Original Paper

Repeated Online Surveillance of Stress and Stress Management Effectiveness in Australian Adults (FocUS-R): Mixed Methods Pilot Study

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Abstract

Background: Trials of stress management interventions have shown modest and inconsistent effects. Emerging evidence suggests that structural constraints may limit the real-world effectiveness of behavioral strategies, yet this process has rarely been examined empirically. Population-level tools for monitoring stress and stress management processes over time remain limited.

Objective: This study aimed to develop and pilot a mixed methods surveillance platform for repeated measurement of stress and stress management effectiveness in real-world contexts and to assess its feasibility, validity, and ability to detect equity-relevant patterns.

Methods: Adults living in Australia completed baseline assessments including sociodemographics, perceived stress (Perceived Stress Scale, 10-item version), psychological flexibility (Multidimensional Psychological Flexibility Inventory), social resources, and health measures. Participants then completed brief fortnightly surveillance surveys for up to 12 months, comprising 0 to 10 Visual Analogue Scale (VAS) ratings of stress and perceived stress management effectiveness, a stress-related symptom checklist, and open-ended reporting of stressors and coping strategies. We assessed feasibility, convergent validity of early VAS indicators, and preliminary equity patterning.

Results: Seventy-seven participants completed baseline measures, and 1195 fortnightly check-ins were recorded as of June 2025. Early VAS stress demonstrated strong convergent validity with baseline perceived stress and stress symptoms. Despite the pilot recruitment skewing toward higher socioeconomic status, clear gradients were observed in both stress and stress management. Lower-income participants reported higher stress, lower perceived stress management, and fewer good stress management check-ins. Psychological flexibility was positively associated with stress management overall, but showed weaker associations among lower-income participants.

Conclusions: Brief, repeated stress surveillance is feasible and can generate equity-informative signals. Pilot findings support a model in which adaptive skills are widely available, but their effective expression is shaped by structural conditions. The FocUS-R (Focus on Understanding Stress, Resilience, and Adaptability) platform may provide a scalable approach for monitoring population stress processes and identifying contexts where structural constraints may limit the effectiveness of behavioral strategies.

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Introduction

Stress is a pervasive, population-level exposure with substantial health and economic consequences. It increases health-service utilization, reduces productivity, and frequently precedes mental, cardiovascular, and metabolic disorders [1]. Despite decades of research elucidating the biological consequences of chronic stress, clear and scalable recommendations for stress management that reliably prevent downstream ill-health remain elusive [2]. Large, well-designed trials of individual-level stress management programs have produced modest and inconsistent real-world effects [2-5].

One explanation is that these strategies are not inherently ineffective, but they are implemented within environments that may constrain their expression, perhaps by overwhelming individual adaptive capacity [6-8]. This reflects a broader problem in stress research, namely, that population-level relationships between stressor exposure and health outcomes do not consistently follow a simple dose-response assumption in which greater exposure produces proportionally greater harm. Groups with objectively greater exposure to stressors do not always show correspondingly higher rates of diagnosed psychiatric or physical stress–related illness [9], a pattern consistent with documented capacity for psychological adaptation under sustained stress [8]. Time poverty, financial strain, insecure or inflexible work, caregiving load, and limited access to supportive services may limit the feasibility of enacting otherwise evidence-based coping strategies. Under such conditions, even well-powered behavioral interventions may yield attenuated effects, not because their underlying logic is incorrect, but because adaptive capacity is being expressed within structurally misaligned contexts. From an epidemiological perspective, this points to a need for new theories of stress and population health, and for studies designed to generate evidence capable of testing them, rather than continued reliance on models which assume a fixed exposure-outcome relationship. Existing frameworks such as the stress process model [10-12], which locates variation in stress outcomes in social structural position, are useful but have rarely been tested in repeated, population-level measurement studies. In this sense, accumulated weak trial findings may be diagnostic of systemic constraints rather than failures of individual skill-building [3,6].

Adaptive capacity, or the ability of an individual to respond to stress, is best understood as a coproduction of people and their environments [8]. The social and economic conditions in which people find themselves, including income security, time pressure, caregiving demands, and neighborhood resources, shape exposure to stressors and the realistic availability of coping repertoires. Socioeconomic inequalities are strongly associated with disparities in mental and physical health, with chronic stress exposure likely to be a key mediating pathway, and as wealth gaps widen globally, the divergence in stress-producing environments across social strata is becoming more pronounced [6]. Critically, this divergence reflects not only differences in exposure to stressors but also differences in opportunity to translate adaptive skills into effective stress management [13]. Underresourced groups may accumulate stressors unevenly, particularly during sustained crises, while facing the greatest barriers to implementing conventional stress management strategies [6]. This broader context is gaining recognition in stress research, with contemporary studies conceptualizing resilience as a dynamic outcome of adaptation to stressor load over time rather than as a fixed personal trait [14,15].

Despite this recognition, the measurement of stress processes at the population level remains limited. Most epidemiological studies rely on cross-sectional surveys or retrospective questionnaires that capture stress exposure at a single time point, providing little insight into how stress fluctuates over time, how individuals attempt to manage stress, or how structural conditions shape the effectiveness of coping strategies; as a result, stress exposure and adaptive capacity are typically measured in isolation [6,8,16]. This gap persists despite clinical and public health frameworks increasingly emphasizing the need to address psychosocial and socioeconomic determinants of health alongside behavioral risk factors [17,18], and major cardiovascular prevention guidelines explicitly calling for community-level and policy interventions targeting social determinants alongside prospective longitudinal research that accounts for real-world contextual factors [19,20]. While routine public health surveillance has transformed our understanding of behavioral risk factors such as smoking and physical inactivity, comparable efforts to monitor stress exposure and stress management capacity remain underdeveloped, limiting the availability of practical tools for assessing how these processes operate across different structural conditions and their implications for preventing stress-related physical and mental disorders.

Building on the recognition that broader environmental exposures, in addition to individual-level traits, determine individual experiences of stress and stress responses, advances in clinical psychology and resilience science have identified modifiable psychological processes that may serve as intervention targets even within constrained environments. Psychological flexibility, defined as the ability to adapt behavioral responses to changing contextual demands while pursuing personal objectives, has emerged as a key mechanism through which individuals translate stressor exposure into either adaptive coping or psychological distress [21]. This contrasts with the individual-level programs evaluated in prior trials (eg, school- and workplace-based mindfulness interventions [4,5]), which target skill acquisition directly rather than surveillance of real-world enactment. Emerging

evidence suggests psychological flexibility may operate differently across socioeconomic contexts: while it can buffer the effects of high stress among disadvantaged groups, its expression and effectiveness may depend on environmental resources and opportunities [10,22]. These dynamics may explain why average effects of skills-only programs appear modest. A prevention-first agenda therefore requires theory-informed measurement capturing both sides of the stress-health equation, with equity in stressor exposure and environmental constraints on one hand, and variation in individual adaptive capacity over time on the other.

To address this gap and evaluate emerging theories of stress and health, we developed FocUS-R (Focus on Understanding Stress, Resilience, and Adaptability), a mixed methods citizen-science platform designed for repeated population surveillance of stress and stress management processes. The platform combines brief quantitative measures of stress and perceived stress management effectiveness with qualitative reporting of stressors and stress management strategies, enabling monitoring of person-environment interactions over time while maintaining minimal participant burden. By linking stressor load, stress management responses, and contextual constraints longitudinally, the platform is designed to identify where structural conditions may limit the effectiveness of individual strategies. Rather than classifying specific strategies as inherently adaptive or maladaptive, FocUS-R captures stress management effectiveness through participants' own ratings of perceived effectiveness, alongside qualitative descriptions of the strategies used, to evaluate how similar strategies may vary in effectiveness across structural and socioeconomic contexts. Its participatory design further seeks to build community engagement and problem awareness, recognizing that structural action depends on public understanding and support.

A substantial body of literature has used ecological momentary assessment (EMA) and daily diary methods to capture within-person stress dynamics at short time [23,24]. These approaches offer high temporal resolution but impose a participant burden that is difficult to sustain over months, limiting their suitability for population-level surveillance across extended follow-up. FocUS-R was designed to trade some temporal resolution for sustainability, using a fortnightly cadence intended to remain feasible over 12 months while still capturing meaningful within-person variation. FocUS-R's contribution is not novelty of repeated measurement per se, but a design suited to sustained population surveillance of stress, paired with an equity-focused mixed methods approach and a citizen-science participatory framing not typical of EMA/diary studies. Participants in comparable participatory surveillance systems have been found to be motivated, in part by a sense of contributing to something beyond their individual data point, not disease-tracking utility alone [25]. We use the term *stress surveillance* to denote repeated, population-level monitoring of stress and stress management processes over time, which we distinguish from single time point measures of perceived or self-reported stress.

This study presents the FocUS-R surveillance framework and pilot implementation findings. FocUS-R is designed as a surveillance and monitoring platform rather than an intervention; its purpose is prevention-oriented detection of contexts where structural constraints may limit stress management effectiveness. Our primary aim is methodological, to evaluate whether brief, repeated measures can capture temporal patterns of stress and stress management effectiveness in a form suitable for population surveillance. A secondary aim is to assess whether this approach generates equity-relevant signals, including socioeconomic patterning, and whether qualitative data can contextualize these patterns. Specifically, we aimed to (1) develop and establish a brief mixed methods approach suitable for repeated population monitoring of stress and stress management effectiveness, (2) evaluate the feasibility and validity of the surveillance platform in a pilot citizen-science cohort, and (3) examine whether repeated surveillance measures detect theoretically plausible socioeconomic gradients in stress management effectiveness.

Methods

Study Design and Overview

FocUS-R is a longitudinal, mixed methods surveillance platform designed to examine stress and stress management as they unfold in everyday life. The framework is grounded in the premise that stress management reflects an interaction between individual adaptive processes and contextual conditions. The design therefore integrates repeated low-burden measurement of stress and stress management with a baseline assessment of sociodemographic context and validated psychological constructs. Consistent with the epidemiological framing established in the Introduction section, this study draws on the stress process model [12], integrated with a contextual behavioral science account of psychological flexibility [21,26], as its guiding theoretical framework.

The study combines (1) a comprehensive baseline survey, (2) brief fortnightly surveillance surveys administered over an extended follow-up, and (3) 6-monthly reassessments of key psychological and health indicators. In addition, an optional participatory component allows participants to share deidentified stress management experiences via a study website and social media platforms. The platform's design, recruitment materials, and ethical considerations were developed in collaboration with a consumer representative.

This paper reports findings from an initial pilot implementation conducted to assess feasibility, evaluate the measurement properties of the brief surveillance indicators, and generate preliminary descriptive signals relevant to contextual patterning. The study is reported according to the CHERRIES (Checklist for Reporting Results of Internet E-Surveys) checklist for reporting the results of internet e-surveys (Checklist 1) [27].

Ethical Considerations

Ethical approval was obtained from the University of Newcastle Human Research Ethics Committee (H-2023-0245). Participation was voluntary, and informed consent was obtained electronically via REDCap, a secure web-based research data capture platform, prior to enrollment [28,29]. All data were collected and managed in REDCap. Identifiers were stored separately from survey response data. Deidentified analytic datasets were stored on secure institutional servers hosted by the Hunter Medical Research Institute. No participant compensation was provided. Given the sensitive nature of the topic, participants were provided with contact details for psychological support services in the study information sheet, in case completing the survey caused increased distress.

Setting, Eligibility, and Consent

Adults aged 18 years or older who resided in Australia and were able to complete surveys in English were eligible. Recruitment prioritized broad community accessibility rather than representativeness.

Recruitment and Enrollment

Recruitment commenced in February 2024 and ran through to the data cut presented in this paper (June 2025), using a convenience-sampling approach across multiple parallel channels. Recruitment of the initial pilot sample with follow-up will remain open until December 2026. The dominant channel was social media platforms (Facebook [Meta Platforms, Inc], Instagram [Meta Platforms, Inc], and LinkedIn [LinkedIn Corp]). This was supplemented by a small number of community engagements in the Hunter New England region, New South Wales, Australia, including interviews with community radio and invited presentations to a local Rotary Club and staff at a regional cancer support hub. Interested individuals accessed the study website and completed consent and baseline surveys through a secure REDCap link. Recruitment during the pilot phase did not target specific socioeconomic groups.

Procedures and Follow-Up

Following enrollment, participants received automated email invitations every 2 weeks to complete brief surveillance surveys. Follow-up assessments repeating key baseline measures were administered at 6 and 12 months. Participants could discontinue at any time. The pilot tracked individuals for up to 12 months to assess engagement and retention over sustained follow-up. Completion rates were monitored within REDCap.

Measures

Measurement Framework

The measurement strategy was structured to balance psychometric validity with minimal participant burden. Baseline assessment captured validated measures of stress, psychological processes, social resources, and health status. Fortnightly surveys captured brief indicators of stress and stress management, along with stressor exposure and symptoms. Six-monthly reassessments will allow preliminary exploration of longitudinal associations.

Baseline Assessment

The baseline survey collected sociodemographic characteristics including age, gender, cultural identity, living arrangements, education, employment, household income, and postcode (for future geocoding), as well as self-reported chronic physical and mental health conditions. Validated instruments collected at baseline are listed in Table 1.

Table 1. Validated instruments administered in the FocUS-R[a] baseline survey, with item counts, scoring, and direction.

Instrument	Items	Scoring, range	Direction
Perceived Stress Scale, 10-item version (PSS-10) [30]	10	Sum, 0-40	Higher=greater perceived stress
Depression Anxiety Stress Scale, 21-item version (DASS-21) [31]	7	Sum, 0-42	Higher=greater stress symptoms
EuroQol-5D Visual Analogue Scale (EQ-VAS) [32]	1	0-100	Higher=better self-rated health
Multidimensional Psychological Flexibility Inventory—Short Form Flexibility (MPFI-SF Flexibility) [26]	12	Mean, 1-6	Higher=greater flexibility
Multidimensional Psychological Flexibility Inventory—Short Form Inflexibility (MPFI-SF Inflexibility) [26]	12	Mean, 1-6	Higher=greater inflexibility
Multidimensional Scale of Perceived Social Support (MSPSS) [33]	12	Sum, 12-84	Higher=greater perceived social support
Primary Care Post-Traumatic Stress Disorder screen for *DSM-5* (PC-PTSD-5) [34]	5	Sum, 0-5 (screen)	Higher=more symptoms
Ten-Item Personality Inventory (TIPI) [35]	10 (2 items per trait)	Mean per trait, 1-7	Trait-dependent

[a]FocUS-R: Focus on Understanding Stress, Resilience, and Adaptability.

Fortnightly Surveillance Survey

Each surveillance survey covered the preceding 14 days and required approximately 5 minutes to complete. The survey comprised 3 components: Visual Analogue Scale (VAS) ratings of perceived stress and stress management effectiveness, stressor and symptom reporting, and open-ended reporting of stress management strategies.

Participants rated both peak and average stress over the prior 2 weeks on 0 to 10 scales (0="complete calm" and 10="highest stress imaginable"). They also rated perceived

effectiveness in managing stress during the same period (0="not managing at all" and 10="managing completely"). These items were intentionally brief and written in plain, nontechnical language to support repeated administration and ecological validity.

Participants indicated whether they had experienced major life events or daily hassles, with optional free-text descriptions. The checklist captured common stress-related somatic, cognitive, affective, behavioral, and sleep symptoms. A single item assessed the functional impact (time off work or usual activities due to stress). An open-ended question invited participants to describe strategies used to manage stress during the prior fortnight. Participants could optionally consent to deidentified sharing of their responses on the project website and social media pages.

Derived Indicators

Stress and stress management ratings were analyzed on their original 0 to 10 scales. To characterize regulatory balance between stress load and perceived stress management effectiveness, we derived a stress-stress management gap calculated as the average stress minus the stress management rating for each survey (negative values indicate that stress management is equal to or exceeds stress). We also defined a high stress management indicator (≥7/10) to represent frequent effective stress management while retaining interpretability on the native scale. A converse low-stress-management indicator was not derived because the continuous stress-stress management gap variable already captures directional imbalance, although an explicit low-management threshold might aid interpretability in future analyses.

For participant-level summaries, mean stress, mean stress management, mean stress-stress management gap, and proportion of good stress management responses were calculated across each individual's observation window. Observation-level analyses retained all available time points with clustering by participant.

Six-Month Follow-Up

At 6 and 12 months, the Perceived Stress Scale, 10-item version (PSS-10), Depression Anxiety Stress Scale, 21-item version (DASS-21 Stress subscale), EuroQol Visual Analogue Scale (EQ-VAS), Multidimensional Psychological Flexibility Inventory—Short Form (MPFI-SF), and Multidimensional Scale of Perceived Social Support (MSPSS) measures were readministered. These data permit exploratory assessment of associations between surveillance-derived indicators and subsequent changes in perceived stress, health, and psychological flexibility.

Qualitative Analysis

Free-text responses describing stressors and stress management strategies were imported into NVivo (version 15; Lumivero) for qualitative analysis. An inductive thematic approach was used, where initial themes were derived using NVivo15's Autocode feature, then assessed, categorized, and refined by 2 authors (EW and MH) to produce a preliminary set of overarching themes. Coding was undertaken by a small author team rather than an independent multirater panel with formal interrater reliability statistics, consistent with common and accepted practice in thematic analysis [36]. To integrate with quantitative outputs, we calculated response-level prevalence of key themes across surveys and income groups and selected representative quotations for reporting. This was a preliminary analysis of overarching themes rather than a comprehensive analysis pursued to the point of thematic saturation, consistent with the exploratory, feasibility-focused aims of this pilot; the applicability of saturation as a benchmark for thematic analysis has itself been directly questioned recently in the methodological literature [37].

Statistical Analysis

Pilot analyses focused on feasibility, measurement properties, and descriptive contextual patterning. Feasibility metrics included enrollment numbers, baseline completion, number of surveillance surveys completed, and retention across follow-up. Convergent validity of the surveillance indicators was assessed by correlating each participant's early surveillance scores (the mean of the first 2 check-ins) with baseline PSS-10 and DASS-21 Stress subscale scores. Short-term stability was assessed using correlations between adjacent check-ins (t vs t+1) for stress and stress management. Pearson correlations with 95% CIs were used.

Associations between contextual indicators (household income categories and continuous MSPSS scores) and participant-level stress-stress management summaries were examined descriptively. To reduce the influence of differing numbers of check-ins per participant, analyses comparing contextual groups were conducted using participant-level means rather than raw observation counts. Given the feasibility focus and modest sample size, analyses were considered exploratory and were not adjusted for multiple comparisons. Missing data were handled using complete-case analysis, and no imputation was performed. Statistical analyses were conducted in R (version 4.5.1; R Foundation for Statistical Computing) [38].

Sample Size and Scope

No formal power calculation was undertaken for this pilot phase. The primary objective was to establish the study methodology and provide an initial methodological evaluation of the surveillance framework using participants recruited during the first 12 months of the pilot study. Analyses were descriptive and exploratory, intended to assess feasibility and generate preliminary signals rather than to formally test hypotheses. The study is ongoing and future data cuts will support multilevel modeling of repeated measures, including health outcomes, and formal testing of moderation by contextual indicators.

Results

Platform Feasibility and Engagement

Between February 2024 and June 2025, 115 participants provided informed consent to this rolling surveillance platform, in which, consistent with the design of comparable participatory surveillance systems such as FluTracking [39], participants are enrolled over time rather than completing a fixed protocol within a closed cohort. Of the consenting participants, 67.0% (n=77) completed core demographic and health sections of the baseline survey. Completion rates for individual psychological scales ranged from 63.5% (n=73) to 67.0% (n=77).

Fortnightly survey completion was not contingent upon completion of the baseline survey. All 115 (100%) consented participants submitted at least one fortnightly check-in survey. Engagement with the fortnightly component differed substantially by baseline completion status; however, participants who completed baseline assessments accounted for the large majority of check-ins (1118 of 1195 total from 77 participants; median 15, IQR 4-22), while the 38 participants without completed baseline data contributed comparatively few (77 check-ins in total; median 1, IQR 1-1). Across the full cohort, 1195 fortnightly surveillance surveys were completed (median 5, IQR 1-18.5: range 1-29 per participant). These data indicate sustained engagement with the brief surveillance format over extended follow-up.

Engagement with the participatory component was high. Among responses to the sharing consent item (n=815), participants consented to deidentified sharing of stress management strategies in 87.0% (709/815) of cases. Nearly all participants who answered this item (69/70, 98.6%) consented at least once, with a mean individual consent rate of 86.6% (SD 25.0%; n=70 participants).

Reliability of Baseline Measures

Cronbach α was calculated for the PSS-10 (α=0.93), DASS-21 Stress subscale (α=0.9), and MPFI-SF Flexibility (α=0.92), and MPFI-SF Inflexibility (α=0.87) scales, with all demonstrating good internal consistency. Cronbach α is not reported for the Ten-Item Personality Inventory, consistent with the original validation study, which reports test-retest reliability rather than internal consistency for this instrument [35].

Validation of Fortnightly Stress Indicators

Convergent validity was supported. Early average stress (mean of first 2 check-ins) correlated positively with baseline PSS-10 (r=0.67, 95% CI 0.51-0.79) and DASS-21 Stress subscale scores (r=0.69, 95% CI 0.54-0.80). Early stress management correlated negatively with PSS-10 (r=–0.47, 95% CI –0.65 to –0.26). The early stress-stress management gap correlated positively with PSS-10 (r=0.64, 95% CI 0.47-0.77).

Short-term stability across adjacent check-ins was moderate (average stress r=0.55, 95% CI 0.50-0.60; stress management r=0.45, 95% CI 0.39-0.50), consistent with both reliability and sensitivity to within-person change.

Across all check-ins, the distribution of stress-stress management states demonstrated face validity: 31.4% (317/1008) were low stress/low or poor stress management, 46.7% (471/1008) low stress/high or good stress management, 14.5% (146/1008) high stress/low stress management, and 7.3% (74/1008) high stress/high stress management. These patterns suggest that the brief VAS indicators captured both regulatory balance and imbalance across varying stress levels.

Pilot Sample Characteristics

Among 77 participants completing baseline demographics, 80.5% (n=62) were women, and the mean age was 51.8 (SD 13.9: range 22-86) years. Household income was concentrated in higher bands (n=35, 45.5%; ≥Aus $150,000 annually; Aus $1≈US $0.66 as of May 28, 2024). Health behaviors were generally favorable, with 93.5% (n=72) reporting no current smoking and 62.3% (n=48) reporting high physical activity levels (Table 2).

Table 2. Baseline sociodemographic and health characteristics of study participants completing core baseline measures in the FocUS-R[a] pilot (N=77).

Characteristics	Values
Gender, n (%)	
Woman	62 (80.5)
Man	15 (19.5)
Age (y), mean (SD)	51.8 (13.9)
Education level, n (%)	
High school or less	30 (38.9)
Certificate	12 (15.6)
Bachelor's degree	24 (31.2)
Graduate certificate/diploma	3 (3.9)
Postgraduate degree	5 (6.5)
Other	3 (3.9)
Annual household income (Aus $), n (%)	

Characteristics	Values
<74,999	14 (18.2)
75,000-149,999	28 (36.4)
>150,000	35 (45.5)
Country of birth, n (%)	
Australia	62 (80.5)
United Kingdom	10 (12.9)
Other	5 (6.5)
Smoking status, n (%)	
Daily/less than daily	5 (6.5)
Not at all	72 (93.5)
Alcohol consumption, n (%)	
Never drink	6 (7.8)
Rarely (less than weekly)	38 (49.4)
1-2 d/wk	22 (28.6)
≥3 d/wk	11 (14.3)
Physical activity level	
High	48 (62.3)
Moderate	29 (37.7)
Low	0 (0)

[a]FocUS-R: Focus on Understanding Stress, Resilience, and Adaptability.

Baseline psychological measures indicated that depression and anxiety scores were predominantly in the normal range (57/77, 74.0% and 50/77, 64.9% respectively), while stress was more frequently elevated, with 46.8% (36/77) at moderate severity or above. Mean PSS-10 score was 18.3 (SD 7.8). Mean psychological flexibility (MPFI) exceeded inflexibility (3.87, SD 0.83 vs 2.76, SD 0.81), consistent with generally adaptive profiles in this sample.

Baseline differences across income categories were observed. Participants in lower-income categories reported higher perceived stress and lower self-rated health than those in higher-income categories. Differences in psychological flexibility and inflexibility were directionally similar but did not reach statistical significance in this pilot sample (Table 3).

Table 3. Baseline perceived stress, self-rated health, and psychological flexibility by household income group among FocUS-R[a] pilot participants (participant-level Ns[b]).

Measure	Overall (N=77)	Low (<Aus $75,000[c]), (n=14)	Medium (Aus $75,000-Aus $149,999), (n=28)	High (≥Aus $150,000), (n=35)	*P* value[d]
Perceived Stress[e] (PSS-10[f]), mean (SD)	18.3 (7.8)	21.5 (8.6)	19.3 (7.4)	16.2 (7.5)	.04
DASS-21[g] Stress subscale[h], mean (SD)	7.2 (5.0)	7.7 (4.5)	8.0 (5.6)	6.5 (4.7)	.40
Self-rated health[i] (EQ-VAS[j]), mean (SD)	71.4 (18.6)	64.1 (20.0)	66.5 (20.5)	78.4 (13.7)	.01
Psychological Flexibility[k] (MPFI[l]), mean (SD)	3.8 (0.8)	3.6 (1.1)	3.7 (0.8)	4.0 (0.7)	.20
Psychological Inflexibility[m] (MPFI), mean (SD)	2.8 (0.8)	3.0 (0.8)	3.0 (0.9)	2.5 (0.7)	.10

[a]FocUS-R: Focus on Understanding Stress, Resilience, and Adaptability.
[b]Ns represents the number of participants contributing baseline measures.
[c]Aus $1≈US $0.66 as of May 28, 2026.
[d]Kruskal-Wallis test.
[e]PSS-10 is a 10-item measure of subjective stress over the past month (range 0-40; higher scores indicate greater perceived stress).
[f]PSS-10: Perceived Stress Scale, 10-item version.
[g]DASS-21: Depression Anxiety Stress Scales, 21-item version.
[h]DASS-21 is a 7-item measure of physiological and psychological stress symptoms (range 0-42; higher scores indicate greater stress symptomatology).
[i]EQ-VAS is a Visual Analogue Scale of self-rated health from 0 “(worst imaginable health)” to 100 “(best imaginable health).”
[j]EQ-VAS: EuroQol Visual Analogue Scale.
[k]MPFI Psychological Flexibility is a 12-item subscale measuring adaptive psychological processes (range 1-6; higher scores indicate greater flexibility).
[l]MPFI: Multidimensional Psychological Flexibility Inventory.
[m]MPFI Psychological Inflexibility is a 12-item MPFI subscale measuring maladaptive psychological processes (range 1-6; higher scores indicate greater inflexibility).

Contextual Patterning in Longitudinal Stress and Stress Management

Using participant-level summaries (mean values on the VAS scales across all completed fortnights), descriptive gradients were observed across income categories. Participants in the lowest income category reported higher mean stress (5.22, SD 1.30 vs 4.67, SD 1.50) and lower perceived stress management effectiveness (4.99, SD 1.19 vs 6.73, SD 1.28) compared with those in the highest category. The mean participant-level proportion of check-ins rated as good stress management (≥7/10) was 24.0% (SD 20.0%) in the lowest income group (n=12) and 61.6% (SD 27.5%) in the highest (n=30). The mean stress-stress management gap was positive in the lowest income group (0.19, SD 1.89) and negative in the highest income group (–2.06, SD 2.50), indicating differing degrees of regulatory balance across contexts.

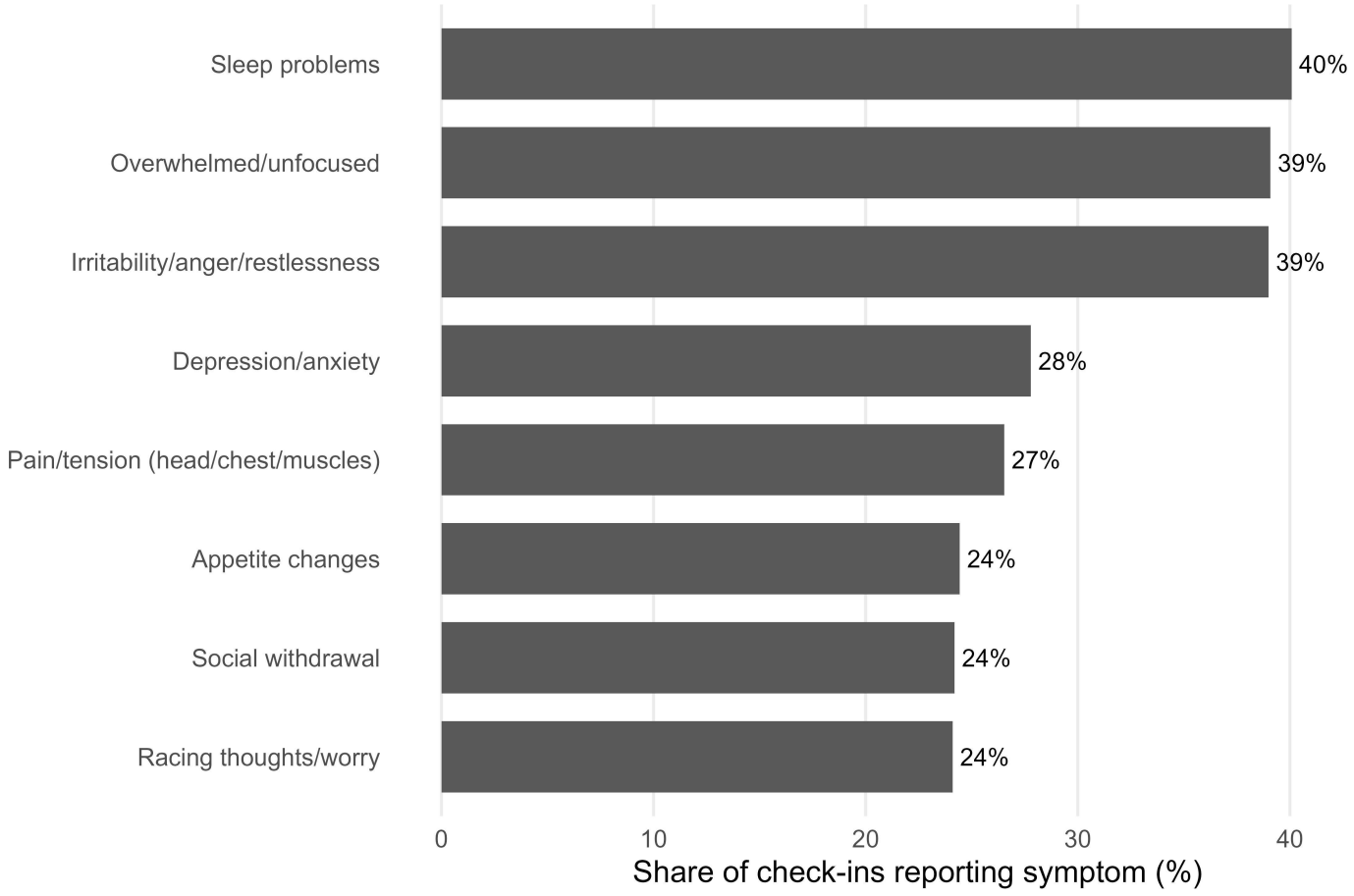
Baseline perceived social support (MSPSS total) was inversely correlated with mean stress (r=–0.37, 95% CI –0.56 to –0.13) and the stress-stress management gap (r=–0.39, 95% CI –0.58 to –0.16), and positively correlated with mean stress management effectiveness (r=0.33, 95% CI 0.09-0.53) and the proportion of high stress management check-ins (≥7/10; r=0.29, 95% CI 0.05-0.50).

Stressor Exposure and Stress Symptom Patterns

The most frequently reported stress symptoms across all fortnightly surveys were sleep disturbance, feeling overwhelmed or unfocused, and anger/irritability (Figure 1).

Daily hassles were reported in approximately 70% of fortnightly surveys, commonly involving work pressure, financial strain, time constraints, and minor health concerns. Major life events were less frequently reported (<10% of surveys), most commonly health crises or bereavement.

Figure 1. Most commonly reported symptoms of stress in fortnightly check-ins from the FocUS-R (Focus on Understanding Stress, Resilience, and Adaptability) pilot (N=115 adults; February 2024-June 2025). Bars show the percentage of fortnightly survey responses in which each symptom was reported during the preceding 2 weeks. Sleep problems (479/1195, 40.0%), feeling overwhelmed or unfocused (467/1195, 39.1%), and irritability/anger/restlessness (466/1195, 39.0%) were the most frequently reported symptoms, followed by depression/anxiety (332/1195, 27.8%) and physical tension or pain (317/1195, 26.5%).



Qualitative Themes: Stress Management and Contextual Constraints

Open-ended responses revealed broadly similar repertoires of stress management strategies across participants, including physical activity, time in nature, social connection, mindfulness practices, rest and recovery, planning behaviors, and creative or leisure activities (Table 4).

Table 4. Qualitative themes describing stress management strategies derived from inductive coding of fortnightly free-text stress management responses, with illustrative participant quotations.

Theme[a]	Description	Representative quotes
Physical activity	Walking (often dog walking), yoga, stretching/tai chi, and structured exercise classes	• "...regular exercise - walking the dog and yoga" • "Go to the gym twice a week, swim once or twice a week and walk our dog every night." • "Yoga, breathwork, ice baths, swims in the ocean" • "Going to the gym for a group class"
Nature-based activities	Spending time outdoors and gardening described as therapeutic	• "Walking outside in nature" • "Take a walk. Pause and sit outside" • "Get outside and garden" • "Walking outside in the fresh air." • "Walking in nature" • "Nature, natural light, fresh air, exercise and interaction with other walkers sets me up for the day" • "...bit of gardening on the weekend"
Social connection	Time with family and friends and maintaining close relationships as a coping mechanism	• "Messages/phone calls/visits with friends and family" • "...talking to friends/family about issues" • "Connection with friends/family/loved ones." • "...catch up with friends" • "...make sure my relationships are looked after" • "...maintain social connections"
Mindfulness and relaxation	Meditation, focused breathing, and mindfulness practices	• "...trying to be mindful and in the moment when I'm with my kids or with my staff" • "...practising breathing and mindfulness." • "Trying to employ mindfulness strategies and principles." • "I'm trying to use the calm breathing technique now" • "Breathing exercises (such as alternate nostril), mindfulness, yoga, meditation" • "Continued daily yoga and meditation practices"
Self-care practices	Healthy diet, reduced screen time, and massage	• "...extra serves of bright coloured salads, along with extra fibre - pre, and probiotics - cultured/fermented foods" • "Ate as healthy as possible while acknowledging I had a bit more of a tendency to want to eat sweet food" • "...reduction sugary foods, more fibre" • "Took time off work and off screens" • "Re-prioritised reading over screens." • "Stay disciplined about taking breaks from screens" • "Craniosacral massage - best massage I've had for stress so far"
Creative/leisure activities	Painting, reading, and listening to podcasts	• "Creative pursuits at home (stitching, weaving, painting)." • "Reading in the sunshine." • "Time alone to read." • "Listen to podcasts/self help books on relationships." • "Reading a fiction book (have not been motivated to read for a long time, so was nice to be sucked into a fictitious world again for a few chapters each night before I went to sleep)" • "Listening to podcasts"
Planning and future orientation	Proactive planning and forward-looking approaches to manage workload and life demands	• "Made plans to go in half marathon next year • "Being organised and planning ahead so not to get too stressed out for this time of year" • "Book a weekend away for my son & I (something to look forward to)" • "Always plan ahead to spread my commitments over time available so not too much to achieve at one time. Get prepared ahead so not under time pressure if events go pear shaped at last minute. If they do then just accept situation is what it is and move forward to salvage what is possible and rearrange." • "...visualise, think positively and towards the future,"
Rest and recovery	Adequate sleep, deliberate breaks from work, and holidays	• "Tried to get more rest" • "Give myself permission to rest (sit down & watch a tv show)" • "Focus on rest while ill; maintaining strong boundaries around time at work" • "Prioritising sleep and exercise. Making time for friends."
Substance use	A minority reported using alcohol or other substances to cope	• "Walking the dog, stretching, talking to friends, WINE" • "Ride bicycle with mates and just to work. Drinking beer." • "Had a beer & tried to ignore my wife's insanity."

Theme[a]	Description	Representative quotes
		• "I read. drink alcohol. went for a swim. did some maths."
		• "Rest, pain meds"

[a]Themes were derived from inductive coding of fortnightly free-text responses.

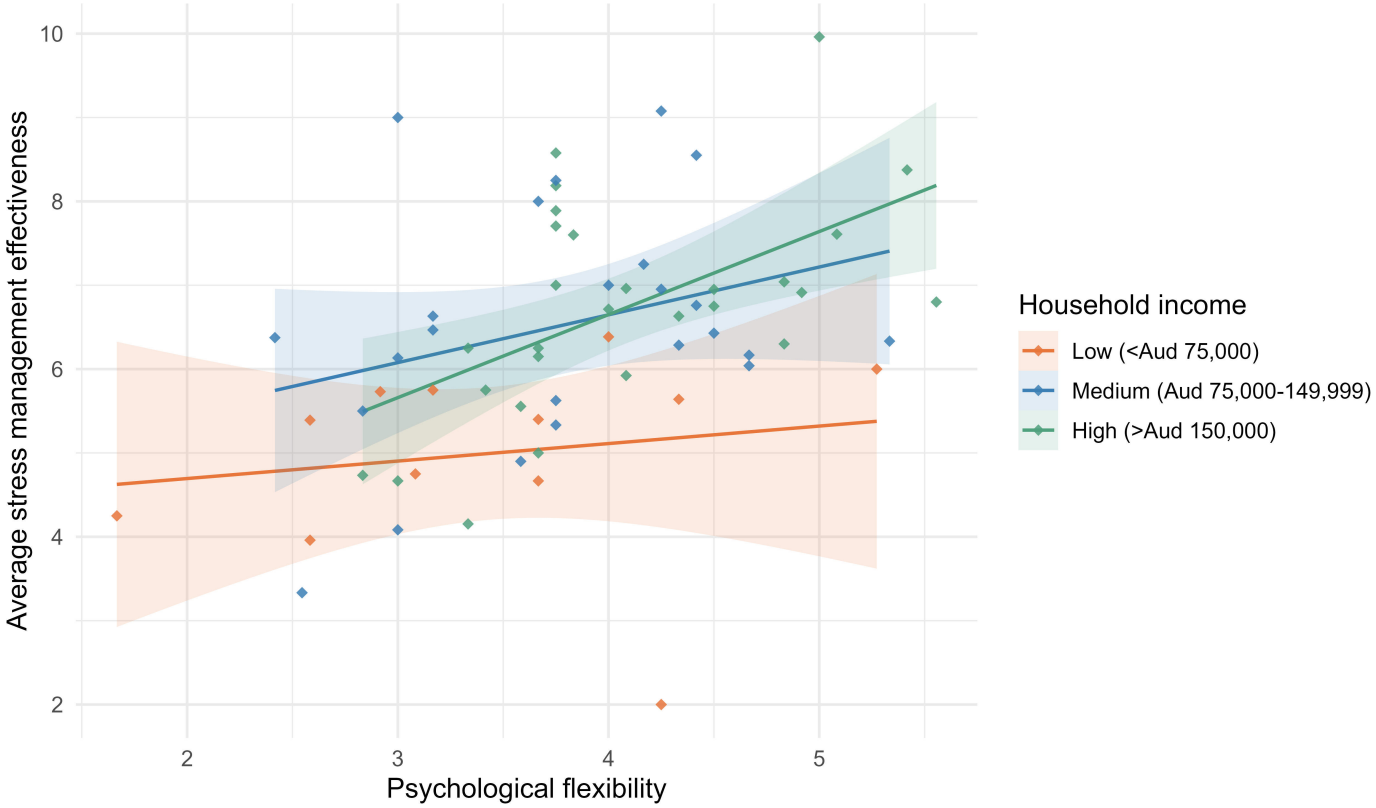
Alongside these shared repertoires, participants described contextual constraints that limited sustained implementation. Reported barriers included inflexible work schedules, financial pressures, caregiving responsibilities, and chronic time scarcity. These narratives suggest that variability in the perceived stress management effectiveness may reflect differences in the opportunity to enact known strategies in daily environments.

Psychological Flexibility and Contextual Moderation

Psychological flexibility was positively correlated with stress management effectiveness (r=0.51) and modestly correlated with income (r=0.26). When examined descriptively across income categories, the association between psychological flexibility and stress management appeared stronger among higher-income participants (r=0.55; P=.002) than among lower-income participants (r=0.17; P=.60). Although the analysis was underpowered, this pattern is consistent with contextual moderation of adaptive skill expression. Formal tests of moderation are planned for larger samples.

This pattern is illustrated in an interaction plot between psychological flexibility and income, which shows that while higher-income participants with greater flexibility report higher perceived stress management effectiveness, psychological flexibility provides less benefit for lower-income participants facing structural constraints (Figure 2).

Figure 2. Association between psychological flexibility and stress management effectiveness by household income among FocUS-R (Focus on Understanding Stress, Resilience, and Adaptability) pilot participants (N=73 adults, February 2024-June 2025). Scatter points represent participant-level averages of self-reported stress management effectiveness across available fortnightly check-ins. Lines show linear regression fits with 95% CIs, stratified by household income groups. Higher psychological flexibility was associated with better reported stress management across income groups, although the relationship appeared stronger among higher-income participants. Aus $1≈US $0.66 as of May 28, 2026.



Discussion

Principal Findings

In this paper, we established a study methodology and provided baseline data to evaluate whether a brief, repeated mixed methods surveillance platform could feasibly capture stress and stress management processes at the population level, assessed its measurement properties, and examined whether it could detect theoretically plausible socioeconomic gradients. Consistent with study aims, the platform sustained engagement for up to 12 months of fortnightly follow-up; the brief VAS indicators showed convergent validity with

established measures; and clear income-related gradients emerged in both stress and stress management effectiveness.

Comparison With Prior Work

The convergence of quantitative indicators with qualitative narratives in this study supports this perspective, suggesting that adaptive capacity is coproduced by individuals and their environments and that structural barriers may suppress the real-world effectiveness of otherwise evidence-based stress management strategies [2,6,8]. The aim of this pilot was not to estimate causal effects of social conditions on stress outcomes, but to evaluate whether brief, repeated surveillance could detect theoretically plausible gradients relevant for future hypothesis-driven research, including studies designed to assess causal pathways. These findings align with long-standing stress process models suggesting that health outcomes emerge from the interaction between stress exposure, available coping resources, and the social conditions in which these processes unfold [11,12,40]. Other recent work has similarly argued that behaviors often framed as individual choices must be understood through an equity lens that distinguishes between opportunity, necessity, and the structural conditions shaping uptake and benefit [41].

Methodologically, the fortnightly VAS items behaved as intended. Early VAS stress ratings showed convergent validity with baseline anchors (moderate to strong correlations with PSS-10 and DASS-21 Stress subscale), and both stress and stress management displayed temporal stability, supporting their use as brief surveillance indicators capable of capturing meaningful variation in perceived stress over time [23,24]. Substantively, we observed clear economic and social gradients. Lower-income participants reported fewer good stress management episodes and a larger stress-stress management gap over time, despite describing similar stress management repertoires (physical activity, social connection, mindfulness/relaxation, and rest) as higher-income participants. On average, lower-income participants rated 24.0% (SD 20.0%) of their check-ins as reflecting effective stress management (≥7/10), compared with 61.6% (SD 27.5%) among higher-income participants (participant-level means; n=12 and n=30, respectively). A complementary social support gradient was also evident. These patterns are consistent with the possibility that approaches assuming uniform implementation contexts may overlook meaningful variation in the feasibility of stress management across social conditions [6].

A plausible pathway emerged from the mixed methods integration, with qualitative data suggesting that workplace inflexibility, time pressure, caregiving demands, and financial constraints impeded the sustained implementation of known strategies. Psychological flexibility, which is an established, teachable process [21], was positively associated with perceived stress management overall (r=0.51), but its association appeared stronger among higher-income participants (r=0.55) and weaker among those with fewer resources (r=0.17). While underpowered for firm conclusions, this pattern is consistent with models in which structural conditions may constrain the returns to individual adaptive skills. The surveillance method applied here offers a way to move beyond the universal-vs-targeted dichotomy toward more context-responsive prevention approaches.

The citizen-science design appears acceptable and valuable. High, repeated consent rates to share strategies (709/815, 86.0% of responses; 69/70, 98.6% of participants contributing at least once) indicate community support for participatory knowledge generation. The repeated surveillance captured temporal dynamics that cross-sectional studies cannot detect, while mixed methods integration provided explanatory context that quantitative measures alone cannot supply. Importantly, this methodology treats participants as partners in knowledge generation, which can provide immediate value to participants while generating population-level insights. This is consistent with other participatory citizen-science approaches that engage community members directly in the research process [42].

Limitations

This pilot study has several limitations. The small size (n=77) and demographic skew toward higher-income, older, women participants relative to the Australian population limit immediate generalizability of this pilot study. Analyses were descriptive and exploratory, consistent with a feasibility pilot. Baseline completion of individual psychological scales ranged from 63.5% (73/115) to 67.0% (77/115), and missing data were handled via complete-case analysis without imputation. Fortnightly stress and stress management ratings relied on retrospective self-report over a 14-day recall window, which may be subject to recall bias; objective or momentary corroboration was not collected. Household income was measured once at baseline and treated as static, though structural circumstances may change over follow-up. The design is correlational and does not support causal inference about the relationship between structural conditions and stress management effectiveness. Retention over 12 months may also reflect informative attrition, whereby participants facing greater structural constraints may be less likely to sustain repeated participation, and this was not formally modeled. The qualitative component was a preliminary analysis of overarching themes rather than a comprehensive analysis (*Qualitative Themes: Stress Management and Contextual Constraints* section). This pilot was not preregistered; as a baseline methods and feasibility paper, this study instead serves as a priori documentation for subsequent analyses of this dataset. Incomplete baseline data for some domains and descriptive analyses without multiplicity adjustment were appropriate for a feasibility pilot but underscore the preliminary nature of these findings. Observed gradients should therefore be interpreted as surveillance signals rather than estimates of population-level effects.

Near-term refinements will focus on diversifying recruitment through targeted community partnerships, streamlining the baseline survey burden to improve completion rates, and incorporating brief measures of workplace conditions, time poverty, and service access to better characterize modifiable structural barriers. The most promising next step is not simply to deliver more

individual-level coping programs, but to develop and test interventions that align psychological skill-building with contextual modification. The surveillance methodology provides a framework for tracking both individual adaptive capacity and environmental enablers, allowing real-time optimization of intervention combinations. Scaling this approach requires moving beyond traditional randomized controlled trial designs toward implementation science methods that can accommodate the complexity of person-environment interactions. Despite widespread recognition that chronic stress is a major driver of health inequalities, routine population surveillance of stress processes remains limited, particularly for capturing the dynamic interplay between stress exposure, coping capacity, and structural constraints. The surveillance approach implemented here offers a scalable way to monitor these processes over time.

Conclusions

These pilot findings suggest that stress-related health inequalities may arise not only from unequal exposure to stressors but also from unequal opportunity to implement stress management strategies within everyday environments. The citizen-science surveillance methodology provides both a feasible approach for generating this integrated understanding and a platform for engaging communities as partners in developing contextually appropriate solutions. Rather than continuing to search for universal stress management solutions, the field should embrace the complexity of person-environment interactions and develop intervention approaches that match individual capacity-building with targeted upstream structural modifications. Only by addressing both sides of the stress management equation can we move beyond the modest effects that have characterized individual-level interventions and achieve meaningful population-level improvements in stress resilience and the prevention of stress-related health problems.

Generative AI Use

No generative AI tool was used in the preparation of this manuscript. All scientific content, analysis, and interpretation were developed by the authors, who take full responsibility for the accuracy and integrity of the manuscript.

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Data Availability

The data generated and analyzed during this study are not publicly available due to ethical and privacy restrictions associated with sensitive participant-reported information. Data may be available from the corresponding author on reasonable request, subject to approval by the relevant Human Research Ethics Committee and compliance with data governance requirements.

Authors' Contributions

Conceptualization: MH, EW, FRW
Formal analysis: MH, EW
Methodology: MH, ED, SB, MN, FRW, EW
Writing – original draft: MH
Writing – review & editing: MH, ED, SB, MN, FRW, EW

Conflicts of Interest

None declared.

Checklist 1

CHERRIES checklist.
[PDF File (Adobe File), 122 KB-Checklist 1]

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Abbreviations

CHERRIES: Checklist for Reporting Results of Internet E-Surveys
DASS-21: Depression Anxiety Stress Scale, 21-item version
EMA: ecological momentary assessment
EQ-VAS: EuroQol Visual Analogue Scale
FocUS-R: Focus on Understanding Stress, Resilience, and Adaptability
MPFI: Multidimensional Psychological Flexibility Inventory
MPFI-SF: Multidimensional Psychological Flexibility Inventory–Short Form
MSPSS: Multidimensional Scale of Perceived Social Support
PSS-10: Perceived Stress Scale, 10-item version
VAS: Visual Analogue Scale

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