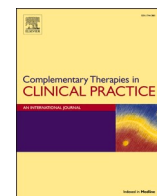




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Feasibility, acceptability, and potential effectiveness of an online expressive writing intervention for COVID-19 resilience

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ABSTRACT

Background & purpose: The COVID-19 pandemic has negatively impacted mental health in the general population. In this trial, our objective was to assess whether a 6-week expressive writing intervention improves resilience in a sample from the general population in the midst of the COVID-19 pandemic.

Materials & methods: This 6-week trial was conducted online. Eligible participants (n=63) were a sample of adults who self-identified as having been significantly affected by the COVID-19 pandemic.

Primary outcome: Connor-Davidson Resilience Scale (CD-RISC).

Secondary outcomes: Perceived Stress Scale – 10-Item (PSS-10); Center for Epidemiologic Studies Depression Scale – Revised (CESD-R); Post-Traumatic Growth Inventory (PTGI).

Results: Resilience measures (CD-RISC) increased from baseline (66.6 ± 14.9) to immediately post-intervention (73.0 ± 12.4 ; $p=0.014$; Cohen's $d=0.31$), and at a 1-month follow-up (72.9 ± 13.6 ; $p=0.024$; Cohen's $d=0.28$). Across the same timepoints, perceived stress scores (PSS-10) decreased from baseline (21.8 ± 6.6) to immediately post-intervention (18.3 ± 7.0 ; $p=0.008$; Cohen's $d=0.41$), and at the 1-month follow-up to (16.8 ± 6.7 ; $p=0.0002$; Cohen's $d=0.56$). Depression symptoms (CESD-R) decreased from baseline (23.3 ± 15.3) at 6 weeks (17.8 ± 15.4 ; $p=0.058$; Cohen's $d=0.22$), and 10 weeks (15.5 ± 12.7 ; $p=0.004$; Cohen's $d=0.38$). Posttraumatic growth (PTGI) increased from baseline (41.7 ± 23.4) at 6 weeks (55.8 ± 26.4 ; $p=0.004$; Cohen's $d=0.44$), and at the 1-month follow-up (55.9 ± 29.3 ; $p=0.008$; Cohen's $d=0.49$).

Conclusion: An online expressive writing intervention was effective at improving resilience in the midst of the COVID-19 pandemic.

NCT#: NCT04589104

1. Introduction

Coronavirus disease 2019 (COVID-19) is caused by the novel coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and has led to over 2.67 million deaths worldwide as of March 2021 [1, 2]. COVID-19 is highly transmissible, and in order to mitigate community spread of COVID-19, countries around the world have implemented social distancing measures, mask wearing, and mass quarantine efforts

to mitigate community spread [3,4]. The COVID-19 pandemic has impacted people in many different ways, causing significant distress in the mental health of the general population [5]. Fear of contracting the virus, food insecurity, social isolation, job loss/transition, and loss of childcare are just a few of the circumstances surrounding COVID-19 that have negatively impacted mental health [6,7]. A global survey conducted between March 29, 2020 and April 14, 2020 observed that general psychological disturbance, post-traumatic stress disorder, and

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Table 1
Baseline demographics of participants (n = 63).

Variable	Number or Mean	% or SD
Age	57.3	15.18
Gender		
Male	6	9.52 %
Female	56	88.89 %
Nonbinary	1	1.59 %
Race		
Caucasian	55	87.30 %
African American or Black	4	6.35 %
Asian or Pacific Islander	4	6.35 %
Ethnicity		
Hispanic	1	1.59 %
Not Hispanic	53	84.13 %
Other/Not reported	9	14.29 %
Marital Status		
Married	35	55.56 %
Separated	2	3.17 %
Divorced	9	14.29 %
Partnered	4	6.35 %
Single	9	14.29 %
Other/Prefer not to say	4	6.35 %
Employment Status		
Full time	19	30.16 %
Part time	11	17.46 %
Retired	18	25.57 %
Unemployed	11	17.46 %
Other	4	6.35 %
Formal Education		
Some college	4	6.35 %
College degree	14	22.22 %
Partial master's degree	6	9.52 %
Full master's degree	26	41.27 %
Partial doctorate degree	3	4.76 %
Doctorate degree	10	15.87 %
Household Income		
\$0-\$24,999	3	4.76 %
\$25,000-\$49,999	9	14.29 %
\$50,000-\$74,999	11	17.46 %
\$75,000-\$99,999	8	12.70 %
\$100,000-\$150,000	15	23.81 %
\$150,000 or more	12	19.05 %
Prefer not to say	5	7.94 %
Geographic Location		
North Carolina	46	73.02 %
Other US (CT, FL, MI, NJ, NY, OH, PA, TN, TX, VA, WA, Washington DC)	15	23.81 %
West Indies	1	1.59 %
Canada	1	1.59 %

depression worsened during the early days of the COVID-19 pandemic, with a 16 % increase in suicidal ideation [8]. As a growing number of individuals suffer from the negative effects of the COVID-19 pandemic on mental health, there is a critical need to offer mental health interventions, support, and tools that are scalable and can be delivered in an effective manner.

Expressive writing is a well-established therapeutic intervention to

improve emotional, psychological, and physiological health in those that have experienced one or more traumatic events [9–11]. We have previously shown that the *Transform Your Health: Write to Heal* program, an expansion of the Pennebaker Paradigm framework for expressive writing, improves perceived stress, depression symptoms, rumination, and resilience [12]. Resilience, an individual's capacity to recover and thrive in the face of adverse events, is inversely associated with negative mental health states and has been a primary focus to counteract stressors associated with the COVID-19 pandemic [13,14]. The present study builds upon our prior work by evaluating the feasibility of delivering a 6-week expressive writing intervention online to a larger number of participants. Few expressive writing studies have been successfully administered online [15–18]. However, COVID-19 precipitated a shift towards internet-delivered health care services, and we sought to leverage this shift in the emphasis on technology to deliver an expressive writing intervention to the general population. We also aimed to determine whether adapting the *Transform Your Health: Write to Heal* program to explore emotions and perspectives in the COVID-19 pandemic improves resilience, perceived stress, depression symptoms, and post-traumatic growth in a sample from the general population during the COVID-19 pandemic.

2. Materials & methods

a. Study design

This interventional study applied a single-group non-randomized and non-blinded pre- and post-test clinical trial design. This study was fully approved by the Duke Health System Institutional Review Board in Durham, NC. All participants provided informed consent online at the start of enrollment. The trial is registered at [ClinicalTrials.gov](https://clinicaltrials.gov) identifier: NCT04589104.

b. Participants

Participants were recruited through an email sent out to the Duke Integrative Medicine email list in May 2020. This email list targeted a general population interested in integrative approaches to health and wellness. Eligible participants were ≥ 18 years of age, able to read and type/write in English, cognitively able to provide informed consent, and self-identified as having been directly affected by the COVID-19 pandemic. "Affected by the COVID-19 pandemic" was defined broadly, and included a wide range of experiences: some participants had lost loved ones to COVID-19, some continued to work as frontline workers, some had lost employment or access to health care, and others' impact was primarily the experience of social isolation. Prior diagnosis of mental health concerns was not part of our exclusion criteria, but all participants were provided a list of mental health resources at the beginning of the study and encouraged to let the study coordinator know if additional support was needed at any time during the study. At baseline, no participant had been diagnosed with COVID-19, and by the completion of the study, two participants had been officially diagnosed with COVID-19. Although the 6-week program was offered at no cost to participants, no additional compensation was provided. Participants were represented by 13 states and 3 countries. Baseline demographics are provided in [Table 1](#).

c. Procedure

Interested participants received a link to an electronic consent and set of baseline surveys to complete online via REDCap (Research Electronic Data Capture). Baseline assessments included measures of resilience, perceived stress, depressive symptoms, post-traumatic growth, and personal COVID-19 impact. Participants then participated in a weekly writing class delivered virtually via Zoom for 6 weeks in June and July 2020. After the final writing session and one month post-

intervention, participants were asked to complete assessments of resilience, perceived stress, depression symptoms, and post-traumatic growth.

d. Intervention
i. Framework

Our 6-week writing intervention was adapted from the *Transform Your Health: Write to Heal* program, a publicly available expressive writing program offered at Duke Integrative Medicine. The adapted *Transform Your Health: Write to Heal* program drew heavily from evidence-based resilience-building techniques of positive psychology that were delivered through writing prompts [19–24]. Prompts were developed to address the impact of the COVID-19 pandemic. A summary of the full intervention's themes and homework assignments can be found in **Supplemental Table 1**.

The first week of the intervention guided participants through the Pennebaker Paradigm [25]. The Pennebaker Paradigm leads writers through four prompts: prompts 1 and 2 dive into the emotional experience of a trauma, while prompts 3 and 4 encourage an exploration of new perspectives. Subsequent weeks each focused on a different theme designed to support participants in cultivating resilience. Themes followed an intentional progression designed to help participants move from expressing difficult emotions about COVID-19 to intentionally cultivating insight, perspective, and growth about the experience of living through the pandemic. Themes included compassion for self and others, forgiveness, gratitude, personal strengths, silver linings, exploring lessons learned, and imagining positive future outcomes. As an example, one prompt invited participants to savor positive moments: "Consider an event, moment, or series of moments in the past few weeks that felt positive or joyful for you, and for the next 20 min, write about your experience in a way that draws out the goodness of it." At all times, participants were encouraged to respond to the prompts in an emotionally honest way, even if that meant veering from the suggested focus.

Across the 6 weeks, participants engaged in expressive writing (focusing on direct emotional expression); transactional writing (letter-writing); poetic writing (response to and writing of poetry); affirmative writing (focus on acknowledging gifts, strengths, and hoped-for outcomes); legacy writing (naming lessons learned); and mindful writing (writing with mindful awareness of the present moment). After each writing prompt, participants were asked to complete a post-writing survey. The post-writing survey encouraged mindful reflection on the process of writing and the writer's inner emotional experience.

Each week, the final prompt of the session invited participants to engage in "mindful writing." Mindful writing encourages writers to cultivate a state of compassionate, open-hearted awareness of the present moment, inviting them to describe their experience without judgment. After weeks 1–5, participants were also given the option to complete a brief homework assignment to complement each week's thematic focus, such as a brief mindfulness or gratitude practice.

ii. Logistics

All study activities were conducted virtually via email, REDCap, and Zoom. The study coordinator recorded attendance at each Zoom session. Participants were encouraged to use video during the beginning of each session and in between each writing prompt to promote a sense of being in the virtual "room" together, as well as to provide the facilitator with a visual cue as to participants' progress with the writing exercises. Writing sessions were not recorded. Each week's prompts were sent out via email after the session so that participants who could not make the live virtual session could complete the assignments on their own before the next session.

iii. Facilitator role and qualifications

The program facilitator for the trial has nearly 40 years of experience in designing, teaching, and facilitating expressive writing in academic, clinical, and research settings. He holds a Master of Arts in Teaching (English), a Master of Arts (English), and a Doctorate of Education with post-doctoral specialization in curriculum and instruction for post-secondary writing and literature. In addition, he has studied mindfulness and authored five books, including *Wellness & Writing Connections* and *Expressive Writing: Words that Heal*, co-authored with James Pennebaker, PhD [25]. During the intervention, the facilitator's role was to guide participants through the writing prompts and post-writing surveys, and to manage session time-keeping. In a few of the sessions, when time permitted, the facilitator guided a brief discussion at the end of all of the writing prompts, inviting participants to reflect on their writing experience.

e. Measures

Primary outcome: resilience. The primary outcome was assessed with the Connor-Davidson Resilience Scale (CD-RISC), a validated 25-item scale to measure resilience assessed in numerous populations [26].

2.1. Secondary outcomes

Depressive symptoms. Depression symptoms were assessed using the 20-item Center for Epidemiologic Studies Depression Scale – Revised (CESD-R), a common screening tool to assess self-reported depressive feelings and behaviors within the past week [27].

Perceived stress. Perceived stress was assessed with the 10-item Perceived Stress Scale (PSS-10), a commonly used questionnaire to evaluate responders' perceptions about their level of stress and their ability to cope with stress over the past month. Using a 4-point Likert-type scale, participants selected the degree to which each item best reflects their thoughts and feelings within the past month. Results from this questionnaire have demonstrated acceptable levels of validity and reliability [28].

Post-traumatic growth. Post-traumatic growth was evaluated with the 21-item Post-Traumatic Growth Inventory (PTGI), an instrument for assessing positive outcomes reported by individuals who have experienced traumatic events. The PTGI includes factors such as New Possibilities, Relating to Others, Personal Strength, Spiritual Change, and Appreciation of Life [29].

f. Data collection and analysis

Enrollment, retention, and adherence data were tracked by the study coordinator using a Microsoft Excel spreadsheet. Other study data were collected directly from the participants via surveys administered in REDCap (Research Electronic Data Capture), a secure, web-based electronic research data capture tool hosted by Duke University [30]. Statistical analyses were performed using RStudio Version 1.2.1335. Two-tailed paired-sample t-tests were used to assess change over time while the level of statistical significance was set at 0.05 ($p < 0.05$). Effect sizes are presented using Cohen's d . Cohen's d values suggested that $d = 0.2$ be considered a small effect size, 0.5 represents a medium effect size, and 0.8 a large effect size.

3. Results

a. Sociodemographics

The study participants ($n = 63$) were predominantly white (87.3 %) and female (88.9 %) (**Table 1**). 31.7 % of participants had obtained a bachelor's degree, and 57.2 % held a master's or doctorate-level graduate degree. 19.1 % of participants reported annual household income less than \$50,000 per year, 30.2 % reported an income of \$50,000–\$99,999 per year, and 42.8 % reported annual household income of over

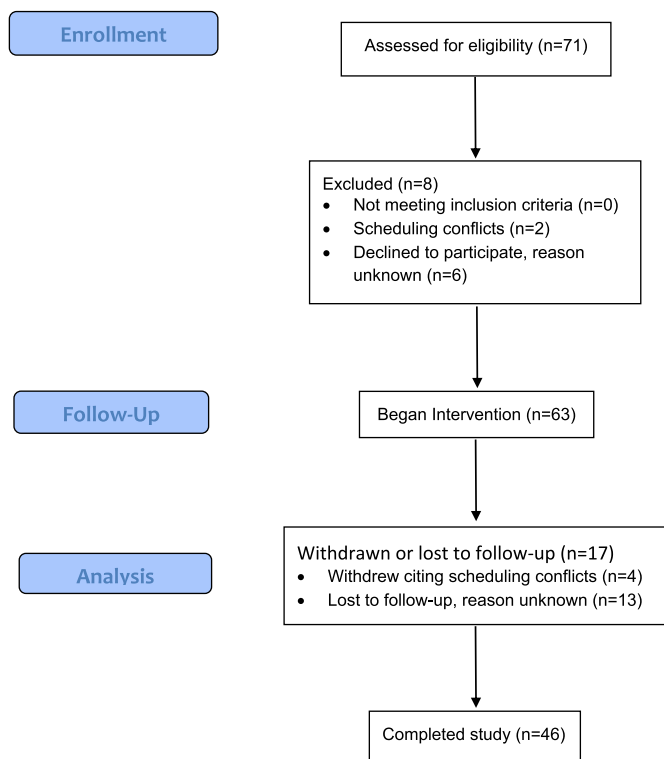


Fig. 1. CONSORT 2010 flow diagram.

\$100,000 per year.

b. Enrollment and retention

123 participants responded to the study recruitment email, and 71 completed full baseline screening measures. The majority of individuals who chose not to participate cited scheduling conflicts. 63 participants began the intervention and were included in the baseline analysis. 4 individuals withdrew from the intervention shortly after it began due to scheduling conflicts, and 13 were considered lost to follow-up. 46 individuals were considered to have completed the study. See Fig. 1 for CONSORT flow diagram.

c. Adherence

Adherence to the intervention was defined by participants' completion of the writing prompts as indicated by (1) attendance of the live writing sessions and (2) completion of the post-writing surveys. If a participant either attended a writing session via Zoom and/or sent in completed post-writing survey forms for that session (even if they were unable to make the session live), they were considered to have participated in that session. Writing sessions were not recorded in order to protect participants' privacy.

A participant was considered adherent if they completed at least 5

out of the 6 writing sessions. 63 participants completed at least 1 writing session, and 43 (68.3 %) were considered adherent to the intervention.

d. Acceptability

No adverse events were reported. Participant responses to the question, "to what degree was the writing meaningful and valuable for you" averaged 8.0 on a 0- to 10-point scale for all types of writing. See Table 2 for scores on specific types of writing. Participants also shared their reflections on the writing activities, expressing their satisfaction, emotions, and feelings during the intervention. Sample comments from participants are reported in Table 3 as an informal demonstration of the acceptability of the intervention.

e. Preliminary efficacy

We hypothesized that (a) participants' resilience and post-traumatic growth scores will increase and (b) perceived stress and depression symptoms scores will decrease immediately after the 6-week intervention and at one-month follow-up. See Table 4 for instruments to measure primary and secondary psychological outcomes.

I. Primary outcome: resilience

CD-RISC scores increased from baseline (66.6 ± 14.9) to immediately post-intervention (73.0 ± 12.4 ; $p = 0.014$), and were maintained at a one-month follow-up (72.9 ± 13.6 , $p = 0.024$). The effect size immediately post-intervention (6 weeks) was small (Cohen's $d = 0.31$) as well as at one-month follow-up (10-weeks; Cohen's $d = 0.28$).

II. Secondary outcomes

Perceived stress: Perceived Stress Scale (PSS-10) scores decreased from baseline (21.8 ± 6.6) to immediately post-intervention at 6 weeks (18.3 ± 7.0 ; $p = 0.008$), and decreased further at the 1-month follow-up (16.8 ± 6.7 ; $p = 0.0002$). The effect size immediately post-intervention at 6-weeks was small (Cohen's $d = 0.41$), and became medium at 1-month follow-up (10-weeks; Cohen's $d = 0.56$).

Depression symptoms: Depression symptoms (CESD-R) descriptively decreased from baseline (23.3 ± 15.3) at follow-up timepoints 6 weeks (17.8 ± 15.4 ; $p = 0.058$), and 1 month post-intervention (15.5 ± 12.7 ; $p = 0.004$). The effect size immediately post-intervention at 6 weeks was small (Cohen's $d = 0.22$), as well as at 1-month follow-up (10-weeks; Cohen's $d = 0.38$).

Post-traumatic growth: Post-traumatic growth (PTGI) increased from baseline (41.7 ± 23.4) to immediately post-intervention (55.8 ± 26.4 ; $p = 0.004$), and the increase was maintained at the 1-month follow-up (55.9 ± 29.3 ; $p = 0.008$). The effect size immediately post-intervention at 6 weeks was small (Cohen's $d = 0.44$), as well as at 1-month follow-up (10-weeks; Cohen's $d = 0.49$).

COVID-19 impact: At baseline, 23.8 % of participants reported having had a close family member with COVID-19, 36.5 % had lost income or work since the beginning of the pandemic, and 55.6 % had experienced significant changes in work arrangements. 9.5 % of

Table 2

Acceptability Ratings: Meaningfulness and Value of the Writing Exercises. Participants used a scale of 0–10 to answer, "To what degree was the writing meaningful and valuable for you?".

Intervention Week	Week 1: Pennebaker Paradigm	Week 2: Releasing & Integrating Difficult Emotions	Week 3: Nurturing Gratitude	Week 4: Embracing Strengths & Resources	Week 5: Cultivating Positive Meaning & Savoring Goodness	Week 6: Inviting Insight, Perspective, & Growth	Overall Mean
Mean Rating (SD)	7.7 (2.04)	8.3 (1.74)	8.1 (2.17)	7.8 (2.15)	8.0 (1.73)	8.1 (1.78)	8 (1.94)
Mean N	50.5	41.7	39.3	39.3	38	35.7	40.8

*Mean N refers to the mean number of post-writing surveys that were turned in by participants each week.

Table 3
Representative participant comments.

Intervention Week	Participant Comments
Week 1: Writing to express difficult emotions	<ul style="list-style-type: none"> • “I was surprised at what I wrote. Didn’t expect this wise voice to show itself.” • “With this prompt, I was able to get in touch with deep feelings that brought tears to my eyes. I realized that I have been repressing feelings of sadness and distracting myself from emotions by keeping busy, with walks, watching the birds, playing board games, doing word puzzles, and other ways of keeping feelings at bay.” • “It felt cathartic, as if stuck emotions were released instead of remaining bottled inside. It also felt good to write things I would not share with family or friends in fear of insulting their experience.” • “During this exercise I remembered the pain and difficult times but tried to focus on the future and the strengths that I have gained so that I can deal with my fears of the future and move forward. Putting all of this into words has given me more strength and a better perspective.”
Week 2: Writing to release & integrate difficult emotions	<ul style="list-style-type: none"> • “I found this writing deeply satisfying because it gave me a sense of my own resources for finding contentment and satisfaction while having my life greatly shrunken in terms of going out into the world.” • “Wow! I realized I like to be in control and don’t always accept life’s circumstances. Interesting.” • “This writing is about what means most to me and what I can let go of—and those are probably the most important choices we make each day. I felt a little sad when I wrote about my greatest fear—of losing someone I love during this time, either from COVID or another natural cause. But I don’t want to dwell with that thought and let me lose the opportunities of today. This writing caused me to both go to the darkest thought as well as understand that living in that fear will rob me of today’s opportunities.” • “WHEW!!! I forgot I had a choice to choose how I show up in this world. The writing experience allowed me to examine how I’d like to move forward. It’s given me a deeper perspective on my value and worth.”
Week 3: Writing to nurture gratitude	<ul style="list-style-type: none"> • “Wow. I could have written more. I didn’t stop to breathe. I let my pen glide back and forth on my note pad. I am looking at this pandemic as a chance for a do-over, and that came out quickly while writing. I felt as though my thoughts and pen were challenging me to do something, to be happier.” • “I resisted this prompt at first. Ugh, I am not a poet, I thought. I didn’t fight it and I used the format and I really like what I wrote. I am so grateful that I signed up for this study because I really like the poem and I would never have written it but for the study. Afterwards, I am feeling kind of proud of myself and hopeful that I may write some other poetry or prose in the future.” • “Gosh-stop already-this is so powerful. I was resistant. Write a dumb poem. Whatever. I used a little of the prompt and then just wrote. I don’t know if it is a poem. But it kind of blew me away-I think the prompt is what I really resonated with and I would write a few lines and then write that prompt again and write a few more lines. It took me to a depth that was surprising and peaceful. I wouldn’t say I am happy really. But on a

Table 3 (continued)

Intervention Week	Participant Comments
Week 4: Writing to invite enhance strengths & resources	<p>scale of 1–10 I am 100 for contentment and peace. (and usually at a 2)”</p> <ul style="list-style-type: none"> • “This writing put me in a happy place. I ended it with a short positive to-do list of things to remember during COVID-19 such as, listening to music, writing about feelings, looking at photos and other things that are simple mindful pleasures. I noticed today that with each writing session I am feeling happier and more positive. There was definitely a cumulative effect for me.” • “It took me a few minutes to begin writing, as I felt anxious ... but after some deep breaths, and a “drop into mindfulness, “I wrote freely, and I felt more peaceful. I’ll keep going with this, as I felt some real purpose and positive energy behind it once I let go of my own judgments toward self ... I feel empowered right now.” • “This write felt like waves coming in and out that were building as the tide was coming in. It had a cleansing and refreshing quality that required work but was satisfying for the effort.” • “This exercise made me feel strong and when I reread what I wrote I realized that it was very positive. This made me realize that I do believe in myself and that I do have faith that I can handle all the affirmations that I made. This again made me cry.” • “Wow, this made me feel really good while writing. I do have an opportunity, and I do not want to squander the opportunity, so it put a spark in me.”
Week 5: Writing to cultivate positive meaning & savor goodness	<ul style="list-style-type: none"> • “Writing trickled out at first as I reflected back to the beginning of COVID. Realized a good number of silver linings in the early days. Not sure if that was hope or fear wrapped up in those silver linings, but capturing them and writing them down made a positive difference in my life, and in the lives of those around me. Felt calm and happy during and after writing.” • “The writing went well I was open and honest and I said how I feel. This week feels harder and scarier and I acknowledged that in my writing.” • “After consciously setting aside my usual pessimistic approach, I found it surprisingly easy and pleasant to look for-and find-the good. It made me feel stronger and more powerful. I intend to practice this!” • “I had a hard time avoiding thinking about all of the negative things but after about 5 min I was able to get on a positive vein. The best part of this writing for me was remembering to look for the positive things because there are so many that we can’t know about yet. This writing made me feel a little positive in the end and helped me feel gratitude.”
Week 6: Writing to invite insight, perspective, & growth	<ul style="list-style-type: none"> • “All this had me realize that life is precious, whether that person is nearing the final decades, or has most of their life ahead of them. Although I have thought about this, here is the first time it’s on paper. The writing wasn’t difficult, just eye-opening.” • “Writing a letter to a future generation about 2020 was lovely. It was deeply satisfying to frame the chaos of the pandemic in terms of hindsight, and to emphasize my values through that frame. It reinforced that there is a choice –and that I see the heroes, the helpers, the creative solutions, the Love that’s bringing us

(continued on next page)

Table 3 (continued)

Intervention Week	Participant Comments
	<p>through this time and that is the story I will tell.”</p> <ul style="list-style-type: none"> • “It was hard at first but I decided to focus on the positive things and that made me feel better. It’s very hard to think of a positive thing without going right back to the negative stuff but I am getting better at it.” • “I feel like the writing gives me the opportunity to move verbalize stagnant emotions -out of my mind and out of my body. It gives me the chance to assess and move ideas and concepts. Otherwise these seem to weigh heavily on my heart and in my stomach.”

participants had experienced the loss of a loved one due to COVID-19, and 19.0 % reported having lost access to health care or mental health care. 50.8 % of participants reported other serious pandemic-related disruptions, such as caring for elderly family members, significant social isolation, fear of contracting COVID-19, and secondary trauma due to working on the front lines of mental health care.

4. Discussion

This study aimed to evaluate the efficacy of a 6-week expressive writing intervention to improve resilience during the COVID-19 pandemic. Results demonstrate that the intervention increased resilience and post-traumatic growth while decreasing depression symptoms and perceived stress, results which were maintained at a 1-month follow-up after completion of the intervention. 68.3 % of participants were considered adherent to the intervention and responded to follow-up surveys at the 6- week and 1-month post-intervention time points. The use of a virtual conferencing platform (Zoom) to deliver the expressive writing intervention was successful and well-accepted by participants. Some participants experienced technical challenges with the Zoom interface at the beginning of the study, but the issues were resolved quickly and no further issues persisted. Overall, participants reported that the writing exercises were valuable and meaningful to them in post-writing surveys, which is consistent with our prior in-person study of expressive writing [12]. Thus, these results suggest that expressive writing based on the *Transform Your Health: Write to Heal* program and adapted to the COVID-19 pandemic can be feasibly and effectively delivered using an online virtual platform.

The COVID-19 pandemic is associated with worsening mental health, increasing the prevalence of depression and anxiety [31]. The mean baseline depression score for our participants was above the threshold for risk of clinical depression [32] and the mean baseline resilience score was comparable to that of trauma survivors [12]. During the first 2 weeks of our expressive writing intervention participants were encouraged to write about difficult or negative emotions related to the pandemic. Expressive writing about challenging events has been found

to be more effective at easing negative dimensions of mental health than emotionally neutral fact-based writing and is correlated with post-traumatic growth [10,33]. Weeks 3 through 6 of our intervention guided participants through writing prompts that focused on nurturing resilience and positive emotions. Evidence-based positive psychology techniques such as savoring positive moments, reflecting on gratitude, and practicing optimism were adapted to our expressive writing prompts [19–24,34].

In post-writing surveys, participants reported that the writing prompts helped them to express deeply held emotions and to thoughtfully examine their perspectives on current events. To date, much of the research on interventions for trauma resilience has focused on adverse events that happened in the past, such as adverse childhood events, sexual assault, or wartime combat. Those studies primarily focus on the role of positive rumination about past experiences, which can lead to meaning-making and post-traumatic growth [35]. On the other hand, our findings offer insight into the impact of expressive writing on resilience during an ongoing trauma. The results of our study are consistent with the findings of similar studies that tested the effects of expressive writing interventions for participants experiencing ongoing trauma. For example, La Marca, Maniscalco [36] reported that expressive writing successfully decreased the psychiatric symptoms and alexithymia (i.e., loss of abilities identifying or describing emotions) and increased health-related quality of life of first-time cancer diagnosis patients undergoing chemotherapy or immunotherapy. Future studies can apply expressive writing interventions to broader populations and test their effectiveness in diverse situations.

Despite the fact that most of the psychological variables we measured improved across the program, the effect sizes were relatively small [28]. Nonetheless, our Cohen’s effect sizes for resilience, depression, stress, and post-traumatic growth are consistent with prior expressive writing studies [12,37]. It is possible that a more homogeneous patient population, as observed in our prior study in trauma patients, may be more amenable to large effect sizes, and that broadening the patient population to a more general population decreases this effect [12]. Different effect sizes may also be due to heterogeneity in gender differences, timing of assessment, and differences in the severity of traumatic events. The homogeneity of participants may help delivering more tailored, situationally appropriate interventions to the target group. For example, participants may feel more comfortable writing in a group with similar traumatic experiences. Additional studies of expressive writing in more homogeneous patient populations are warranted to evaluate this discrepancy. We may also conduct future studies with participants having a similar baseline level of resilience or other psychosocial functions and test the effects of the online expressive writing intervention.

Several expressive writing studies have been conducted during COVID-19 with the aim to improve response to stress [38,39]. The results of those expressive writing studies during the COVID-19 pandemic have been mixed. One study on expressive writing for health care workers during the COVID-19 pandemic found that participants who received a writing intervention showed higher improvements in PTSD,

Table 4
Primary and secondary outcomes.

Outcome	Measure	# of Items	Scale	Range	High Score Means	Time Point
Resilience	CD-RISC	25	0 (Not true at all) to 4 (True nearly all of the time)	0–100	Greater resilience	T1, T2, T3
Depression Symptoms	CESD-R	20 (4 reverse- score items)	0 (Not at all or less than one day) to 4 (Nearly every day for 2 weeks)	0–60	≥16 = risk for clinical depression	T1, T2, T3
Perceived Stress	PSS-10	10 (4 reverse-score items)	0 (Never) to 4 (Very often)	0–40	Higher perceived stress	T1, T2, T3
Post-traumatic Growth	PTGI	21 (5 factors: Relating to others; New possibilities; Personal strength; Spiritual change; Appreciation of life)	0 (I did not experience this change as a result of my crisis) to 5 (I experienced this change to a very great degree as a result of my crisis)	0–105	Higher level of PTG	T1, T2, T3

depression, and global psychopathology symptoms than participants assigned to a neutral writing control group [40]. On the other hand, one randomized study reported increased stress with expressive writing compared to treatment as usual, suggesting that expressive writing may at times lead to less than favorable outcomes [38]. Our study may have had different results because our intervention differs from other intervention programs in several aspects, including the expressive writing approach, study duration, and outcomes assessments. Thus, a longer study duration, larger sample size, and multi-center approach combined with the *Transform Your Health: Write to Heal* program structure may provide a more rigorous and effective study design. Further research should be conducted to develop an optimized expressive writing intervention tailored to the unique needs of people who are influenced by the multidimensional challenges of COVID-19.

4.1. Limitations

Limitations include a patient sample that was relatively homogenous in terms of race and gender: our cohort was mostly white, mostly female, and highly educated, and results may not necessarily be generalizable to a wider population. Our inclusion criteria were broad, as we did not specify how participants had to have been affected by the pandemic in order to participate, and this may have limited the homogeneity of our sample. Many participants expressed unsettled feelings by the racial protests in the aftermath of George Floyd's murder in late May 2020, which may have added an unexpected confounding variable of stress throughout the study period. There was no control group and no randomization, given the preliminary nature of this work. As we used a one-group pretest-posttest design, we cannot guarantee that the quality of the intervention maintained to our usual face-to-face program or that the impacts of this intervention were perceived in the same way by participants. Finally, participants were a self-selected group of individuals who were likely already interested in expressive writing and complementary approaches to health and well-being, potentially adding bias and confounding to our results.

5. Conclusions

This is one of the earliest trials of expressive writing conducted for resilience during the COVID-19 pandemic. While previous research on expressive writing for resilience to a trauma has largely focused on incidents that happened in the past, our study sheds light on the prospective impact of expressive writing on mental well-being in the midst of an ongoing trauma. Study participants significantly improved their resilience, depression symptoms, perceived stress, and post-traumatic growth over the course of 6 weeks that was maintained one month after the intervention. Our findings also affirm the feasibility of administering an expressive writing intervention online, which has valuable implications in the context of pandemic-related physical distancing guidelines. Expressive writing is an accessible, scalable, low-burden, and cost-effective intervention that may have wide relevance to the general population throughout the extended COVID-19 crisis and beyond. Further studies are warranted to examine the impact of expressive writing in the context of COVID-19 in more racially diverse samples and in sub-populations such as frontline health care workers or COVID-19 survivors.

CRedit authorship contribution statement

Elizabeth Bechard: Conceptualization, Methodology, Software, Investigation, Resources, Data curation, Writing – original draft, Project administration. **John Evans:** Conceptualization, Methodology, Investigation, Writing – review & editing. **Eunji Cho:** Writing – review & editing. **Yufen Lin:** Writing – review & editing. **Arthi Kozhumam:** Writing – review & editing. **Jill Jones:** Writing – review & editing. **Sydney Grob:** Writing – review & editing. **Oliver Glass:**

Conceptualization, Methodology, Formal analysis, Writing – review & editing.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ctcp.2021.101460>.

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