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Research article

A Cross-Sectional Comparison of Perceived Stress and Emotional Affect between Adults with and without Emotional Disturbances Using a Novel Vibroacoustic Strategy

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Abstract

Perceived stress has increased due to the COVID-19 pandemic. In addition, those with diagnosed emotional disturbances note higher perceived stress ratings than those without these conditions. Emotion-focused coping can be a practical adjunctive component with problem-based solutions during elevated stress. However, it is unknown if there are differences in perceived stress levels and emotional affect in adults with and without emotional disturbances using a novel emotion-focused coping strategy. A cross-sectional study of 97 adults using the novel strategy completed an online survey of the Perceived Stress Scale (PSS-10) and Positive and Negative Affect Schedule (PANAS). Group one (NEDG) included 34 individuals without a history of emotional disturbance. Group two (EDG) included 63 individuals reporting an emotional disturbance (Anxiety; N= 58 & Depression; N=5). There was no significant difference in perceived stress between the NEDG (17.6 + 5.3) and EDG (17.0 + 5.5) groups. Moreover, there were no significant differences in PANAS between groups. Positive affect was in the 51st percentile (95 % CI: 45.7-56.6%), and negative affect was in the 74th percentile (95% CI: 70.4-78.9%) of normative data. Individuals with or without emotional disturbance may experience similar perceived stress levels and emotional affect while using a novel coping strategy. Additional research investigating this novel strategy is warranted.

Keywords: Perceived Stress Positive Affect, Negative Affect, COVID-19, Stress Management, Emotional Coping, Vibroacoustic Therapy

Key Practitioner Message

- Emotion-focused coping includes vibroacoustic therapy that facilitate a relaxation response.
- Individuals with and without reported emotional disturbances using a novel, vibroacoustic strategy did not differ in perceived stress, positive affect, or negative affect.
- Perceived stress levels in those using the novel strategy were similar to population norms prior to the COVID-19 pandemic.
- Individuals with reported Anxiety using the novel strategy reported improvement in their condition.

Introduction

Perceived stress levels have increased from the COVID-19

pandemic [6]. Prior to the COVID-19 pandemic, perceived stress levels in diverse (age, gender, education, etc.) adults, as determined by the perceived stress scale (PSS-10), were approximately 16-18 pts [1-3]. Since the pandemic, average PSS-10 scores have increased to approximately 20-29 pts [4-8] and those with anxiety disorders have higher perceived stress scores compared to nonanxious individuals [2,3,5,8,9]

Prolonged stress severity can result in anxiety and depressive disorders [10] and negatively influence health and mortality [11]. There are emotional differences between those with and without anxiety or depressive disorders. Individuals with anxiety and depressive disorder demonstrate affective hyperactivity and describe feeling more threatened and less in control of their emotions when compared to nonanxious individuals. Moreover,

excess stress can lead to an anxiety disorder relapse [12]. There are emotional differences between those with and without anxiety or depressive disorders. Individuals with anxiety and depressive disorder demonstrate affective hyperactivity and describe feeling more threatened and less in control of their emotions when compared to nonanxious individuals [32]. Moreover, individuals with anxiety or depressive disorders have a lower positive affect and higher negative affect compared to individuals without these disorders [13-16].

Emotion-focused coping is a component of stress management intended to lower perceived stress and negative affect. Emotion-focused coping includes soothing behaviors or mechanisms that provide extrinsic and intrinsic processes involved in monitoring, evaluating, and modifying emotional reactions [17,18]. Soothing activities may include listening to music, taking a shower, massage, and meditation. Listening to music was one of the most effective coping strategies during the COVID-19 pandemic [19, 21]. In addition, non-noxious sensory activities (e.g., touch, massage) for relaxation appear to lower physiological stress markers (e.g., heart rate, blood pressure, and cortisol levels) and increase hormones (oxytocin, serotonin, and dopamine) associated with positive mood and mental well-being [22-24].

Sensate® (BioSelf Technology, London, England) is a vibrotactile wellness device providing a non-noxious, somatosensory activity called Somacoustics [25]. Somacoustics combines infrasonic resonance with aural soundscapes, which posits a soothing experience for emotion-focused coping. This proposed activity is like vibroacoustic therapy, which uses infrasonic sound (< 50 Hz) to produce vibrations while applied to the body [26]. Skille, suggests that vibroacoustic stimulation may improve stress-induced depression, anxiety, tension, and fatigue.

Bartel et al. [27] offered a theoretical basis using sound vibrations, including infrasound, for various health benefits but acknowledged the complexity of sound vibrations and suggested additional research is needed exploring delivery types (e.g., sound frequency, body location) on various health conditions. A 2013 qualitative study was conducted with 11 individuals completing six (30-60 minute) sessions of low-frequency (27-113 Hz) sound applied to the posterior side of the whole body while individuals were in a [28]. Individuals were instructed to close their eyes during each session. However, there was no indication of additional music added for listening. Subjective improvement in perceived stress and emotional enrichment (e.g., inner peace, self-awareness, and clarity) was noted, and individuals reported a positive experience from the sessions [28].

However, no formal stress or emotional questionnaires were used for assessment. A 2019 study implemented low-frequency (Hz level not disclosed) music impulse stimulation on the abdomen of 18 adults with depression while they listened to synchronized music [29].

Individuals completed eight 20-minute sessions throughout 1-month. Results from the study suggest a significant improvement in the Hamilton Depression Rating scale and improvement in depressive symptoms with no adverse side effects [29]. These findings do offer some possible support for low-frequency vibroacoustic stimulation for stress and depression, but additional research is needed, as recommended by Bartel et al. [27]. There-

fore, investigating whether the use of this novel strategy can attenuate the known disparities in perceived stress and affect between adults with and without emotional disorders constitutes a critical step in assessing its real-world utility.

Purpose

This study aimed to determine if there was a difference in perceived stress, positive affect, and negative affect in adults with and without an emotional disturbance using Somacoustics. A secondary purpose is to determine subjective changes in emotional disturbance while using Somacoustics.

Materials and Methods

This study was a cross-sectional, observation of comparative analysis of current adults using Somacoustics for stress management. While a longitudinal design with a traditional control group offers the highest level of efficacy evidence, this comparative design provides preliminary evidence on the current state of users. Participants were recruited from a marketing email sent by the manufacturer to individuals who purchased the novel device before June 2022. In addition, a link was provided on the manufacturer's social media accounts to encourage consumer participation. Inclusion for this study were adults (> 18 years of age) who were consistent users of the novel device (> 3 days per week) between one to six months. There were no incentives offered for participation.

Individuals were assigned to either a group with or without a self-reported diagnosis of an emotional disorder (e.g., Anxiety, Obsessive Compulsive Disorder, Post-Traumatic Stress Disorder, and Depression). The research dataset was obtained following Human Subject Regulations 45 CFR Part 46 and per the principles stated in the Declaration of Helsinki. Ethics approval was obtained by the Grand Canyon University Institutional Review Board.

An online survey was developed using Google Forms. The form was password protected, and only the researcher had access to the development and individual responses. Each question was an optional response, and participants could stop the survey anytime. Before beginning the survey, participants were informed of the purpose and the study. Participants acknowledged consent by agreeing to participate in the study. Survey questions were offered as either multiple-choice or multiple-checkbox responses. Participants were asked about their stress experiences prior to using the novel device. The historical stress assessment included standard terms for referencing stress (e.g., anxious, nervous, jittery, scared, worry, and dread). These questions were not previously validated but are standard terms used to assess prior stress [30].

Perceived stress was assessed with the Perceived Stress Scale-10 [30]. The PSS-10 instrument includes ten questions based on the original 14-item questionnaire that assesses how an individual perceives their current situation as unpredictable, uncontrollable, and overloaded. Each response is coded to a five-point Likert scale (0= never to 4=very often-4 pts) with a maximum score of 40 pts. The scale demonstrates acceptable consistency, validity, and reliability in several demographics and is commonly used in stress research [2]. Higher PSS-10 scores indicate more significant perceived stress [30].

Positive and negative affect was assessed with the Positive and Negative Affective Scale (PANAS) [16]. Positive affect assesses emotional constructs related to determination, enthusiasm, inspiration, and excitement. Negative affect assesses emotional constructs related to distress, fear, irritability, and nervousness. This questionnaire consists of 10 positive affect traits (e.g., PA; interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active) and ten negative affect traits (NA; distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery and afraid) [16]. Each response is coded to a five-point Likert scale A (1= not at all, to 5= extremely). PANAS is commonly used in positive/negative affective research, and higher scores (10-50 pts) represent more significant positive or negative affect. The instrument has high internal consistency and intercorrelations when assessing effect within a few weeks (PA=.87, NA=.87, and $r=-.22$) [16]. Prior research has demonstrated PANAS to be correlated with the Beck Anxiety Inventory, State Anxiety Scale, and Beck Depression Inventory [13,14, 16, 31].

Finally, a brief assessment of perceived changes in an emotional disturbance was included in the survey. Participants who reported being diagnosed with an anxiety or depressive order were asked if changes occurred in their condition (Worsened, No Change, Improved, or Greatly Improved). The survey was administered in August 2022, and the survey questions, minus PSS-10 and PANAS, are included in the Appendix.

Each instrument was coded as ratio and ordinal measures. Once coding was complete, the file was saved and imported to IBM SPSS v27 for statistical analysis. The sample size was based on approximate PSS-10 scores of those with emotional disturbance to be 4 pts higher than a baseline PSS-10 score of 19 [5, 6, 8]. Assuming a pooled standard deviation of 6.5 pts [5,6,8], an estimated sample of 84 participants (42 per group) to achieve a power of 80% and a significance of 5% (two-sided) was determined [41]. An independent sample t-test was used to assess possible differences between PSS-10 and PANAS. In addition, cross-tabulations using a chi-square analysis were performed on prior historical stress. A one-sample chi-square goodness of fit (GOF) test was used to assess the proportion of responses for perceived changes in emotional disorders. The alpha for this study was set at 95% ($p<.05$).

Results

Two hundred and thirty-one (231) individuals were evaluated for inclusion. Ninety-seven (97) individuals met the inclusion criteria. Group 1 included 34 individuals (No Emotional Disorder; NEDG); Group 2 included 58 individuals reporting a diagnosis of anxiety and 5 with depression (EDG). The average age of the included population was 48.9 ± 10.4 years. The population was skewed towards female participants, with 81.5% female and 18.5% male. The population's education level included 76% having at least a bachelor's degree and 46% having a graduate degree. There was no difference in demographics between groups. Detailed demographics of the sampled population are presented in Table 1.

The two questions about previous stress suggest differences in stress frequency and duration between groups. Fifty-three per-

cent (N=18) of the NEDG group reported experiencing stress sometimes or on occasion. In comparison, 79% (N=50) of the EDG group reported experiencing stress often or always. These differences are significant when running a chi-square analysis $X^2(3,n=97)= 13.14, p<0.01$.

Individuals within the emotional disorder group reported experiencing stress for a longer duration when compared to individuals in the nonemotional disorder group $X^2(5,n=95)= 17.01, p<0.01$. Eighty-seven percent (N=53) of EDG compared to 55.9% (N=19) of NEDG reported experiencing stress for greater than six months. Detailed stress history is presented in Table 1.

Somacoustic usage was similar between groups, with no significant differences in frequency, length, or duration. Most participants (>60%) reported using the 10- and 20-minute sessions, and close to 50% reported using the device 6-7 days per week. Detailed Somacoustic usage is presented in Table 2.

An independent sample t-test indicated no significant difference in PSS-10 levels between groups. Participants in NEDG had a mean PSS-10 score of 17.6 ± 5.3 (95% CI: 15.6-19.2), and participants in EDG had a PSS-10 score of 17.0 ± 5.5 (95% CI: 15.6-18.3). There was no significant difference in positive affect (NEDG= 31.5 ± 6.5 ; EDG= 32.0 ± 6.4) and negative affect (NEDG= 20.2 ± 6.4 ; EDG= 21.2 ± 6.8) between groups. In addition, over 70% of individuals using this novel strategy may result in a PSS-10 score considered as low to mild stress [3] (Figure 1).

A chi-square GOF test was performed to determine whether the proportion of those who indicated a diagnosis of anxiety reported an improvement (Improved and Greatly Improved) vs. no change in their condition. The proportions significantly differed with a preference for improvement compared to no changes $X^2(1,n=58)= 6.90, p<0.01$. Approximately 41.4% of those with anxiety report an improvement, and 26% of the participants report their anxiety as greatly improved. There was no significant difference in perceived anxiety changes between types of anxiety ($p=.07$), as noted by a Pearson chi-square test. Detailed responses are presented in Table 3.

Twelve individuals (55%) with a history of depression (n=18) reported an improvement in their depression. There was no reported response of worsening of depression, as seven reported no changes. Chi-square GOF was performed to determine if there was a significant difference between responses for improvement and no change, and the proportions did not differ, $X^2(1, n=18)=.80, p=.37$. Detailed responses are presented in Table 3.

Discussion

This was the first study examining possible differences in perceived stress, positive affect, and negative affect between adults using a novel coping strategy. Perceived stress scores in adults that used this method were similar to those prior to the COVID-19 pandemic [1-3]. It was believed that there would be differences in stress scores between those with and without an anxiety disorder. However, this was not the case. A 2017 cross-section study compared PSS-10 scores in adults (N=150) with confirmed anxiety disorders with active symptoms but no

Table 1. Detailed demographics of the study population.

	Group		
	NEDG	EDG	
MEAN AGE + SD (yrs)	49.1 + 9.4	48.5 +10.9	
Gender	Total (%)		
Male	8	10	18 (18.6)
Female	26	53	79 (81.4)
Total	34	63	97 (100)
<u>EDUCATION</u>			
High School or Equivalent	1	6	7 (7.2)
Some College	2	7	9 (9.3)
Vocational Training	1	6	7 (7.2)
Bachelors Degree	13	16	29 (30)
Graduate Degree	17	28	45 (46.4)
Total	177	63	97 (100)
<u>STRESS FREQUENCY</u>			
Never	0	1	1 (1.0)
Sometimes or On Occasion	18	12	30 (30.9)
Often	12	37	51 (52.6)
Always	2	13	15 (15.5)
Total	34	63	97 (100)
<u>STRESS DURATION</u>			
Not Applicable-Stress was managed	6	0	6 (6.3)
< 1 Month	2	2	4 (4.2)
1-2 Months	1	2	3 (3.2)
3-4 Months	3	1	4 (4.2)
5-6 Months	3	3	6 (6.3)
> 6 Months	19	53	72 (75.8)
Total	34	62	96 (100)

EDG: Emotional Disturbance Group; NEDG=No Emotional Disturbance Group; SD= standard deviation

comorbid major mental health illness. Individuals in the high anxiety group (HAM-A >17 pts) had PSS-10 scores nearly 7 pts higher than those in the low anxiety group (21.8 + 4.7 vs. 14.2 + 5.9; $p < 0.001$) [33]. Moreover, as PSS-10 scores increased, so did anxiety symptomatology. Interestingly, nearly all the participants (96%) reported not receiving treatment for their anxiety. Andreou et al. [3] experienced similar results with increased anxiety symptoms as PSS-10 scores increased. Stress scores tend to increase by approximately 1.5-2 pts with each added symptom and 3-4 pts with each progressive classification change in the Depression Anxiety Stress Scale (DASS-21). The DASS-21 is not a categorical measure of clinical diagnoses for depression or anxiety but does have high associations with the PHQ-8 ($r = .71$, $p < .001$) for depression and GAD-7 ($r = .61$, $p < .001$) for anxiety [34]. More recent studies suggest a 4-5 pt increase in PSS-10 scores in individuals with mental health problems [5,9].

When comparing pre-stress assessments from the current study, there was a significant difference in the number of individuals feeling stress over a longer duration. Over 85% of EDG participants reported feeling stressed for longer than six months compared to approximately 55% of NEDG participants ($X^2(5, n=95) = 17.01$, $p < 0.01$). The two pre-stress questions offered similar wording and duration to criteria within the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) for evaluating generalized anxiety [35]. Therefore, many NEDG participants might have an undiagnosed anxiety disorder, or they chose to abstain from reporting a diagnosis of a listed mental health condition. Second, participants surveyed in our study were purposefully using a method to help manage their stress. Approximately 70% of study participants reported using the novel coping strategy for 5-7 days per week, and the average length of use was 3.5 months. Therefore, the use of the novel coping strategy, along with other possible stress management options, may have influenced the outcome and prevented assessing possible differences between study groups. This is further discussed in the discussion.

Albeit there was no difference in PSS-10 scores between groups, the results are similar to normative gender and age data prior to the COVID-19 pandemic and during the COVID-19 pandemic. The current study was skewed towards female participants, but there was no significant difference between male and female stress scores (Female = 17.4 + 5.3; Male = 16.2 + 6.5; $p = .23$). Cohen et al. [2] compared three national surveys incorporating the PSS-10 and demographics between 1983, 2006, and 2009. In 2009, the mean PSS-10 score in women (N=1032) and men (N=968) was 16.1 + 7.6 and 15.5 + 7.4, respectively. When considering the age of the 2009 sample, the results are similar to the current study. Men and women between 45-54 years (N=219) had a stress score of 16.9 + 7.8, and the mean age and PSS-10 score of our study population were 48.8 + 10.4 years (95% CI: 46.6 -50.8 yrs) and 17.1 + 5.5 (95% CI: 16.0-18.3) respectively. Normative data from Andreou et al. [3] reported PSS-10 scores in adults over 35 years of age (N=318) to be 16.7 + 6.5, and women score higher than men by approximately 2 pts. A 2018 study provided PSS-10 data from adults (N=74; 41 female, 33 male) aged 25-59 years (Mean; 39.4, + 5.76), completing an in-app guided mindfulness program. Initial PSS-10 of those using the mindfulness app and control group were 16.7 + 5.3 and 17.6 + 6.0, respectively [1]. In contrast, PSS-10 scores of those using this novel coping strategy are lower than assessed PSS-10 scores (20-22 pts) of similar demographics (i.e., college-educated middle-aged females) during the COVID-19 pandemic [4, 5-8, 36].

Agyapong et al. [8] conducted a comparative cross-section study assessing the effectiveness of a text message intervention (TEXT4HOPE) focused on reducing stress, anxiety, and depression during the pandemic. Individuals (N=766) self-subscribed to a 6-week program receiving daily supportive text messages. The current study exhibited similar demographics to the Agyapong et al. [8] study, where 88% (N=678) of the participants were female, 61% (N=413) of females were between 41-60 years of age, and 89% of females (N=611) reported having a college education. Results from the TEXT4Hope program resulted in a 4% decrease in the PSS-10 score (20.4 + 6.7 to 19.5 + 7; $p < .001$) yet remained similar to other studies assessing PSS-10 during the COVID-19

pandemic [4, 5, 6, 36]. Based on these data, PSS-10 scores in the current study support pre-pandemic similarities, and over 70% of individuals using this novel strategy may result in a PSS-10 score considered low to mild stress [3] (Figure 1).

There was no significant difference in positive affect between groups (NEDG= 31.5 + 6.5; EDG=32.0 + 6.4) in this study. Positive affect with both groups was similar to established nor-

mative data from the general population and individuals with managed mental health conditions (e.g., anxiety, depression) (PA=30-32 pts) [13, 15,16]. In addition, negative affect between both groups was not significantly different (NEDG= 20.2 + 6.4; EDG= 21.2 + 6.8) but was higher than population norms [15,16]. Interestingly, the NA scores were similar to those with emotional disorders receiving a novel, transdiagnostic internet-based treatment protocol (20-22 pts) and lower than patients not receiving treatment (28-30 pts) [13,14].

Table 2. Somacoustic usage between groups.

	Groups		Total (%)
	NEDG	EDG	
WEEKLY FREQUENCY			
3 Days	2	17	19 (16.6)
4 Days	8	7	15 (15.5)
5 Days	7	9	16 (16.5)
6 Days	1	5	6 (6.2)
7 Days	16	25	41 (42.3)
Total	34	63	97 (100)
LENGTH OF USE			
1 Month	7	4	11 (11.3)
2 Months	5	16	21 (21.6)
3 Months	9	19	
4 Months	6	6	
5 Months	4	7	
6 Months	3	11	
Total	34	63	
DURATION OF USE			
10 Minutes	15	18	33 (34.4)
20 Minutes	11	18	29 (30.2)
30 Minutes	4	17	21 (21.9)
> 30 Minutes	4	9	13 (13.4)
Total	34	62	96 (100)

Table 3. Perceived changes in emotional disturbances

	Groups				Total (%)
	AX	AX with OCD	AX with PTSD		
PERCEIVED ANXIETY					
Worsened	0	0	0	0	0(0)
No Change	5	6	9	9	19 (32.8)
Improved	14	3	4	4	24 (41.4)
Greatly Improved	10	3	2	2	15 (25.9)
Total	29	14	15	15	58 (100)
PERCEIVED DEPRESSION CHANGE	D	D with AX	D with OCD	D with PTSD	Total (%)
Worsened	0	0	0	0	0 (0)
No Change	2	2	2	1	7 (38.9)
Improved	3	5	1	1	10 (55.6)
Greatly Improved	0	0	0	1	1 (5.6)
Total	5	7	3	3	18 (100)

EDG: Emotional Disturbance Group; NEDG=No Emotional Disturbance Group

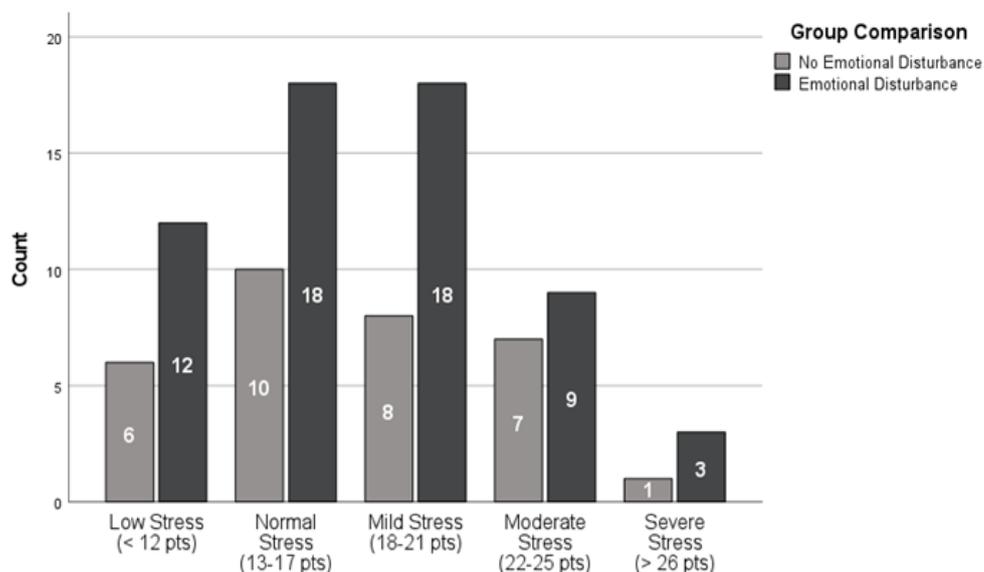


Figure 1. Perceived stress scale (PSS-10) classifications of study participants by group.

Crawford et al. [15] offered percentiles due to normative values from a non-clinical sample cannot estimate the rareness of an individual score. Based on this information, the participants in the current study had a positive affect rating in the 50th percentile (95% CI: 45.7-56.6%), and negative affect was in the 74th percentile (95% CI: 70.4-78.9%). However, as noted earlier, positive and negative affect scores were very similar to more recent studies with individuals with emotional disorders [13,14]. Diaz-Garcia et al. [15] evaluated the psychometric properties of PANAS in a clinical sample with anxiety (N=237) and depression (N=284). Results from the study demonstrate adequate assessment of positive and negative affect with norms much different than the general population [15,16]. Participants were recruited to participate in an online psychological treatment program [37]. The total sample's average positive affect scores were $20.2 + 6.9$, and negative affect scores were $29.1 + 8.14$. There were no differences in negative affect between those with anxiety and those with depression. However, individuals with depression scored significantly lower in positive affect by approximately 3 to 4 pts ($p < 0.01$) compared to those with anxiety [14]. The differences between scores in the current study may be attributed to the active management of an emotional disorder. Individuals in the Diaz-Garcia et al. [14] study had not started a treatment protocol for an emotional disorder. Therefore, the differences may be confounded by the practice use of a coping strategy resulting in the differences.

NA scores from the current study are similar to those participating in an online treatment protocol for emotional disorders [13, 37]. Díaz-García et al. [13] randomized individuals (N=216) to a transdiagnostic internet-based protocol (TIBP; $n = 71$), a TIBP+ positive affect component (TIBP+PA; $n = 73$), or a waitlist control group (WLC; $n = 72$). The primary treatment protocol was approximately 18 weeks, and participants were encouraged to work on one of the treatment protocols weekly, with messages encouraging participants to continue implementing the skills or techniques for management. The protocols were focused on down-regulating negative affect and promoting positive affect. Most of the study participants were female (72%), with over 50% having an anxiety disorder, with the leading comorbid disorder being depression [13].

After the treatment protocol, there were significant improvements in positive and negative affect compared to the control group. More specifically, individuals in the TIBP and TIBP+PA increased positive affect to $25.2 + 7.1$ and $27.3 + 9.2$, respectively, whereas WLC participants remained unchanged ($19.3 + 5$ and $19.7 + 7.3$). Moreover, there were significant decreases in negative affect in both treatment groups with no change in WLC participants ($28.6 + 9.0$ and $28.8 + 9.0$). The mean negative affect score post-treatment in the TIBP and TIBP+PA were $20.7 + 6.9$ and $20.8 + 8.3$, respectively. Results from the current study offer some promise of obtaining PANAS levels similar to those participating in a therapeutic program for emotional regulation.

At the end of the current study's survey, individuals with anxiety reported a significant proportion of improvement (67.2%) when compared to those reporting no change (32.8%) ($p < 0.01$). There was a slight difference, yet insignificant, between anxiety types and those responding in improvement. Individuals indicating a diagnosis of PTSD or OCD reported more unchanged re-

sults compared to those with possible general anxiety. There was no difference between those reporting an improvement or unchanged status in their depressive disorder. No participant with anxiety or depression reported worsening their condition using the novel coping strategy. It is unknown what improved with the participants since the survey did not assess specific symptoms. It is speculated that individuals experience some level of emotional relaxation. Individuals from the Ahonen et al. [28] study using low-frequency music with acoustic vibration reported a sense of emotional and physical relaxation with specific descriptive improvement with emotional enrichment, concentration skills, and tension & stress management without adverse effects [28]. The study by Sigurdardóttir et al. [29] suggests improvement in individuals with depression from targeted low-frequency acoustic vibration over 3-4 weeks. A more recent study suggests minimal stress and emotional response improvement from vibroacoustic therapy, but the researcher did indicate the participants were not previously under stress, and no adverse side effects were reported [38]. Therefore, individuals experiencing stress might experience some emotional improvement without harmful effects from using the novel technology.

There are limitations to this study design and its findings. First, the study was a casual, comparative study using this novel strategy from a cross-section of individuals. It is unknown if stress, positive affect, or negative affect increased or decreased prior to implementing this management method. Second, it is unknown if other coping mechanisms may have been implemented with this novel strategy. Participants could have implemented additional coping methods, such as problem-based, emotion-focused, or professional interventions. Third, formal evaluation of anxiety and depressive changes were not assessed, and results are solely based on participant perception. Fourth, the population was skewed towards middle-aged females that were primarily college educated. It is unknown whether these results would differ from a more homogeneous sample. Finally, infrasonic resonance for emotional regulation remains theoretical [27,39] but may offer promise based on similar technologies [28,29,38]. Based on these limitations, additional research investigating this novel technology is warranted.

Excess stress continues to be a global problem. Before the COVID-19 pandemic, leading causes of distress were related to finances, job security, and economic concerns. These concerns are still prevalent, and additional stressors include continued concern with COVID-19 [5], geopolitical (war, inflation), and social issues (racial equality, civil liberties, and violence/crime) [35]. Chronic, elevated stress levels lead to future emotional disorders [10], which can influence early mortality [11]. Problem-based stress management options are the preferred mechanism to resolve stress. However, many of the current influencers of individual stress may not be within personal control and quickly resolved. Therefore, additional emotion-based solutions are warranted to manage perceived stress and emotional disturbances. Somacoustics might offer a viable coping strategy for middle-aged women. Additional research validating the various uses of this novel strategy is warranted [40-44]. Specifically, future research should implement a randomized controlled trial (RCT) design to more robustly establish the effect of Somacous-

tics against a non-user control and/or an active comparator (e.g., a standard meditation app or white noise) to overcome the limitation of the current cross-sectional design.

Conflict of Interest Disclosure

Scott McDoniel has no declared conflicts. He is not an employee of BioSelf Technologies and owns no patents, stocks, or equities in Sensate. Dr. McDoniel completed this study while working as a faculty member at Grand Canyon University. He is now an Assistant Professor in the College of Health Sciences at Parker University.

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Data Availability

The data that support the findings from the current study are openly available in Mendeley Data (McDoniel, 2023).

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