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Measuring Stress and Coping in Later Adulthood: Examining the Psychometric Properties of the Revised Stress Assessment Inventory for Older Adults

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Article

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Abstract

Background: Cognitive and behavioral factors contribute to the mitigation of stress-related health outcomes in later life. Given that stress management interventions for older adults are an important target for healthcare, there is a need for a relatively short and standardized assessment tool to comprehensively measure stress and coping in later adulthood while minimizing the burden on participants. The Stress Assessment Inventory (SAI), a 123-item measure designed to assess stress and coping resources in younger adults.
Objective: The objective of this study was to examine the psychometric properties of the SAI in 294 older adults.
Methods: The SAI was evaluated on its dimensionality, reliability, and validity.
Findings: A shortened SAI is proposed for older adults, with good internal consistency and criterion validity. The Revised SAI was found to have a three-factor model that captures Adaptive Cognitive Resources, Maladaptive Behavioral and Cognitive Habits, and Adaptive Health Habits.
Discussion: The current study supports the use of the Revised SAI in community-dwelling older adult populations as a comprehensive tool to assess stress and coping for use by researchers and healthcare professionals.

Résumé

Les facteurs cognitifs et comportementaux contribuent à atténuer les problèmes de santé liés au stress chez les personnes âgées. Les interventions de gestion du stress qui leur sont destinées étant un aspect important des objectifs de soins de santé, un outil d'évaluation relativement court et standardisé est nécessaire pour mesurer de manière globale le stress et les mécanismes de gestion du stress à un âge avancé, et en réduire au minimum le fardeau. L'inventaire d'évaluation du stress (*Stress Assessment Inventory – SAI*), un questionnaire en 123 points conçu pour évaluer le stress et les ressources de gestion du stress chez les jeunes adules, a été utilisé auprès de 294 personnes âgées. Une version plus courte du questionnaire présentant une bonne cohérence interne et des critères valides est proposée aux personnes âgées. Le SAI révisé constitue un modèle d'évaluation à 3 facteurs: ressources cognitives adaptatives, habitudes cognitives et comportementales inadaptées et habitudes de santé adaptatives. L'étude actuelle appuie l'utilisation du SAI révisé auprès de populations de personnes âgées vivant dans la communauté comme outil d'évaluation globale du stress et des mécanismes de gestion du stress pour les chercheurs et les professionnels de la santé.

Introduction

With a rise in the aging population (World Health Organization, 2022), researchers, health providers, and policy makers need to focus on how to support the physical and psychological well-being of older adults. There is a robust body of literature suggesting that chronic stress exposure over the life course accelerates the aging process and increases the risk for poor health outcomes in later adulthood, such as cardiovascular disease (Lakatta & Levy, 2003), cognitive impairment, and neurodegenerative disease (Hou et al., 2019). The association between chronic stress and increased health risks in later adulthood may result from the wear and tear of interconnected biological systems that stem from the activation of stress-sensitive systems over the lifespan (Lazarus & Folkman, 1984). However, it is important to acknowledge that stress is a

multidimensional construct, including inputs (i.e., the stressors), processes (i.e., individual difference factors), and outputs (i.e., physiological, physical, emotional, and cognitive responses). The Transactional Model of Stress (TMS), developed by Richard Lazarus, posits that stress is a process involving an interaction between an individual and their environment, emphasizing the subjective nature of stress. In this model, stress results from the individual's appraisal of a situation (i.e., processes), rather than the situation itself (i.e., inputs). Lazarus identified two key processes in this appraisal: (1) primary appraisal, where the individual assesses whether an event is a threat, harm, challenge, or benign positive; and (2) secondary appraisal, where the individual evaluates their ability to cope with the stressor (Lazarus & Folkman, 1984). The model highlights that stress arises from the person's perception of their ability to manage demands placed upon them, thus suggesting that stress responses can vary widely depending on individual perceptions and resources. Lazarus's work revolutionized how we understand stress, focusing on cognitive and behavioral processes rather than solely on external stressors or physiological reactions. Accordingly, whether stress is experienced is largely dependent on available mitigating resources.

The extant literature has identified factors that contribute to the mitigation of perceived stress and stress-related health outcomes in later life, including physical activity (Rueggeberg et al., 2012), sufficient sleep (Heffner et al., 2012), adaptive coping strategies (Nowlan et al., 2015), and traits of resilience, including cognitive hardiness (Sharpley & Yardley, 1999). Aligned with the TMS, these behavioral and cognitive factors are critical targets in psychosocial interventions to help mitigate the negative impact that perceived stress may have on the individual (Beckie, 2012; Hazlett-Stevens et al., 2019).

Despite a shift in the distribution of the global population toward older ages, the tools available to assess stress and stress-mitigating factors in later adulthood are lacking (Agarwal et al., 2019). Not only is this problematic given the growing distribution of older adults, but older adults are also particularly sensitive to the effects of stress due to normal age-related changes in interconnected biological systems (Sapolsky, 1999) and are at increased risk of health complications (Kivimäki et al., 2023). One inventory that may be of value is the SAI (Nowack, 1990), which offers a comprehensive self-report measure of stress and stress-mitigating resources.

The SAI was originally developed as a comprehensive measure of stress in employees within organizational health promotion programs (Nowack, 1990). Although initially assessed in an occupational cohort, the scaled questions are not specific to work or occupational stress and coping and may be generalized to factors outside of the occupational domain. The SAI is aligned with the TMS such that it measures perceptions of stressors and factors that mitigate the effects of perceived stress (Nowack, 1990). More specifically, the SAI measures cognitive (e.g., appraisal and resilience), behavioral (e.g., diet and exercise), and environmental (e.g., social support) factors that may mitigate or contribute to the experience of stress and subsequent health ailments. The SAI was made commercially available by Western Psychological Services as the 'Stress Profile' (Nowack, 1999) and as the 'StressScan' (Nowack, 2008). The instrument was validated 30 years ago and continues to be used to assess organizational stress and stress-related outcomes in younger to middle-aged adults. Its widespread use has served to assess the relationship between stress and stress management for professional well-being, psychological predictors of health, and factors that help individuals cope with stressors (e.g., Fusilier & Manning, 2005; Pozos-Radillo et al., 2021; Pozos-Radillo et al., 2024; Fowler, 2006).

As a comprehensive measure of stress, the SAI can be a useful tool for older adults who are relatively vulnerable to the deleterious effects of stress on health and well-being. However, validation of the SAI in older adults is warranted. Furthermore, the SAI is four times longer than the recommended length of questionnaires, which contributes to respondent burden and fatigue and lower response rates (Sharma, 2022). Given the paucity of tools that comprehensively measure stress in older adults and the potential utility of the SAI, despite its methodological shortcomings, the objective of the current study was to assess the validity of the SAI in community-dwelling older adults.

Materials and methods

Participants

Participants included 294 physically and cognitively healthy older men and women aged 60–95 years living in the Greater Toronto Area, Canada. Please see Table 1 for further details on the sample. Based on sample size criteria for conducting a factor analysis, the sample size for the present analysis is considered 'fair' to 'good' (Comrey & Lee, 1992).

Measures

Data were collected from two studies that examined cognitive functioning and well-being in older adults living independently in the community: 201 participants from Study 1 (see D'Amico et al., 2021) and 93 participants from Study 2 (see Fiocco & Mallya, 2015). Both samples were recruited through community flyers and the Toronto Metropolitan University Senior Participant Pool. All participants completed the SAI, the Perceived Stress Scale (PSS), and the Quality of Life Scale (QOLS). The PSS and QOLS were selected in the current study to assess the validity of the SAI in older adults due to their measurement of similar constructs and well-established use for psychological research in older adults (Burckhardt et al., 1989; Cohen et al., 1983). The Psychological Well-being Scale of the SAI was also used to assess validity, as it was originally designed for validity testing. Both studies were approved by the Research Ethics Board at Toronto Metropolitan University (REB#2014–164, REB#2012–192).

The stress assessment inventory

The SAI measures cognitive and behavioral moderators of the stress–illness relationship, specifically physical and mental challenges that may arise from and perpetuate chronic activation of the stress response (Nowack, 1990). It comprised 123 items; 5 of those items are a 'reliability check' to assess response bias, and the remainder of the items are organized into seven scales.

The 6-item Stress Scale measures the occurrence of hassles from six distinct sources (health, work, personal finances, family, social obligations, and environmental concerns) over the last 3 months. Responses are given on a 5-point Likert scale from 1 = *Never* to 5 = *Always*, with higher scores indicating greater stress.

The 25-item Global Health Habits Practices Scale measures engagement in healthy lifestyle habits over the last 3 months. It has four subscales: Exercise, Sleep/Relaxation, Preventative Health Practices, and Nutrition/Eating. Each item is rated on a 5-point Likert scale from 1 = *Never* to 5 = *Always*, with higher scores indicating greater engagement in protective health practices.

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Table 1. Participant characteristics

	Study 1 (*N* = 201)		Study 2 (*N* = 93)		Total (*N* = 294)	
Study variable	*M* or %	SD or *n*	*M* or %	SD or *n*	*M* or %	SD or *n*
Demographics						
Age	68.65	6.95	68.93	4.65	68.73	6.32
Sex (% female)	63%	127	74%	69	67%	196
Years of education	16.61	3.26	16.19	3.39	16.48	3.30
Retired (% retired)	61%	122				
Ethnicity (% White)	88%	177	89%	83	88%	260
Body mass index (BMI)	26.68	4.84	25.37	4.01	26.31	4.65
High blood pressure	18%	38	30%	28	22%	66
Stress assessment inventory						
SAI Stress Scale	13.86	3.82	15.15	3.57	14.27	3.79
SAI Global Health Scale						
SAI Exercise Subscale	11.38	8.52	11.09	3.07	11.29	3.05
SAI Sleep Subscale	18.08	3.04	17.90	3.02	18.03	3.00
SAI Eating Subscale	19.20	3.18	19.68	3.44	19.35	3.27
SAI Prevention Subscale	45.83	4.14	45.64	3.73	45.77	4.01
SAI Social Support Scale	66.39	12.67	57.53	13.13	63.57	13.44
SAI Type A Behavior Scale	26.73	5.71	25.70	5.53	26.40	5.66
SAI Cognitive Hardiness Scale	108.12	13.55	107.26	9.91	107.85	13.26
SAI Coping Scale						
SAI Positive Reappraisal Subscale	17.67	3.20	17.32	2.93	17.56	3.12
SAI Negative Reappraisal Subscale	11.71	3.50	12.31	3.37	11.90	3.46
SAI Threat Minimization Subscale	16.45	3.24	16.01	2.92	16.31	3.15
SAI Problem-focused Coping Subscale	13.99	2.60	14.84	3.01	14.26	2.76
SAI Psychological Well-being Scale	45.53	8.56	44.78	8.76	45.29	8.61
Criterion validity-dependent variables						
Quality of Life Scale	88.07	12.73	86.66	12.48	87.61	12.64
Perceived Stress Scale	12.05	6.46	13.85	6.80	12.62	6.61

Notes: Stress Assessment Inventory (SAI) means and standard deviations are based on the original responses, before item reduction. Retirement data were not collected for Study 2.

The 15-item Social Support Network Scale comprises three items related to satisfaction with five distinct social support networks: immediate boss or supervisor; other people at work; spouse, lover, or significant other; family members/relatives; and friends. Satisfaction is rated on a 6-point Likert scale from 1 = *Not at all satisfied* to 5 = *Extremely satisfied*, or 6 = *Not applicable.*

The 10-item Type A Behavior Scale measures the frequency of being hard-driven, impatient, and competitive in response to daily life challenges. Each item is rated on a 5-point Likert scale from 1 = *None of the time* to 5 = *All of the time*, with higher scores indicating greater propensity toward Type A Behaviors.

The 30-item Cognitive Hardiness Scale measures one's propensity to commit to one's work, self, and hobbies, perceived control over significant life outcomes, and viewing life's changes as challenges rather than threats (Sharpley & Yardley, 1999). Items are rated on a 5-point Likert scale from 1 = *Strongly agree* to 5 = *Strongly disagree*, with higher scores indicating greater cognitive hardiness.

The 20-item Coping Style Scale assesses emotion-focused and problem-focused coping strategies. It comprises four subscales: Positive Appraisal, Negative Appraisal, Problem-Focused Coping, and Threat Minimization. Respondents indicate the degree to which they engage the strategy on a 5-point Likert scale from 1 = *Never* to 5 = *Always*, with the higher scores indicating greater use of the strategy.

The 12-item Psychological Well-being Scale is intended as the inventory's outcome measure, predicted by the other scales and subscales of the SAI for validity testing (Nowack, 1990). The degree to which psychological well-being is experienced is rated on a 5-point Likert scale from 1 = *Never* to 5 = *Always*, with higher scores indicating greater psychological well-being.

In a sample of younger and middle-aged adults (Nowack, 1990), the underlying structure of the inventory was proposed to contain three factors: Component 1 – Global Health Practices, Eating/Nutrition, Preventative Hygiene, Sleep/Relaxation, and Exercise; Component 2 – Positive Appraisal, Threat Minimization, Problem-

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Focused Coping, Cognitive Hardiness, and Social Support; and Component 3 – Intrusive Negative Thoughts, Type A Behavior, and Stress (Nowack, 1990). Internal consistency of the SAI scales was mostly good (α = .82–.83), except the Stress Scale was acceptable (α = .67) and the Psychological Well-being Scale was excellent (α = .93). The subscales had acceptable internal consistency (α = .69–.79).

The perceived stress scale

The 10-item PSS measures one's perception of stress during the last month (Cohen et al., 1983). Respondents rate items on a 5-point Likert scale from 0 = *Never* to 4 = *Very often*, with higher scores indicating greater perceived stress. The PSS is widely used in older adult samples and has demonstrated good internal consistency (α = .81–.82; Ezzati et al., 2014).

The quality of life scale

The 16-item QOLS measures current satisfaction across six domains: material and physical well-being; relationships; social, civic, and community activities; personal development and fulfilment; recreation; and independence. Items are rated on a 7-point Likert scale from 1 = *Terrible* to 7 = *Delighted*, with higher scores indicating greater satisfaction. The QOLS has been validated in older adults and has good internal consistency (α = .87–.89; Burckhardt et al., 1989).

Statistical analysis

Twenty-four (.06%) data points were missing from the total dataset. Since <1% of the data was missing, complete-case analyses were conducted (Jakobsen et al., 2017), resulting in a final sample size of 294. All items from the SAI were first subjected to a theoretically driven item-reduction process to assess their relevancy and applicability to healthy older adults.

Consistent with classical test theory, the SAI was evaluated on its dimensionality, reliability, and validity (Nunnally, 1978). Dimensionality was evaluated using very simple structure (VSS), parallel analysis, and exploratory factor analysis (EFA; Revelle & Rocklin, 1979; Horn, 1965). First, each scale within the SAI was evaluated on its dimensionality using polychoric correlations as recommended for categorical data (Jöreskog, 1990). Items that performed poorly in the EFA were removed. Then, sum scores were calculated for each unidimensional scale and subscale to evaluate the dimensionality of the overall SAI using Pearson's correlations. The Psychological Well-Being Scale was not included in the EFA of the SAI as it is an outcome measure for validity testing. All EFA models were estimated using unweighted least squares and oblique rotations to improve factor loadings.

Reliability was assessed by internal consistency measured by McDonald's Omega for all scales within the SAI and for the SAI overall. Validity was assessed using three linear regression models regressing the SAI scales, subscales, and covariates (age, sex, and education) on PSS, QOLS, and Psychological Well-being Scale.

All analyses of dimensionality and reliability were conducted with R version 4.2.1 (R Core Team, 2022) using the Psych package (for VSS, parallel analysis, EFA, and McDonald's Omega; Revelle, 2023) and EFA.dimensions package (for calculating polychoric correlation matrices; O'Connor, 2000). Validity testing was conducted using IBM SPSS 29.0.10. For additional details on model evaluation, model selection, and item retention, please refer to the Supplemental Materials (S1. Supplemental Statistical Analysis).

Results

Bartlett's test was statistically significant ($p < .001$), and the Kaiser–Meyer–Olkin (KMO) value was .82 for the current dataset, exceeding the recommended KMO value of .70 (Dziuban & Shirkey, 1974), supporting the decision to conduct a factor analysis.

Theoretically driven item reduction

Items that queried work-related habits were removed, given the sample's demographic (M_{age} =68.73); the average retirement age in Canada is 65 years (Statistics Canada, n.d.). Items that noted work and other relevant activity were retained (e.g., missed a large proportion of, or an entire night of sleep, because of work projects, travel schedule, social activities, shift work, family problems, etc.). One item was removed due to potential ambiguity and misinterpretation; specifically, the frequency of practicing safe sex over the past 3 months may prompt a different response depending on whether one considers abstinence or unprotected sex with a long-term partner as always practicing safe sex or never practicing safe sex. A total of 27 items (22%) met the criteria for removal. See Supplemental Material for the list of removed items (S2. Theoretically Driven Item Reduction).

Factor structure

The best-fitting factor structure of each scale within the SAI is reported below. See Supplemental Material for all factor structure iterations and their corresponding correlation matrix, model fit statistics, factor loadings, and communalities (S3. Factor Structure Iterations).

Stress scale

A one-factor model was selected, containing five items pertaining to five different daily hassles one can experience (health, personal finances, family, social obligations, and environmental concerns). The one-factor model accounted for 39% of the variance, and the standardized root mean square of the residual (SRMSR) = .02.

Global health scale

A three-factor model was selected, and based on the items within each factor, the proposed subscales within the Global Health Scale and their proportion of variance explained were Exercise (21%; three items), Sleep/Rest (13%; three items), and Eating/Nutrition (17%; four items). The cumulative variance explained by the Global Health Scale was 52%, and the SRMSR was .03. All items within the original Preventative Hygiene and Risk subscale were dropped due to not meeting the item retention criteria.

Social support scale

As the Social Support Scale included a 'Not applicable' response option with a value of 6, all 'Not applicable' responses were treated as missing data, which led to 13.75% missing data for the scale. Deletion and imputation attempts were made based on recommendations (Jakobsen et al., 2017). Despite attempts, the model fit for the Social Support Scale was unacceptable (see S3.3 Social Support Scale). As such, the Social Support Scale was not included in the final EFA of the overall SAI.

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Type A behavior scale

A one-factor model was selected for the Type A Scale, with all four items loading onto a single factor. The Type A Behavior Scale accounted for 30% of the variance, and the SRMSR was .05.

Cognitive hardiness scale

A three-factor model was selected. Based on the cluster of items within each factor, the subscales within the Cognitive Hardiness Scale, comprising of the three components of hardiness, and their proportion of variance explained were Control (19%; six items), Challenge (15%; four items), and Commitment (11%; four items). The cumulative variance explained by the overall scale was 45%, and the SRMSR was .04.

Coping scale

A three-factor model was selected. Based on the cluster of items within each factor, the proposed subscales and their proportion of variance explained were Negative Appraisal (20%; five items), Positive Appraisal (16%; four items), and Problem-focused Coping (15%; five items). The variance explained was 52%, and the SRMSR was .03.

Psychological well-being scale

A one-factor model best fits the Psychological Well-being Scale. Nine items were retained, explaining 75% of the variance, and the SRMSR was .03.

EFA of the revised subscales

The factor analysis of each scale within the SAI reduced the original inventory from 123 items to 65 items, comprising 7 scales and 12 subscales. Based on the analyses, the following new scales and subscales are proposed:

The Stress Scale, The Global Health Scale (Subscales: (i) Eating/Nutrition, (ii) Sleep/Rest, and (iii) Exercise), The Type A Behavior Scale, The Cognitive Hardiness Scale (Subscales: (i) Control, (ii) Challenge, and (iii) Commitment), The Coping Scale (Subscales: (i) Positive Appraisal, (ii) Negative Appraisal, and (iii) Problem-focused Coping), The Psychological Well-Being Scale.

A three-factor model was selected for the overall inventory based on its interpretability, strength of factor loadings, and communalities. The final model had an SRMSR of .04 and accounted for 42% of the cumulative variance, with factors 1–3 accounting for 21%, 13%, and 8% of the variance, respectively. Please see Supplemental Table 8 for factor loadings and communalities. For a detailed summary of model fit statistics for all evaluated scales and the overall SAI, please see Supplemental Tables (S4. Supplemental Tables).

Factor 1 captures Adaptive Cognitive Resources, given that its primary factor loadings consist of three subscales from the Cognitive Hardiness Scale comprising the following: (a) Control, challenge, and commitment; (b) Positive-Appraisal Subscale; and (c) Problem-focused Coping Subscale. Factor 2 represents Maladaptive Behavioral and Cognitive Habits, with primary loadings on the Stress Scale, the Sleep Subscale (inverse relationship), the Negative Appraisal Subscale, and the Type A Behavior Scale. Factor 3 was labeled Adaptive Health Habits, consisting of the Eating/Nutrition Subscale and the Exercise Subscale.

Internal consistency

Scales within the SAI ranged from poor (ω = .63–.67; Type A Behavior Scale, Sleep subscale, and Eating Subscale) to excellent reliability (ω = .95; Psychological Well-being scale). The overall inventory also had good reliability (ω = .84). See Supplemental Materials for McDonald's Omega values for each scale and subscale.

Criterion validity

Perceived stress scale

The adjusted regression model (controlling for age, sex, and education) was statistically significant, with SAI explaining ~45% of the variance in PSS scores – $F(14, 274) = 17.18$, $p < .001$, adj. $R^2 = .45$. Stress, sleep, and the control subscale of the cognitive hardiness scale were significantly associated with predictors of PSS scores with small effect sizes ranging from $\beta = -.17$ to $-.23$. See Table 2 for more details.

Quality of life scale

The adjusted regression model was statistically significant, with SAI explaining 60% of the variance in QOLS scores – $F(14, 269) = 30.76$, $p < .001$, adj. $R^2 = .60$. Age, stress, education, exercise, two components of cognitive hardiness (control and challenge), and positive appraisal were significantly associated with QOLS scores, with small effect sizes ranging from β = .078–.236. See Table 2 for regression coefficients and standard errors.

Psychological well-being scale

The adjusted regression model was statistically significant, with SAI explaining ~64% of the variance in Psychological Well-being Scale scores – $F(14, 274) = 36.817$, $p < .001$, adj. $R^2 = .64$. Stress, all three components of cognitive hardiness (control, challenge, and commitment), and positive appraisal were significantly associated with Psychological Well-being Scale scores, with small to medium effect sizes ranging from $\beta = -12$ to .28. See Table 2 for regression coefficients and standard errors.

Discussion

Driven by the need for a brief, comprehensive assessment tool of stress and coping for older adults, this study evaluated the utility of Nowack's (1990) SAI. The SAI was originally validated and developed to capture the variables that moderate the health consequences of experiencing work and life stress in younger and middle-aged adults. Following a theoretically driven item-reduction process and assessment of the dimensionality, internal consistency, and criterion validity of the SAI, the current study suggests that the Revised SAI can be a valuable, comprehensive assessment of stress for community-dwelling older adults.

Guidance for use and value of the revised SAI

The value of the Revised SAI lies in its capacity to robustly examine chronic stress and relevant mitigating factors in older adults in a relatively brief format that is estimated to take respondents 25 min to complete. Aligned with the TMS, the Revised SAI is able to capture the appraisal of stressors and available resources that may mitigate stress. The availability of an assessment tool for older adults is necessary in the context of population aging and the need to assess stress and potential mitigating factors in later adulthood.

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Table 2. Regression models assessing criterion validity of SAI scales and subscales

10-item Perceived Stress Scale				
Item	*B*	95% CI	SE *B*	*β*
Age	−.039	(−0.131, 0.053)	.047	−.037
Sex	−.438	(−1.599, 0.722)	.589	−.033
Education	−.131	(−0.315, 0.052)	.093	−.065
Stress	.338**	(0.133, 0.542)	.104	.177
Exercise	.066	(−0.139, 0.271)	.104	.030
Sleep	−.530**	(−0.870, −0.189)	.173	−.165
Eating	−.124	(−0.368, 0.120)	.124	−.050
Type A behavior	.237	(−0.348, 0.194)	.128	.096
Cognitive hardiness – control	−.374**	(−0.047, 0.386)	.103	−.229
Cognitive hardiness – challenge	−.222	(−0.531, 0.018)	.140	−.089
Cognitive hardiness – commitment	−.077	(−0.224, 0.251)	.138	−.030
Negative appraisal	.169	(−0.131, 0.053)	.110	.088
Positive appraisal	−.256	(−1.599, 0.722)	.140	−.102
Problem-focused coping	.014	(−0.315, 0.052)	.121	.006
Quality of Life Scale				
	B	95% CI	SE *B*	*β*
Age	.156*	(0.004, 0.309)	.077	.078
Sex	1.031	(−0.893, 2.955)	.977	.041
Education	.390*	(0.086, 0.693)	.154	.102
Stress	−.766***	(−1.103, −0.429)	.171	−.210
Exercise	.364	(0.021, 0.706)	.174	.086
Sleep	.359	(−0.207, 0.925)	.288	.058
Eating	.168	(−0.240, 0.575)	.207	.035
Type A behavior	.181	(−0.235, 0.598)	.211	.038
Cognitive hardiness – control	.746***	(0.410, 1.082)	.170	.236
Cognitive hardiness – challenge	.452	(−0.010, 0.913)	.235	.093
Cognitive hardiness – commitment	1.171***	(0.722, 1.619)	.228	.236
Negative appraisal	−.120	(−0.477, 0.237)	.181	−.033
Positive appraisal	.835***	(0.381, 1.289)	.230	.174
Problem-focused coping	−.110	(−0.501, 0.281)	.199	−.025
				.078
Psychological well-being				
	B	95% CI	SE *B*	*β*
Age	.082	(−0.001, 0.165)	.042	.072
Sex	.752	(−0.284, 1.788)	.526	.052
Education	.088	(−0.076, 0.251)	.083	.040
Stress	−.243**	(−0.426, −0.061)	.093	−.117
Exercise	.096	(−0.088, 0.279)	.093	.040
Sleep	.027	(−0.277, 0.331)	.155	.008
Eating	.136	(−0.082, 0.354)	.111	.050
Type A behavior	−.052	(−0.277, 0.172)	.114	−.019
Cognitive hardiness – control	.502***	(0.320, 0.683)	.092	.279
Cognitive hardiness – challenge	.429***	(0.183, 0.675)	.125	.157

(Continued)

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Table 2. *Continued*

10-item Perceived Stress Scale				
Item	*B*	95% CI	SE *B*	*β*
Cognitive hardiness – commitment	.595***	(0.354, 0.837)	.123	.210
Negative appraisal	−.006	(−0.200, 0.187)	.098	−.003
Positive appraisal	.645***	(0.400, 0.891)	.125	.235
Problem-focused coping	.133	(−0.079, 0.345)	.108	.053

Notes: B, unstandardized regression coefficient; SE *B*, standardized error; *β*, standardized coefficient.
*$p < .05$.
**$p < .01$.
***$p < .001$.

Close to half of the SAI items were dropped while retaining validity and internal consistency. Validation of the Revised SAI demonstrated a factor structure that distinctly captures stress and factors associated with stress: protective cognitive coping, protective behavioral habits, and daily hassles with maladaptive cognitive and behavioral habits.

The Revised SAI, in its current form, may be used in cross-sectional, longitudinal, and intervention research in older adults to measure chronic and life stress comprehensively. The Revised SAI is particularly beneficial for longitudinal and intervention-based studies as its balance of thoroughness and brevity allows researchers to track stress and coping over time with minimal respondent burden. This contrasts with the need for multiple questionnaires to capture constructs in the Revised SAI, including perceived stress, coping, lifestyle behaviors, and personality.

Modifications and limitations of the revised SAI

Theoretically driven item reduction and EFA of the original scales and subscales resulted in notable scale modifications. First, the original 123-item scale was reduced to 56 items while retaining most of the scales and subscales.

The Social Support scale was removed because a proportionally high number of participants selected 'not applicable' for scale items, suggesting low applicability of scale items in this population, contributing to poor psychometric performance. As research has shown, the buffering effect of social support on stress in older adults (Dehghankar et al., 2024) exclusion of the scale was likely due to the scale properties rather than social support being of low importance for moderating the relationship between stress and poor health in older adults. The Social Support scale queries respondents' satisfaction with the support they receive 'at work *and* in personal life' from five distinct social support networks, including romantic partners, friends/community members, and family members. As a significant portion (at least $n = 122$) of participants were retired, many respondents may have felt this question did not apply to them due to explicit mention of work. Furthermore, having 'never' and 'not applicable' response options when measuring the frequency of receiving social support may have been a source of confusion. If a participant does not have a given support network (e.g., no romantic partner) or does not tend to seek social support listed from a given social support network (e.g., does not seek work-related social support from family members), it can be unclear which would be the most appropriate response option.

All items within the Preventative Hygiene subscale were removed due to poor performance, suggesting a lack of applicability or sensitivity in the current sample. The health of older adults has improved in recent decades, evidenced by a longer life expectancy, and in part attributed to decreased smoking rates and attention to blood pressure, implying an overall improvement in personal health literacy and self-care (Statistics Canada, 2015). The preventative hygiene items of the SAI may not be appropriate or sensitive enough to assess risk in older adult populations, and a focus on mitigating physical health stressors, including hearing healthcare, frequency of vaccinations, or hazard-proofing one's home if there is a risk of falls, may be of greater relevance.

The Threat Minimization subscale was removed due to poor performance, likely due to the disconnect between included items and the psychological construct. Literature suggests that avoidance, or threat minimization, is a maladaptive strategy for younger and older adults (Birditt et al., 2020). Interestingly, in Nowack's (1990) study, the Threat Minimization subscale clustered with other adaptive coping mechanisms, which contradicts the current literature (Ayers et al., 2010). This suggests that the scale may not have accurately captured the construct.

Scales and subscales of the revised SAI demonstrated acceptable internal consistency, except for the Type A Behavior Scale, the Exercise Subscale, and the Sleep/Rest. Poor internal consistency of the Type A Behavior Scale may be attributed to removing over half of the items due to explicit mention of work, and low correlations between the remaining items. Reliability of the Type A Behavior Scale may be strengthened with items that accurately and cohesively capture this personality construct, beyond employment. Furthermore, Type A is not a singular construct. Indeed, research suggests that it is the toxic core of Type A, namely the aggression-hostility component, that is associated with poor physical and psychological well-being (Birks & Roger, 2000). Similarly, poor internal consistency of the subscales may be accounted for by the relatively fewer items within the subscales. As such, it is recommended that these scales be interpreted with caution.

Findings for the overall factor structure of the revised SAI scale and subscales revealed a three-factor solution comprising (1) Adaptive Cognitive Resources, (2) Maladaptive Behavioral and Cognitive Habits, and (3) Global Health Practices. This aligns with the initial three-component solution in younger and middle-aged adults (Nowack, 1990). Interestingly, unlike the original validation study, the Sleep Subscale did not load onto the Global Health Practices factor and instead loaded negatively onto the Maladaptive Behavioral and Cognitive Habits factor. This may be attributed to the nature of the items inquiring about a lack of sleep. The Sleep Subscale can be further improved by adding items that assess sleep and rest more robustly as an overall health practice.

The SAI displayed good criterion validity with validated measures of stress and well-being, as well as the Psychological Well-being Scale of the SAI. Across all outcome measures, the Stress Scale and Cognitive Hardiness-Control were significant predictors

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in the model. However, subscale items of Eating, Negative Appraisal, Type A Behavior, and Problem-focused Coping did not significantly contribute to the variance across outcome scores. Although Type A Behavior may not represent the toxic core and, therefore, may not be an appropriate assessment of the risk profile of Type A, the interpretation of null associations for the remaining items may be attributed to the analytical sample. Interestingly, the Type A subscale of the SAI has been one of the strongest predictors of self-reported health outcomes in younger and middle-aged adults (Pozos-Radillo et al., 2024). As such, further research may be needed to explore Type A behavior as a predictor of health in older adults.

Overall, the analytical sample was relatively healthy, and it is important to recognize that a self-selected bias may have occurred, which may underestimate the magnitude of the associations. Accordingly, replication in a larger, more diverse sample is required.

Future directions

The Revised SAI is valid and reliable in its current form. However, further adaptations to the inventory are suggested for future research. First, it is recommended that the statements be modified to better reflect the lived experience of this large, heterogeneous population. For example, 'trouble with aging parents' may be revised to 'trouble caring for a loved one', referring to stress associated with the family caregiver role. While items that referenced work were removed in the current study, items that list work-related contexts (e.g., I feel hurried and pressured for time, i.e., not having enough time to get everything done at work or home) may be modified to be more relevant to retired older adult respondents. Second, major revisions to the Social Support scale, which was excluded in the final iteration of the inventory due to poor psychometric performance, are recommended before use in this population. Namely, simplifying item responses and modifying the questions to address social support more broadly.

To date, studies supporting the ability of the SAI to predict stress-related illness have yielded mixed results (Huerta-Franco et al., 2019; Pozos-Radillo et al., 2024). To further validate the Revised SAI's ability to predict stress-related illness in older adults, it is recommended that the predictive validity of the SAI for objective health outcomes, such as the number of medical visits or symptoms of illness, be explored. As chronic stress is associated with poorer health outcomes, this further validation would support the application of the SAI as a screener for stress and coping by physicians that can inform targeted patient care (Prior et al., 2016; Stubbs et al., 2018).

Considering the study findings and recommendations, study limitations must be addressed. First, while the sample size was adequate for the present analysis, data collection from a larger sample would offer a more accurate representation of the true underlying factor structure (Mundfrom et al., 2009). Second, the sample of participants was predominantly white, young, healthy, and highly educated, scoring relatively high on the QOLS (Burckhardt et al., 1989) and low on the PSS (Cohen et al., 1983). Additional validation should be conducted in a more diverse and representative sample of older adults in North America.

Conclusions

The Revised SAI is a valuable assessment tool for evaluating stressors and strategies used to manage daily stress that may moderate the stress–illness relationship. With recommended modifications and further validation, the Revised SAI may be a valuable assessment tool for stress researchers, specifically for psychosocial intervention-based and longitudinal research. Given the complex relationship between psychosocial stress, physical health, and cognitive function, comprehensive measures, such as the SAI, that provide a clear pathway for behavioral change are highly valuable. Given the rapidly aging population, constructing such measures specific to older adults is crucial for facilitating lifestyle changes that may protect against avoidable age-related decline. Further modifications are recommended, including adding relevant items to scales with low internal consistency and criterion validity, aligning scales and subscales with up-to-date empirical findings and theoretical frameworks relevant to older adults, and addressing measurement issues. Examining the predictive validity of the Revised SAI for stress-related illness would increase the strength of the measurement tool, which could be used by medical professionals screening for and treating stress in older adults.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/S0714980825100159.

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