Background and Purpose

To meet the urgent need for innovative, effective, and accessible approaches to mitigate the impact of stress on healthcare workers during the COVID-19 pandemic, we developed a remote biofeedback program. Our objective was to implement a heart rate variability biofeedback (HRV-BF) stress management program in a population of frontline healthcare workers and measure its effectiveness when offered through telemedicine compared to an in-person HRV-BF program. Biofeedback is a process by which an individual’s physiological markers such as heart rate, respiration, muscle tension, surface temperature, and/or sweat (measures of sympathetic nervous system activation) are measured and “fed” back to them on a computer screen. HRV-BF is a form of cardiorespiratory biofeedback during which a patient is shown real-time heart rate data and guided through breathing techniques to maximize heart rate variability and produce a state of calm alertness. Proposed mechanisms for HRV-BF include the restoration of autonomic homeostasis, stimulation of vagal afferent pathways, or modulation of inflammatory responses by the parasympathetic nervous system. Our focus in this study was on trainees and residents, a population among whom anxiety is prevalent and among whom burnout appears to increase and persist as training progresses, making them particularly vulnerable to stress during the pandemic. A meta-analysis analyzing all problems addressed by HRV-BF showed significant effect sizes, with largest effect sizes for anxiety, depression, anger, as well as improved symptomatology and functioning in both normal and pathological ranges.

Methods

In this trial, we randomized frontline medical and nursing trainees at the University of California at Irvine Medical Center between November 2020 and May 2021 to either a 10-day HRV-BF intervention consisting of a series of five 30-minute one-on-one telemedicine sessions and accompanying home practices (n=32) or an identical intervention delivered in person (n=15). Validated survey tools were administered pre- (baseline) and post-intervention (at day 10), as well as follow-up (at day 30) for a total of three assessment points. Self-report outcomes included levels of depression, anxiety, and stress based on the Depression, Anxiety, and Stress Scale (DASS-42) and objective outcomes included HRV change score (coherence score) pre- and post-intervention for each group.

Participants were 67.33% female; 69.57% of the sample were of ages 24-34 years. Preliminary analysis with paired samples t-tests showed an improvement in the mean total score of the DASS-42 between baseline versus post-intervention (Difference = -7.89, p<.0001) and baseline versus 30-day follow-up (Difference = -11.12, p<.0001) within the telemedicine group. Scores across all subscales (depression, anxiety, and stress) within the telemedicine group also showed significant improvement between time points following Bonferroni correction for multiple comparisons (all p<0.017). Similar improvement was observed in the mean total score of the DASS-42 between baseline versus 30-day follow-up (Difference=-11.10; p=0.03) within the in-person group; however, no significant differences were found post-intervention (p=0.22). Additionally, subscale scores did not show significant improvement over time within the in-person group. Independent samples t-tests comparing means between administration type (telemedicine versus in-person) did not show significant differences in total DASS-42 scores and all subscales (all p>0.05). This tentatively confirms our hypothesis of non-inferiority of the telemedicine intervention compared to in-person delivery. We look forward to sharing the HRV results as data analysis is on-going.

Results

COVID-19 Frontline Medical Trainees and Residents at UCI Medical Center

5 Zoom sessions n=32
5 In-Person sessions n=15

Depression Anxiety Stress Scale

Stress Subscale

Anxiety Subscale

Discussion

Although we are eager to continue the analyses of our data, currently, we have shown that this brief, remote HRV biofeedback program improves self-reported depression, anxiety and stress levels. We have also demonstrated that telemedicine delivery is feasible and non-inferior to an in-person program. This study has implications for accessibility and effectiveness of stress management interventions for frontline workers and first responders during future pandemics/surges and natural disasters, and other emergencies that may add substantial strain to the healthcare system and its staff.

Conclusions

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