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TO WHOM IT MAY CONCERN

Reg: Independent Evaluation of Brainwave Science Inc.'s stress management device: *CalmSync*

I am an Associate Professor with tenure in the Department of Computer Science and Electrical Engineering at the University of Maryland Baltimore County (UMBC). I am the Principal Investigator of the Sensorimotor Control Laboratory/ Vinjamuri Lab at UMBC. I serve as the center director for NSF IUCRC called BRAIN at UMBC. Supported by National Science Foundation (NSF CAREER award, NSF I-Corps and NSF IUCRC), NIDILRR (SBIR), New Jersey Health Foundation (Research and Innovation grants), United States-India Science and Technology Endowment Fund (Rehab Robotics), and several other internal grants this lab specializes in Sensorimotor Control, Brain Machine Interfaces, Exoskeletons, human-robot interaction and collaboration, and neurotechnologies for mental health. I received Mary E. Switzer Merit Fellowship from NIDILRR in 2010, IEEE Senior Membership in 2011, Harvey N Davis Distinguished Teaching Award in 2018 from Stevens Institute of Technology and NSF CAREER Award in 2019. I am a visiting scientist at the National Institute on Drug Abuse (NIDA) of National Institutes of Health (NIH). I have a visiting appointment at IIT-Hyderabad, and Manipal Academy of Higher Education, India, and I teach fractal credit courses there in summer and intersessions. Given our expertise and the qualifications outlined above, my team and I are well-equipped and experienced to conduct a comprehensive evaluation of *CalmSync*.

We conducted an independent evaluation of Brainwave Science Inc.'s stress management device, *CalmSync*, which integrates both hardware and software components. The hardware consists of a wearable headband equipped with four sensors: two for frontal electroencephalographic (EEG) signals, one for heart rate monitoring, and one for body temperature. The software includes a mobile application that provides an intuitive user interface and employs an AI-driven algorithm to assess stress, anxiety, and relaxation levels on a scale from 1 to 4. To assess the effectiveness of *CalmSync*, we performed a structured study involving 33 participants—sample size determined by power and statistical analysis—divided evenly into three groups: (1) a Guided Meditation and Breathing Therapy group, (2) a Music Therapy group, and (3) a Control group that received no intervention. All participants were subjected to validated stress induction protocols: the Montreal Imaging Stress Task (MIST) for cognitive stress and the Trier Social Stress Test (TSST) for social stress. In addition to collecting physiological and algorithmic data, we gathered qualitative feedback from participants regarding their experience with the device. The results from both quantitative and qualitative analyses provide promising evidence supporting the utility of *CalmSync* in monitoring and managing stress responses.

We analyzed the relationship between AI-predicted stress scores generated by *CalmSync* and participants' self-reported stress ratings using Pearson's correlation coefficient. The analysis

demonstrated a strong and statistically significant positive correlation ($r = 0.51$, $p < 0.0001$), indicating strong alignment between the AI algorithm's output and subjective user experience. To further assess the impact of the therapeutic interventions, we conducted two sample t-tests comparing the AI-predicted stress scores of the therapy groups to those of the Control group. Results revealed that both the Music Therapy group ($t = 5.14$, $p < 0.0001$) and the Breathing Therapy group ($t = 2.09$, $p < 0.0001$) exhibited significantly lower stress scores than the Control group. Notably, the Music Therapy intervention showed the most pronounced effect. In addition, we compared stress scores during the stress induction phase versus the therapy phase. The Control group exhibited only a 33% reduction in stress levels (mean score: 2.674 ± 0.774 vs. 1.779 ± 0.979), whereas the therapy groups demonstrated a 66% reduction (mean score: 2.719 ± 0.661 vs. 0.95 ± 0.363). These statistically significant findings underscore the effectiveness of *CalmSync* in facilitating measurable stress reduction, when paired with targeted interventions such as guided breathing or music therapy.

Qualitative feedback from 33 participants on the *CalmSync* device revealed positive impressions overall. On a scale of 1 to 5, the average comfort rating was approximately 4.2, with 79% of users finding the device "comfortable" or "very comfortable" while others experienced slight tightness. 91% were able to wear it by themselves, highlighting ease of use. No major skin irritation was reported across the board. The overall device design scored an average of 4.2, and overall satisfaction was also high, with an average rating of 4.3. The *CalmSync* UI and therapy instruction clarity were consistently rated as "clear" by all. Participants appreciated its potential for stress monitoring and mental health management. Overall, the device was seen as intuitive, non-invasive, and effective for stress tracking and intervention, with minor adjustments needed for fit and daily usability.

In summary, our independent evaluation strongly supports *CalmSync* as an intuitive, non-invasive, and scientifically validated tool for real-time stress monitoring and intervention. With robust alignment between AI-predicted and self-reported stress levels, significant reductions in stress through guided therapies, and overwhelmingly positive user feedback, *CalmSync* demonstrates clear potential as a next-generation solution for personalized mental health and wellness management. Please reach out to me if you have any questions.

Sincerely

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