EDUCATION
RESEARCH SERVICE

ORIGINAL ARTICLE

Resilient responses to stressful events among chiropractic students: A cross-sectional survey

Kira J. Baca, DC, MS, BSEd, Dustin C. Derby, EdD, and Stacie A. Salsbury, PhD, RN

ABSTRACT

Objective: Resilient students may better navigate the challenges of chiropractic training. This study explored the relationships between response to stressful experiences, perceived stress, and quality of life among students at 1 US chiropractic college campus.

Methods: A cross-sectional survey was conducted with 873 students. The anonymous online questionnaire included demographics, quality of life, perceived stress, and the Response to Stressful Events Scale (RSES). Hierarchical multiple regression analyses assessed for significant relationships among variables.

Results: A sample of 221 students (60% female) completed the survey (25% response rate). Male respondents reported greater psychological health. Participants reporting high quality of life exhibited higher resiliency on the RSES flat score and many RSES domains. Respondents who rated greater psychological health and social relationships exhibited greater spiritual resiliency. Respondents reporting higher psychological health and lower levels of perceived stress exhibited higher self-efficacy resilience. Psychological health was the most important predictor for RSES flat score and domains, except for spiritual resilience, for which social relationships were most important. Male gender was predictive of 3 RSES domains: meaning making, active coping, and cognitive flexibility.

Conclusion: More resilient responses to stressful events were reported by male chiropractic students and those who reported greater psychological health, higher quality of life, or lower perceived stress. Female students and those experiencing psychological challenges or lower quality of life might consider resilience training to increase the use of protective coping strategies. These findings may permit academic institutions to identify students at highest risk and employ interventions to prevent program withdrawal.

Key Indexing Terms: Chiropractic; Health Education; Academic Performance; Resilience; Adaptation; Psychological; Burnout

J Chiropr Educ 2024;38(1):82–95 DOI 10.7899/JCE-23-9

INTRODUCTION

Chiropractic educational programs affect students' physical and mental well-being.[1–4] Students engaged in rigorous health sciences curricula experience stress,[1,2,5–8] which may affect perceived quality of life (QOL).[3] Resilience is a person's capacity to resist the physical, psychological, or social effects of adversity[7,9–11] and is 1 of 9 personal characteristics associated with student success during medical training.[12] Possessing resilience may positively influence student learning and subsequent professionalism,[6] although resiliency varies among individuals based on their coping style.[13,14] A gradual chronological increase in resilience occurs in some students of these rigorous programs, which may be due to exposure and adaptation to experienced stress.[2]

The stressful demands of chiropractic programs are the subject of international research, along with test anxiety, confidence, burnout, financial situations, musculoskeletal injury, exercise, educational environment, lifestyle factors, and workload; all are implicated in students' negative or positive experiences.[1,3,15–19] Innes et al outlined several novel psychological traits that may affect students' experience of stress in chiropractic curricula, such as uncertainty intolerance,[20] attitudes toward non–evidence-based health care,[21] beliefs about chiropractic scope of practice,[22] and resilience.[2] Chiropractic student use of emotion-based coping styles and lower resilience were associated with lower perceptions of well-being and higher levels of stress, especially among female students and during recovery from physical injury.[2]

First Published Online January 23 2024

Chiropractic students exhibit similar levels of negative emotions as other health care students do, including anxiety, depression, and stress, but higher levels than non–health care students.[2] While the empathy levels of chiropractic students are similar to other health care students, female students demonstrate significantly higher levels of empathy than male students do.[23] A difference in response to stress is also noted, with increased testing anxiety in females.[2,24] Moreover, coping styles that are task, problem, emotion, or avoidant based show gender trends during stressful situations. While females are more likely to seek help and be more expressive of their stress, they also appraise stressful situations more severely.[25]

Response to stressful situations may be an indicator of resilience. While researchers have assessed chiropractic students' resilience, coping styles, and stress,[1–4,7,26,27] none have evaluated the perceived response to stressful situations. The objective of this study was to explore chiropractic student resilience using the Response to Stressful Events Scale (RSES).[14] We aimed to answer 3 questions: (1) Which is the best predictor of overall RSES: perceived stress, QOL, or demographics? (2) Which is the best predictor of specific RSES domains (coping mechanisms): perceived stress, QOL, or demographics? (3) Do our results exhibit gender-based resilience outcomes?

METHODS

Our research design was a cross-sectional online survey with multivariate hierarchical regression analysis. This study received expedited approval from the Palmer College of Chiropract institutional review board (assurance No. X2019-001, January 24, 2019). Our report follows the STROBE checklist for observational studies.[28]

Setting and Participants

The study setting was the Palmer College of Chiropractic in Davenport, Iowa, USA. The doctor of chiropractic (DC) program is completed across 10 trimesters, spanning 3.3 years, with the option for individualized curricular schedules for students who prefer reduced class loads. A baccalaureate (BS) track completed in tandem with the DC program offers students the ability to practice in states that require a BS degree.

We did not perform a formal sample size calculation for this pilot project. Rather, we used a convenience sample of chiropractic students who were willing to complete this survey to decrease coverage error by including all chiropractic students (n = 873) enrolled in the DC program in March 2019.

Questionnaires

Demographic variables included self-reported current trimester, time in the DC program, age, marital status, gender, veteran status, previous careers, highest degree earned, and grade point average. In this study, the gender demographic represented the multidimensional construct of gender identity among participants rather than the sex assigned at birth.[29,30] Self-reported options for the gender variable included male, female, and other. For this survey, male and female were used for gender to reflect the spectrum gender may represent.[31] Other options on the survey consisted of nonbinary, transgender, and those who preferred not to identify.[31] Gender and associated options were based on culturally accepted and supported evidence.[29,30] See Appendix A (available online accompanying the article) for details on survey content.

RSES* -

Domain 1: Meaning-Making - Perspective-taking, cultivating revitalization, and learning lessons from stressful experiences

Domain 2: Active Coping - Thoughts and behaviors to alter internal or external sources of stress

Domain 3: Cognitive Flexibility - Critical thinking, consideration of alternatives, and problem-solving

Domain 4: Spirituality - Belief in a higher power that guides, shapes, and informs experiences

Domain 5: Self Efficacy - Confidence in one's own ability to manage and successfully emerge from the stressful situations

WHOQOL-BREF* -

QOL Single item 1: self-reported overall quality of life, question 1

QOL Single item 2: self-reported overall quality of health, question 2

Domain 1: Physical Health - Energy and fatigue, pain and discomfort, sleep, and rest

Domain 2: Psychological Health - Bodily image and appearance, negative feelings, positive feelings, self-esteem, thinking, learning, memory, and concentration

Domain 3: Social Relations - Personal relationships, social support, sexual activity

Domain 4: Environment - Mobility, activities of daily living, dependence on medicinal substances and medical aids, work capacity

Figure 1 - RSES and WHOQOL-BREF domains. Variables from the WHOQOL-BREF, used in the HMR models and compared against RSES. *Response to Stressful Events Scale (RSES); World Health Organization Brief Quality of Life survey (WHOQOL-BREF).

The RSES served as our measure of resilience, or the cognitive, behavioral, and emotional coping responses of chiropractic students.[13,14] The 22-item RSES is rated on a 5-point scale ranging from 0 = *not at all like me* to 4 = *exactly like me*. Items are calculated in the positive direction for a total summed score in which "higher scores indicate higher levels of protective responses to stressful life events."[14(p162)] The RSES can be interpreted as a flat score or by its 5 domains (Fig. 1)[32]: Meaning Making and Restoration (domain 1), Active Coping (domain 2), Cognitive Flexibility (domain 3), Spirituality (domain 4), and Self-Efficacy (domain 5).[14] The RSES was developed and resulting data validated with predominately male samples of active-duty military personnel of the same age as health professions students and in veterans, with internal consistency (α = .91–.93) and test-retest reliability (r = .87) demonstrated.[14] Although developed by the military for use in active-duty personnel, the RSES has been used in civilian settings, such as with emergency first responders, although there is limited research in this area.[33,34]

The Perceived Stress Scale (PSS)[35–37] measured student perceptions of the intensity of stress levels over the past month. The PSS is a 10-item instrument, scored on a 5-point

Likert-type scale (0–4), with answers ranging from *never* to *very often*, with higher total scores suggesting greater perceived stress. A psychometric review of data from the PSS measures suggests adequate levels of validity and internal consistency of about $\alpha = .7$.[37] The PSS is commonly used with students in chiropractic training programs internationally, with most studies indicating moderate to high levels of perceived stress, particularly among female chiropractic students.[1,2,17,38]

The World Health Organization Quality of Life (WHOQOL-BREF)[39–41] provided a snapshot of student perceptions of their general QOL. While studies have evaluated QOL among health care students, we did not find studies that had used this concept or specific measure in chiropractic students.[42–45] The WHOQOL-BREF, an abbreviated version of the 100-item WHOQOL-100, contains 26 items, including 2 benchmarks for QOL and general health and 24 individual items broken down into 4 domains (Fig, 1): domain 1, Physical Health; domain 2, Psychological Health; domain 3, Social Relationships; and domain 4, Environment. Each item used an adaptation of a 5-point (0–4) Likert-type scale, asking *how much*, *how completely*, *how often*, *how good*, or *how satisfied*. Raw scores are calculated using the 5-point interval scale, with domain scores omitted if >20% of a domain, or 1 of 3 questions of domain 3, is unanswered. To account for an unequal number of items in each domain, scores are transformed to a 0–100 scale for comparison between domains. The internal consistency of data resulting from the WHOQOL-BREF is reported as [original: all domains $\alpha = .65–.93$; international: domains 1, 2, 4 $\alpha > .7$, domain 3 $\alpha = .51–.77$].[40,41]

Data Collection

Data were collected using SurveyMonkey (SurveyMonkey Enterprise, San Mateo, CA, USA), an online survey platform, from March 13 to April 2, 2019. The Department of Institutional Research and Effectiveness (IRE) distributed an email survey link to all DC students. All students, regardless of their survey completion status, received multiple communications from IRE over a 1-month deployment period. An email sent 1 week prior to survey release contained a brief study description, contents of the survey, and important disclosures regarding the anonymous and voluntary nature of participation and ability to skip questions. Before entering the survey, students consented to participation using a check box. Email-linked surveys and encouragements were sent for 3 consecutive weeks following study launch. The 4th email included a final encouragement and restated the importance of student participation. Institutional research personnel collected, stored, and analyzed the resulting data. No participation incentives were offered.

Data Analysis

Data were exported from the survey platform into Microsoft Excel (Microsoft Corp, Redmond, WA, USA), then uploaded into IBM SPSS Statistics, v.25 (IBM Corp, Armonk, NY, USA) for analysis. Descriptive and inferential statistics were calculated, and a data summary was generated on SPSS (Tables 1–7). Internal consistency reliability was examined using Cronbach's alpha, with scores >.7 indicating adequate reliability.

Table 1 - Respondent Demographics

Demographics	n (%)	μ
Student population		
Surveyed	873 (100)	
Respondents	227 (26)	
Qualifying	221 (25)	
Gender		1.6
Male	88 (39.8)	
Female	**131 (59.3)**	
Other	2 (.9)	
Age range, y		2.1
18–22	41 (18.6)	
23–27	**139 (62.9)**	
28–32	24 (10.9)	
33–44	14 (6.3)	
45+	3 (1.4)	
Highest degree earned		2.78
High school	24 (10.9)	
Associate's degree	13 (5.9)	
Bachelor's degree	**174 (78.7)**	
Master's degree	8 (3.6)	
PhD	2 (.9)	
Trimester		4.63
1	20 (9.0)	
2	**46 (20.8)**	
3	26 (11.8)	
4	20 (9.0)	
5	29 (13.1)	
6	25 (11.3)	
7	10 (4.5)	
8	21 (9.5)	
9	19 (8.6)	
10	5 (2.3)	
Year		1.93
1	83 (37.6)	
2	76 (34.4)	
3	57 (25.8)	
4+	5 (2.3)	

Self-reported demographic results from respondents of Palmer College of Chiropractic, spring 2019. Number (n) and percentage (%) of the population, as well as population mean (μ) values are described. Bold text indicates any demographic that was disproportionately higher than the rest of its respective category.

Hierarchical multivariate regression (HMR) assessed both the RSES flat score and 5 RSES domain outcomes against 12 predictors: "How would you rate your QOL (single-item QOL)," "How satisfied are you with your health," WHOQOL domains (Physical Health, Psychological Health, Social Relationships, and Environment), PSS, and gender, age, trimester, highest degree earned, and year at the college.

Mean imputation was used if ≤20% of the answers of any 1 domain were left unanswered per participant, and participants were omitted from the analysis if more than 1 domain score was missing. If only 1 domain score was missing, the mean imputation was used on that single domain to ensure completion across all domains.

Variables were entered across 4 steps in accordance with theoretical or empirically known impact on RSES scaled

score: step 1, gender; step 2, single-item QOL, How satisfied are you with your health, and the 4 WHOQOL domains; step 3, age, trimester, highest degree earned, and year at the college; and step 4, PSS.

Interpretation of HMR results occurred primarily using the standardized beta (β), R^2, R^2 change, and semipartial squared (sr^2), where β indicates the direction (ie, positive or inverse), importance (ie, which variable contributes more), and strength of the effect (ie, a higher absolute value indicates a stronger effect) for each contributing variable. The R^2 and R^2 change statistics indicate goodness-of-fit (ie, accounted for variance) for the regression model, where the higher the value the better the fit, and sr^2 indicates the unique variance contribution of individual variables. The alpha value chosen for this pilot study was .05.

RESULTS

Table 1 reports the sample demographics. Of 873 eligible chiropractic students, 242 responded (28%). Of 242 respondents, 21 were eliminated for omitting more than 20% of their survey responses. Thirty-seven participants required mean imputation for missing items (35 exhibited <3% omissions (21 female, 13 male). The resulting used sample (n = 221, 25% of sampled students) consisted of 40% male, 60% female, and .9% *other* (non–gender conforming, transgender, or preferred not to say) compared with 58% male and 41% female students in the DC program around the time of data collection (no *other* or comparable category is reported by the college).[46] Sample and total student populations data for mean age and highest degree earned were comparable. The mean age of all students on campus was 26 years, which corresponds to the modal age range (23–27 years old) of our sample. A BS or higher was earned prior to enrollment by the majority of both our population and that of the college student body (83% and 86%, respectively).[46] Two individuals selected the gender category *other*, which was an insufficient number of cases for a distinct analysis within HMR analysis.

Assumption Testing

Data collection resulted in a robust sample size with almost double the recommended cases needed for HMR analysis (ie, at least 10 cases per indicator). Inspection of bivariate correlations indicated singularity (ie, the absence of extreme correlations ±1.0). Although the WHOQOL Psychological Health exhibited high correlations (≥.7) with the single-item QOL (r = .724) and the PSS (r = −.703), all variables met conventionally acceptable multicollinearity thresholds for variance inflation factor (<5; range: 1.000 to 4.145).[47] Examination of z-scores and Mahalanobis distance occurred for univariate and multivariate outliers. Two multivariate outliers were indicated but retained for data analysis after the data were further inspected. Residual and scatter plots indicated that the assumptions of normality and linearity were all satisfied.

Internal Consistency Reliability

The PSS (k = 10) exhibited acceptable reliability, α = .886, scale mean = 17.91, and σ2 = 43.02. Three of 4 WHOQOL domains exhibited lower than expected reliability: Physical Health (k = 7; α = .371, scale mean = 22.62, σ2 = 7.64), Psychological Health (k = 6; α = .459, scale mean = 20.24, σ2 = 9.25), Social Relationships (k = 3; α = .681, scale mean = 10.81, σ2 = 6.45), and Environment (k = 8; α = .739, scale mean = 29.91, σ2 = 19.55). Given the presence of domains within the RSES,[14] calculating Cronbach's alpha on the entire instrument would violate the assumption of tau equivalence. The RSES domains exhibited acceptable reliability: Meaning Making (k = 9; α = .868, scale mean = 24.22, σ2 = 42.06), Active Coping (k = 8; α = .796, scale mean = 22.23, σ2 = 25.27), Cognitive Flexibility (k = 3; α = .690, scale mean = 7.48, σ2 = 6.22), Spirituality (k = 2; α = .884, scale mean = 4.05, σ2 = 8.57), and Self-Efficacy (k = 2; α = .786, scale mean = 5.95, σ2 = 3.08).

Regression: RSES Flat Score

Explanatory variables in step 1, $F(1, 219) = 9.931$, $p < .002$, $R^2 = .043$, and Step 2, $F(7, 213) = 20.991$, $p < .001$; $R^2 = .408$, were significantly predictive of the outcome RSES flat score. The linear combinations of variables in step 2 predicted variance in the model over and above that of steps 1, 3, and 4 ($\Delta R^2 = .365$, $p < .001$; Table 2).

Three variables contributed to 41% of the variance of RSES. Gender (β = −.181, $t[219] = -3.328$, $p < .001$; sr^2 = .031), single-item QOL (β = .213, $t[219] = 2.556$, $p < .011$; sr^2 = .018), and WHOQOL Psychological Health (β = .505, $t[219] = 5.509$, $p < .001$; sr^2 = .084) significantly predicted RSES flat score. Examination of the RSES flat score suggested that males who report higher ratings on the single-item QOL and higher ratings for WHOQOL Psychological Health also exhibit higher resilience to stressful events. Psychological Health was the most important model predictor within the linear combination of variables concerning the RSES flat score.

Regres sions: RSES Domains 1–5

Domain 1: Meaning Making

Explanatory variables in step 1, $F(1, 219) = 6.243$, $p < .05$, $R^2 = .028$, and step 2, $F(1, 213) = 15.383$, $p < .001$, $R^2 = .336$, were significantly predictive of the outcome Meaning Making. The linear combinations of variables in step 2 predicted variance in the model over and above that of steps 1, 3, and 4 ($\Delta R^2 = .308$, $p < .001$; Table 3).

Three variables contributed to 34% of the variance of Meaning Making. Gender (β = −.142, $t[219] = -2.478$, $p < .05$, sr^2 = .019), the single-item QOL (β = .207, $t[219] = 2.347$, $p < .05$; sr^2 = .017), and the WHOQOL Psychological Health (β = .416, $t[219] = 4.281$, $p < .001$, sr^2 = .057) significantly predicted the Meaning Making score. Similar to the RSES flat score analysis, males who reported high ratings on the single-item QOL and the WHOQOL Psychological Health all exhibited higher levels of Meaning Making responses to stressful events as compared with their counterparts. Psychological Health was the most important model predictor within the linear combination of variables concerning Meaning Making.

Domain 2: Active Coping

Explanatory variables in step 1 $F(1, 219) = 12.828$, $p < .001$, $R^2 = .055$), and step 2, $F(7, 213) = 16.404$, $p < .001$,

Table 2 - RSES Flat Score Hierarchical Multivariate Regression Model

RSES – Flat Scores Variable	β	*t*	sr^2	*R*	R^2	ΔR^2
Step 1				.208	.043	
Gender	−.208	−3.151	.043			
Step 2						
Gender***	−.181	−3.328	.031	.639	.408	.365
How would you rate your quality of life?*	.213	2.556	.018			
How satisfied are you with your health?	−.029	−.391	.000			
QOL1: Physical domain	.018	.233	.000			
QOL2: Psychological domain*	.505	5.509	.084			
QOL3: Social Relationship domain	−.081	−1.223	.004			
QOL4: Environmental domain	−.040	−.601	.001			
Step 3				.648	.419	.011
Gender	−.168	−3.064	.026			
How would you rate your quality of life?	.208	2.472	.017			
How satisfied are you with your health?	−.019	−.244	.000			
QOL1: Physical domain	.038	.462	.001			
QOL2: Psychological domain	.486	5.178	.074			
QOL3: Social Relationship domain	−.082	−1.228	.004			
QOL4: Environmental domain	−.028	−.411	.000			
Trimester	−.078	−.744	.002			
Year at Palmer	.047	.437	.001			
What is your highest EARNED degree?	−.008	−.146	.000			
Age range	.103	1.728	.008			
Step 4				.649	.421	.001
Gender	−.161	−2.875	.023			
How would you rate your quality of life?	.199	2.325	.015			
How satisfied are you with your health?	−.011	−.146	.000			
QOL1: Physical domain	.035	.421	.000			
QOL2: Psychological domain	.456	4.394	.054			
QOL3: Social Relationship domain	−.086	−1.282	.005			
QOL4: Environmental domain	−.029	−.422	.000			
Trimester	−.082	−.778	.002			
Year at Palmer	.050	.467	.001			
What is your highest EARNED degree?	−.009	−.151	.000			
Age range	.096	1.584	.007			
Perceived Stress Scale score, after reverse coding	−.054	−.677	.001			

Results for the hierarchical multivariate regression model comparing RSES flat scores to gender, WHOQOL-BREF domains, and PSS to show the potential predictability of RSES flat scores of resilience from various variables.
*p < .05; ***p < .001.*

R^2 = .350, were significantly predictive of the outcome Active Coping. The linear combinations of variables in step 2 predicted variance in the model over and above that of steps 1, 3, and 4 (ΔR^2 = .295, $p < .001$; Table 4).

Three variables contributed 31% of variance of Active Coping. Gender (β = −.211, t[219] = −3.706, $p < .001$; sr^2 = .042), single-item QOL (β = .172, t[219] = 1.977, $p < .05$; sr^2 = .012), and the WHOQOL Psychological Health (β = .483, t[219] = 5.032, $p < .001$; sr^2 = .077) significantly predicted the Active Coping score. Results for RSES domain 2, Active Coping, were similar to the flat score analysis. Males with high ratings on the single-item QOL and higher Psychological Health all exhibited higher levels of active coping skills concerning resilience to stressful events as compared with their counterparts. Psychological Health was the most important model predictor within the linear combination of variables concerning Active Coping.

Domain 3: Cognitive Flexibility

Explanatory variables in step 1, F(1, 219) = 5.722, $p < .05$, R^2 = .025, and step 2, F(7, 213) = 5.365, $p < .001$, R^2 = .150, were significantly predictive of the outcome Cognitive Flexibility. The linear combinations of variables in step 2 predicted variance in the model over and above that of steps 1, 3, and 4 (ΔR^2 = .124, $p < .001$; Table 5).

Two variables contributed to 15% of the variance of Cognitive Flexibility. Gender (β = −.150, t[219] = −2.309, $p < .05$, sr^2 = .021) and WHOQOL Psychological Health (β = .275, t[219] = 2.504, $p < .05$, sr^2 = .025) significantly predicted the Cognitive Flexibility score. Males with high ratings on the single-item QOL and Psychological Health exhibited higher levels of cognitive flexibility in response to stressful events, with Psychological Health the most important model predictor within the linear combination of variables.

Table 3 - RSES Domain 1 (Meaning Making) Hierarchical Multivariate Regression Model

RSES 1 - Meaning Making Variable	β	*t*	sr^2	*R*	R^2	ΔR^2
Step 1				.166	.028	
Gender	−.166	−2.499	−.166			
Step 2						
Gender*	−.142	−2.478	−.167	.579	.336	.308
How would you rate your quality of life?*	.207	2.347	.159			
How satisfied are you with your health?	−.052	−.658	−.045			
QOL1: Physical domain	.053	.632	.043			
QOL2: Psychological domain***	.416	4.281	.281			
QOL3: Social Relationship domain	−.024	−.346	−.024			
QOL4: Environmental domain	−.032	−.444	−.030			
Step 3				.585	.343	.007
Gender	−.135	−2.313	−.158			
How would you rate your quality of life?	.212	2.362	.161			
How satisfied are you with your health?	−.049	−.600	−.041			
QOL1: Physical domain	.077	.884	.061			
QOL2: Psychological domain	.394	3.942	.263			
QOL3: Social Relationship domain	−.027	−.386	−.027			
QOL4: Environmental domain	−.023	−.313	−.022			
Trimester	−.110	−.983	−.068			
Year at Palmer	.075	.658	.046			
What is your highest EARNED degree?	−.018	−.298	−.021			
Age range	.063	.992	.068			
Step 4				.585	.343	.000
Gender	−.134	−2.236	−.153			
How would you rate your quality of life?	.210	2.300	.157			
How satisfied are you with your health?	−.047	−.571	−.040			
QOL1: Physical domain	.076	.872	.060			
QOL2: Psychological domain	.387	3.495	.236			
QOL3: Social Relationship domain	−.028	−.397	−.028			
QOL4: Environmental domain	−.023	−.314	−.022			
Trimester	−.111	−.988	−.068			
Year at Palmer	.076	.663	.046			
What is your highest EARNED degree?	−.018	−.298	−.021			
Age range	.061	.949	.066			
Perceived Stress Scale score, after reverse coding	−.013	−.153	−.011			

Results for the hierarchical multivariate regression model comparing RSES domain 1 scores to gender, WHOQOL-BREF domains, and PSS scores to show the potential predictability of RSES meaning making coping strategy from various variables.
*p < .05; ***p < .001.

Domain 4: Spirituality

Explanatory variables in step 1, $F(1, 219) = 1.029$, $p = .311$, $R^2 = .004$, were not significant predictors of domain 4 Spirituality. The step 2 variable resulted in a predictive model for Spirituality $F(7, 213) = 5.381$, $p < .001$, $R^2 = .150$. The linear combinations of variables in step 2 predicted variance in the model over and above that of steps 1, 3, and 4 ($\Delta R^2 = .146$, $p < .001$; Table 6).

Two variables contributed to 15% of the variance of Spirituality. Unlike prior models, gender was not a predictive indicator. WHOQOL Psychological Health (β = .370, $t[219] = 3.365$, $p < .01$, $sr^2 = .045$) and WHOQOL Social Relationships (β = −.158, $t[219] = -1.985$, $p < .05$, $sr^2 = .016$) significantly predicted the Spirituality score. Departing from other findings, respondents reporting higher psychological and social relationship QOL ratings and exhibited greater spiritual resilience to stressful life events. The WHOQOL Social Relationship was the most important model predictor within the linear combination of variables concerning Spirituality.

Domain 5: Self-Efficacy

Explanatory variables in step 1, $F(1, 219) = 8.726$, $p < .01$, $R^2 = .038$; step 2, $F(7, 213) = 17.432$, $p < .001$, $R^2 = .364$, $\Delta R^2 = .326$; and step 4, $F(12, 208) = 11.125$, $p < .001$, $R^2 = .391$, $\Delta R^2 = .013$, were significantly predictive of the outcome Self-Efficacy. The linear combinations of variables in step 2 predicted variance in the model over and above that of step 3 (Table 7).

Two variables contributed to 39% of the variance of Self-Efficacy. WHOQOL Psychological Health (β = .345, $t[219] = 3.235$, $p < .001$, $sr^2 = .031$) and the PSS score (β = −.174, $t[219] = -2.136$, $p < .05$, $sr^2 = .013$) significantly predicted

Table 4 - RSES Domain 2 (Active Coping) Hierarchical Multivariate Regression Model

RSES 2 - Active Coping Variable	β	*t*	sr^2	*R*	R^2	ΔR^2
Step 1				.235	.055	
Gender	−.235	−3.582	−.235			
Step 2				.592	.350	.295
Gender***	−.211	−3.706	−.246			
How would you rate your quality of life?*	.172	1.977	.134			
How satisfied are you with your health?	−.060	−.763	−.052			
QOL1: Physical domain	.062	.744	.051			
QOL2: Psychological domain***	.483	5.032	.326			
QOL3: Social Relationship domain	−.065	−.939	−.064			
QOL4: Environmental domain	−.096	−1.362	−.093			
Step 3				.604	.364	.014
Gender	−.199	−3.459	−.233			
How would you rate your quality of life?	.149	1.685	.116			
How satisfied are you with your health?	−.041	−.509	−.035			
QOL1: Physical domain	.050	.578	.040			
QOL2: Psychological domain	.491	4.997	.327			
QOL3: Social Relationship domain	−.059	−.847	−.059			
QOL4: Environmental domain	−.089	−1.246	−.086			
Trimester	.054	.491	.034			
Year at Palmer	−.042	−.377	−.026			
What is your highest EARNED degree?	.039	.662	.046			
Age range	.103	1.656	.114			
Step 4				.611	.373	.009
Gender	−.180	−3.088	−.209			
How would you rate your quality of life?	.124	1.391	.096			
How satisfied are you with your health?	−.022	−.269	−.019			
QOL1: Physical domain	.041	.480	.033			
QOL2: Psychological domain	.413	3.822	.256			
QOL3: Social Relationship domain	−.070	−.999	−.069			
QOL4: Environmental domain	−.091	−1.280	−.088			
Trimester	.044	.402	.028			
Year at Palmer	−.034	−.300	−.021			
What is your highest EARNED degree?	.038	.652	.045			
Age range	.085	1.346	.093			
Perceived Stress Scale score, after reverse coding	−.140	−1.698	−.117			

Results for the hierarchical multivariate regression model comparing RSES domain 2 scores to gender, WHOQOL-BREF domains, and PSS scores to show the potential predictability of RSES active coping strategy from various variables.
*$p < .05$; ***$p < .001$.

Self-Efficacy. That is, those who reported higher psychological health and lower levels of perceived stress had higher degrees of self-efficacy to respond to stressful events. The WHOQOL Psychological Health was the most important model predictor within the linear combination of variables concerning Self-Efficacy.

DISCUSSION

Our team used a novel instrument, the RSES, to explore the concept of resilience among chiropractic students at 1 US chiropractic college.[13,14] In answer to the 1st research question, our findings suggest that 41% of the variance in the overall RSES score can be predicted by just 3 variables: male gender, the WHOQOL Psychological Health, and the WHOQOL single-item QOL. In answer to our 2nd research question, the best predictor of specific RSES domains included the WHOQOL Psychological Health score for Meaning Making, Active Coping, Cognitive Flexibility, and Self-Efficacy, while the WHOQOL Social Relationships score was the best predictor for Spirituality. In answer to our 3rd research question, female chiropractic students do appear less resilient than male chiropractic students based on the RSES tool. In most of our models, barring RSES domain 4 (Spirituality) and 5 (Self-efficacy), gender was 1 of the 2 to 3 leading predictors of RSES values for both flat and domain scores. Except for the RSES Self-Efficacy domain, perceived stress measured by the PSS did not predict resilience.

Our use of the RSES instrument with a chiropractic student population is novel and warrants cautious interpretations, but our findings may address student burnout, depression, and suboptimal learning environments, which are increasing across fields of health care education.[1,26,48] Academic institutions are investigating effective coping strategies and what makes some

Table 5 - RSES Domain 3 (Cognitive Flexibility) Hierarchical Multivariate Regression Model

RSES 3 - Cognitive Flexibility Variable	β	*t*	sr^2	*R*	R^2	ΔR^2
Step 1				.160	.025	
Gender	−.160	−2.392	−.160			
Step 2***				.387	.150	.124
Gender*	−.150	−2.309	−.146			
How would you rate your quality of life?	.175	1.750	.111			
How satisfied are you with your health?	.040	.447	.028			
QOL1: Physical domain	−.060	−.634	−.040			
QOL2: Psychological domain*	.275	2.504	.158			
QOL3: Social Relationship domain	−.132	−1.661	−.105			
QOL4: Environmental domain	.005	.065	.004			
Step 3				.427	.182	.032
Gender	−.143	−2.187	−.137			
How would you rate your quality of life?	.202	2.015	.126			
How satisfied are you with your health?	.033	.370	.023			
QOL1: Physical domain	.006	.064	.004			
QOL2: Psychological domain	.216	1.942	.121			
QOL3: Social Relationship domain	−.140	−1.758	−.110			
QOL4: Environmental domain	.018	.225	.014			
Trimester	−.313	−2.504	−.157			
Year at Palmer	.210	1.646	.103			
What is your highest EARNED degree?	−.045	−.666	−.042			
Age range	.076	1.074	.067			
Step 4				.433	.187	.005
Gender	−.157	−2.364	−.148			
How would you rate your quality of life?	.220	2.175	.136			
How satisfied are you with your health?	.019	.209	.013			
QOL1: Physical domain	.013	.130	.008			
QOL2: Psychological domain	.276	2.240	.140			
QOL3: Social Relationship domain	−.132	−1.651	−.103			
QOL4: Environmental domain	.020	.244	.015			
Trimester	−.306	−2.442	−.153			
Year at Palmer	.203	1.594	.100			
What is your highest EARNED degree?	−.044	−.658	−.041			
Age range	.090	1.253	.078			
Perceived Stress Scale score, after reverse coding	.106	1.130	.071			

Results for the hierarchical multivariate regression model comparing RSES domain 3 scores to gender, WHOQOL-BREF domains, and PSS scores to show the potential predictability of RSES cognitive flexibility coping strategy from various variables.
*$p < .05$; ***$p < .001$.

students more resilient.[2,5,6,12] Chiropractic training is stressful for all students, with their primary stressors being personal debt and finances, time to engage in nonschool interests, the competitiveness of the curriculum, and the required competence and endurance to complete the program. Success, despite these barriers, may be indicators of resilience.[16] Currently, little is known about how chiropractic students manage these stressors in their daily lives or how those stressors affect chiropractors' choices upon graduating, including starting a practice, buying a practice, working for an established practitioner, or other forms of work in or outside of the chiropractic profession. These are questions worth exploring in future research.

Of the demographic data collected, the strongest correlations were with participants reporting male gender. While male and female student comparisons can be made between this study and the results of other, similar studies, few respondents identified as nonbinary, gender nonconforming, or transgender, which precluded an analysis of these students. Being a male played a positive role on the scores observed on the RSES survey. Our finding that female students report lower resilience levels than male students in the same chiropractic program is consistent with research that showed resilience measures are associated with self-reported stress and psychological well-being in Australian chiropractic students.[2,24] Unfortunately, we cannot compare our findings directly to the Innes et al study due to instrumentation differences.[2] We can conclude, however, that many facets of personal, social, and professional identity, including sex and gender, remain salient avenues for future research as chiropractic becomes more diverse, equitable, and inclusive as a profession.[49,50]

Although persons of any gender identity have pursued training in chiropractic from the inception of the profession, researchers are only beginning to explore how the sex (a

Table 6 - RSES Domain 4 (Spirituality) Hierarchical Multivariate Regression Model

RSES 4 -Spirituality Variable	β	*t*	sr^2	*R*	R^2	ΔR^2
Step 1				.068	.005	
Gender	−.068	−1.015	−.068			
Step 2						
Gender	−.053	−.815	−.056	.388	.150	.146
How would you rate your quality of life?	.125	1.253	.086			
How satisfied are you with your health?	.074	.822	.056			
QOL1: Physical domain	−.080	−.844	−.058			
QOL2: Psychological domain**	.370	3.365	.225			
QOL3: Social Relationship domain*	−.158	−1.985	−.135			
QOL4: Environmental domain	−.051	−.626	−.043			
Step 3				.402	.161	.011
Gender	−.039	−.598	−.041			
How would you rate your quality of life?	.109	1.073	.074			
How satisfied are you with your health?	.092	1.005	.069			
QOL1: Physical domain	−.081	−.818	−.056			
QOL2: Psychological domain	.369	3.266	.220			
QOL3: Social Relationship domain	−.157	−1.954	−.134			
QOL4: Environmental domain	−.038	−.469	−.032			
Trimester	.020	.159	.011			
Year at Palmer	−.016	−.125	−.009			
What is your highest EARNED degree?	.002	.025	.002			
Age range	.108	1.504	.104			
Step 4				.404	.163	.002
Gender	−.048	−.719	−.050			
How would you rate your quality of life?	.120	1.171	.081			
How satisfied are you with your health?	.083	.896	.062			
QOL1: Physical domain	−.076	−.775	−.054			
QOL2: Psychological domain	.406	3.249	.220			
QOL3: Social Relationship domain	−.152	−1.882	−.129			
QOL4: Environmental domain	−.037	−.456	−.032			
Trimester	.025	.195	.014			
Year at Palmer	−.020	−.157	−.011			
What is your highest EARNED degree?	.002	.030	.002			
Age range	.117	1.600	.110			
Perceived Stress Scale score, after reverse coding	.066	.696	.048			

Results for the hierarchical multivariate regression model comparing RSES domain 4 scores to gender, WHOQOL-BREF domains, and PSS scores to show the potential predictability of RSES spirituality coping strategy from various variables.
*$p < .05$; **$p < .01$.

biological variable) and gender (a social and cultural variable) of chiropractors may influence their experiences as students and work as health care professionals. Within the landscape of chiropractic training, female students report higher levels of test anxiety than male students, yet also demonstrate significantly higher levels of empathy.[23,24] Male and female chiropractors generate similar biomechanical forces during spinal manipulation.[51] Yet females (13%–17%) report much higher rates of physical injury than males do (1%) in chiropractic training while learning and performing adjustments.[52] Females also report more adverse events from receiving manipulation as a student and work-related musculoskeletal injuries later as practicing chiropractors.[53,54] Why female students in chiropractic training experience these higher rates of stressors is another area for future research. Interestingly, the increased incidence of adverse circumstances tended to increase resilience among Brazilian medical students.[7] One possible explanation is that exposure to adversity may trigger the innate development of coping strategies as a natural part of human development and adaptation.[27] In the case of chiropractic, longitudinal research to determine if the stressors of training impede or bolster professional flourishing is warranted.

What might our results mean for the professional lives of chiropractors and the health outcomes of their patients? Possibly, that without developing the knowledge and skills that support personal resilience, the stressors experienced in chiropractic school may follow practitioners, especially female chiropractors, into practice. For example, female chiropractors younger than 40 years practicing in South Africa reported greater levels of depression, anxiety, and stress during the COVID-19 pandemic than male chiropractors did.[55] Statistically, female chiropractors earn less money than male chiropractors do, have practices with smaller number of patients, and experience interpersonal stress from declines in patient

Table 7 - RSES Domain 1 (Self-Efficacy) Hierarchical Multivariate Regression Model

RSES 5 -Self Efficacy Variable	β	*t*	sr^2	*R*	R^2	ΔR^2
Step 1				.196	.038	
Gender	−.196	−2.954	−.196			
Step 2				.604	.364	.326
Gender	−.149	−2.656	−.179			
How would you rate your quality of life?	.085	.991	.068			
How satisfied are you with your health?	.066	.844	.058			
QOL1: Physical domain	.006	.079	.005			
QOL2: Psychological domain	.437	4.598	.301			
QOL3: Social Relationship domain	.008	.110	.008			
QOL4: Environmental domain	.032	.453	.031			
Step 3				.614	.378	.013
Gender	−.132	−2.324	−.159			
How would you rate your quality of life?	.065	.742	.051			
How satisfied are you with your health?	.083	1.056	.073			
QOL1: Physical domain	−.001	−.012	−.001			
QOL2: Psychological domain	.441	4.538	.300			
QOL3: Social Relationship domain	.008	.108	.007			
QOL4: Environmental domain	.049	.692	.048			
Trimester	.120	1.102	.076			
Year at Palmer	−.115	−1.037	−.072			
What is your highest EARNED degree?	−.029	−.503	−.035			
Age range	.115	1.860	.128			
Step 4				.625	.391	.013
Gender	−.109	−1.894	−.130			
How would you rate your quality of life?	.034	.387	.027			
How satisfied are you with your health?	.107	1.353	.093			
QOL1: Physical domain	−.012	−.138	−.010			
QOL2: Psychological domain**	.345	3.235	.219			
QOL3: Social Relationship domain	−.006	−.082	−.006			
QOL4: Environmental domain	.046	.662	.046			
Trimester	.108	.996	.069			
Year at Palmer	−.104	−.947	−.066			
What is your highest EARNED degree?	−.030	−.523	−.036			
Age range	.092	1.479	.102			
Perceived Stress Scale score, after reverse coding*	−.174	−2.136	−.147			

Results for hierarchical multivariate regression model comparing RSES domain 5 scores to gender, WHOQOL-BREF domains, and PSS scores to show the potential predictability of RSES self-efficacy coping strategy from various variables.
*$p < .05$; **$p < .01$.

rosters when becoming mothers.[56–60] Female chiropractors may experience boundary violations, such as unwelcomed comments, sexual harassment, and inappropriate sexual behavior, by their patients or professional colleagues, without knowing how best to address these concerns when they arise or to report such incidents as necessary.[61,62] Despite these factors, higher levels of empathy in female students may empower female chiropractors to spend more time with their patients, manage clinical risk through patient-centered and interprofessional approaches, and achieve better outcomes for patients, such as those with acute neck conditions.[58,63,64] Clearly, more research is needed on the development of psychosocial characteristics, such as resilience and empathy, in chiropractic students, including studies that test educational interventions. For example, given our finding that social relationships were important sources for coping with stressful experiences, perhaps interventional studies on support groups for chiropractic students might be considered.

Our QOL evaluation appears to be an innovative investigation, as we have found no previous studies exploring how chiropractic students rate the quality of their lives. Future studies exploring chiropractic student experience and positive psychology concepts, such as resilience, might consider measuring QOL, although future studies should validate QOL measures for chiropractic students. We noted low alpha scores on WHOQOL domains 1, 2, and 4, which were inconsistent with other studies and psychometric analyses.[40,41,45] While the WHOQOL-BREF is a well-established instrument that is translated into numerous languages, a known limitation is its less robust psychometrics for younger adult populations, such as those in this study.

This and similar other studies[2,7,26] establish a baseline and lay the groundwork for qualitative explorations of resilience. Studies could include serial cohort measurements to assess whether student resilience increases or decreases throughout

the chiropractic curriculum, mixed methods studies to identify the traits possessed by those students who have overcome great adversity and demonstrate high resilience scores, and assessment of the impact of resilience-building programs for students, akin to resilience training provided for soldiers prior to going to combat.[65] Although this is not to suggest that attending chiropractic college is comparable to the rigors and stressors of military combat, employing resilience-building techniques in high-stress environments can be successful and could be a strategy employed to increase the success of chiropractic students. This has significant potential impact for institutional retention rates, as burnout is a leading predictor of dropping out of medical training.[26] This discovery could have institutional impact, as fewer students would be lost to attrition, and individual impact, as students could matriculate with less stress, have better QOL, and more successfully assimilate information.

Study Limitations

Although the study did achieve high survey coverage of the population, it experienced a degree of survey nonresponse error. The study did, however, yield a robust sample size with more than double the number of cases needed to adequately complete the HLM quantitative analyses.

Despite the adequate representation of age and degree demographics in our resulting sample, the current study's findings are not generalizable to chiropractic student populations broadly due to its nature as a convenience sample at 1 US chiropractic college, the lower response rate, and the low number of transgender, nonbinary, or gender nonconforming students who took the survey. The disproportionate number of declines by male students, paired with the unbalanced proportion of female to male and other responders, may skew the results, since males make up a higher proportion of chiropractic students at this institution and male gender was a strong predictor of RSES scores across most domains. That male students were more likely to decline to complete the survey raises the question as to why. Are male chiropractic students less interested in biopsychosocial concepts than female students are? Do male and female students prioritize their time differently and, if so, how and why? Do other reasons drive these gender differences? And how might students who do not identify as male or female experience the stressors of chiropractic school? All of these questions offer much in the way of future research opportunities. Future studies may consider incentives to encourage participation and increase sample sizes.

Of those students who completed the questionnaire, an equal proportion of males and females omitted data. However, most of those omitting amounts of data disqualifying their survey were female. The reasons students omitted items are unknown. Perhaps students hesitated to self-disclose unfavorable answers, despite guarantees of anonymity, in courses taught by known faculty members. Such hesitancy to disclosure negative self-perceptions might also explain our low sample size. Perhaps nonparticipants or those who omitted items did not want to appear less resilient. Maybe questions about mental health were upsetting. Refusal to participate may also represent a coping strategy, such as protecting one's time for other activities. Future studies with more representative samples and additional chiropractic educational institutions could increase generalizability to other chiropractic student populations. In addition, data collection for this survey occurred in the spring of 2019, well before the start of the COVID pandemic. Studies exploring the resilience of chiropractic students either during or postpandemic may report different results than those reported here.

While this study relied on established questionnaires, in some cases the current study found lagging validity and reliability evidence for chiropractic students. As such, utility may be less robust than originally anticipated during the study design phase of this project. Validation and reliability testing of the RSES in larger chiropractic student cohorts is recommended. We believed similarities existed between chiropractic students and active military personnel in our choice to use the RSES, as these populations are similar in age. However, the RSES was designed and validated in male-dominated samples (88%–99%) with significant combat experience, including receiving hostile fire (88%) and joining battle missions (83%).[14] Resilience under combat circumstances may differ appreciably from resilience required in demanding classroom settings. Thus, the content validity of RSES items should be established with subject matter experts (ie, chiropractic students). Such validation would bolster our understanding of the unique stressors and resiliencies of this population and is recommended by the authors of the RSES, who considered the instrument as potentially appropriate for civilian populations for whom stress or trauma were likely.[14]

This study is among the first to use RSES to report gender differences in resiliency scores, which makes this study a unique contribution to the literature, underscoring the need for the chiropractic profession to develop and test an RSES instrument to measure the resilience experiences unique to chiropractic students. Perhaps the RSES does not fully capture key facets of resilience in student populations, particularly for female students. Innes[2] reported that females are more likely to choose emotion-based coping styles, although this trait did not fully explain differences in resilience scores in their sample. Therefore, construct validity might be explored, especially in relation to personal qualities that, like resilience, educators might seek to instill in chiropractic students, such as hardiness and grit, and for which there may be some conceptual overlap.

Qualitative research could allow a deeper look into the reasons for the trends we are seeing in our results regarding resilience scores and gender as well as that factors that play into the discrepancies seen between those identifying as male, female, and nonconforming or transgender. Finally, establishing the predictive validity of the RSES would be useful for studies evaluating evidence-based interventions for coping and increased resilience of chiropractic students over the course of their academic career.

CONCLUSION

Resilience is one of the best lines of defense against negative stressors, such as burnout, depression, fatigue, and unsatisfactory QOL. This study explored factors that are predictive of resilience, by looking at responses to stressful experiences, in the chiropractic student population of 1 college campus.

Using the self-reported factors of perceived stress, QOL, and gender, it is possible to predict the resilience level of students in intensive graduate-level programs, including chiropractic education. These findings may permit academic institutions to identify students at highest risk and to use interventions to prevent program withdrawal.

ACKNOWLEDGMENTS

Data from this project were previously presented at the Association of Chiropractic Colleges Research Agenda Conference. Dr Michelle Drover and Dr Tracey Littrell are acknowledged for the conceptualization and oversight of the original pilot study on which this article is based within Palmer College's Research Honors Program.

FUNDING AND CONFLICTS OF INTEREST

The original research study was unfunded. SAS reports external funding as a co-investigator on 2 grants funded by the National Institutes of Health unrelated to this project (UH3AT011187, UH3AT009761). DD serves as human protections administrator, Institutional Review Board, Palmer College of Chiropractic; DD was not involved in the research ethics approval process for this research.

About the Authors
Kira Baca (corresponding author) is an instructor in the Diagnosis and Radiology Department at Palmer College of Chiropractic (1000 Brady Street, Davenport, IA 52803; kira.baca@palmer.edu). Dustin Derby is the senior director of institutional research and effectiveness at Palmer College of Chiropractic (1000 Brady Street, Davenport, IA 52803; dustin.derby@palmer.edu). Stacie Salsbury is an associate professor with the Palmer Center for Chiropractic Research at Palmer College of Chiropractic (741 Brady Street, Davenport, IA 52803; stacie.salsbury@palmer.edu). This article was received March 17 2023; revised August 10 2023; and accepted September 2 2023.

Author Contributions
Concept development: KB, SAS. Design: KB, DD. Supervision: KB, SAS. Data collection/processing: KB, DD. Analysis/interpretation: KB, DD, SAS. Literature search: KB, SAS. Writing: KB, DD, SAS. Critical review: KB, DD, SAS.

REFERENCES

1. Rank MP, de la Ossa PP. Stress and burnout in chiropractic students of European chiropractic colleges: a cross-sectional study. *J Chiropr Educ*. 2021;35(1):14–21. doi:10.7899/JCE-19-7
2. Innes SI. The relationship between levels of resilience and coping styles in chiropractic students and perceived levels of stress and well-being. *J Chiropr Educ*. 2017;31(1):1–7. doi:10.7899/JCE-16-2
3. Spegman AM, Herrin S. Chiropractic interns' perceptions of stress and confidence. *J Chiropr Educ*. 2007;21(2):129–137.
4. Zhang N, Henderson CNR. Coping strategies and chiropractic student perceived stress. *J Chiropr Educ*. 2022;36(1):13–21. doi:10.7899/JCE-20-28
5. Bacchi S, Licinio J. Resilience and psychological distress in psychology and medical students. *Acad Psychiatry*. 2017;41(2):185–188. doi:10.1007/s40596-016-0488-0
6. Howe A, Smajdor A, Stöckl A. Towards an understanding of resilience and its relevance to medical training. *Med Educ*. 2012;46(4):349–356. doi:10.1111/j.1365-2923.2011.04188.x
7. Tempski P, Santos IS, Mayer FB, et al. Relationship among medical student resilience, educational environment and quality of life. *PLoS ONE*. 2015;10(6):e0131535. doi:10.1371/journal.pone.0131535
8. McKenna KM, Hashimoto DA, Maguire MS, Bynum WEI. The missing link: connection is the key to resilience in medical education. *Acad Med*. 2016;91(9):1197–1199. doi:10.1097/ACM.0000000000001311
9. Hiver P, Solarte ACS. Resilience. In: Gregersen T, Mercer S, eds. *The Routledge Handbook of the Psychology of Language Learning and Teaching*. New York, NY: Routledge; 2021.
10. Martin-Breen P, Anderies JM. *Resilience: A Literature Review*. Brighton, UK: Bellagio Initiative, IDS; 2011. https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/3692
11. Martin AJ, Marsh HW. Academic resilience and its psychological and educational correlates: a construct validity approach. *Psychol Sch*. 2006;43(3):267–281. doi:10.1002/pits.20149
12. Koenig TW, Parrish SK, Terregino CA, Williams JP, Dunleavy DM, Volsch JM. Core personal competencies important to entering students' success in medical school: what are they and how could they be assessed early in the admission process? *Acad Med*. 2013;88(5):603–613. doi:10.1097/ACM.0b013e31828b3389
13. De La Rosa GM, Webb-Murphy JA, Johnston SL. Development and validation of a brief measure of psychological resilience: an adaptation of the response to stressful experiences scale. *Mil Med*. 2016;181(3):202–208. doi:10.7205/MILMED-D-15-00037
14. Johnson DC, Polusny MA, Erbes CR, et al. Development and initial validation of the response to stressful experiences scale. *Mil Med*. 2011;176(2):161–169. doi:10.7205/MILMED-D-10-00258
15. Meckamalil C, Brodie L, Hogg-Johnson S, Carroll LJ, Jacobs C, Côté P. The prevalence of anxiety, stress and depressive symptoms in undergraduate students at the Canadian Memorial Chiropractic College. *J Am Coll Health*. 2022;70(2):371–376. doi:10.1080/07448481.2020.1751173
16. Zhang N, Henderson CNR. Predicting stress and test anxiety among 1st-year chiropractic students. *J Chiropr Educ*. 2019;33(2):133–139. doi:10.7899/JCE-18-11
17. Kizhakkeveettil A, Vosko AM, Brash M, PH D, Philips MA. Perceived stress and fatigue among students in a doctor of chiropractic training program. *J Chiropr Educ*. 2017;31(1):8–13. doi:10.7899/JCE-15-27
18. Ndetan HT, Rupert RL, Bae S, Singh KP. Epidemiology of musculoskeletal injuries among students entering a chiropractic college. *J Manipulative Physiol Ther*. 2009;32(2):134–139. doi:10.1016/j.jmpt.2008.12.011
19. Ndetan HT, Rupert RL, Bae S, Singh KP. Prevalence of musculoskeletal injuries sustained by students while attending a chiropractic college. *J Manipulative Physiol Ther*. 2009;32(2):140–148. doi:10.1016/j.jmpt.2008.12.012
20. Innes SI, Leboeuf-Yde C, Walker BF. The relationship between intolerance of uncertainty in chiropractic students and their

treatment intervention choices. *Chiropr Man Ther*. 2017;25:20. doi:10.1186/s12998-017-0150-2
21. Innes SI, Leboeuf-Yde C, Walker BF. How frequent are non-evidence-based health care beliefs in chiropractic students and do they vary across the pre-professional educational years. *Chiropr Man Ther*. 2018;26:8. doi:10.1186/s12998-018-0178-y
22. Innes S, Goncalves G, Leboeuf-Yde C. Who are the chiropractic students favouring a limitless scope of practice? Exploring the relationship with personality, magical thinking, and academic achievement. *Chiropr Man Ther*. 2022;30(1):30. doi:10.1186/s12998-022-00440-6
23. Innes SI, Simpson JK. Empathy levels in Australian chiropractic students. *J Chiropr Educ*. 2022;36(2):110–116. doi:10.7899/JCE-21-16
24. Zhang N, Henderson CNR. Test anxiety and academic performance in chiropractic students. *J Chiropr Educ*. 2014;28(1):2–8. doi:10.7899/JCE-13-20
25. Aldwin CM, Park CL. Coping and physical health outcomes: an overview. *Psychol Health*. 2004;19(3):277–281. doi:10.1080/0887044042000193514
26. Dyrbye LN, Power DV, Massie FS, et al. Factors associated with resilience to and recovery from burnout: a prospective, multi-institutional study of US medical students. *Med Educ*. 2010;44(10):1016–1026. doi:10.1111/j.1365-2923.2010.03754.x
27. Tedeschi RG, Calhoun LG. The posttraumatic growth inventory: measuring the positive legacy of trauma. *J Trauma Stress*. 1996;9(3):455–471. doi:10.1002/jts.2490090305
28. Elm E von, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet*. 2007;370(9596):1453–1457. doi:10.1016/S0140-6736(07)61602-X
29. Bates N, Chin M, Becker T, eds. *Measuring Sex, Gender Identity, and Sexual Orientation*. Washington, DC: National Academies Press; 2022. doi:10.17226/26424
30. Wamsley L. *A Guide to Gender Identity Terms*. NPR. Published June 2, 2021. Accessed August 4, 2023. https://www.npr.org/2021/06/02/996319297/gender-identity-pronouns-expression-guide-lgbtq
31. Lady SD, Burnham KD. Sexual orientation and gender identity in patients: how to navigate terminology in patient care. *J Chiropr Humanit*. 2019;26:53–59. doi:10.1016/j.echu.2019.08.005
32. Dorais S, Gutierrez D. The influence of spiritual transcendence on a centering meditation: a growth curve analysis of resilience. *Religions*. 2021;12(8):573. doi:10.3390/rel12080573
33. Gonzalez TC, Burnett H, Helm H, Edwards L. An examination of resilience, compassion fatigue, burnout, and compassion satisfaction between men and women among trauma responders. *North Am J Psychol*. 2019;21:1–20.
34. Burnett HJ. Revisiting the compassion fatigue, burnout, compassion satisfaction, and resilience connection among CISM responders. *SAGE Open*. 2017;7(3):2158244017730857. doi:10.1177/2158244017730857
35. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983;24(4):385–396. doi:10.2307/2136404
36. Taylor JM. Psychometric analysis of the ten-item perceived stress scale. *Psychol Assess*. 2015;27(1):90–101. doi:10.1037/a0038100
37. Lee EH. Review of the psychometric evidence of the perceived stress scale. *Asian Nurs Res*. 2012;6(4):121–127. doi:10.1016/j.anr.2012.08.004
38. Etxeberria IR, de la Ossa PP, Rank MP. Stress self-perception and burnout in chiropractic students in a lockdown situation due to COVID-19: a cross-sectional and comparative study. *J Chiropr Educ*. 2022;36(2):77–83. doi:10.7899/JCE-21-15
39. World Health Organization Quality of Life (WHOQOL). Accessed August 19, 2022. https://www.who.int/publications-detail-redirect/WHO-HIS-HSI-Rev.2012.03
40. Skevington SM, Lotfy M, O'Connell KA. The World Health Organization's WHOQOL-BREF quality of life assessment: psychometric properties and results of the international field trial. A report from the WHOQOL Group. *Qual Life Res*. 2004;13(2):299–310. doi:10.1023/B:QURE.0000018486.91360.00
41. The WHOQOL Group. The World Health Organization quality of life assessment (WHOQOL): development and general psychometric properties. *Soc Sci Med*. 1998;46(12):1569–1585. doi:10.1016/S0277-9536(98)00009-4
42. Ribeiro ÍJS, Pereira R, Freire IV, de Oliveira BG, Casotti CA, Boery EN. Stress and quality of life among university students: a systematic literature review. *Health Prof Educ*. 2018;4(2):70–77. doi:10.1016/j.hpe.2017.03.002
43. Gan GG, Hue YL. Anxiety, depression and quality of life of medical students in Malaysia. *Med J Malaysia*. 2019;74(1):57–61.
44. Solis AC, Lotufo-Neto F. Predictors of quality of life in Brazilian medical students: a systematic review and meta-analysis. *Braz J Psychiatry*. 2019;41:556–567. doi:10.1590/1516-4446-2018-0116
45. Zhang Y, Qu B, Lun S, Wang D, Guo Y, Liu J. Quality of life of medical students in China: a study using the WHOQOL-BREF. *PLOS ONE*. 2012;7(11):e49714. doi:10.1371/journal.pone.0049714
46. Palmer College of Chiropractic. Student body demographics. Accessed November 21, 2022. https://www.palmer.edu/about-palmer/college-profile/student-body-demographics/
47. O'Brien RM. A caution regarding rules of thumb for variance inflation factors. *Qual Quant*. 2007;41(5):673–690. doi:10.1007/s11135-006-9018-6
48. Amir O, Sagiv M, Eynon N, et al. The response of circulating brain natriuretic peptide to academic stress in college students. *Stress*. 2010;13(1):83-90. doi:10.3109/10253890902818357
49. Johnson CD, Green BN. Diversity in the chiropractic profession: preparing for 2050. *J Chiropr Educ*. 2012;26(1):1–13. doi:10.7899/1042-5055-26.1.1
50. Chiropractic Educators Research Forum. Preparing for the future: diversity in chiropractic education: Chiropractic Educators Research Forum (CERF), December 4, 2021. *J Chiropr Educ*. 2022;36(2):194–198. doi:10.7899/JCE-21-49
51. Forand D, Drover J, Suleman Z, Symons B, Herzog W. The forces applied by female and male chiropractors during thoracic spinal manipulation. *J Manipulative Physiol Ther*. 2004;27(1):49–56. doi:10.1016/j.jmpt.2003.11.006
52. Bisiacchi DW, Huber LL. Physical injury assessment of male versus female chiropractic students when learning and performing various adjustive techniques: a preliminary investigative study. *Chiropr Osteopat*. 2006;14(17):1–6. doi:10.1186/1746-1340-14-17
53. Kizhakkeveettil A, Sikorski D, Tobias G, Korgan C. Prevalence of adverse effects among students taking technique classes: a retrospective study. *J Chiropr Educ*. 2014;28(2):139–145. doi:10.7899/JCE-14-1
54. Lamprecht A, Padayachy K. The epidemiology of work-related musculoskeletal injuries among chiropractors in the eThekwini municipality. *Chiropr Man Ther*. 2019;27(1):18. doi:10.1186/s12998-019-0238-y

55. Landman DM, Sewpersadh A, Peterson C. Depression, anxiety, and stress among chiropractors in South Africa during the early COVID-19 pandemic. *J Chiropr Humanit*. 2022;29:37–43. doi:10.1016/j.echu.2022.08.001
56. Waalen JK, Mior SA. Practice patterns of 692 Ontario chiropractors (2000–2001). *J Can Chiropr Assoc*. 2005;49(1):21–31.
57. Mior SA, Waalen J. Personal and practice predictors associated with the income of Ontario chiropractors. *J Manipulative Physiol Ther*. 2008;31(4):277–284. doi:10.1016/j.jmpt.2008.03.001
58. Yelverton C, Zietsman A, Johl G, Peterson C. Differences in practice characteristics between male and female chiropractors in South Africa: Secondary analysis of data from scope of practice survey 2015. *J Manipulative Physiol Ther*. 2022;45(1):90–96. doi:10.1016/j.jmpt.2022.03.014
59. Himelfarb I, Hyland J, Ouzts N, et al. Practice analysis of chiropractic 2020 - NBCE survey analysis. National Board of Chiropractic Examiners. Published 2020. Accessed March 15, 2023. https://www.nbce.org/practice-analysis-of-chiropractic-2020/
60. Bowlin C. The interaction between relationship satisfaction and perceived stress in graduate psychology students. Published online 2013. Accessed December 1, 2022. https://www.proquest.com/openview/009871cd4857fb99d45462faaadfd673/1?pq-origsite=gscholar&cbl=18750
61. Gleberzon B, Statz R, Pym M. Sexual harassment of female chiropractors by their patients: a pilot survey of faculty at the Canadian Memorial Chiropractic College. *J Can Chiropr Assoc*. 2015;59(2):111–121.
62. Innes S, Maurice L, Lastella M, O'Mullan C. Understanding Australian female chiropractors' experiences of inappropriate patient sexual behaviour: a study using interpretive phenomenological analysis. *Chiropr Man Ther*. 2021;29(1):36. doi:10.1186/s12998-021-00394-1
63. Muehlemann MB, Peterson CK, Humphreys BK. Differences in outcomes of patients treated by male vs female chiropractors. *J Manipulative Physiol Ther*. 2017;40(6):420–426. doi:10.1016/j.jmpt.2017.05.001
64. Wangler M, Peterson C, Zaugg B, Thiel H, Finch R. How do chiropractors manage clinical risk? A questionnaire study. *Chiropr Man Ther*. 2013;21(1):18. doi:10.1186/2045-709X-21-18
65. Adler AB, Williams J, McGurk D, Moss A, Bliese PD. Resilience training with soldiers during basic combat training: randomisation by platoon. *Appl Psychol Health Well-Being*. 2015;7(1):85–107. doi:10.1111/aphw.12040