Further Examination of the Psychometric Properties of the Current Experiences Scale and Model of Resiliency

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Abstract

Background: Stress-related disease is increasing, with high resilience proposed as protective. Whilst the Current Experiences Scale (CES) shows promise as a measure of resilience, its psychological correlates and relationship to psychological stress remain unclear.
Objectives: (1) Further explore the psychometric properties of the CES, (2) identify modifiable psychological factors associated with the CES and (3) test a previously published model for the influence of adaptive strategies and stress management factors on resiliency and stress.
Methods: N = 455 individuals (mean age = 47.8, 65.1% female) completed measures of adaptive strategies: mindfulness (Cognitive and Affective Mindfulness Scale-Revised), positive affect (Positive and Negative Affect Schedule) and gratitude (The Gratitude Questionnaire), stress management skills: coping (Measure of Current Status-A), depression (Patient Health Questionnaire-8) and anxiety (General Anxiety Disorder Assessment) and outcomes: resilience (CES) and stress (Perceived Stress Scale). Cronbach's alpha and confirmatory factor analysis (CFA) examined the psychometric properties of the CES. Multivariable regression identified psychological variables associated with resilience. Structural equation modelling (SEM) tested the previously published model for resilience.
Results: The CES and its subscales showed good internal consistency (α = .75-.93). The 23-item CES produced excellent results for model fit (Root Mean Square Error of Approximation (RMSEA) = .07, Standardized Root Mean Square Residual (SRMR) = .06, Comparative Fit Index (CFI) = .99; Tucker-Lewis Index (TLI) = .99). Higher gratitude (P < .0001), mindfulness (P < .0001), positive affect (P < .0001) and coping (P < .0001) were associated with higher resilience. Depression (P = .23) and anxiety (P = .34) were not. A model of resilience which included gratitude, mindfulness, positive affect and coping as determinants of resilience and perceived stress performed well (RMSEA = .03, SRMR = .02, CFI = .99; TLI = .99).
Conclusions: The CES was validated in a large sample. The association of gratitude, mindfulness, positive affect and coping with resilience may guide practitioners seeking to design resilience-enhancing programs.

Background

Recent years have seen an increase in the number of stressors faced by U.S. adults and heightened levels of perceived stress.[1] This trend has contributed to increasing incidence of stress-related chronic health conditions.[2] Such conditions include type 2 diabetes mellitus,[3] coronary heart disease, stroke, hypertension[4] and obesity,[5] which rank amongst the leading annual causes of morbidity and mortality in the U.S.A.[2]

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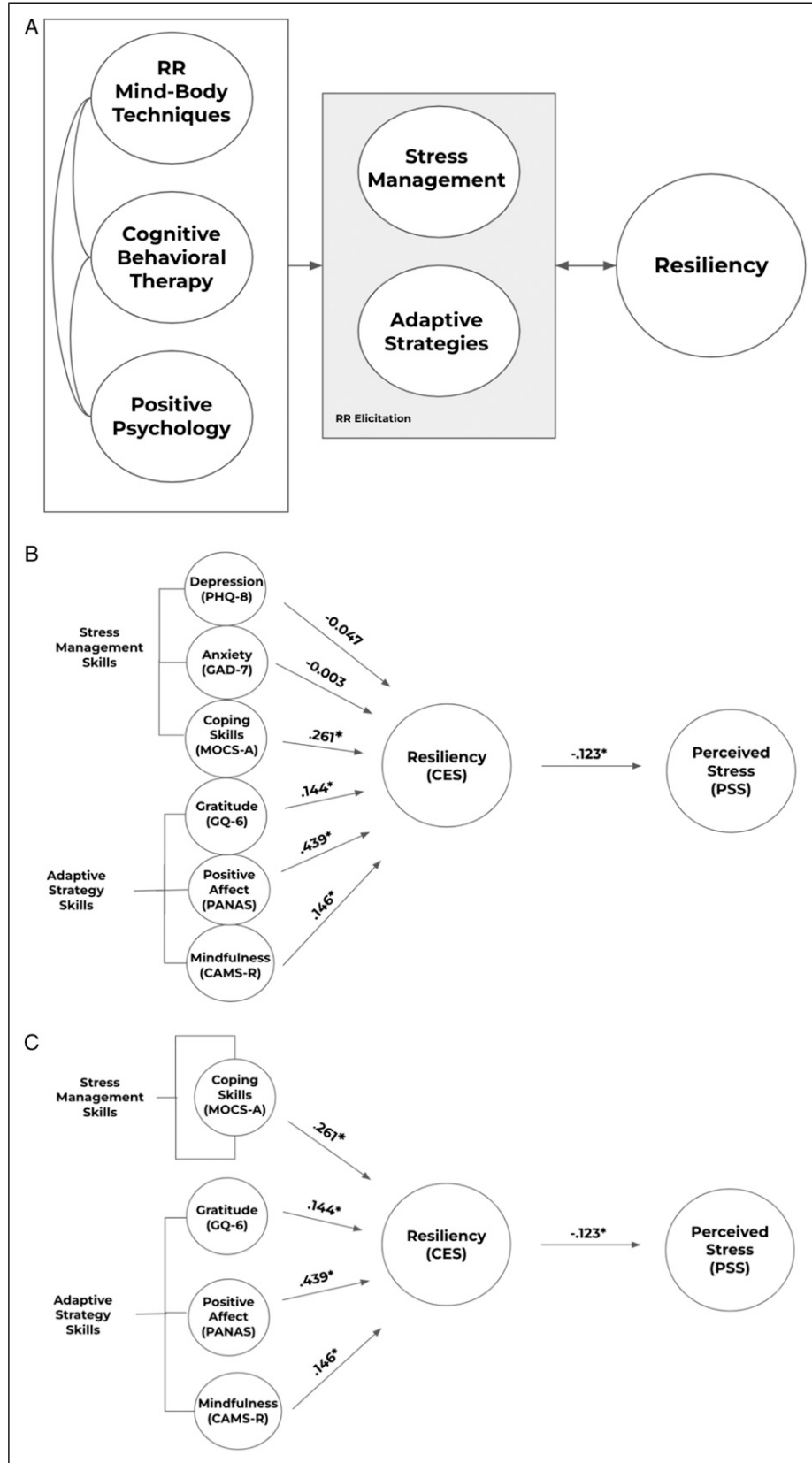Email: jamesgrovesmm@gmail.com; jamesgroves@hsph.harvard.edu

Figure 1. Theoretically-driven models for resiliency.

Our published theoretical model conceptualizes resilience as "the ability to maintain adaptive functioning in response to the ongoing stress of daily living".[6] Resilience may be manifest in the psychological domain, where individuals maintain functioning despite the presence of psychosocial stressors, or in the physical domain, where individuals resist decline in physical function despite the presence of stressors such as biological disease processes.[7] In the resilience literature broadly, higher levels of resilience have been associated with decreased levels of perceived stress in relation to daily stressors and may have a protective association with cardiovascular diseases and metabolic disturbances.[8] The implementation of interventions which enhance resilience may be beneficial in reducing stress levels and reducing morbidity and mortality.

However, there has been a lack of consensus on the operationalization of resilience to guide an evidence-based measure of resiliency.[9] There also remains a demand for greater knowledge of the modifiable determinants of resilience. Limited understanding in these areas may be a barrier to optimal implementation of interventions which can measurably enhance resilience, decrease perceived stress and reduce the incidence of stress-related conditions and symptoms. Enhancing understanding in these areas may also lead to the development of more systematic resilience intervention programs, as was called for by a review of resilience programs.[10]

In 2021, seeking to address this gap, our team published a comprehensive resiliency framework.[11] It is this theoretically-driven framework on which the Current Experiences Scale (CES) is based (Figure 1A). Our framework is informed by Lazarus and Folkman's coping model[12] and the diathesis stress model[13] to propose that developing an adaptive, resilient response to chronic stress - whereby vulnerability to the deleterious effects of stress on health is reduced - can be brought about by beneficially modifying certain key psychological factors. These key psychological factors are categorized within our framework as either stress management factors, which are targeted by psychological techniques such as cognitive-behavioural therapy, or adaptive strategy factors, which are targeted by psychological techniques such as positive psychology and awareness-training practices (e.g., mindfulness meditation). Within our framework, eliciting the 'relaxation response' through these psychological techniques is a means to beneficially modifying the key stress management and adaptive strategy physiological factors.

This framework informed the development of a resilience measure named the Current Experiences Scale (CES), a measure of the ability to cope with the ongoing stressors of daily life, adapted from the well-validated Posttraumatic Growth Inventory.[14] In our initial validation study, we tested a 25-item, 6-factor model of the CES using confirmatory factor analysis and found that a 23-item, 6-factor solution with correlated subscales was a good fit to the data.[11] The subscales included specific resilience domains of appreciation for life, the ability to hold adaptive perspectives, personal strengths, spiritual connectedness, the ability to relate to others, and positive health behaviors. In addition, the CES was shown to have good convergent validity, internal consistency reliability, and sensitivity to change (i.e., scores increased following participation in a Resiliency Treatment Program: The Stress Management and Resiliency Training - Relaxation Response Resiliency Program, SMART-3RP[6]).

There are several next steps of this work needed to advance the measurement and conceptualization of resiliency in this framework.

The first aim of the current study is to provide further validation of the psychometric properties of the CES, including testing the factor structure and internal consistency reliability in a larger, independent sample, as well as providing the exploration of descriptive statistics of the CES total score and subscale scores to offer measurement norms for the CES. We hypothesise that the study will demonstrate good psychometric performance of the 6-factor, 23-item CES, along with good internal consistency of the measure and its subscales. We expect mean CES total and subscale scores to resemble those previously published. The second aim is to explore the modifiable psychological correlates of resilience as reflected in the CES and our theoretical framework (i.e., adaptive strategies: mindfulness, gratitude, positive affect and stress management factors: coping skills, depression and anxiety symptoms[11]) (Figure 1A). We hypothesise that higher CES score will be significantly associated with higher levels of mindfulness, gratitude, positive affect and coping skills and lower levels of depression and anxiety when sociodemographic factors such as age, gender and race/ethnicity are controlled. The third aim is to test our previously published theoretical framework (Figure 1A) for the determinants of resiliency and psychological stress using Structural Equation Modelling (SEM). We hypothesise that a model based on our theoretical framework which proposes a pathway of association from the stress management and adaptive strategy psychological factors to resiliency and then to stress, will show good fit for our collected data.

Methods

Participants

Participants were N = 455 adults who presented to a mind-body medicine clinic at a large academic health center in the northeastern United States and completed survey questionnaires as part of the clinic's clinical research procedures. Participants were, on average, 47.8 years of age (SD = 28.8) and predominantly female (65.1%), white (85%), college educated (87%), and married (58.4%). Participants indicated informed consent before completing the survey. Ethical approval was received from the Mass General Brigham Institutional Review Board (IRB).

Measures

Resilience. The Current Experiences Scale is a 23-item measure that reflects current functioning in the domains of appreciation for life (AL), adaptive perspectives (AP), personal strength (PS), spiritual connectedness (SC), relating to others (RO) and health behaviours (HB).[11] The CES total score can range from 0-115 (unweighted sum of these subscales), with higher scores indicating greater resiliency.

Adaptive Strategy Factors. Trait mindfulness (i.e., the ability to be mindful in daily life) was measured with the 12-item Cognitive and Affective Mindfulness Scale-Revised (CAMS-R)., where higher scores represent greater mindfulness.[15] Positive affect was measured with the Positive and Negative Affect Schedule (PANAS), a 10-item scale where higher scores indicate greater positive affect.[16] Gratitude was measured with The Gratitude Questionnaire (GQ-6), which is a 6-item scale where higher scores indicate greater gratitude.[17]

Stress Management Factors. Use of coping and stress management techniques was measured with the Measure of Current Experience Status-Part A (MOCS-A). Higher scores reflect higher perceived ability to employ adaptive coping techniques within a 13-item instrument.[18] Depression was measured using the Patient Health Questionnaire-8, which measures symptoms within the last 2 weeks with scores ranging from 0-24, with higher scores indicating a greater depression and functional impairment.[19] Anxiety was measured using the General Anxiety Disorder-7 questionnaire, which assesses symptoms within the last 2 weeks. Scores range from 0-21, with higher scores indicating more anxiety symptoms.[20]

Analysis

For Aim 1, means and standard deviations for CES total score across demographic groups were calculated. For the six CES subscales, mean and standard deviations were calculated. For CES total score, internal consistency was evaluated using Cronbach's alpha and Macdonald's Omega coefficient, including the hierarchical subscale.[21] For each of the CES subscales internal consistency was evaluated using Cronbach's alpha. Confirmatory factor analysis was performed using RStudio[22] with categorical indicators and weighted least squares estimation to assess whether the CES 23-item, 6-factor model was appropriate. Model fit was examined using a set of model fit indices according to established cut offs: comparative fit index (CFI) >.95, Tucker-Lewis Index (TLI) >.95, root mean square error of approximation (RMSEA) <.08 and standardized root mean squared residual (SRMR) <.08.[23] Individual item factor loadings were evaluated to ensure substantive loadings with an acceptance level set as >.40.[24] For Aim 2, multivariable regression was performed with Stata 17 software[25] to determine which adaptive strategy or stress management factors were correlated with resilience as measured by CES, where CES was the outcome variable and measures of adaptive strategy and stress management factors were explanatory variables, adjusted for age, gender and race/ethnicity. In Aim 3, structural equation modelling (SEM) was performed to test the fit of the theoretical resiliency framework with our data[11] (Figure 1A). In performing this analysis, we were specifically seeking to test whether a three-step associative pathway existed within the data to suggest that the numerous adaptative strategy and stress management psychological factors were associated with resilience, which was in turn associated with stress. This associative pathway was taken from the theoretical framework on which the CES is based, captured in Figure 1A. SEM was chosen to perform this analysis since it allows such multi-step associative pathways to be quantitatively tested using indices of model fit. Our resiliency framework was operationalized in Figure 1B, with measures for 'adaptive strategies' and 'stress management' converging to determine resilience score and consequently stress. To provide a more rigorous assessment, we incorporated the results of Aim 2 and also tested an alternative model (Figure 1C), which included only the measures of adaptive strategies and stress management factors shown through multivariable regression to be associated with CES scores: CAMS-R, GQ-6, PANAS, MOCS-A (i.e., omitting PHQ-8 and GAD-7). Model fit indices and acceptance levels for the SEM were again CFI >.95, TLI >.95, RMSEA <.08 and SRMR <.08.

Results

Descriptive Statistics for CES Total Score

Total CES Scores are described in Table 1, with possible scores ranging from 0-115 and higher scores indicating greater resiliency. Mean CES across all participants was 72.5 (SD 17.10, range = 25-113).

Descriptive Statistics for CES Subscales

Means and standard deviations for each of the CES's six subscales are presented in Table 2. Mean score for the appreciating life subscale was 10.43 (SD 2.78, range = 1-15), for the alternative perspectives subscale was 15.60 (SD 4.57, range = 3-25), for the personal strength subscale was 14.56 (SD 4.38, range = 1-24), for the spiritual connectedness subscale was 4.49 (SD 2.88, range = 0-10), for the relating to others subscale was 20.72 (SD 5.19, range = 4-30) and for the health behaviors subscale was 6.69 (SD 2.18, range = 0-10).

Confirmatory Factor Analysis of the CES

Internal consistency reliability was good for CES total score (α = .93, ω = .97, ω_h = .87) and Cronbach's alpha exceeded .70 for all subscales: appreciating life (α = .75), alternative perspectives (α = .81), personal strength (α = .81), spiritual connectedness (α = .76), relating to others (α = .82) and health behaviors (α = .85) (Table 3). For model fit, the 23-item scale passed acceptance levels for model fit index cut-offs with RMSEA = .07,

Table 1. Descriptive Statistics Current Experiences Scale Total Scores.

Demographic Category	Total (N = 455) n(%)	CES Total Score Mean	CES Total Score SD
All groups	455	72.50	17.10
Gender			
Male	159 (34.9)	68.56	16.68
Female	296 (65.1)	74.60	17.03
Race/Ethnicity			
White non-hispanic	392 (85.0)	72.35	16.90
Non - white/Other	68 (15.0)	74.11	19.42
Relationship status			
Married	266 (58.4)	73.33	16.99
Non - married	189 (41.6)	71.33	17.25
Highest educational attainment			
College graduate	396 (87.0)	72.42	18.86
Less than college graduate	63 (13.0)	73.05	18.48

SD, Standard Deviation.

Table 2. Descriptive Statistics Current Experiences Scale Subscales.

Subscale	Mean score	SD
Appreciating life	10.43	2.78
Alternative perspectives	15.60	4.57
Personal strength	14.56	4.38
Spiritual connectedness	4.49	2.88
Relating to others	20.72	5.19
Health behaviors	6.69	2.18

SD, Standard Deviation.

SRMR = .06, CFI = .99 and TLI = .99. Factor loadings for each item of the CES are shown in Table 3. All factor loadings exceeded the acceptability level of .40.

Multivariable Linear Regression Analyses of Psychological Correlates of Resilience

Results of the multivariable regression model for resilience are shown in Table 4. Significantly associated with resilience were all measures for adaptive strategies: CAMS-R (P < .001), GQ-6 (P < .001) and PANAS (P < .001), and MOCS-A (P < .001) from the stress management group. However, PHQ-8 (P = .23) and GAD-7 (P = .34) were not significantly associated with resilience. Women were shown to have significantly higher scores than men (P < .001), and higher age also was associated with greater resilience (P = .028). The variables included in the model explained 71% of the variance of CES total score.

Structural Equation Modelling to Test the Resiliency Theoretical Framework

Results found that the model indicated in Figure 1B was a poor fit to the data, (RMSEA = .28, SRMR = .07, CFI = .84; TLI = .56). On the other hand, the model indicated in Figure 1C, which excluded depression and anxiety as determinant of resiliency and stress, showed excellent fit, passing acceptance levels for all model fit indices (RMSEA = .03, SRMR = .02, CFI = .99; TLI = .99), with a coefficient of determination of .68.

Discussion

Summary of Main Findings

This study has demonstrated that in a large cross-sectional sample, higher gratitude, mindfulness, positive emotional states and coping skills were associated with higher levels of resilience as measured by the CES, when controlling for the effects of sociodemographic variables. Furthermore, a model of resilience which incorporated these four as determinants of resilience and stress performed well. This result suggested the existence of a three-step associative pathway between such psychological factors and levels of resilience and stress in our data in a manner which is consistent with the theoretical framework on which the CES is based. Such a finding could have important implications for how practitioners choose to design resiliency treatment programs to reduce stress-related illness, suggesting the listed psychological factors as therapeutic targets for resiliency training.

Levels of depression and anxiety were not associated with resilience, and models which incorporated these as psychometric determinants of resilience performed relatively poorly. This result suggests that levels of depression or anxiety should not be seen as a 'proxy' for resilience as measured by the CES, and that severe levels of depression or anxiety do not necessarily suggest a lack of resilience an inability to develop it.

As well as providing these novel insights, the current study adds to previous work[11] to establish greater confidence in the CES as a psychometrically valid measure of resilience. This is an important outcome given the youth of this score as a

Table 3. Item Factor Loadings and Internal Consistency for the 23-Item Current Experiences Scale.

Total Score α = .93, ω = .97	AL α = 0.75	AP α = 0.81	PS α = 0.81	SC α = 0.76	RO α = 0.82	HB α = 0.85
1. I know my priorities about what is important in life	.68					
2. I try change things that need changing		.60				
3. I appreciate the value of my own life	.77					
4. I feel self reliant			.62			
5. I have an understanding of spiritual matters				.93		
6. I take care of my health						.89
7. I have a sense of closeness with others					.81	
8. I know that I can handle difficulties			.78			
9. I am willing to express my emotions					.56	
10. I am able to accept the way things work out			.71			
11. I appreciate each day	.83					
12. I engage in good health behaviors						.91
13. I have compassion for others					.66	
14. I'm able to do good things with my life		.88				
15. I watch for new opportunities		.78				
16. I put effort into my relationships					.77	
17. I have a strong religious faith				.74		
18. I am aware of how strong I am			.78			
19. I know now wonderful people are					.83	
20. I am developing new interests		.71				
21. I am needing new interests					.63	
22. I am good at managing stress			.64			
23. I am establishing a new path in my life		.59				

Note. AL = Appreciation for Life, AP = Alternative Perspectives, PS = Personal Strength, SC = Spiritual Connectedness, RO = Related to Others, HB = Health Behaviors.

Table 4. Multivariable Regression Model for Associations with Current Experiences Scale.

Outcome	Explanatory variable	Unstandardized B-Weight [95% CI]	SE	Standardized B-Weight	P-Value
CES	CAMS-R	.57 (.32-.82)	.13	.146	<.001*
	PANAS	1.03 (.85-1.20)	.09	.439	<.001*
	GQ-6	.72 (.45-1.00)	.13	.144	<.001*
	PHQ-8	−.16 (-.42-.70)	.13	−.047	.23
	GAQ-7	−.10 (-.31-.11)	.10	−.033	.34
	MOCS-A	.56 (.42-.70)	.07	.261	.001*
	Age	.03 (.00-.07)	.02	.058	<.028*
	Female	5.11 (3.33-6.89)	.91	.146	<.001*
	White non-hispanic	−.63 (-3.77-2.52)	1.60	−.010	.689

Coefficient of Determination (R^2) = 0.71, SE = Standard Error.

resiliency measure. It provides further validation of the psychometric properties of the CES in an independent sample, as well as explore new questions of measurement norms, modifiable correlates of resilience, and validity of our theoretical model. Results provided typical values for the CES and its subscales, which can serve to inform future studies of resilience. We replicated the finding of good internal consistency reliability and observed acceptable item factor loadings. The model fit within the CES's 23-item, 6-factor structure was shown to be well preserved.

The Current Experiences Scale: Descriptive Statistics

The mean and the standard deviation of the CES were presented to establish norms in a large sample of individuals, independent of the participants in the initial validation study. A slightly lower absolute mean CES of 72.50 was observed as compared to the previous study (vs. 75.83), whilst standard deviation was similar - (17.10 vs. 15.29 previously).[11] Means of the six CES subscales resembled previously published values.[11] These results will aid future studies which choose to use the CES to measure

resilience, where results from smaller groups can be compared to the mean of this large group of individuals which may be taken to represent 'typical' values or norms.

Resilience scores were significantly higher for women than men. This finding differs from previous evaluations of resilience: for example, past use of an alternative resilience measure, the Connor-Davidson Resilience Scale, has revealed similar scores for men and women in some settings[26] whilst higher scores for men than women have been reported in others.[27] Given that in the current study participants were presenting to a mind-body medicine clinic for possible participation in a resiliency treatment program, it is plausible that the present finding may have been manufactured by a selection bias, where enrolling males have a disproportionately low resilience relative to the general population as compared to the females enrolled, which may be a function of the increased psychosocial barriers with seeking psychological help which have previously been reported for males as compared to females.[28] Such a premise highlights the need to develop future strategies to reduce such barriers to resiliency program training for men, particularly in the context that men are at greater risk for cardiovascular diseases[29] amongst the leading causes of stress-related morbidity and mortality in the U.S.A,[2] given that this risk may be reduced at higher levels of resilience.[9]

Older age was associated with a significantly higher resilience. However, this manifested in a small effect, where each additional year of age correlated with an increase in CES total score of .03. Previous studies utilising the Connor-Davidson Resilience Scale have found a similar weakly positive correlation between age and resilience,[30] whilst others have seen no significant difference in resilience across various ages.[31] Future studies will be required to understand whether this is a replicable finding for the CES.

The Current Experiences Scale: Psychometric Properties

Internal consistency for CES total score and its six subscales exceeded an acceptability level for Cronbach's alpha of .7[32] and resembled previously published values.[11] Factor loading for the CES' 23 items revealed encouraging results, which were also similar to the values observed in our previous study.[11] Measures for model fit of the CES' 23-item, 6-factor replicated previous results,[11] and surpassed acceptance levels for all indices.

The findings converge to indicate good psychometric performance of the 6-factor, 23-item CES as a measure of resilience in a large independent sample of individuals and demonstrate validity in the key psychometric properties of the CES. Whilst this analysis is somewhat replicative, the reporting of these results is important given the relative youth of this scale as a resilience measure. Furthermore, the previous study's sample was smaller and selected participants from four homogenous and well-defined clinical cohorts,[11] whilst the current study's sample is more heterogeneous and

reflective of the general population. As a consequence of the current work, future studies may use the CES with increased confidence of its status as a validated measure of resilience.

Psychological Variables Associated with Resilience: Adaptive Strategies and Stress Management

Associated with higher resilience were higher scores for gratitude, positive emotions, mindfulness and coping skills.

Gratitude has been linked with resilience and resilience-promoting characteristics such as optimism, curiosity, purpose in life, perceived social support, and religiosity/spirituality,[33] whilst recent studies on adjustment to COVID-19 stressors found that higher gratitude scores predicted adaptive responses[34] and were a differentiator between those who were able to respond in a "resilient" manner from those who were not.[35] Positive affect was strongly associated with resilience in physicians,[36] and previous evidence has suggested that levels may determine the likelihood of a lack of resilience in resulting in burnout.[37] Theoretical links have been made between mindfulness and resilience,[38] and dispositional mindfulness scores have been shown to be associated with higher resilience in healthcare professionals.[39,40] Strong coping skills have been associated with resilience in patients.[41]

The current study mirrors these findings. It suggests that patients who have lowest scores in these measures may be at greatest risk for low resilience, with consequences such as burnout,[42] psychosomatic symptoms[43] and stress-related conditions.[3-5] Measures of gratitude, positive emotions, mindfulness and coping skills may therefore have utility as screening tools to identify those who would most benefit from resiliency enhancement to prevent these costly consequences.

Creation of resiliency interventions for patients is increasingly common, with varying degrees of effectiveness.[10] Our results suggest that treatment programs which can successfully improve the adaptive strategy and stress management variables listed above may be useful for increasing resilience and decreasing perceived stress - effects which, if sustained, would theoretically reduce the incidence of stress-related conditions and associated morbidity and mortality.[3-5] This study suggests that these factors may be considered psychological therapeutic targets for the resiliency treatment programs. Interventions designed to improve mindfulness are well-described,[44] whilst positive psychology approaches have a track-record of enhancing gratitude and positive emotional states,[45] and the same can be said of cognitive-behavioural therapy for coping skills.[46] Practitioners seeking to design and implement resilience programs may consider employing a synergistic combination of these psychological approaches in their curriculum, as is done in the SMART-3RP,[6] in order to improve multiple skills simultaneously and give participants a broad skill set from which to manage life's daily stressors. They may also consider tracking scores in mindfulness, gratitude, coping and positive affect across time as process components of the evaluation of the resiliency program's effectiveness.

Relationship Between Depression/Anxiety and Resilience

Whilst we have replicated the finding of a negative bivariate correlation between depression or anxiety and resilience within this dataset (Supplementary Table 1), depression and anxiety scores were not significantly associated with resilience in multivariable models when controlling for socio-demographic factors, and the structural equation model which incorporated depression and anxiety as determinants of resilience performed poorly.

It has been noted in previous studies that a relationship between depression, anxiety and resiliency may exist.[47] However, the results of our analyses may suggest a confounding role for socio-demographic factors or the other psychological measures included within the multivariable model in accounting for the negative correlation between depression or anxiety and resiliency in this sample. Our interpretation of this data is that the current study provides evidence against viewing depression and anxiety levels as determinants of resilience or as a 'proxy' variable for resiliency.

We consider the current findings compatible with the diathesis stress model, which recognises that depressive or anxiety symptoms may occur across a range of scenarios, depending not only on an individual's resilience or vulnerability to stress but also their environmental circumstances and stressors.[13] Such a premise fits well with the definition of resilience as "the ability to maintain adaptive functioning in response to the ongoing stress of daily living".[6] Rather than describing current stressors or symptoms, resiliency aims to characterize an individual's capacity to respond and function adaptively within stressful circumstances. The implication from our results is that patients who suffer from anxiety or depression should not be necessarily judged to be incapable of being able to attain a high level of resilience. Similarly, those with a diagnosis of depression or anxiety should not be assumed to suffer from a low level of resilience by practitioners. Instead, a separate measure such as the CES will be required to accurately assess resiliency and identify those who might benefit most from enrolment within a resiliency treatment program.

Limitations

The generalizability of this study's findings to the US population as a whole is somewhat limited by a patient population which lacked diversity. 85% of this sample were white non-Hispanic individuals, whilst in the US population, this percentage sits lower at 60%.[48] Similarly, 87% of individuals within the sample had obtained a college degree, however, such individuals make up only 32.9% of the US general population.[48] These disparities are of relevance because differences have been observed across different ethnic and socio-demographic groups in terms of exposure to stressors,[49] levels of resilience[50] and the determinants of resilience.[51] Thus, whilst our resilience model may have face validity for the US population as a whole, this must be

quantitatively evaluated in a more diverse group of individuals. The under-representation of those of lower socio-economic status and underserved racial and ethnic groups is common within mind-body research and practice,[52] and efforts are needed to make mind-body research and clinical services more accessible to these groups.

The study's analysis was in a cross-sectional sample of individuals, and therefore findings from these analyses are inherently limited in their ability to demonstrate causality or any sense of temporality to associations between adaptive strategies and stress management factors and resilience. However, our results identify useful psychological targets to inform future longitudinal investigation into the determinants of resilience.

Future Directions

This study's description of typical CES scores and the demonstration of the validity of its psychometric properties in a large number of individuals may aid future studies which aim to use this measure to quantify and characterize resilience. The highlighting of gratitude, mindfulness, positive emotional states and coping skills as psychological correlates of resilience builds on previous research and may facilitate use of associated psychometric tools to screen for patients at risk for low resilience to prevent the development of stress-related conditions. Our work may also help to guide researchers and practitioners seeking to design resiliency-enhancing programs in suggesting these factors as psychological therapeutic targets. For already developed resiliency interventions, these results may suggest the utility of measuring these variables as possible mechanistic processes of treatment.

Future research should assess typical statistics for CES scores and their determinants in a more diverse population and retest our finding that greater symptoms of depression and anxiety do not predict lower CES scores when socio-demographic variables are controlled.

Conclusions

The rising incidence of stress-related conditions in the US highlights the need to enhance resilience.[2] Such a process will firstly require an understanding of the modifiable determinants of resilience and secondly, an understanding how these factors can be beneficially modified to produce a more resilient patient population. This study offers further validation of the CES as a reliable measure of resilience, and suggests four factors - gratitude, mindfulness, positive emotional states and coping skills - as modifiable correlates of resilience. We also demonstrate that symptoms of depression and anxiety should not necessarily be seen as indicators of low resilience or barriers to its development. Resiliency treatment programs which implement approaches based on relaxation response eliciting mindfulness meditation, cognitive-behavioural therapy and positive psychology to improve the adaptive

strategies and stress management factors listed above may have a crucial role to play in reducing stress and stemming the tide of increasing stress-related disease in the U.S.A.[1]

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Supplemental Material

Supplemental material for this article is available online.

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