

The Role of Rhythmic Breathing in Stress Reduction and Well-Being: A Pilot Study

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ABSTRACT

Background: Nursing workload has dramatically changed over the last 20 years. The job duties of acute care hospital medical surgical nurses have changed and contributed to a shift in the well-being of nurses and in their overall work-related stress.

Aim: The aim of this study was to explore the effects of the daily practice of pranayama on overall stress and well-being of clinical nurses.

Methods: A descriptive, cross-sectional pilot study was performed to impart to nurses in acute care medical surgical nurses' pranayama as an aid to stress reduction and thereby improve well-being. Well-being and stress surveys were collected at baseline, pre and post intervention.

Results: The results of the surveys indicated improved well-being index scores (World Health Organization's WHO-5). However, the stress surveys did not reveal statistically significant results.

Conclusion: The take-away from the pilot study was that pranayama practice improved WHO-5 scores and has the potential to improve overall well-being of acute care medical surgical nurses. The results of this study strongly support the need for a larger-scale investigation to further explore the benefits of pranayama practice.

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Keywords: stress reduction, well-being, pranayama, breathing

BACKGROUND

Clinical nurses are fundamental to the delivery of quality healthcare. However, numerous studies highlight that nursing is an inherently stressful profession (Balaji & Varne, 2017; Ibrahim et al., 2022; Solomon, 2022). Factors such as chronic understaffing exacerbated by the COVID-19 pandemic have intensified stress levels among nurses. Nurses often face extended working hours, reduced rest days, and the added burden of managing patient care under limited resources (Duva et al., 2022; Falatah, 2021; Lee & Jang, 2020).

Nurses make critical decisions impacting patient safety and care in their role as patient advocates. Persistent inadequate staffing and excessive workloads amplify workplace stress, leading to cognitive overload, reduced clarity,

and burnout over time (Simpson et al., 2016). Denizsever et al. (2021) reported that workplace stress directly impaired nurses' decision-making capabilities, potentially compromising patient safety if left unaddressed.

Pranayama as Stress Management Tools

Pranayama, a core component of yoga, offers a potential solution to mitigate nurses' workplace stress. Yoga, derived from the Sanskrit word "Yuj," meaning union, aims to harmonize the mind, body, and spirit (Tiwari & Negi, 2019). Yoga is traditionally structured around eight interconnected limbs: (1) yama (ethical restraints), (2) niyama (self-discipline and observances), (3) asana (physical postures), (4) pranayama (breath control), (5) pratyahara (withdrawal of the senses), (6) dharana (concentration), (7) dhyana (meditation), and (8) samadhi (spiritual absorption) (Tiwari & Negi, 2019). Pranayama, the fourth limb, serves as a bridge between the physical and mental aspects of yoga, emphasizing controlled breathing techniques to enhance overall well-being (Krishna & Ramya, 2024; Tiwari & Negi, 2019). The integration of pranayama addresses both physical and emotional well-being, aligning with the American Nurses Association definition of holistic care, which encompasses body, mind, emotion, spirit, and social dimensions (Harrington, 2015).

The ancient sage Patanjali introduced the concept of Astanga Yoga in his *Yoga Sutras*, that emphasized eight interconnected principles for living a purposeful and balanced life (Char, 2021). Among these principles, pranayama is central to controlling the life force (prana) and fostering mental clarity and resilience (Char, 2021). Pranayama involves the conscious modulation of inhalation, retention, and exhalation of breath, promoting relaxation and stress relief (Char, 2021). This ancient Indian practice could be particularly beneficial for clinical nurses to enhance their well-being and improve their capacity to deliver patient care.

Literature Review

A comprehensive literature review was performed using multiple databases, including PubMed, the Cochrane Library, Ovid, and CINAHL, to gather evidence supporting the intervention and study design. Pranayama, an essential element of yogic practice, encompasses controlled breathing techniques (yama) that modulate the flow of prana (vital energy) within the body (Krishna & Ramya, 2024). This controlled breathing regulation not only impacts physiological functions but also plays a crucial role in enhancing mental and emotional well-being (Krishna & Ramya, 2024). A recent study by Ibrahim et al. (2022) evaluated the impact of mindfulness, breathing exercises, and meditation on nurses caring for COVID-19 patients. Using the Warwick-Edinburgh Mental Well-being Scale, the researchers found significant improvements in psychological well-being post-intervention (Ibrahim et. al., 2022).

Similarly, Balaji and Varne (2017) demonstrated the benefits of a three-month regimen of yogasana (third limb of yoga physical posture), meditation, and pranayama in reducing stress and cortisol levels among nursing staff. These findings revealed substantial improvements in both the International Stress Management Association Questionnaire scores and plasma cortisol levels, supporting the role of yoga in stress management (Balaji & Varne, 2017).

Solomon (2022) explored the impact of anuloma and viloma pranayama on nurses' stress levels. Anuloma and viloma, also known as alternate nostril breathing, is a pranayama technique that harmonizes the breath flow between the nostrils, enhancing respiratory efficiency and promoting mental clarity (Krishna & Ramya, 2024). After intervention, significant reductions in stress scores were observed using the Expanded Nursing Stress Scale.

Additionally, Sharma (2020) investigated the effects of fast and slow pranayama on stress management among student nurses. Both practices were effective, but slow pranayama showed superior benefits in reducing perceived stress levels.

Research indicates that clinical nurses experience significant stress in their professional roles, which can adversely affect their mental well-being and decision-making, ultimately compromising patient safety (Balaji & Varne 2017; Ibrahim et al., 2022; Solomon 2022). The above findings are particularly relevant to the present study as they suggest that pranayama can be an effective intervention for managing stress among nurses.

These studies underscore the potential of pranayama as a practical tool for stress reduction among nurses. By incorporating evidence-based practices such as pranayama into daily routines, nurses may experience improved mental health and enhanced decision-making, benefiting patient care.

Theoretical Model

The theoretical underpinning of Polyvagal Theory (PVT) and the evidence from research including studies by Balaji and Varne (2017), Ibrahim et al (2022) and Solomon (2022), guided the researchers to answer if pranayama influences nurse's stress level and well-being. PVT, created and developed by Dr. Stephen Porges (2017), describes the physiological/psychological states of human behavior as well as the challenges related to wellness and mental health. The theory proposes that specific intentional behaviors such as breathing, vocalizations, and posture that are the ancient yogic rituals can trigger a physiological state mediated by vagal pathways that foster health and optimize well-being (Sullivan et al., 2018). The theory emphasizes that to optimize well-being and reap positive benefits one must practice self-regulation (Sullivan et al., 2018). In the context of PVT, self-regulation refers to the intentional modulation of the autonomic nervous system to restore a state of physiological safety and balance (Sullivan et al., 2018). According to PVT, this process can be facilitated through practices such as mindfulness, conscious breathing, physical movement, and social engagement, all of which help shift the nervous system from a state of stress or dysregulation to one of calm and stability (Sullivan et al., 2018). Porges' theory proposes many methods of self-regulation based on activation of the vagus nerve (Cranial Nerve X) toning. Some of the methods include slow diaphragmatic breathing, gentle touch, chanting, prayers, meditation, and dance (Porges, 2017).

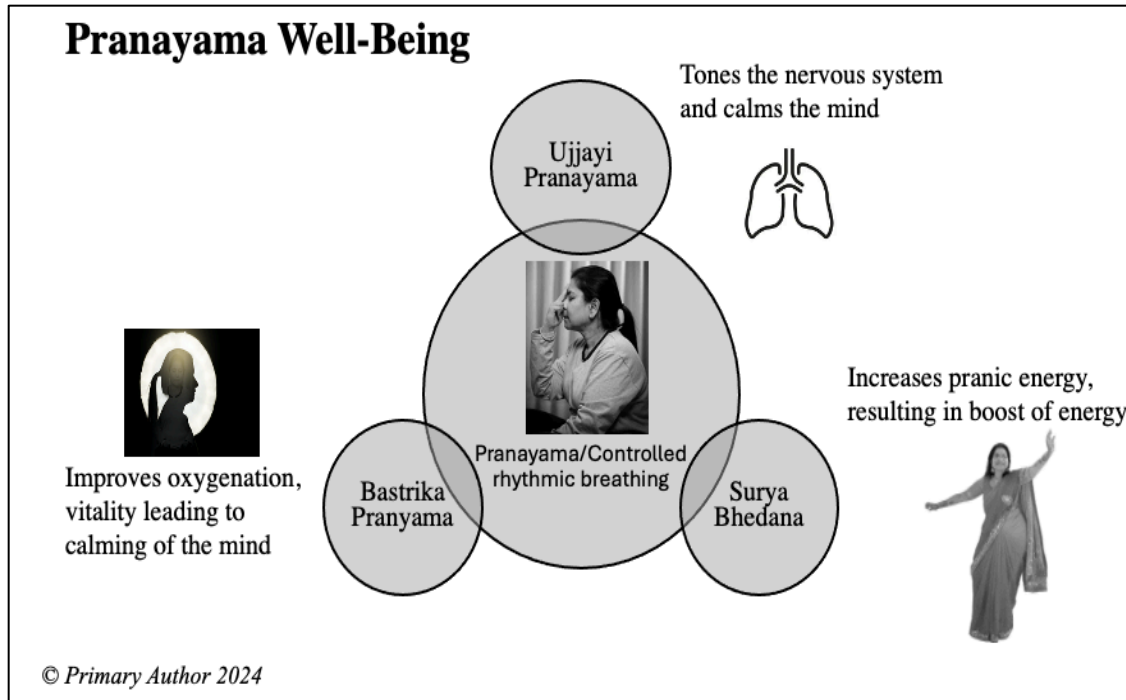
Yogic practices such as pranayama have been explored for centuries by philosophers, religious leaders, and writers and more recently by scientists, and there are many different understandings of what it means. Sullivan et al. (2018) has shared the frameworks for understanding the convergence of PVT and yoga therapy linking to physiological, psychological, and behavioral attribute for self-regulation and resilience. Self-regulation and resilience are the abilities to be in homeostasis and be able to bounce back and adapt to stressful situations (Sullivan et al., 2018). PVT emphasizes the importance of vagal toning to regulate the nervous system for optimal social and psychological performance. In PVT, one of the recommended vagal toning practices is breath work to influence the neural pathways (Porges, 2017). In yoga therapy, pranayama is one of the effective ways to stimulate vagal toning and elicit relaxation response (Tiwari & Negi, 2019).

Based on the evidence, the researchers intended to study pranayama techniques that promote progressive relaxation, and its effects on stress and well-being. The study hypothesized that consistent engagement in pranayama can serve as an effective intervention to alleviate stress and enhance well-being. Breath regulation provides vital energy, the prana life force energy: it is the doorway to calm the mind. A study by Heck et al. (2017) highlighted conscious breathing could promote top-down emotional regulation which allows individuals to consciously manage

their thoughts, emotions, and physiological states, promoting self-regulation and adaptive behavior within the limbic system to calm the mind, boost energy levels, and manage external stressors effectively (Figure 1).

Figure 1

Pranayama Well-Being



Note. The diagram highlights three breathing practices designed to promote top-down emotional regulation. These techniques help calm the mind, boost energy levels, and manage external stressors effectively.

The aim of this study was to investigate whether the daily practice of a combination of fast and slow pranayama can lower perceived stress levels and improve overall well-being among acute care clinical nurses. It is hypothesized that regular pranayama practice serves as an effective intervention to reduce stress and enhance well-being in this population.

METHOD & DESIGN

A descriptive, cross-sectional pilot study was conducted at an academic medical hospital in the southeastern United States. Institutional Review Board approval was obtained prior to the initiation of the study to ensure compliance with all regulatory and ethical guidelines for research involving human subjects. All procedures adhered to the ethical standards outlined for such studies. An official request letter was submitted to the hospital's Chief Nursing Officer to gain formal approval for conducting the study.

Recruitment and Participants

Thirty-nine acute care clinical nurses from a hospital in the Southeast region were voluntarily recruited to participate in the study. Participants were informed of their right to refuse participation or withdraw from the study at any time without repercussions. Consenting was performed via a bi-directional video platform; therefore, verbal consents were obtained after ensuring participants of the confidentiality of their responses. Once consent was obtained from participants, appointments were scheduled for the collection of baseline data and training participants in Ujjayi pranayama, Bhastrika pranayama, and Surya Bheda pranayama. The researchers trained participants in both slow (Ujjayi and Surya Bheda) and rapid (Bhastrika) pranayama techniques, utilizing Bhastrika breathing to energize and Ujjayi and Surya Bheda to promote calmness and sustained energy. This dynamic interaction between breath and mind highlights its potential as a practical tool for self-regulation and mindfulness in daily life (Chopra & Platt-Finger, 2023). To acknowledge their participation, nurses were offered an elective credit applicable to their institution's professional advancement plan upon completion of the study.

Intervention: Pranayama Practices

Participants completed a demographic questionnaire and two validated survey instruments before being taught the pranayama techniques. The two validated surveys used included a modified version of the Secondary Traumatic Stress Scale-5 (STSS) (Bride, 2013) and the World Health Organization-5 Well-Being Index (WHO-5) (Topp et al., 2015). The STSS, was originally developed by Bride to assess intrusion, avoidance, and arousal symptoms related to indirect trauma exposure among professionals (Bride, 2013). The STSS was later refined, with researchers using an 8-item self-reported version focused specifically on indirect exposure to patients (Bride, 2013). The WHO-5 is a 5-item survey that is used to assess subjective psychological well-being (Topp et al., 2015).

After the completion of demographic questions and two baseline surveys, the participants were trained in three pranayama (regulated breathing) techniques designed to manage stress and improve well-being:

1. Ujjayi Pranayama (Ocean Breathing): Participants practiced slow breathing by constricting the epiglottis muscles to produce a sound resembling ocean waves during both inhalation and exhalation. This practice is known to tone the nervous system, promote relaxation, and calm the mind (Char, 2021). The exercise took approximately eight minutes to complete.
2. Bhastrika Pranayama (Bellows Breath): This fast-paced breathing technique involved deep diaphragmatic inhalation followed by forceful exhalation to expel air from the lungs. Bhastrika pranayama is associated with enhanced oxygenation, improved vitality, and the calming of the mind while energizing the body (Char, 2021). The practice required three minutes to complete.
3. Surya Bhedana Pranayama (Right Nostril Breathing): This focused breathing technique involved inhalation through the right nostril while the left nostril was closed. Surya Bhedana pranayama is believed to increase pranic energy, enhance vitality, and boost the activity of the sympathetic nervous system (Char, 2021). It took approximately three minutes to complete. Pranic energy is associated with improved strength, vitality, and overall energy levels (Char, 2021).

Participants received structured education on the pranayama techniques by a trained instructor after completing the baseline surveys. Once participants demonstrated competency in the three pranayama techniques, they were

instructed to integrate the practices into their daily routines for the next two months. The daily practice recommendations included morning sessions of Ujjayi and Bhastrika (bellows) pranayama, followed by a midday session of Surya Bheda pranayama. At the end of one month and two months of daily pranayama practice, follow-up surveys (STSS and WHO-5) were sent to participants electronically to assess changes in stress levels and well-being.

Statistical Analysis

Data were collected and securely stored on a REDCap server between October 3, 2023, and December 5, 2023. Follow-up first month data was collected in December 2023 and second month data collected in January 2024. Prior to statistical analysis, all data were reviewed for completeness, and survey responses were scored according to the published guidelines for each instrument. The STSS assessed stress levels, while the WHO-5 evaluated subjective well-being. Both instruments utilized five-point Likert-style response scales.

Statistical Procedures

To evaluate changes in participants' stress levels and well-being over time, paired *t*-tests were conducted to compare scores from baseline to one-month post-intervention and from baseline to two-months post-intervention. A 5% level of significance ($p < 0.05$) was used to determine statistical significance. In addition to reporting the *p*-values, Cohen's *d* effect sizes were also calculated to quantify the magnitude of change, where $d = 0.2$ is considered to be a "small" effect size, $d = 0.5$ is "moderate" and $d = 0.8$ is "large" (Cohen, 1988). All statistical analyses were performed using statistical package for the social sciences software (SPSS), version 27.

RESULTS

Of the 39 nurses who initiated the survey, only 20 completed the consent process and baseline questionnaires. One nurse withdrew after providing consent, leaving 19 nurses from a single community hospital for analysis. Of these, 10 participants completed the 1-month follow-up, a different set of 10 participants completed the 2-month follow-up, and only eight completed all three time points. The drastic drop in participation from 39 initial respondents to 8 completing all time points was attributed to skepticism about the effectiveness of pranayama as a stress-reduction tool, lack of time due to work overload, changes in organizational structure, and insufficient support from leadership. Furthermore, the lack of funding and absence of financial incentives for participants may have also contributed to the decline in engagement.

The majority of the 19 nurses were older than 35 years (57.8%) and had a BSN (84.2%) (Table 1). A small majority of nurses had 10 years or less of experience (57.9%) and the majority had been on their unit 0-5 years (63.2%) (Table 1). All the nurses worked day shift on a medical surgical unit.

Table 1*Demographics (n=19)*

		N (%)
Age	20-25	1 (5.3%)
	26-30	3 (15.8%)
	31-35	4 (21.1%)
	36-40	1 (5.3%)
	41-45	3 (15.8%)
	46-50	2 (10.5%)
	51-55	1 (5.3%)
	56-60	1 (5.3%)
	61-65	0 (0%)
	66-70	3 (15.8%)
Shift	Day Shift	19 (100%)
	Night Shift	0 (0%)
Occupation	RN	11 (57.9%)
	unknown	8 (42.1%)
Education	AND	1 (5.3%)
	Diploma	2 (10.5%)
	BSN	16 (84.2%)
Years' Experience	0-5	5 (26.3%)
	5-10	6 (31.6%)
	10-15	2 (10.5%)
	>15	6 (31.6%)
Years Worked on Unit	0-5	12 (63.2%)
	5-10	4 (21.1%)
	10-15	1 (5.3%)
	>15	2 (10.5%)

For the STSS-5 scores, there was a slight decrease in total scores, as well as in the avoidance and intrusion subscores, from baseline to 1 month and 2 months (Table 2). The STSS-5 survey includes questions assessing intrusion, avoidance, and arousal related to indirect trauma from caring for traumatized patients (Jacobs et al., 2019). Avoidance refers to actively avoiding thoughts or situations that trigger memories of the trauma, while intrusion involves unwanted re-experiencing of patients' traumatic events (Jacobs et al., 2019).

However, these changes were minimal and not statistically significant compared to baseline. In contrast, the 10 nurses who completed both baseline and either the 1 month or the 2-month follow-up for the WHO-5 showed significant increases in their well-being from baseline, with an average improvement of $\pm 12.40 \pm 11.54$ points at 1 month ($p = .008$) and 7.60 ± 8.10 at 2 months ($p = .016$) (Table 2, Figure 2). These improvements represent a large effect size for improved well-being scores at both follow-up time points ($d = 1.075$ at 1 month, $d = 0.938$ at 2 months).

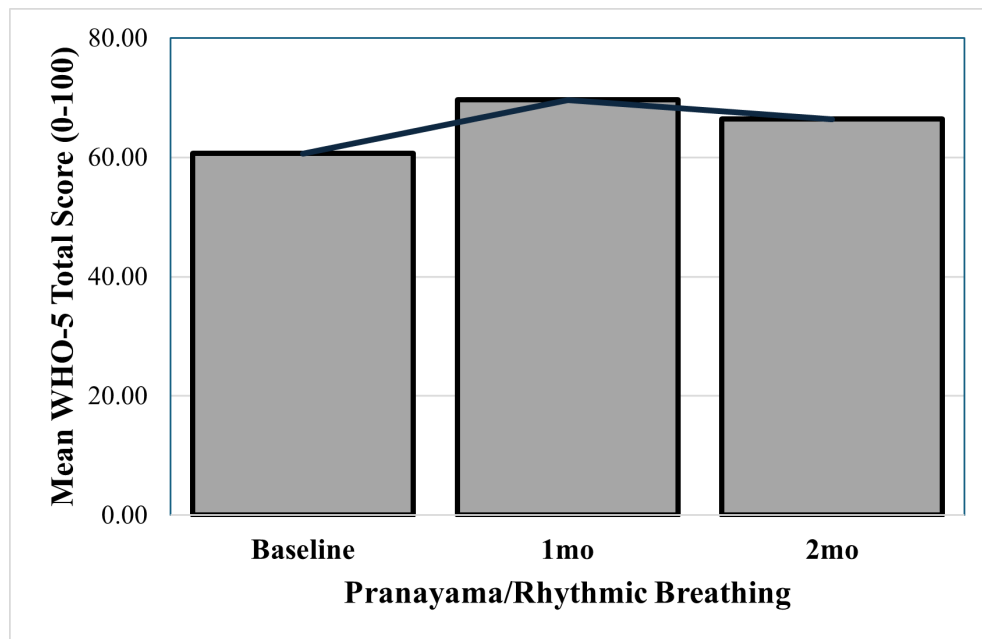
Table 2

World Health Organization Well-being Index – 5 (WHO-5) and Secondary Traumatic Stress Scale DSM-V (STSS-5) Descriptive Statistics and Changes from Baseline to 2mo

Measure	Timepoint	n	Mean (SD)	Compare To Baseline	Change Score Mean (SD)	Paired t-test p-value	Effect Size Cohen's d
STSS-5	Baseline	19	11.63 (3.96)	-	-	-	-
Intrusion	1mo	10	11.40 (2.91)	1mo – baseline	-0.30 (3.71)	.804	-0.081
Subscore	2mo	10	11.50 (2.88)	2mo – baseline	-0.90 (2.23)	.235	-0.403
STSS-5	Baseline	19	4.42 (1.50)	-	-	-	-
Avoidance	1mo	10	4.50 (4.65)	1mo – baseline	0.30 (2.06)	.656	0.146
Sub score	2mo	10	4.60 (4.43)	2mo – baseline	0.20 (1.87)	.743	0.107
STSS-5	Baseline	19	18.16 (5.27)	-	-	-	-
Total Score	1mo	10	17.50 (4.79)	1mo – baseline	-0.50 (4.99)	.759	-0.100
	2mo	10	17.80 (4.05)	2mo – baseline	-0.90 (3.48)	.434	-0.259
WHO-5 Total Score (0-100)	Baseline	19	60.63 (17.55)	-	-	-	-
	1mo	10	69.60 (12.10)	1mo – baseline	12.40 (11.54)	.008	1.075
	2mo	10	66.40 (11.19)	2mo – baseline	7.60 (8.10)	.016	0.938

Figure 2

Mean WHO-5 scores by Timepoint



Note. The bar graph illustrates the significant improvement in well-being among 10 nurses who completed both baseline and follow-up assessments (WHO-5). At 1 month, the average well-being score increased by 12.40 ± 11.54 points ($p = .008$), and at 2 months, by 7.60 ± 8.10 points ($p = .016$).

DISCUSSION

The aim of this study was to explore the effects of daily practice of pranayama on overall stress and well-being of clinical nurses. While the results demonstrated an improvement in nurses' well-being, no significant reduction in stress levels was observed, likely due to the small sample size and short study duration. Despite these limitations, the findings suggest that teaching nurses a simple, cost-effective breathing technique can enhance their overall well-being and reduce stress. Such practices can be integrated into daily huddles, onboarding processes, and annual staff education to promote grounding and resilience.

However, the generalizability of these findings is limited. This pilot study was conducted at a single community hospital with a small sample of participants, which may not reflect the diversity of experiences and challenges faced by nurses in other settings. Variations in institutional culture, leadership support, workload, and resources in different healthcare facilities could influence the effectiveness of pranayama interventions. As a result, these findings may not be fully representative of nurses in other hospitals or regions.

To enhance the external validity of these results, further research with larger and more diverse sample sizes across multiple healthcare settings is needed. Such studies would help to determine whether the benefits of pranayama observed in this pilot study can be replicated and generalized to broader populations of nurses.

Future Implications

Implementing consistent pranayama practices has the potential to improve nurses' well-being and reduce stress. Further research is recommended to confirm these findings and explore their applicability in diverse practice settings. Additionally, future studies could examine the long-term effects of pranayama on stress management, job satisfaction, and patient care outcomes. Investigating the integration of these practices into workplace wellness programs and assessing their feasibility in high-stress clinical environments may provide valuable insights for institutional adoption.

CONCLUSION

Healthcare organizations should consider integrating pranayama into onboarding programs, annual staff education, and daily workplace routines. Consistent practice of pranayama has the potential to be a practical and accessible tool for reducing stress and improving well-being among acute care nurses. Nursing roles are inherently high-stress due to the demands of delivering quality patient care with limited resources. This chronic stress contributes to diminished well-being among nurses. Providing nurses with accessible tools to manage stress and enhance well-being is crucial for improving their health and fostering a positive work environment.

While the findings of this study suggest positive effects, further research is needed to validate these results and explore broader applications. The importance of prioritizing nurses' well-being is increasingly recognized at a national level, as demonstrated by the American Nurses Association's *Healthy Nurse, Healthy Nation* initiative, launched in 2017 (McNamara, 2019). This initiative emphasizes the need to improve the health of nurses, ultimately enhancing patient care and the overall healthcare system. Integrating pranayama-based interventions into such wellness programs could serve as a valuable strategy to support nurses' mental and physical health in demanding clinical environments.

Future efforts should focus on expanding the implementation of pranayama practices across entire healthcare systems. Potential strategies include incorporating pranayama into daily huddles, providing structured 10-minute breathing breaks, and developing mobile applications for guided practice. By investing in the well-being of their workforce, healthcare systems could foster a healthier, more resilient staff, ultimately benefiting both clinicians and patients alike.

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Author's Note

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.