Short-term effects of integrative and complementary health practices on depression, anxiety, and stress: A longitudinal pilot study

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Líliam César de Castro Medeiros[1], Adriano Bressane[2], Eduardo Fontana Guariglia[3], Elisa Esposito[4], Olívia Balster Fiore Correia[5], Lanah Correa da Silva[6] and Julia Bertoldo Ribeiro[7]

ABSTRACT

Background: Studies on Complementary and Alternative Medicine (CAM) have been forming a significant body of evidence, but not without limitations. While most studies reported benefits, some of them reported mixed effects or inconclusive results. Objectives: This study investigates the short-term effects of CAM interventions on depression, anxiety, and stress scale (DASS). Furthermore, the research explored the underlying mechanisms linking interventions to observed effects. Study Design: A longitudinal pilot study was conducted, in which participants engaged in CAM-based interventions including Lian Gong, Forest bathing, Music therapy, Circle dancing, and Hatha-yoga. The Depression, Anxiety, and Stress Scale (DASS) was used to assess mental health before and after interventions. Methods: A total of 149 repeated measures were collected. Statistical analyses included paired comparisons using one-tailed tests (Student t-test or Wilcoxon test) based on the distribution of data. Effect sizes were calculated following established guidelines. A significance level of 0.05 and a test power of 0.8 were maintained. Results: The study demonstrated promising short-term reductions in DASS scores across different CAM interventions. Hatha-yoga notably reduced depression and stress with medium effect sizes. Lian Gong, Forest bathing, Circle dance, and Music therapy also showed significant reductions in these disorders, with varying effect sizes. Conclusions: This pilot study provides evidence of the positive impact of CAM on mental health, although effectiveness varies by intervention type. Hatha-yoga, Lian Gong, Forest bathing, Circle dance, and Music therapy all exhibited potential benefits. These findings underscore the importance of further research, including long-term longitudinal evaluations, to explore sustained effects and temporal variations over time.

Keywords: Complementary practice, Integrative intervention, Mental health.

[1] Doutorado em Matemática Computacional
São Paulo State University (UNESP), Presidente Dutra Highway, Km 137,8, CEP 12247-004, São José dos Campos - SP, Brazil;
[2] Doutorado em Ciências Ambientais
São Paulo State University (UNESP), Presidente Dutra Highway, Km 137,8, CEP 12247-004, São José dos Campos - SP, Brazil;
E-mail: adriano.bressane@unesp.br
[3] Bacharelado em Medicina Psiquiátrica
São Paulo University (USP), Dr. Arnaldo Avenue, 455, CEP 01246-903, São Paulo - SP, Brazil;
[4] Doutorado em Engenharia Química
Federal University of Sao Paulo (UNIFESP), Talim Street, 330, CEP 12231-280, São José dos Campos - SP, Brazil;
[5] Doutorado em Psicologia Clínica
Pontifical Catholic University (PUC), Marquês de São Vicente Street, 225, CEP 22451-900, Rio de Janeiro - RJ, Brazil;
[6] Bacharelado em Engenharia Ambiental
São Paulo State University (UNESP), Presidente Dutra Highway, Km 137,8, CEP 12247-004, São José dos Campos - SP, Brazil;
[7] Bacharelado em Engenharia Ambiental
São Paulo State University (UNESP), Presidente Dutra Highway, Km 137,8, CEP 12247-004, São José dos Campos - SP, Brazil;

INTRODUCTION

The stress factors of contemporary society have resulted in a growing need for therapeutic interventions [1-2]. Compounding the issue, the health systems and conventional medicine have demonstrated insufficiency in meeting the ever-evolving healthcare demands [3]. As a promising approach, Complementary and Alternative Medicine (CAM) have garnered attention from both professionals and the general population [4-6].

CAM represents a spectrum of non-traditional therapeutic practices rooted in diverse cultural and philosophical backgrounds [1, 7-9]. These practices, ranging from acupuncture, herbal medicine, to mindfulness, address gaps in conventional healthcare by offering treatments that may lead to fewer adverse effects, a reduction in medication use, and decreased necessity for prolonged treatments or hospital admissions, thus potentially lowering healthcare costs [10-11]. Despite CAM's growing popularity and anecdotal successes, a significant evidence gap persists regarding their efficacy. This lack of research data hinders the integration of CAM practices into mainstream healthcare.

Therapeutic interventions through CAM aim to fill critical voids in addressing chronic conditions, mental health issues, and lifestyle diseases that conventional medicine sometimes inadequately manages due to over-reliance on pharmacotherapy, which often comes with side effects and high costs. By exploring CAM's mechanisms of action and establishing evidence-based benefits, these interventions can be better recognized and utilized, offering an integrative approach to health that complements traditional medical treatments and meets a broader range of patient needs [12].

This study investigates the short-term impacts of CAM on mental distress, specifically targeting reductions in symptoms of depression, anxiety, and stress. These psychological states are quantitatively assessed using the Depression, Anxiety, and Stress Scale (DASS), a well-regarded instrument that measures the severity and prevalence of these symptoms. By incorporating DASS in our methodology, we aim to provide a standardized framework for evaluating the effectiveness of CAM interventions in alleviating mental health challenges, thereby offering clear, measurable outcomes to guide further research and clinical practice in this emerging field.

To further the understanding of the benefits of such practices, we have also discussed the mechanisms underlying the relationship between interventions and their observed effects. Although the study was appropriately powered to detect a medium effect size in all analyzed interventions, the relatively limited sample size may affect the generalizability of the findings. In addition, this study also did not assess the sustained effect over time. Therefore, we consider this research as a pilot study of short-term effects, with the main proposal of establishing an initial understanding of an under-researched healthcare approach. To provide a context for the present study, the following section presents some related works.

RELATED WORKS

To search for the most reliable, relevant, and up-to-date related works, Web of Science database were used, in which the following query was applied: title-abs-key (“medicine" or “health” and (“complementary” or “alternative” or “integrative”) and (“mental” or “psychological” or “emotional” or “mood”) and (limit-to (pubstage, “final”)) and (limit-to (doctype, “ar”)) and limit-to (subjarea, “psyc”)) and (limit-to (pubyear, “from 2014 to 2023”)). Thus, 164 articles were found and preliminarily screened. After excluding those outside the scope, 15 studies have been selected and discussed below.

Music-based intervention enhances sleep quality in older adults [13]. The study examined such effect on the community-dwelling adults in Singapore. The authors found that people who participated in the intervention group reported better sleep quality than the control group. In turn, combining music therapy and low impact aerobic exercise shows enhanced therapeutic benefits in patients with fibromyalgia [14]. This study found that aerobic exercise is effective in improving depression and general discomfort, but effectiveness is higher when combined with music.

Mongolian Mind-Body Interactive Psychotherapy (MMIP) also enhances quality of life (QoL). Chagan-Yasutan et al. [15] investigated the effect on patients with esophageal cancer. The results showed that MMIP provided a significant improvement on body and psychological function. However, further large-scale studies are required to determine the impact of MMIP for QoL in patients undergoing surgery or chemotherapy. Mind-body exercises (MBE), antidepressants, and depressive symptoms exhibit complex bidirectional associations [16]. The authors investigated the longitudinal relationship between these factors, and the results show significant association over time. As a limitation, the questions do not distinguish between different types of MBE. In line, Pilates-based intervention also yields significant and robust improvements in mental health, which outcome surpassing other exercise modalities [17]. The study found that Pilates resulted in significant, large, and heterogeneous reductions in depressive and anxiety. The effects size was larger than previously reported effects of Tai Chi and Qigong.

Mindfulness-based stress reduction benefits traumatized youth. Jee et al. [18] presented a pilot project that implemented a stress reduction program among residents in foster and kinship care. The study found that the youth reported enhanced self-awareness, new strategies to manage ongoing stress. Mindfulness-based intervention also alleviates symptoms in post-treatment breast cancer survivors. Reich et al. [19] identified symptom clusters among survivors and determine the effectiveness of this intervention in improving psychological and fatigue symptoms. The results demonstrated evidence of the effectiveness, with sustained effects for several weeks after interventions. Wachholtz et al. [20] assessed the key ingredients of meditation that positively impact mood and headache factors across different some techniques. The study showed significant decreases

in anger and migraine pain over time. Further analysis showed that the bulk of the change occurred in some days after practice of the meditation-based intervention. The results also suggest that cognitively active forms of meditation are more effective than distraction techniques.

Acupuncture linked to reduced analgesic prescriptions in veterans with hepatitis C (VHC). Golden et al. [21] explored the effects on physical and psychological symptoms commonly experienced by VHC. The study found a trend toward improvement in fatigue, depression, pain, and medication use. In line with this, acupuncture and electroacupuncture also shown promising results in treating anxiety [22]. The study shows that these interventions are effective, on their own or as adjuncts to pharmacological therapy. The positive effect was independent of anxiolytic medication, and both techniques showed similar efficacy.

With the largest body of research and evidence found in this literature review, yoga-based intervention has shown several health benefits. Marques et al. [23] assessed the effects of Chair-based Yoga (CBY) in older women living in social caregiver centers. The results showed that CBY practice led to a trend towards improved health-related emotional status. Boni et al. [24] also linked Yoga practice with reduced self-reported anxiety, but causality remains unproven. Although the authors have been used a cross-sectional design, which means that causality cannot be established, the study found that length of practice was significantly correlated with lower anxiety in practitioners. In turn, Ponte et al. [25] found that the Yoga significantly improves quality of life, including a reduction of psychological distress.

Contact with nature provides mental health benefits [26]. The authors found that the likelihood of occurrence of anxiety, stress, and depression symptoms tends to decrease when the frequency of nature contact increases. Yet, the positive effect of this contact was significant only when its frequency was moderate (about once or twice a week) or higher. The study did not control other factors that may influence mental health, such as the quality of contact and or type of nature, which may influence the observed effects.

From the above, studies have been forming a body of evidence, but not without limitations. Several studies were observational or used cross-sectional designs, making it difficult to establish causality relationships. While most studies reported benefits, some of them reported mixed or inconclusive results. Therefore, we consider that there is a basis for conducting a longitudinal pilot study on the short-term effects of CAM on DASS.

METHODS

To implement the CAM-based interventions, a schedule has been made available to visitors at an urban park in São José dos Campos, São Paulo State, Brazil. Then, individuals who voluntarily attended the specified locations and dates were invited to participate in the interventions (Table 1).

To be eligible for the study, participants were required to be at least 18 years old and agree with the Informed-Consent Form, so that the research was conducted in strict adherence to the ethical guidelines for human research established in Brazil, receiving approval under the protocol number #58149622.3.0000.0077.

Table 1. Profile of participants in CAM-based interventions.

intervention	age	gender	total (%)	cum. (%)
Music therapy	young adult (18-44 years old)	female	41.8	41.8
		male	16.3	58.1
	middle-age (45-60 years old)	female	30.3	88.4
		male	11.6	100
Hatha-yoga	young adult (18-44 years old)	female	38.2	38.2
		male	14.6	52.8
	middle-age (45-60 years old)	female	39.6	92.4
		male	7.6	100
Lian Gong	young adult (18-44 years old)	female	16.2	16.2
		male	8.0	24.2
	middle-age (45-60 years old)	female	45.9	70.1
		male	29.9	100
Forest bathing	young adult (18-44 years old)	female	17.8	17.8
		male	4.0	21.8
	middle-age (45-60 years old)	female	50.5	72.3
		male	27.7	100
Circle dancing	young adult (18-44 years old)	female	30.5	30.5
		male	15.0	45.5
	middle-age (45-60 years old)	female	31.8	77.3
		male	22.7	100

To broaden the study's participant base, a comprehensive outreach strategy was employed through social media platforms, where a detailed schedule of the CAM-based interventions, including dates, times, and locations, was shared. This approach facilitated the engagement of interested individuals, and ensured a diverse group of participants, each voluntarily choosing to partake in the study, thereby enhancing the research's scope and potential impact on understanding CAM's effectiveness in mental health.

In this longitudinal study, we recruited a total of 149 participants, collecting data on their mental health before and after engaging in various CAM-based interventions. These interventions included Lian Gong (n = 29), Forest bathing (n = 34), Music therapy (n = 28), Circle dancing (n =

22), and Hatha-yoga (n = 36). It was implemented a standardized protocol across all CAM interventions, with each session spanning 50 minutes, as described in Table 2.

Table 2. Protocol of the CAM-based interventions.

	Main Steps	Time (minutes)
Lian Gong	1. Warm-up with breathing exercises. 2. Body stretching. 3. First set of 6 therapeutic exercises. 4. Second set of 6 exercises. 5. Final set of 6 exercises and closing relaxation.	1. 10 2. 10 3. 10 4. 10 5. 10
Forest Bathing	1. Sensory immersion introduction. 2. Mindful walking. 3. Guided observation of nature. 4. Breathing exercises. 5. Reflection and experience sharing.	1. 10 2. 10 3. 10 4. 10 5. 10
Music Therapy	1. Session introduction and music selection. 2. Calm music active listening. 3. Group singing participation. 4. Simple instruments exploration. 5. Discussion and reflection on the experience.	1. 10 2. 10 3. 10 4. 10 5. 10
Circle Dancing	1. Dance movement introduction. 2. Basic step learning. 3. Traditional dance practice. 4. Contemporary dance practice. 5. Cool down and group reflection.	1. 10 2. 10 3. 10 4. 10 5. 10
Hatha Yoga	1. Initial asanas introduction and practice. 2. More complex asanas progression. 3. Pranayama exercises. 4. Guided meditation. 5. Final relaxation.	1. 10 2. 10 3. 10 4. 10 5. 10

To evaluate the mental health, participants filled out questionnaire based on the Depression, Anxiety, and Stress Scale (DASS), a validated assessment tool widely used to measure the psychological constructs [27]. For the paired comparison between the measurements taken before and after the interventions one-tailed tests were used, particularly, Student t-test for normally distributed data and Wilcoxon test otherwise. The effect size (d_{Cohen}) of CAM on DASS was measured by:

$$d_{Cohen} = \frac{\mu_{\text{before}} - \mu_{\text{after}}}{\sqrt{\frac{(n_{\text{before}} - 1)\sigma^2{}_{\text{before}} + (n_{\text{after}} - 1)\sigma^2{}_{\text{after}}}{n_{\text{before}} + n_{\text{after}} - 2}}} \quad (1)$$

Where n_i is the number of repeated measures, μ_i and σ_i are the mean and standard deviation, respectively. According to Cohen [28], an effect size equal to or inferior than 0.40 is considered small, between 0.40 and 0.80 is considered medium, and equal to or superior than 0.80 is considered large. All analyses considered a test power of 0.8 for a significance level of 0.05. Considering the number of repeated measures for each CAM, the minimum detectable effect sizes in the tests were 0.473 for Lian Gong, 0.441 for Forest bathing, 0.482 for Music therapy, 0.548 for Circle Dancing, and 0.423 for Hatha-yoga.

RESULTS

The findings revealed promising evidence on the short-term reduction in DASS, but it varied

among different CAM-based interventions, as can be seen in Table 3. The Hatha-yoga provided a significant effect on depression and stress (Figure 1). There was a noteworthy decrease in depression from an average of 2.95 (±3.1) to 1.45 (±2.6), as well as a reduction in stress from 3.30 (±3.1) to 1.30 (±2.2). Effect sizes for both cases were medium ($0.4 < d_{Cohen} < 0.8$). The practice of Lian Gong yielded significant short-term reductions in depression ($p_{Wilcoxon} = 0.009$) and stress ($p_{Student} = 0.007$). The effect sizes observed for these reductions were considered large ($d_{Cohen} \geq 0.8$) for depression and medium for stress (Figure 2). The Forest bathing and Circle dance - provided significant effects ($p_{Student} < \alpha = 0.05$) in reducing all assessed disorders (Figures 3 and 4). Finally, Music therapy led to a significant decrease in anxiety ($p_{Wilcoxon} = 0.024$), corresponding to a medium effect size ($d_{Cohen} = 0.756$) (Figure 5).

Table 3. Effect of CAM-based interventions on DASS.

intervention		$\mu_{before}(\pm\sigma)$	μ_{after} $(\pm\sigma)$	$p_{Shapiro}$	p_{Test}	d_{Cohen}
	D_S	2.95 (±3.10)	1.45 (±2.63)	0.168	0.036*	0.425
Hatha-yoga	A_S	2.25 (±2.38)	1.70 (±2.54)	0.548	0.194*	*ns*
	S_S	3.30 (±3.13)	1.30 (±2.16)	0.618	0.013*	0.539
	D_S	2.64 (±3.23)	0.50 (±0.94)	0.036	0.009**	0.911
Lian Gong	A_S	2.71 (±2.30)	1.93 (±1.98)	0.421	0.147*	*ns*
	S_S	3.57 (±3.11)	1.14 (±1.79)	0.474	0.007*	0.752
	D_S	2.00 (±1.55)	0.50 (±1.23)	0.201	0.038*	0.913
Forest bathing	A_S	3.33 (±1.86)	0.50 (±0.84)	0.096	0.011*	1.326
	S_S	3.83 (±2.99)	0.00 (±0.00)	0.390	0.013*	1.280
	D_S	3.67 (±3.57)	0.78 (±1.72)	0.098	0.025*	0.769
Circle dancing	A_S	2.44 (±2.40)	0.67 (±0.87)	0.037	0.025**	0.857
	S_S	3.67 (±3.43)	0.11 (±0.33)	0.159	0.006*	1.071
	D_S	3.80 (±4.28)	1.53 (±2.30)	0.056	0.036*	*ns*
Music therapy	A_S	1.87 (±2.70)	0.40 (±0.83)	< 0.001	0.024**	0.756
	S_S	4.07 (±6.03)	1.33 (±2.26)	0.618	0.013*	*ns*

D_S: depression scale; A_S: anxiety scale; S_S: stress scale; μ: mean; σ: standard deviation; p: probability of error when rejecting the null hypothesis; d_{Cohen}: effect size; *ns*: not significant; *$p_{Student}$; **$p_{Wilcoxon}$.

Figure 1. Effect of Hatha-yoga on DASS.

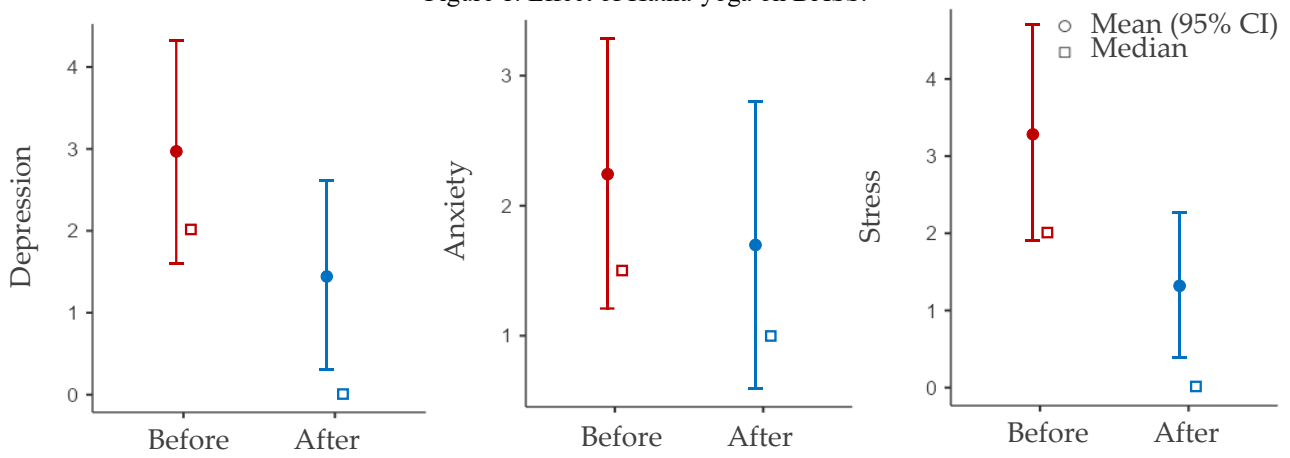


Figure 2. Effect of Lian Gong on DASS.

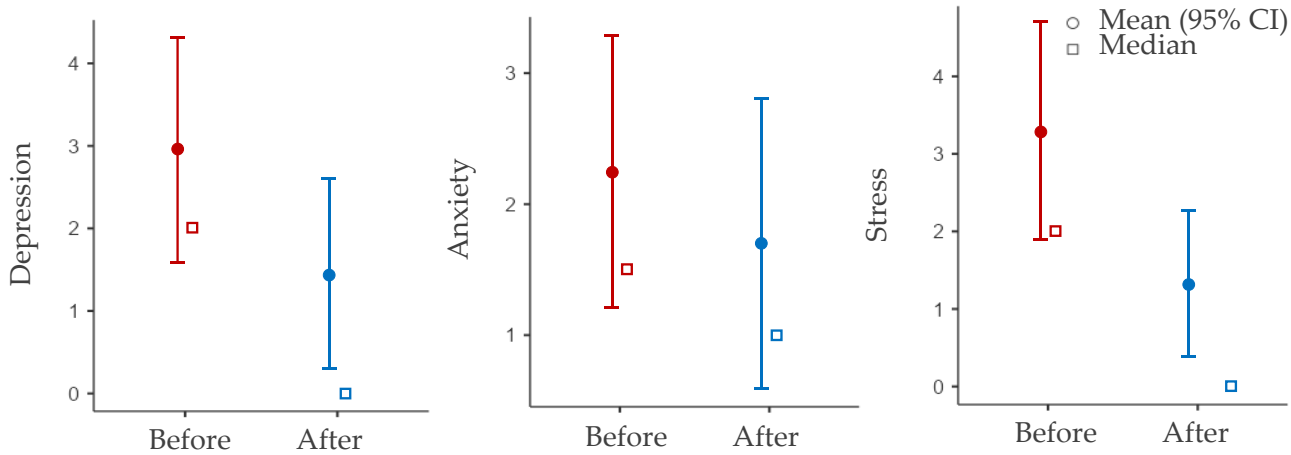


Figure 3. Effect of Forest bathing on DASS.

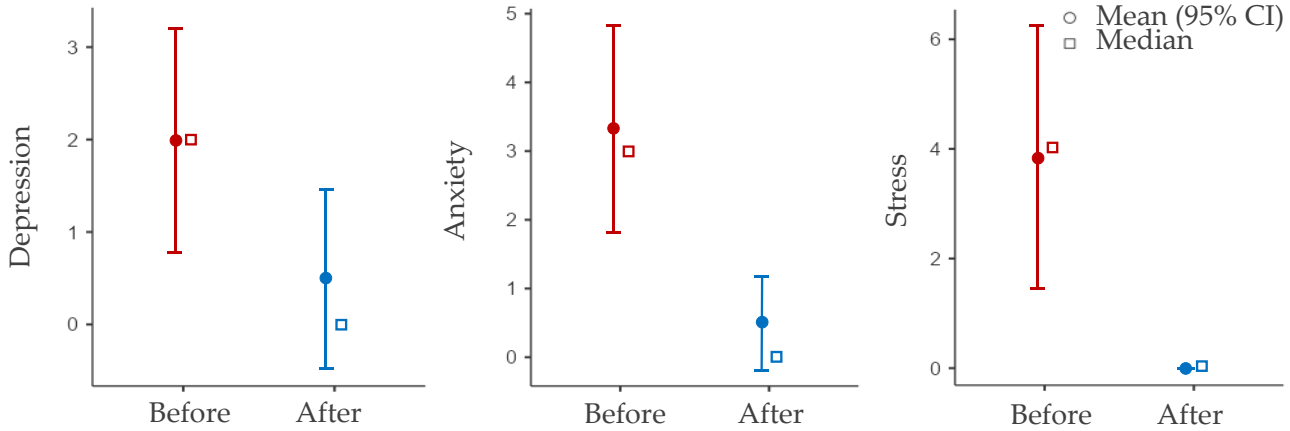


Figure 4. Effect of Circle dance on DASS.

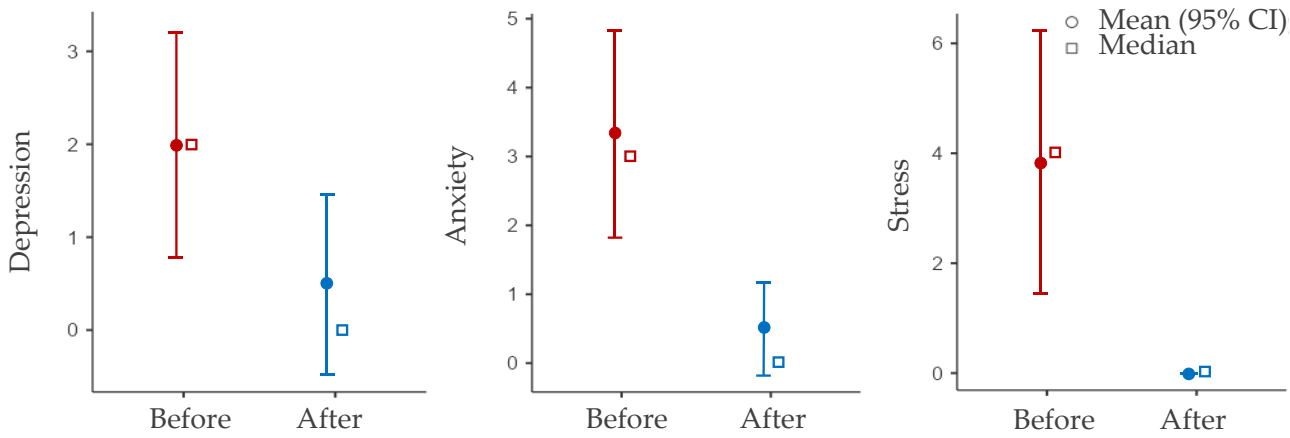
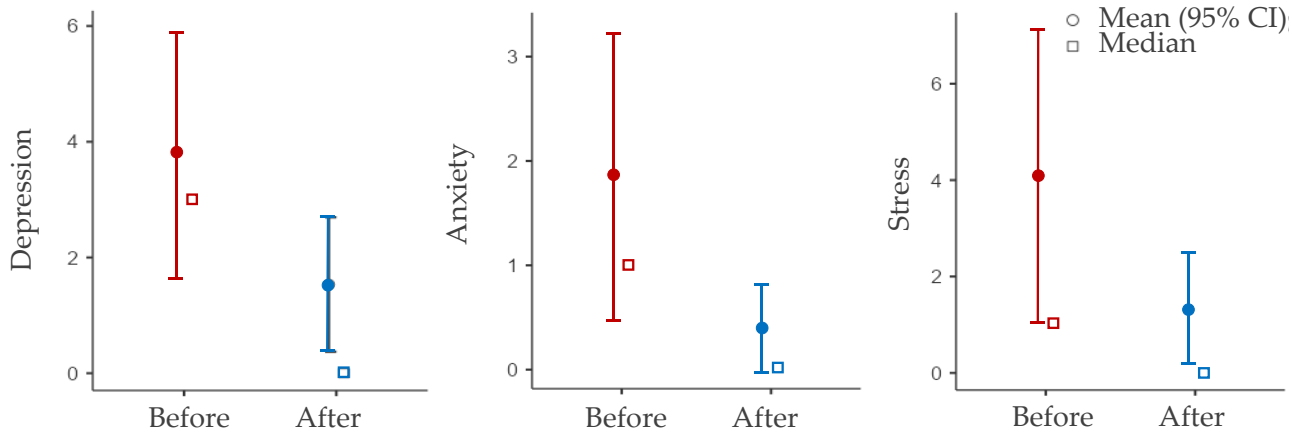


Figure 5. Effect of Music therapy on DASS.



DISCUSSION

The observed short-term reductions in emotion state of participants suggest a meaningful positive effect of the Hatha-yoga. Overall, Yoga incorporates breathing techniques, physical postures, and meditation, offering the potential to engage the cognitive system, stimulate the endocrine system, and enhance the musculoskeletal system [29]. Thus, the engagement in Yoga has been associated with enhanced neuroplasticity, particularly in brain regions involved in emotion regulation and stress management, such as the prefrontal cortex, hippocampus, and amygdala [30]. However, further research is needed to explore their potential effect on anxiety. Our findings align with previous research. For example, Manincor et al. [31] conducted a study that examined the impact of yoga practices on depression and anxiety. The results indicated a significant difference in the reduction of depression between individuals who participated in yoga practices and a control group, but did not find a significant reduction in anxiety.

Lian Gong is a Chinese therapeutic technique that focuses on harmonious exercise to promote physical, mental, and emotional balance. Physical aspects of Lian Gong, such as postures and movements, can trigger the release of endorphins and other endogenous opioids, contributing to feelings of wellbeing and pain relief [32-33]. In addition, as a physical activity, this intervention can be

linked to changes in neurotransmitter levels, such as increased serotonin and gamma-aminobutyric acid (GABA) levels. Serotonin is essential for mood regulation, and higher GABA levels are associated with reduced anxiety and stress [34]. Therefore, the observed benefits are consistent with other studies [35-36].

Forest bathing and Circle dance resulted in a significant reduction in all assessed disorders. Notably, the effect size was substantial, with a d_{Cohen} value of 0.8 or greater. It is worth noting that the variability of scale (σ) also decreased, indicating that both practices not only reduced the scales but also promoted greater emotional stability. Forest bathing is a Japanese practice that has garnered global attention [37]. This activity entails immersing oneself in nature for engagement in conscious sensory experiences. An explanation for their benefits is given by the Attention Restoration Theory [38]. This theory suggests that when we immerse ourselves in nature, our senses become more attuned, allowing us to notice the diverse shades of green, sounds of the forest, aromas of flowers or damp earth, textures of trees and the ground through our hands and feet. Thus, we tend to develop a heightened awareness centered on the present moment, relinquishing thoughts focused on the past and the ones centered on the future.

Music therapy has been widely recognized as an integrative therapeutic approach. Kaplan and Berman [39] extensively discuss the beneficial effects observed in various meta-analyses regarding the treatment of diverse disorders. The relaxation provided by music can lead to the activation of the parasympathetic branch of the Autonomic Nervous System (ANS), promoting relaxation and counteracting the effects of sympathetic dominance associated with stress [40]. This balance in the ANS may contribute to the observed reduction in stress. This effect can also reduce the activation of the hypothalamic-pituitary-adrenal (HPA) axis, which plays a central role in the body's stress response [41]. By reducing cortisol levels, Music therapy may help alleviate stress and improve overall mental wellbeing.

In turn, Circle dance also may enhance social connectedness and feelings of belongingness by stimulating the release of oxytocin, a hormone and neurotransmitter associated with bonding and social support. Oxytocin's stress-reducing and emotional wellbeing-promoting effects are relevant in this context, so that Circle dance may also influence neural networks related to attention and self-awareness [42].

CONCLUSION

This study delved into the short-term impact of various CAM interventions on mental health, specifically targeting depression, anxiety, and stress levels as measured by the Depression Anxiety Stress Scale (DASS). The study found notable short-term reductions in DASS scores across different CAM interventions, with Hatha-Yoga significantly reducing depression and stress.

The findings contribute initial evidence to the field by demonstrating the potential mental health benefits of CAM interventions. These findings highlight the importance of incorporating diverse, culturally sensitive, and non-pharmacological treatments into mental health care, potentially offering cost-effective and accessible alternatives or complements to conventional treatments.

Future research directions should include longer-term studies to assess the sustained effects of CAM interventions and explore the mechanisms underlying their benefits. Additionally, studies with larger sample sizes and diverse populations could help to generalize these findings and support the integration of CAM practices into mainstream healthcare.

In conclusion, this pilot study underscores the significance of further exploring CAM as a complementary approach to mental health care, emphasizing the need for an integrative health model that embraces the diversity of therapeutic options to address the multifaceted nature of mental health issues. The ongoing relevance of this research topic to both the academic and professional communities signifies a critical step towards broadening our understanding and acceptance of complementary and alternative medicine in fostering overall mental well-being.

DATA AVAILABILITY

Ethical restrictions: due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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