Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Short communication

Moderators of a resiliency group intervention for frontline clinicians during the COVID-19 pandemic

Louisa G. Sylvia [a,b,c,*], Nevita George [a,c], Dustin J. Rabideau [a,b], Joanna M. Streck [a,b], Evan Albury [a,c], Daniel L. Hall [a,b,d,e], Christina M. Luberto [a,b,d,e], Helen R. Mizrach [a,e], Giselle K. Perez [a,b,d], Sydney Crute [a,e], Darshan H. Mehta [a,b,d], Mary Susan Convery [a,b,d], Sara E. Looby [a,b], Gregory Fricchione [a,b,d], Maurizio Fava [a,b], Sabine Wilhelm [a,b], Elyse R Park [a,b,d,e]

[a] Massachusetts General Hospital, Boston, MA, USA
[b] Harvard Medical School, Boston, MA, USA
[c] Dauten Family Center for Bipolar Treatment Innovation, Boston, MA, USA
[d] Benson-Henry Institute, Boston, MA, USA
[e] Benson-Henry Institute for Mind Body Medicine, Boston, MA, USA

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ABSTRACT

Background: To mitigate the psychological burdens of COVID-19 for frontline clinicians (FCs), we adapted an existing evidence-based resiliency program, Stress Management and Resilience Training Relaxation Response Program (SMART-3RP), for FCs. This analysis explores moderators of stress coping to determine which subgroups of FCs benefited most from SMART-3RP.

Methods: 102 FCs from Mass General Brigham hospitals engaged in the adapted SMART-3RP. Assessments were completed at group entry (Week 0) and completion (Week 4). The primary outcome was stress coping, and we examined 15 possible baseline moderators. We fit linear mixed effects regression models and assessed potential baseline moderators using a likelihood ratio test. We report model-based estimates and confidence intervals for each moderator-by-time interaction (i.e., differential effect), where positive/negative values indicate more/less improvement in average perceived stress coping.

Results: Stress coping improved from Week 0 to Week 4 (mean improvement [95% CI] = 0.9 [0.6 to 1.2]). FCs with higher anxiety (differential effect [95% CI] = 0.3 [0.1 to 0.4]), depression (0.4 [0.2 to 0.6]), and loneliness (0.4 [0.1 to 0.6]), but lower levels of mindfulness (CAMS-R_{focus}: 1.0 [0.4 to 1.6]; CAMS-R_{accept}: 1.3 [0.7 to 2.0]) and self-compassion (0.4, [0.1 to 0.8]) at baseline experienced greater benefits in perceived stress coping from the SMART-3RP. Baseline health uncertainty along with sociodemographic and work characteristics did not moderate stress coping.

Discussion: Results highlight particular sub-populations of FCs that may benefit more from a stress management intervention, especially during emergency responses (e.g., COVID-19 pandemic).

1. Background

The novel coronavirus (COVID-19) created a workforce of frontline clinicians (FCs) who treated and cared for COVID-19 patients and subsequently experienced a myriad of stressors (Lu et al., 2020). This led to the development of stress-related disorders for FCs, such as anxiety and depression (Pappa et al., 2020). To support FCs at the onset of the COVID-19 pandemic, we adapted an evidence-based resiliency program, the Stress Management and Resilience Training Relaxation Response Program (SMART-3RP) to build relaxation and mindfulness techniques among FCs (Mehta et al., 2016; Park et al., 2020). This program was adapted to help FCs face stressful circumstances specific to the pandemic such as health uncertainty, changes in their work environment, and personal challenges.

We recently reported that this adapted SMART-3RP program for FCs decreased emotional distress and increased perceived stress coping,

* Corresponding author: 50 Staniford St, Suite 580, Boston, MA 02114
E-mail address: lsylvia2@mgh.harvard.edu (L.G. Sylvia).

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defined as individual's ability to cope with stressors in their life (Park et al., 2020). In the present investigation, which is a secondary analysis of our earlier study, we explored potential moderators of perceived stress coping to determine which characteristics of FCs were associated with differential improvement in perceived stress coping from SMART-3RP. We focused on perceived stress coping as prior studies among FCs have highlighted that increases in perceived stress coping is associated with improvements in overall psychological health (Dunkley et al., 2017; Thimm et al., 2018; Rettie and Daniels, 2020), thus perceived stress coping is a proxy for global improvements in well-being. Identifying characteristics that moderate the effect of the SMART-3RP on improvements in perceived stress coping could be used to target FCs who will benefit the most from a stress management intervention, especially during emergency responses like the COVID-19 pandemic.

2. Methods

2.1. Subjects and procedure

Participants were English-speaking adult (>18 years) clinicians (i.e., responsible for patient care) in the Massachusetts General Brigham (MGB) healthcare system. There were no other exclusion criteria to recruit a generalizable sample of clinicians. FCs were grouped by the following specialties: physicians, nurses, physical therapists, occupational therapists, respiratory therapists, speech language pathologists, advanced practice providers, and mental health clinicians. Inclusion criteria required FCs to be over 18 years old and from either Boston Hope or Massachusetts General Hospital. Participants were excluded if they did not speak English. The study was conducted in accordance with ethical standards of the World Medical Association and was approved by our Institutional Review Board.

FCs (Age: M= 45, SD=12.2, 92.1% female, 83.3% white) were recruited through hospital-wide emails and departmental announcements. Once registered (via an online website), participants completed a 25-item survey at group entry (Week 0) and group completion (Week 4) through REDCap (Research Electronic Data Capture), a secure, HIPAA compliant web-based application. Groups were conducted via zoom, an MGB-approved and HIPAA-compliant video conferencing platform. Participants were assigned to a group based on their specialty area, and each group met twice per week for 60 min over 4 weeks (i.e., 8 sessions in total). Groups were co-led by psychologists, physicians, social workers, and/or nurses employed at MGB and trained in delivering the SMART-3RP.

2.2. Measures

All assessments were administered pre- and post-group, but focused on baseline moderators.

2.3. Primary outcome

Stress Coping (Stress Coping) (Park et al., 2020). The perceived stress coping question, created by author (EP), is a single item measure ("How able have you been to cope with the stress in your life?") rated on a 10-point scale (i.e., 0=not at all) to 10=very well).

2.4. Potential baseline moderators

Sociodemographic variables. Age, provider specialty, gender identity, and race/ethnicity.

Work Variables. Self-report of a recent change in work hours (i.e., increased, decreased or stayed the same) and work characteristics (i.e., work setting, clinical role, patient population, use of telehealth to conduct clinical care).

Measure of Current Status (Carver, 2006) (MOCS-A). We used two items: coping response (" I am confident about being able to choose the best coping response for hard situations") and degree of emotional thoughts (" I can come up with emotionally balanced thoughts even during negative times"). Items were rated on a 5-point scale. The MOCS-A has demonstrated reliable psychometric properties in previous studies (Antoni et al., 2006).

Cognitive and Affective Mindfulness Scale- Revised (Feldman et al., 2007) (CAMS-R). We used two items: acceptance ("able to accept thoughts and feelings") and mindfulness ("focus on the present moment"). Items were rated on a 4-point scale. The CAMS-R has good psychometric properties and focuses on aspects of mindfulness most clearly distinct from worry and rumination (Feldman et al., 2007).

Patient Health Questionnaire-4 (PHQ-4) (Kroenke et al., 2009). The PHQ-4 assesses anxiety with two items ("feeling nervous, anxious or on edge" and "not being able to stop or control worrying?") and depression with two items ("feeling down, depressed, or hopeless?" and "little interest or pleasure in doing things?"). We summed the two items to have a total score for anxiety and depression (range=0 to 6). This scale has good internal reliability, construct validity, and factorial validity along with reliable criterion, construct, and procedural validity of its two subscales, the PHQ-2 and GAD-2 (Kroenke et al., 2009).

Self-compassion Scale (Neff, 2003) (SCS). The SCS assessed self-compassion via one item ("When times are really difficult, I am tough on myself") rated on a 5-point Likert scale. Higher scores indicated less self-compassion. The SCS has good test-retest reliability as well as other psychometric properties (Neff, 2003).

University of California, Los Angeles (UCLA) Loneliness Scale (Russell et al., 1978). The UCLA Loneliness Scale assessed loneliness/isolation with two items ("I feel completely alone" and "I feel isolated from others"). Questions were rated on a 3-point scale (Not at All=0, Several Days=1, More than Half the Days=2, Nearly Every Day=3) and has demonstrated highly reliable psychometric properties, both in terms of internal consistency and test-retest reliability (Russell et al., 1978).

Health Uncertainty Item (Rogers et al., 2016). The Health Uncertainty Item is a single item measure that was used to assess how uncertain participants were about their health during COVID-19. For this study, we adapted the language on the scale to say, "my health" rather than "cancer recurrence".

Personal Strengths (Yanez et al., 2011). The Personal Strengths questions were taken from the Current Experiences Scale and assessed how confident participants were in their ability to cope with stress: ("I am confident about being able to choose the best coping response or hard situations") and ("I can come up with emotionally balanced thoughts even during negative times").

3. Statistical analysis

We examined six categorical baseline moderators (gender, race, clinical specialty, work hours in the past month, CAMS-R acceptance, CAMS-R mindfulness) and nine continuous moderators (i.e., anxiety and depression per the PHQ-4, SCS, ULCA, health uncertainty, MOCS-A coping response and emotional thoughts, age, number of individuals in one's household).

We calculated pairwise mean differences (post – pre) in perceived stress coping and corresponding 95% confidence intervals (CIs) for all participants and separately for each subgroup. Subgroups based on continuous moderators (e.g., age quartiles) were created for illustrative purposes only. Positive/negative pairwise mean difference values correspond to improvement/worsening in average perceived stress coping post-intervention. We then fit linear mixed effects regression models with random individual intercepts to incorporate all-available baseline and Week 4 outcomes into our analysis. Models were fit with and without an interaction term between the potential moderator and a post-intervention indicator (i.e., a moderator-by-time interaction) and assessed using a likelihood ratio test. We report likelihood-based estimates and CIs for the interaction terms. For simplicity, we assumed a

linear relationship between continuous moderators and mean change in perceived stress coping. Due to the exploratory nature of these analyses, no adjustments for multiple comparisons were made.

4. Results

Perceived stress coping significantly improved from pre to post-intervention (model-based mean improvement [95% CI] = 0.9 [0.6 to 1.2]) (Park et al., 2020). Pairwise mean differences and 95% CIs overall and for each subgroup are displayed in Figure 1; complete model-based results are presented in the Table 1. Estimates and CIs in the Table 1 correspond to differential effects between subgroups (for categorical variables) or per one-unit increase (for continuous variables) (e.g. the difference in average improvement among males vs. females or per one-point increase on the PHQ-4 anxiety subscale). We found that baseline levels of acceptance and mindfulness (both CAMS-R items), anxiety and depression (PHQ-4), self-compassion (SCS), loneliness (UCLA), and coping response (MOCS-A) (the p-value was 0.08 for the

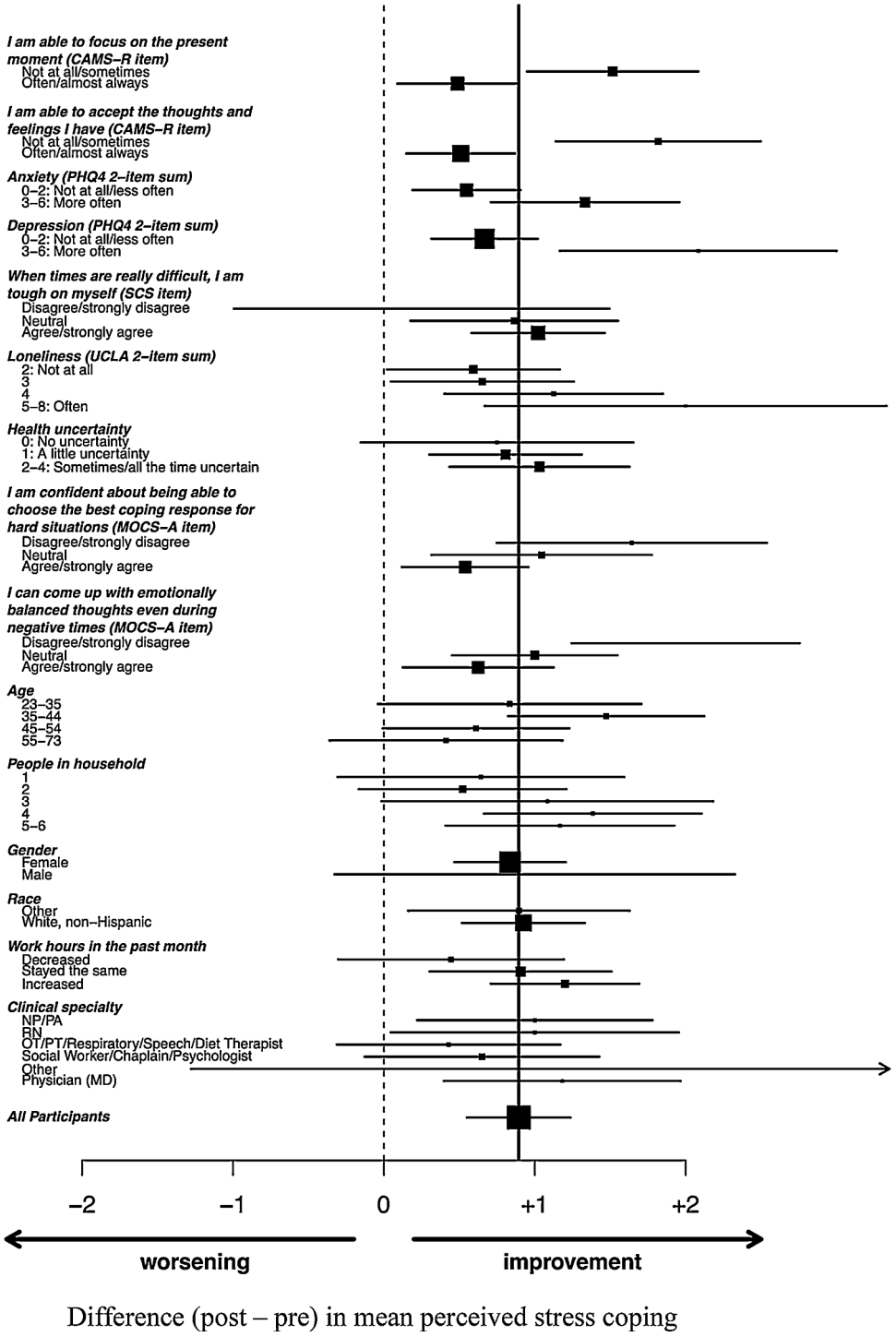

Fig. 1. Forest plot of the differential effect of each moderator. We present pairwise mean differences (solid squares) and 95% confidence intervals (horizontal lines). Larger/smaller squares corresponds with larger/smaller sample sizes. Vertical lines indicate no differential effect (dotted) and observed pairwise differential effect among all participants (solid).

Table 1
Results based on mixed-effects regression models for each potential moderator.

Variable*	Subgroup	Differential effect**	95% CI	p-value
Age	(per 10-year increase)	-0.10	[-0.37, 0.17]	0.46
People in household		0.19	[-0.04, 0.43]	0.10
Gender	Male	-0.04	[-1.27, 1.17]	0.94
	Female	Reference		
Race	Other†	0.12	[-0.63, 0.88]	0.75
	White, non-Hispanic	Reference		
Work hours in the past month	Decreased	-0.67	[-1.53, 0.19]	0.31
	Stayed the same	-0.26	[-1.00, 0.48]	
	Increased	Reference		
Clinical specialty	NP/PA	-0.27	[-1.42, 0.88]	0.53
	RN	-0.26	[-1.40, 0.87]	
	OT/PT/Respiratory/ Speech/Diet Therapist	-0.85	[-1.98, 0.27]	
	Social Worker/ Chaplain/ Psychologist	-0.69	[-1.75, 0.35]	
	Other‡	0.18	[-1.41, 1.72]	
	Physician (MD)	Reference		
Focus on present moment	Not at all/sometimes	0.99	[0.36, 1.61]	<0.01
	Often/almost always	Reference		
Accept thoughts and feelings	Not at all/sometimes	1.32	[0.68, 1.97]	<0.01
	Often/almost always	Reference		
Anxiety		0.25	[0.08, 0.42]	0.01
Depression		0.42	[0.21, 0.62]	<0.01
Tough on myself		0.41	[0.05, 0.77]	<0.01
Loneliness		0.36	[0.08, 0.63]	0.01
Health uncertainty		0.18	[-0.21, 0.56]	0.37
Ability to choose coping response		-0.45	[-0.83, -0.06]	0.02
Emotionally balanced thoughts		-0.39	[-0.82, 0.05]	0.08

*Focus on present moment: Cognitive and Affective Mindfulness Scale- Revised; Accept thoughts and feelings: Cognitive and Affective Mindfulness Scale-Revised; Anxiety: Patient Health Questionnaire -4; Depression: Patient Health Questionnaire-4; Tough on myself: Self-Compassion Scale; Loneliness: UCLA Loneliness Scale; Ability to choose coping response: Measure of Current Status Questionnaire; Emotionally balanced thoughts: Measure of Current Status Questionnaire

**Differential effect corresponds to the difference in average perceived stress coping improvement for subgroup vs. reference group (for categorical variables) or per one-unit increase in variable (for continuous variables), except as noted for age, which corresponds to a per 10-year increase. Positive/negative differential effect indicates more/less improvement in average perceived stress coping, whereas a differential effect of zero indicates no association between the moderator variable and average perceived stress coping improvement.

†Includes 2 American Indian or Alaska Native, 9 Asian, 4 Black or African American, 7 Hispanic, and 1 Other

‡Includes 4 Technicians/Translators, 3 Advance Practice Clinicians/Midwives/ Nurse Anesthetists, and 4 Other.

other MOCS-A item, emotionally balanced thoughts) moderated changes in perceived stress coping. Specifically, individuals who perceived themselves as benefiting more, in terms of perceived stress coping, from the intervention were generally less mindful and self-compassionate, but more anxious, depressed, and lonely at baseline. None of the questions assessing sociodemographic variables, work characteristics, or baseline health uncertainty moderated changes in perceived stress coping.

5. Discussion

We found that FCs who benefited the most from the SMART-3RP program, evidenced by their level of improvement in perceived stress coping, were generally less mindful and self-compassionate and more anxious, depressed, and lonely before initiating the program. Conversely, sociodemographic, work characteristics and baseline health uncertainty did not moderate improvements in perceived stress coping for FCs. These findings build upon the growing literature surrounding the impact of the COVID-19 pandemic on mental health outcomes. Research has found that negative mental health outcomes, such as depression and anxiety, may persist into post-lockdown environments (Woon et al., 2020). Therefore, there is a great need to identify effective prevention and early intervention methods during an emergency response to improve psychological outcomes (Sidi, 2020). As FCs are especially vulnerable to poorer mental health outcomes during the pandemic, future efforts to design sustainable interventions should focus on identifying moderating factors that may strengthen protective mental health mechanisms, such as resiliency and stress coping (Gavin et al., 2020). While our study is one of the first, to our knowledge, to evaluate the moderating factors of stress coping in the early stages of the COVID-19 pandemic, creating frameworks to support mental health should be a priority at this time (Rauch et al., 2020).

These findings had several limitations. First, to reduce survey burden, we only selected single items from empirically validated scales (e.g., Current Experiences Scale). Additionally, the generalizability of study results was limited by the lack of demographic diversity and overall low scores on items suggesting that participants were generally psychologically stable at baseline. Given this latter point, it is possible that the FCs who may need this program most did not register for it voluntarily and therefore, a larger proportion of FCs may have been less psychologically stable than the study accounted for and could have benefited more from this intervention. Strengths of the study includes the diversity in clinician specialty and institutional setting (i.e., hospital affiliation) among the sample as well as the implementation of SMART-3RP during the initial peak of COVID-19. The latter allowed researchers to examine the impact of the intervention to improve perceived stress coping at the height of the pandemic. Overall, our analyses add to the growing body of knowledge on the impact of psychological stressors in the midst of an ongoing pandemic and shed light onto which FCs may benefit most from a stress management intervention during an emergency response.

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