
PSS4	−0.214	−0.328	−0.231	1.000						
PSS5	−0.212	−0.385	−0.251	0.494	1.000					
PSS6	0.340	0.455	0.364	−0.208	−0.292	1.000				
PSS7	−0.253	−0.314	−0.228	0.384	0.479	−0.261	1.000			
PSS8	−0.244	−0.396	−0.280	0.482	0.553	−0.340	0.470	1.000		
PSS9	0.406	0.414	0.393	−0.156	−0.146	0.353	−0.219	−0.156	1.000	
PSS10	0.425	0.588	0.492	−0.326	−0.426	0.549	−0.295	−0.420	0.503	1.000

Notes:

All correlations are significant at $p < .001$ except those between item 9 and items 4 ($p = .011$), item 5 ($p = .025$), and item 8 ($p = .011$).

three scores for the validation sample were significantly higher than those for the calibration sample at $p = .001$.[13]

The mean total PSS10 score for men was 15.83 ($\sigma = 6.53$) versus 18.19 ($\sigma = 6.13$) for women ($t = -4.35$, $p < .001$). Similarly, the mean General Distress factor score for men of 10.03 ($\sigma = 4.66$) was significantly lower ($t = -4.98$, $p < .001$) than the mean score for women of 11.97 ($\sigma = 4.43$). However, the mean Ability-to-Cope factor score for men of 5.81($\sigma = 2.87$) was not significantly different (at $p = .05$) from the mean score of 6.22 ($\sigma = 2.56$) reported by women ($t = -1.78$, $p = .076$).[14]

Table 2 reports the correlations among each of the PSS10 scale item raw scores (i.e., the four Ability-to-Cope items are not reverse-scored for this analysis). As anticipated, the correlations among the six General Distress items are significant and positive, as are those among the four Ability-to-Cope items. The cross-correlations between individual General Distress and Ability-to-Cope items are negative and with the exception of the correlation between items 5 and 10 are lower than those between individual items and others on each of their respective factors. These reported correlations provide support for the convergence and discrimination among the measures used for the General Distress and Ability-to-Cope subscales.

13. Bonferroni-adjusted probabilities were computed to assess the significance of mean differences as multiple tests of significance were simultaneously conducted.

14. The reverse-scoring of the Ability-to-Cope items explains the otherwise counterintuitive finding that women scored higher than men on both subscales.

Factorial Validity Analyses

Calibration and Validation Samples

Table 3 presents a summary of the goodness-of-fit statistics for the three competing models with the calibration and validation samples. The one-factor solution (Model 1) did not indicate good fit for either sample. The two-factor model (Model 2) exhibited better fit. However, the LaGrange Multiplier (LM) test to assess model misspecification—that is, to identify parameters that would contribute to a significant drop in χ^2 if freely estimated in a subsequent run (Byrne, 2006: 108) —revealed for both samples that Item 9 (i.e., "...been angered because of things that were outside of your control?") loaded significantly on both Factor 1 (General Distress) and Factor 2 (i.e., Ability-to-Cope). Although this item has been reported in prior research to measure general distress/perceived helplessness, it is evident that this item also taps a respondent's feelings of control, a theme inherent to the items associated with Factor 2. Due to this conceptual congruency between Item 9 and Factor 2, we respecified the model to include this additional parameter (Model 2b), thus allowing item 9 to cross-load on both factors. For both samples, the inclusion of this cross-loading significantly enhanced model fit.[15] The test of the second-order factor model (Model 3) generated identical fit statistics to Model 2b as it was mathematically equivalent to that model.[16]

Cross-Validation Analyses

We cross-validated Model 3 by testing for invariance between the calibration and validation samples. Based on the output of the single sample analyses, we incorporated the best fitting measurement models for each group in a multisample analysis. Using Byrne's (2006: 228–49) specified procedure, we first constructed and tested a multigroup model in which we specified the same number of factors and factor loadings between each group but imposed no equality constraints on the parameters; that is, we estimated in a multigroup model, the same parameters as those in the baseline model for each group. In addition to allowing for the simultaneous testing of invariance across the two groups, "the fit of this configural model provides the baseline value against which all subsequently specified invariance models are compared" (Byrne, 2006: 234). The goodness-of-fit statistics reported in Table 1 indicate that this was a well-fitting multigroup model.

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15. Byrne (2006) states that it is not necessary to compute the difference in Satorra-Bentler χ^2 values between nested models to assess relative fit because the multivariate LM test statistic value generated in EQS "can be interpreted as an approximate decrease in the χ^2 statistic of overall model fit resulting from the respecification of a model in which certain fixed parameters are instead freely estimated" (137).

16. Golden-Kreutz et al. (2004: 221) note that while the two-factor and second-order models are mathematically equivalent, they are not conceptually the same as the latter explicitly includes the single second-order factor to account for the correlation between the two first-order factors as described above.

TABLE 3

Results of confirmatory factor analyses of alternative PSS10 models (calibration and validation samples)

MODEL	$SB\chi^2$	df	p	$SB\chi^2/df$	NFI	NNFI	CFI	RMSEA
Calibration Sample (Schools 1&3: $n = 344$):								
1. One-factor model	158	35	<.001	4.509	0.805	0.793	0.839	0.101
2. Two-factor model	46	34	.120	1.346	0.943	0.980	0.985	0.032
2b. Two-factor model with cross-loading (Item 9: F2)	36	33	.320	1.098	0.955	0.994	0.996	0.017
3. Second-order factor model	36	33	.320	1.098	0.955	0.994	0.996	0.017
Validation Sample (School 2: $n = 213$):								
1. One-factor model	146	35	<.001	4.174	0.771	0.759	0.813	0.123
2. Two-factor model	37	34	.319	1.098	0.942	0.993	0.994	0.022
2b. Two-factor model with cross-loading (Item 9: F2)	29	33	.654	0.895	0.954	1.009	1.000	0.000
3. Second-order factor model	29	33	.654	0.895	0.954	1.009	1.000	0.000
Multisample analysis (Schools 1&3 vs. School 2):								
1. Configural second-order factor model with disturbance terms between factors (only) constrained to be equal	66	66	.479	1.000	0.955	1.000	1.000	0.000
2. Second-order model with all factor loadings constrained to be equal between samples[1]	73	76	.588	0.956	0.950	1.003[2]	1.000	0.000
Standard for Acceptance	**NA**	**NA**	**> .05**	**< 2.0**	**> 0.95**	**> 0.95**	**> 0.95**	**< 0.06**

Notes:

$SB\chi^2$ = Satorra-Bentler Scaled χ^2; NFI = Normed Fit Index; NNFI = Nonnormed Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

[1] Satorra-Bentler χ^2 difference (in relation to configural model) = 6.571, df = 10, p = .765.

[2] Byrne (2006: 98) states that values for the NNFI can fall outside the zero to 1.000 range.

After establishing the goodness-of-fit of the configural model, the next step examined the equality of the measurement model; that is, we tested for the equivalence of factor loadings by specifying equality constraints for all of the freely

estimated factor loadings, including the cross-loading between Item 9 and Factor 2.[17] The results indicated a good fit to the data. We then compared these nested models using the scaled difference chi-square test ($\Delta SB\chi^2$; Satorra and Bentler, 2001: 511). The test result ($\Delta SB\chi^2 = 6.571$, $df = 10$, $p = .765$) indicated that the difference in fit between the two models was not significant. Combined, these results supported the total invariance (i.e., number of factors, factor loading pattern, and theoretical structure) across the calibration and validation sample of business students.[18] Therefore, we pooled the data from both samples for the subsequent gender analyses.

Figure 1 illustrates the factor loading path coefficients derived from the cross-validation analysis of the second-order factor model with the calibration and validation samples. Single coefficients appear for all loadings as LM test output revealed that none of the cross group equality constraints should be released.[19]

Gender Analyses

Table 4 presents a summary of goodness-of-fit statistics for the three competing models for women and men. The one-factor solution did not indicate good fit for women or men. Again, the two-factor model exhibited better fit for both groups. For women, the LM test revealed that adding the above-referenced Item 9–Factor 2 cross-loading would significantly enhance model fit, and we thus respecified the two-factor model to include this cross-loading. For men, the LM test revealed that model fit would be significantly enhanced by specifying that cross-loading as well as one between Item 2 (i.e., "Felt that you were unable to control the important things in your life?") and Factor 2. Given the conceptual congruency between wording of this item and the "control" theme inherent among the Factor 2 items, respecifying the two-factor model for men to allow Item 2 to load on both factors appeared in order. The respecified models (i.e., Model 2b) for women and men resulted in significant model fit enhancements. Again, the second-order factor models generated model fit statistics identical to those of the respecified two-factor models.

We utilized a similar procedure to that reported above to test for invariance of the second-order factor model (i.e., Model 3 in the single-sample analyses) between women and men. In this case, we constrained all of the freely estimated factor loadings to be equal except that for the Item 2–Factor 2 cross-loading, as

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17. Technically, this step entails specification of equality constraints for only those factor loadings that are similarly specified in each baseline model (Ibid: 238). We constrained all of the freely estimated factor loadings to be equal as they all were similarly specified in the baseline models for the calibration and validation samples.

18. The argument in Byrne (2006) is that invariance holds if fit for the multigroup model is deemed adequate and there is minimal difference in fit from that of the configural model (239).

19. Bentler (2006: 192) states that the LM test is available in multisample analysis to test cross-group equality constraints.

FIGURE 1 Multisample analysis path coefficients for the second-order factor model[a,b]
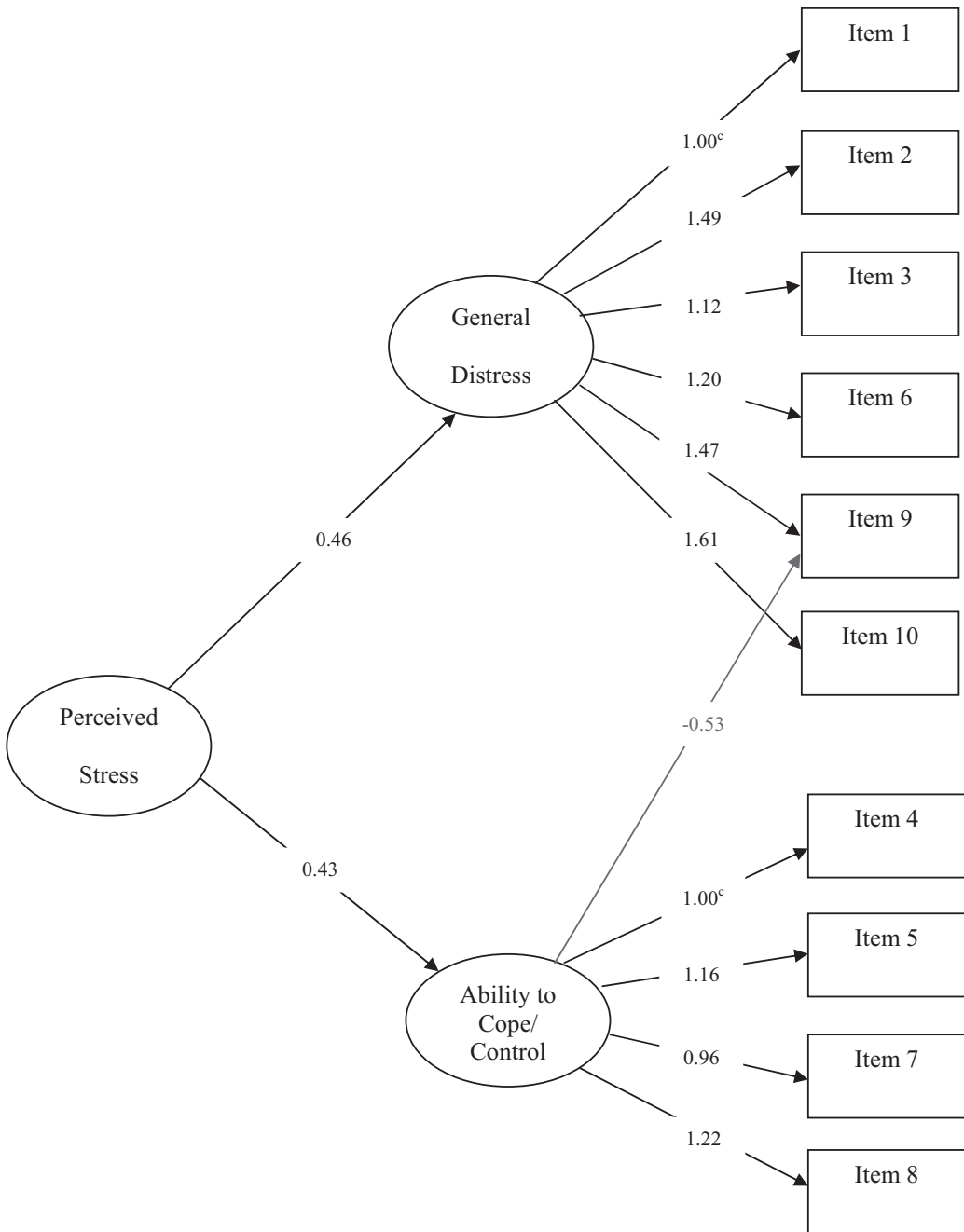
Notes:

[a] All estimable coefficients between individual PSS10 items and first-order factors, and between each first-order factor and the second-order factor, are significant at $p < .01$.

[b] Error and disturbance terms are omitted for ease of diagramming and interpretability.

[c] Structural equations modeling procedures require that one measure of each construct be fixed to 1.0 to establish the scale of the latent construct.

TABLE 4

Gender analyses of alternative PSS10 models

MODEL	SBχ^2	df	p	SBχ^2/df	NFI	NNFI	CFI	RMSEA
Women ($n = 249$):								
1. One-factor model	145	35	<.001	4.144	0.763	0.751	0.806	0.114
2. Two-factor model	67	34	<.001	1.960	0.891	0.924	0.943	0.063
2b. Two-factor model with cross-loading (Item 9:F2)	56	33	.007	1.695	0.909	0.945	0.960	0.053
3. Second-order factor model	56	33	.008	1.098	0.909	0.945	0.960	0.053
Men ($n = 308$):								
1. One-factor model	162	35	<.001	4.640	0.803	0.790	0.836	0.110
2. Two-factor model	36	34	.353	1.075	0.956	0.996	0.997	0.016
2b. Two-factor model with two cross-loadings[1]	26	32	.755	0.818	0.968	1.011	1.000	0.000
3. Second-order factor model	26	32	.755	0.895	0.968	1.011	1.000	0.000
Multisample gender analysis:								
1. Configural second-order factor model with disturbance terms between factors (only) constrained to be equal	79	65	.113	1.216	0.945	0.986	0.990	0.028
2. Second-order model with designated factor loadings constrained to be equal between samples[2]	87	74	.148	1.172	0.940	0.989	0.991	0.025
Standard for Acceptance	**NA**	**NA**	**> .05**	**< 2.0**	**> 0.95**	**> 0.95**	**> 0.95**	**< 0.06**

Notes:

SBχ^2 = Satorra-Bentler Scaled χ^2; NFI = Normed Fit Index; NNFI = Nonnormed Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.
[1] Cross-loadings are Item 9–Factor 2 and (for men only) Item 2–Factor 2.
[2] Satorra-Bentler χ^2 difference (in relation to configural model) = 7.482, df = 9, p = .587.

it was a significant parameter only for men. The goodness-of-fit statistics reported in Table 4 for the configural model indicated good fit. The subsequent test of the equivalence of factor loadings including the cross-loading of Item 9 and Factor 2 also indicated a good model fit to the data. The scaled difference chi-square test result (ΔSBχ^2 = 7.482, df = 9, p = .587) indicated that the difference in fit between the two models was not significant. Again, these results supported the invariance of the constrained parameters between women and men.

Figure 2 illustrates the factor loading path coefficients derived from the cross-validation analysis of the second-order factor model with men and women. Single coefficients appear for all loadings except those for Item 2 as LM test output

FIGURE 2   Multisample gender analysis path coefficients for second-order factor model[a,b]
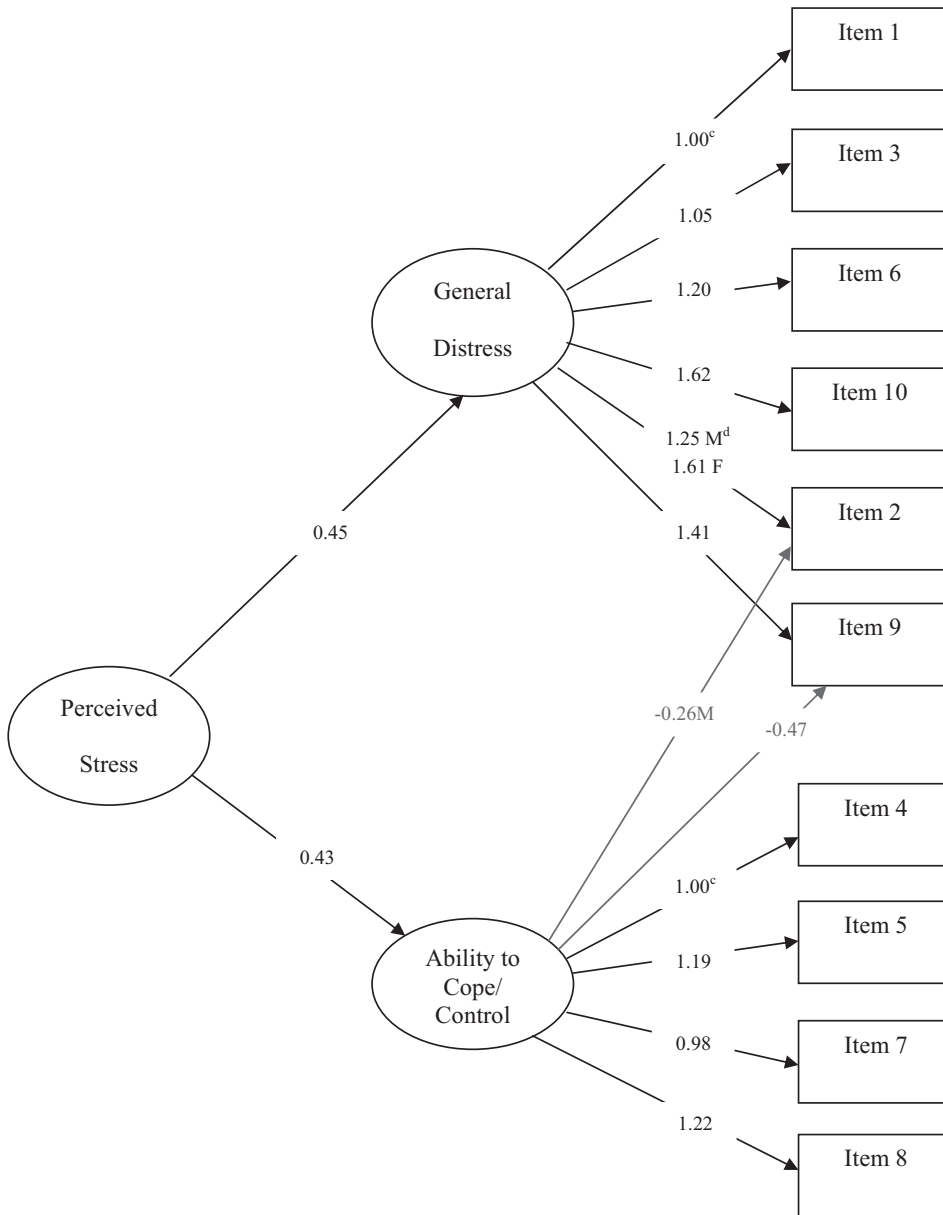
Notes:
[a] All estimable coefficients between individual PSS10 items and first-order factors, and between each first-order factor and the second-order factor, are significant at $p < .01$.
[b] Error and disturbance terms are omitted for ease of diagramming and interpretability.
[c] Structural equations modeling procedures require that one measure of each construct be fixed to 1.0 to establish the scale of the latent construct.
[d] M = males, F = Females.

TABLE 5

Supplementary factorial validity analyses

MODEL	SBχ^2	df	p	SBχ^2/df	NFI	NNFI	CFI	RMSEA
Panel A: Accounting majors (n = 264):								
1. One-factor model	131	35	<.001	3.746	0.838	0.838	0.874	0.104
2. Two-factor model	55	34	.014	1.610	0.932	0.964	0.973	0.049
2b. Two-factor model with cross-loading (Item 9:F2)	44	33	.105	1.318	0.946	0.981	0.986	0.035
3. Second-order factor model	44	33	.105	1.318	0.946	0.981	0.986	0.035
Panel B: Second-order models excluding items 2 & 9								
Multisample analysis (Schools 1&3 vs. School 2):								
Second-order model with all factor loadings constrained to be equal between samples	33	45	.913	0.727	0.967	1.016[1]	1.000	0.000
Multisample gender analysis:								
Second-order model with designated factor loadings constrained to be equal between samples	41	45	.638	0.913	0.958	1.005[1]	1.000	0.000
Accounting Majors	24	19	.211	1.243	0.957	0.987	0.991	0.031
Standard for Acceptance	**NA**	**NA**	**>.05**	**< 2.0**	**> 0.95**	**> 0.95**	**> 0.95**	**< 0.06**

Notes:

SBχ^2 = Satorra-Bentler Scaled χ^2; NFI = Normed Fit Index; NNFI = Nonnormed Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.
[1] Byrne (2006: 98) states that values for the NNFI can fall outside the zero to 1.000 range.

revealed that none of these cross group equality constraints should be released. The impact of the cross-loading for Item 2–Factor 2 for men is reflected in the distinct coefficients for men and women for Item 2–Factor 1, as well as the coefficient designated for men between Item 2 and Factor 2.

Supplemental Factorial Validity Analyses

The unanticipated cross-loadings reported above, coupled with a desire to assess the factor structure for the accounting major subsample, motivated a series of

TABLE 6

PSS10 item means, standard deviations, item–total correlations, coefficient alphas, and Spearman-Brown reliability coefficients (full sample, $n = 557$)

How often have you...	μ	σ	Full scale	Factor 1: General distress	Factor 2: Ability to cope
1. Been upset because of something that happened unexpectedly?	1.709	0.983	0.616	0.676	
2. Felt that you were unable to control the important things in your life?	1.602	1.123	0.755	0.778	
3. Felt nervous and "stressed"?	2.551	1.022	0.637	0.695	
4. Felt that things were going your way?	1.678	0.867	0.564		0.755
5. Felt confident about your ability to handle your personal problems?	1.233	0.866	0.629		0.808
6. Found that you could not cope with all the things that you had to do?	1.583	1.083	0.658	0.703	
7. Been able to control the irritations in your life?	1.558	0.883	0.578		0.749
8. Felt that you were on top of things?	1.537	0.895	0.648		0.806
9. Been angered because of things that were outside of your control?	1.897	1.037	0.596	0.697	
10. Felt difficulties were piling up so high that you could not overcome them?	1.575	1.115	0.791	0.909	
Coefficient alpha			0.848	0.824	0.785
Spearman-Brown reliability coefficient			0.861	0.797	0.781

supplemental factor structure analyses. Table 5 presents the results of the additional measurement model tests. Panel A provides goodness-of-fit statistics for the three competing models for accounting majors. The pattern of model fit mirrored that for the calibration and validation samples; that is, lack of support for a one-factor solution, better fit for the two-factor model, and enhanced fit for the two-factor and second-order factor solutions with Item 9 allowed to cross-load on Factor 2.

As panel B of Table 5 indicates, cross-validation analysis of the PSS10 factor structure between the calibration and validation samples excluding Items 2 and 9 provided very strong support for the second-order factor structure model and factorial invariance between groups. A well-fitting model was also obtained from cross-validation analysis of the second-order factor structure and factorial invariance between men and women excluding Items 2 and 9. Finally, a well-fitting model was obtained from an analysis of the second-order factor structure for accounting majors excluding Items 2 and 9. It is noteworthy that in none of these analyses did the exclusion of Items 2 and 9 result in a decrement in model fit.

Reliability Analyses

Table 6 presents for the full sample the mean scores and standard deviations for each of the PSS10 items, as well as reliability statistics. Item–total reliability coefficients ranged from 0.564 for Item 4 to 0.791 for Item 10 for the full scale, 0.676 for Item 1 to 0.909 for Item 10 on the General Distress factor, and 0.749 for Item 7 to 0.808 for Item 5 on the Ability-to-Cope factor. Coefficient alphas for the full scale and each factor exceeded the 0.70 minimum threshold suggested by Nunnally (1978) as sufficient to demonstrate each measure's internal consistency, as well as those reported by Cohen and Williamson (1988: 44) and a number of other studies cited by Reis, Hino, and Añez (2010: 109). The Spearman-Brown reliability coefficients, all above 0.70, also supported the internal consistency of the items on each measure. Reliability statistics for the calibration and validation subsamples, as well as for women and men, were similar and thus not presented for simplicity of reporting.

Convergent and Divergent Validity Analyses

Table 7 presents the results of correlation analyses between PSS10 scores and those of the other stress correlates. There were strong positive correlations (at $p < .001$) between the scores on the PSS10 and General Distress subscale and those on the SAS4 and each of the GHQ-12 factors. Conversely, there were strong negative correlations between the Ability-to-Cope subscale and those on the SAS4 and each of the GHQ-12 factors.[20] With respect to divergent validity, while the correlations between the CD-RISC2 and both the PSS10 and General Distress subscale were statistically significant, they were negative and somewhat lower than the correlations observed with the other measures.[21] These findings were consistent between panel A, where

20. The Ability-to-Cope item scores used in these analyses were not reverse-scored. Also, the Ability-to-Cope summated factor score did not include either the Item 9 or Item 2 cross-loadings noted above. Though not reported, had these cross-loadings been included, there would have been no change in the significance of the reported correlations between this factor and the other measures.

21. Furr and Bacharach (2008) note that, in large sample sizes, small correlations may be statistically significant but may not indicate poor discriminant (i.e., divergent) validity. In these cases they propose that "the statistical significance is almost meaningless and should probably be ignored" (233).

TABLE 7

Pearson and Spearman correlations of PSS10 with SAS4, GHQ-12, and CD-RISC2[1,2,3]

Panel A: PSS10 Items 2 and 9 included (on perceived stress and general distress only)

Scale	School	Perceived stress	General distress (F1)	Ability to cope (F2)
Stress Arousal Scale 4 (SAS4)	1–3	0.677 (0.668)	0.698 (0.691)	−0.406 (−0.407)
General Health Questionnaire: Anxiety and Depression	2	0.616 (0.601)	0.583 (0.573)	−0.457 (−0.466)
Social Dysfunction	2	0.430 (0.432)	0.303 (0.343)	−0.474 (−0.481)
Loss of Confidence	2	0.521 (0.495)	0.464 (0.422)	−0.437 (−0.428)
Resilience (CD-RISC2)	1, 3	−0.388 (−0.396)	−0.255 (−0.299)	0.484 (0.459)

Panel B: PSS10 Items 2 and 9 excluded

Scale	School	Perceived stress	General distress (F1)	Ability to cope (F2)
Stress Arousal Scale 4 (SAS4)	1–3	0.630 (0.622)	0.660 (0.658)	−0.406 (−0.407)
General Health Questionnaire: Anxiety and Depression	2	0.611 (0.600)	0.588 (0.577)	−0.457 (−0.465)
Social Dysfunction	2	0.434 (0.450)	0.290 (0.338)	−0.474 (−0.482)
Loss of Confidence	2	0.503 (0.495)	0.432 (0.411)	−0.437 (−0.428)
Resilience (CD-RISC2)	1, 3	−0.416 (−0.491)	−0.250 (−0.292)	0.484 (0.459)

Notes:

[1] Spearman correlation coefficients are shown in parentheses.

[2] All correlations significant at $p < .001$. Probability values calculated for the Pearson's correlations using the Bonferroni adjustment, which provides protection for multiple tests of correlations.

[3] Correlations between PSS10 scores and those for resilience represented a divergent validity assessment, while those between the PSS10 and the SAS4 and GHQ-12 factors were designed to assess convergent validity.

items 2 and 9 were included as part of Perceived Stress and General Distress and panel B where these two items were totally excluded. Moreover, though not reported in Table 6, three of the six General Distress Items had nonsignificant correlations with each of the two CD-RISC2 items, and another had correlations with each of the CD-RISC2 items that were not significant at $p = .01$. These findings provide additional evidence of divergent validity between the two scales.

DISCUSSION, LIMITATIONS, AND CONCLUSIONS

The growing concern over the impact of stress on business and accounting students, coupled with the popularity of the PSS10 as a generalized stress measure with other populations, motivated the current effort. This study's goal was to validate the PSS10 for use with business and accounting students by examining the

scale's factor structure and factorial invariance across designated student subpopulations, the reliability and internal consistency of the items loading on each of its subscales, and its convergent and divergent validity. Similar to Golden-Kreutz et al. (2004: 221) and Reis et al. (2010: 111), this study's factor structure analyses found empirical support for a second-order (i.e., hierarchical) factor model in which the two first-order factors (General Distress and Ability-to-Cope), are influenced in opposite directions by a single second-order factor (i.e., Perceived Stress). As indicated in Figures 1 and 2, as Perceived Stress increases, General Distress increases and Ability-to-Cope decreases. The six negatively worded items are directly influenced by the General Distress factor, and indirectly influenced by Perceived Stress. The four positively worded items are directly influenced by the Ability-to-Cope factor and indirectly influenced by Perceived Stress. Thus, as Golden-Kreutz et al. (2004) conclude, Perceived Stress, the common second-order factor, "influences all 10 items and is the main source of covariation among them" (221). Furthermore, these second-order factor structure model findings support Cohen and Williamson's (1988: 45) admonition that perceived stress as measured by the PSS should be considered a unidimensional construct, albeit with two indicators (i.e., General Distress and Coping).

In contrast to the above-referenced studies, we found cause for concern that Item 9 may not be a valid indicator of General Distress or Ability-to-Cope due to its loading significantly (i.e., cross-loading) on both factors. Similar concern can be raised with Item 2 for men, thus suggesting that Items 2 and 9 might require wording modification or deletion in order to validate fully the PSS10 for utilization with accounting and other business majors.[22] While these findings and those in the supplemental factor structure analyses may be sample-driven, they are sufficiently compelling to warrant further investigation into the propriety of excluding these two items in future for use of the scale with business and accounting student populations.

As reported above, this study found a similar gender pattern of PSS10 scores as those reported by Gitchel et al. (2011: 22); that is, women had higher overall PSS10 and General Distress scores than men, but the gender difference in Ability-to-Cope scores was not significant at $p = .05$. However, in this study the gender difference in Ability-to-Cope scores was marginally significant (at $p = .1$). Given this finding, coupled with the fact that the gender pattern of responses noted by Gitchel at al. (2011) has not been ubiquitous (e.g., see Cohen and Williamson, 1988: 390; Ramírez and Hernández, 2007: 204), it appears presumptuous at this time to indict the PSS10's construct validity based on gender differences in subscale scores.

The statistics presented in Table 6 supported the reliability and internal consistency of the items loading on the full scale as well as the General Distress and Ability-to-Cope subscales. Moreover, Table 7 provided convergent and divergent

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22. We could find only one recent PSS10 factor study that reported an item cross-loading (Örücü and Demir, 2009: 107), and that was between Item 5 and Factor 1. In that study, the authors included this item in Factor 2 (i.e., Ability-to-Cope) only, in line with previous research.

validity evidence for the PSS10. That is, for the full scale as well as each subscale: (1) there were high correlations with other measures thought to be theoretically similar and (2) a lower correlation with the measure (i.e., the CD-RISC-2) thought to be dissimilar.

While this study provides empirical support for the psychometric properties of the PSS10, there are caveats to these findings. As Smith et al. (2012: 123) note with respect to the SAS4, self-report measures of stress have not been indisputably proven to cause activation of the physiological stress response, and the self-report mode of psychological measurement is potentially vulnerable to individual biases and defense mechanisms. However, as noted above, the conditions measuring stress using the PSS10 have been shown to be correlated with physiological stress arousal, and the scale has been shown to be a valid and reliable measure in previous research. In addition, while there was demographic and geographic diversity among the students in this sample, additional analysis of the scale's properties with other comparable student populations would independently confirm or refute the item cross-loadings measured in this study. This study also did not assess test-retest reliability of the scale. However, prior research has established the scale's test-retest reliability in diverse samples (for a review, see Reis et al. 2010: 111). Finally, this study assessed convergent and divergent (i.e., discriminant) validity by using a heterotrait-homomethod approach; that is, we examined multiple traits as represented by the other measures (i.e., the GHQ, SAS4, and CD-RISC2), but utilized only one method (i.e., self-report). Future research aimed at building on this study's findings should consider incorporating additional methods (e.g., interviews) to provide corroborative validity evidence.

It must also be noted that the PSS10 has not been validated for use for clinical diagnostic purposes. The score tabulation page for the online version of the PSS10 contains a statement above a table of "average" scores that reads "If you are 12 points above the noted average score, then you likely are experiencing significantly high amounts of stress and may be endangering your health" (http://www.roadto wellbeing.ca/cgi-bin/perceived-stress.cgi). However, as scale codeveloper Dr. Sheldon Cohen notes (1) the online version scoring has not been updated with the 2009 normative (i.e., *eNation Survey*) data and (2) "the PSS is not a diagnostic instrument so there are not cutoffs" for classification of high, medium, or low stress levels (http://www.psy.cmu.edu/˜scohen/scales.html). Thus, use of PSS10 scores for clinical diagnostic purposes awaits additional research aimed at establishing base mean perceived stress levels for asymptomatic and symptomatic (e.g., carefully diagnosed stress-related disease and/or anxiety disorder patients) subject groups.

The above limitations notwithstanding, this study's findings open the door for future research designed to address a variety of issues associated with the impact of stress on accounting and business students. For example, an examination of the relationship between perceived stress and course grades, course failure, and/or actual or planned attrition from the major might provide insightful information that school administrators and counselors can use as a basis for designing and initiating

mitigation efforts.[23] Furthermore, targeted studies could examine if and how the U-shaped performance function applies to accounting and business majors by examining the relationship between PSS10 scores and test performance, course performance, and/or overall academic achievement (e.g., attained GPA in the major and/or overall GPA). Relatedly, the PSS10 could be used to examine the relationship between perceived stress and class absenteeism, the latter an oft-cited reason for poor student performance. A natural extension of the present study would be a follow-up investigation of the viability of the PSS10 as a perceived stress measure among accounting and business professionals. In fact, this would set the stage for longitudinal studies designed to examine the extent to which excessive perceived stress at college follows individuals to the workplace and the personal and professional impact on those for whom it does as well as the impact on their employers. From a clinical perspective, PSS10 mean score levels could be examined among asymptomatic and symptomatic subject groups in efforts to establish baseline "low," "medium," and "high" stress levels, thus addressing the above-noted limitation of the scale. Finally, the PSS10 could be used in studies designed to test a number of the relationships proposed by Smith et al. (2010: 116) in their hypothesized model of the antecedents and consequences of stress in accounting work settings.

The PSS10, in both its current form and potential eight-item configuration, offers a substantive benefit in terms of practical expediency; that is, the scale can be completed in just a few minutes, and it can be easily hand scored in under a minute. It thus makes it efficacious for utilization in both clinical and research settings. From a clinical perspective, it can be utilized by university administrators and/or student services personnel as an initial screening measure for distressed students, as well as a means of assessing student progress during counseling. In research settings, this valid, reliable, and parsimonious scale will allow additional measures to be incorporated into investigations that might otherwise be excluded due instrument length constraints. (For a discussion of additional benefits of parsimonious scales, see Smith et al., 2012: 122–23.)

To conclude, Law (2010: 196) cites a number of business occupations that are subject to employee burnout, including public accounting, and suggests that those students experiencing high burnout from schoolwork and concurrent employment may carry over these negative effects to the workplace after graduation. Given the documented relationship between stress and burnout among practicing accountants

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23. This proposed research initiative is motivated by the high level of attrition from the accounting major at the lead author's institution over the past several years. Anecdotally, in his department chair role, the lead author has repeatedly heard students cite the excessive demand of the coursework as the primary reason for their decision to drop the major. Some may argue that (1) a variety of factors (e.g., the rigor of the major, disinterest in the subject matter, etc.) may account for this observed phenomenon and (2) to an extent voluntary turnover from the major is good and natural. However, in this program and others that cannot produce enough graduates to satisfy the demand of their high-profile employer constituents, the potential benefits from additional research into the role that stress plays in student performance and voluntary departure from the major appear to be quite tangible.

and the potential negative consequences of excessive stress to the affected individuals (e.g., decreased academic performance), school administrators, and potentially future employers, the availability of a valid and reliable measure to assess perceived stress among business and accounting students would appear substantively valuable. In fact, the ability to assess student stress levels before burnout tendencies manifest would facilitate more timely and cost effective intervention strategies. The above caveats notwithstanding, the PSS10 has the potential to validly identify those students who may be in need of psychological counseling or some other type of stress management intervention before their excessive stress manifests itself in the form of burnout tendencies. This, coupled with the PSS10's ease of administration, argues for further consideration of the scale by business school administrators, clinicians, and researchers.

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