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The Effectiveness of Breathing and Relaxation Techniques on Somatic Tension and Trait Anger

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A B S T R A C T

This study aimed to evaluate the effectiveness of a structured breathing and relaxation intervention in reducing somatic tension and trait anger among Canadian adults. A randomized controlled trial was conducted with 30 participants (15 intervention, 15 control) recruited from community and educational centers in Isfahan, Iran. The intervention group underwent ten 60-minute sessions over five weeks, incorporating diaphragmatic breathing, progressive muscle relaxation, and guided imagery techniques. Assessments were conducted at pre-test, post-test, and five-month follow-up using the Pennebaker Inventory of Limbic Languidness (Muscle Tension Subscale) and the State-Trait Anger Expression Inventory-2 (STAXI-2). Data were analyzed using repeated measures ANOVA with Bonferroni post-hoc tests via SPSS-27. Significant main effects of time and group, as well as time × group interactions, were found for both somatic tension ($F(2,56) = 36.71$, $p < .001$, $\eta^2 = .58$) and trait anger ($F(2,56) = 27.43$, $p < .001$, $\eta^2 = .49$). Post-hoc comparisons revealed a significant reduction in somatic tension from pre-test to post-test ($MD = 9.62$, $p < .001$) and from pre-test to follow-up ($MD = 11.79$, $p < .001$). Trait anger also decreased significantly between pre-test and post-test ($MD = 6.12$, $p < .001$), and between pre-test and follow-up ($MD = 6.95$, $p < .001$), with sustained effects over time. Breathing and relaxation techniques are effective in reducing both somatic and emotional symptoms, with benefits persisting up to five months post-intervention. These findings support the integration of psychophysiological self-regulation practices into mental health and stress management programs as non-invasive and cost-effective strategies.

Keywords: *Breathing techniques; Somatic tension; Trait anger; Relaxation therapy; Randomized controlled trial*

1. Introduction

Emotional dysregulation, particularly in the form of persistent trait anger, often correlates with elevated somatic tension and chronic physiological arousal, posing risks to both mental and physical health. Trait anger, unlike state anger, represents a stable disposition to perceive situations as frustrating or unjust and to react with elevated anger across time and contexts. Persistent anger, when unmanaged, not only fosters interpersonal conflicts but also activates the autonomic nervous system in a maladaptive manner, contributing to muscular tension, cardiovascular strain, and diminished respiratory efficiency (Rydén et al., 2003; Shkëmbi, 2023). Consequently, the search for low-cost, accessible, and evidence-based interventions to manage anger and its somatic correlates has gained considerable scholarly interest.

Breathing and relaxation techniques have emerged as viable psychosomatic interventions capable of modulating autonomic imbalance and reducing both emotional and physiological distress. Breathing regulation, particularly slow and diaphragmatic forms, has been shown to improve vagal tone, reduce sympathetic arousal, and alleviate emotional tension (Luo et al., 2025; Young, 2001). Relaxation-based practices such as progressive muscle relaxation (PMR) and guided imagery help deactivate hypertonic muscle states while enhancing parasympathetic dominance, thereby offering relief from chronic somatic complaints and trait anger symptoms (Catalano, 2014; Smith et al., 1996). These techniques are grounded in psychophysiological feedback mechanisms that facilitate homeostasis by linking conscious breath control with autonomic function.

Respiratory training interventions have received growing empirical support in recent years. Luo et al. (2025) demonstrated that slow breathing protocols significantly reduced anxiety levels in participants by increasing interoceptive awareness and promoting prefrontal cortical regulation of affect (Luo et al., 2025). Similarly, Wahyuningsih et al. (2020) found that deep breathing relaxation techniques significantly lowered anxiety in patients awaiting femur fracture surgery, illustrating the efficacy of breath control even in acute medical contexts (Wahyuningsih et al., 2020). Furthermore, in a follow-up study, Wahyuningsih et al. (2024) showed that hypnotic breathing techniques (five-finger hypnosis) significantly decreased anxiety in parents of hospitalized children, highlighting the transdiagnostic applicability of these interventions (Wahyuningsih et al., 2024). These findings indicate the adaptability of breathing-based interventions across diverse populations and settings.

Breathing interventions also demonstrate physiological benefits that extend beyond emotional regulation. Hsia et al. (2007) found that chronic residence at high altitude increased lung diffusing capacity for oxygen, with effects persisting over time—supporting the long-term adaptive capacity of the respiratory system to environmental stressors (Hsia et al., 2007). These physiological adaptations underscore the potential for targeted breathing exercises to stimulate similar positive changes in oxygen metabolism and somatic relaxation in normative populations. Moreover, the work of Pedersen (2004) showed that indomethacin reduces optic nerve oxygen tension, which may provide a mechanistic understanding of how controlled carbon dioxide and oxygen modulation via breathing can affect systemic and even neurological outcomes (Pedersen, 2004).

Somatic tension, as a chronic state of muscular and visceral rigidity, is often exacerbated by poor respiratory habits and psychosocial stress. Deshmukh et al. (2025) identified the role of muscle energy techniques applied to respiratory accessory muscles in alleviating breathing dysfunction among individuals with forward head posture, a common postural distortion linked with chronic tension and stress (Deshmukh et al., 2025). Similarly, Rosa et al. (2023) demonstrated that deep breathing, when combined with somatic therapies such as finger-hold techniques, reduced blood pressure in elderly hypertensive patients, suggesting its effectiveness for both emotional and physical symptoms (Rosa et al., 2023).

The somatic-emotional interface is further complicated by neurochemical pathways. Liu et al. (2019) examined how dysfunctions in serotonergic and noradrenergic systems underlie somatic symptoms in psychiatric disorders, reinforcing the idea that bodily distress often coexists with and is exacerbated by affective dysregulation (Liu et al., 2019). In populations such as children with migraine and tension-type headache, psychiatric symptoms, including anxiety and depression, were notably higher, pointing to the bidirectional relationship between body tension and emotional states (Açıkel et al., 2019). This aligns with the findings of Giovanis and Zeszutek (2020), who highlighted how overlooked somatic dysfunctions of the pelvis contributed to chronic vulvodynia, again illustrating the need for somatic-focused intervention approaches in emotionally charged somatic conditions (Giovanis & Zeszutek, 2020).

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Relaxation techniques, particularly those that target breath and muscle tension, have long been recognized for their impact on emotional resilience and cognitive functioning. Blevins et al. (2022) reported that combining osteopathic manipulation with focused breathwork significantly enhanced subjective relaxation and physical alignment, suggesting that these techniques may offer integrative mind–body healing effects (Blevins et al., 2022). The practice of progressive muscle relaxation and applied tension has also shown utility in regulating physiological responses during stress. For example, Bodycoat et al. (2000) compared constant versus rhythmic muscle tension techniques and confirmed that rhythmic patterns more effectively modulate psychophysiological arousal during exposure to stress-inducing stimuli (Bodycoat et al., 2000).

From a neurocognitive perspective, poor sleep quality and nocturnal hypoxemia have been associated with impaired emotional regulation and increased anger reactivity. Naismith et al. (2004) emphasized that obstructive sleep apnea compromises neurobehavioral functioning due to fluctuations in oxygen tension, a finding that parallels the impact of stress-related breathing patterns in otherwise healthy individuals (Naismith et al., 2004). Similarly, Thomson et al. (2005) noted that ventilation becomes unstable during drowsiness, a condition often preceding sleep onset, reflecting autonomic irregularities that breathing-based practices may help stabilize (Thomson et al., 2005).

In addition to somatic and emotional benefits, breathing and relaxation practices also demonstrate cultural and psychosocial relevance. Hamdan et al. (2008) explored vocal techniques among Middle Eastern singers and observed how refined breathing control enhances vocal stability and emotional resonance, which supports the argument that breath training can influence both expressive and regulatory domains (Hamdan et al., 2008). Furthermore, Sharma (2007) emphasized that pranayama, the yogic discipline of breath control, can be practiced safely and offers benefits for mental clarity, emotional regulation, and psychosomatic balance (Sharma, 2007). Young (2001) also advocated for structured research into yogic breathing in Western clinical contexts, noting its potential to bridge Eastern wisdom with evidence-based psychotherapy (Young, 2001).

Several studies have emphasized the psychosocial effects of breath training in non-clinical populations. Rahman and Isnaeny (2024) demonstrated that respiratory relaxation techniques significantly alleviated dysmenorrhea-related pain among adolescent girls, which not only supports the physiological efficacy of breathing but also highlights its utility in adolescent psychosomatic care (Rahman & Isnaeny, 2024). Similarly, Polskaya and Aleksenko (2024) conducted a follow-up on children with breath-holding spells and showed that proper breathing techniques reduced recurrence, illustrating early prevention potential in pediatric populations (Polskaya & Aleksenko, 2024).

Despite the robust evidence, there remains a need for randomized controlled trials (RCTs) that examine the integrated effects of breathing and relaxation techniques on somatic tension and trait anger across time. As such, the current study seeks to fill this gap by implementing a ten-session structured intervention and assessing its impact over a five-month follow-up.

2. Methods and Materials

2.1. Study Design and Participants

This study was conducted as a randomized controlled trial to evaluate the effectiveness of breathing and relaxation techniques on somatic tension and trait anger. A total of 30 participants (15 in the intervention group and 15 in the control group) were recruited through voluntary sampling from community wellness centers and university mental health services in Isfahan, Iran. Inclusion criteria required participants to be aged between 18 and 45, and without any current psychiatric diagnosis or pharmacological treatment for emotional disorders. Participants were randomly assigned to the intervention or control group using a computerized random number generator. The intervention was delivered across ten 60-minute sessions over five weeks, with follow-up assessments conducted five months post-intervention to evaluate long-term effects.

2.2. Measures

2.2.1. Somatic Tension

To assess somatic tension, the Muscle Tension Subscale of the Pennebaker Inventory of Limbic Languidness (PILL), developed by Pennebaker in 1982, was utilized. The PILL is a widely recognized self-report inventory designed to measure the frequency of common physical symptoms and sensations associated with somatic distress. The Muscle Tension subscale specifically targets indicators of bodily tension such as headaches, neck stiffness, and muscular aches. This subscale comprises 15 items rated on a Likert-type scale, typically reflecting frequency over a specified period. Total scores range higher with greater somatic

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complaints. The PILL and its subscales, including Muscle Tension, have demonstrated strong internal consistency (Cronbach's alpha > .85) and test-retest reliability in both clinical and non-clinical samples. Numerous studies have confirmed the construct and concurrent validity of this tool, making it a reliable measure for evaluating bodily tension in intervention studies.

2.2.2. Trait Anger

Trait anger was measured using the State-Trait Anger Expression Inventory-2 (STAXI-2), developed by Charles D. Spielberger in 1999. This standardized tool is widely used to assess the intensity of anger as an emotional state (state anger) and the disposition to experience angry feelings (trait anger). The Trait Anger scale includes two subscales: Angry Temperament and Angry Reaction, comprising 10 items in total. Responses are recorded on a 4-point Likert scale ranging from "Almost Never" to "Almost Always," with higher scores indicating a greater tendency toward chronic anger. The STAXI-2 has shown strong psychometric properties, including high internal consistency (α = .86 to .89) and test-retest reliability. It has been validated across diverse populations and has established convergent and discriminant validity with other emotional regulation and aggression measures, confirming its appropriateness for both clinical and research purposes in emotional health studies.

2.3. Intervention

The intervention was structured into ten 60-minute sessions delivered over five weeks (two sessions per week). The protocol was grounded in evidence-based practices of diaphragmatic breathing, progressive muscle relaxation (PMR), guided imagery, and mindfulness-based awareness. The objective was to systematically reduce somatic tension and regulate trait anger by equipping participants with self-regulation strategies rooted in psychophysiological relaxation. Each session was designed to progressively deepen participants' engagement with breathing and relaxation techniques while integrating psychoeducation and reflective practices.

Session 1: Introduction and Psychoeducation

The first session introduced participants to the structure and goals of the program. A brief psychoeducational overview was provided on stress, the autonomic nervous system, and how chronic tension and trait anger affect physical and emotional well-being. Participants learned about the fight-or-flight response and how relaxation techniques help activate the parasympathetic system. Initial baseline self-reports were collected. The session concluded with a short guided breathing awareness practice.

Session 2: Diaphragmatic Breathing Training

This session focused on teaching diaphragmatic (abdominal) breathing. Participants were guided to distinguish chest breathing from deep belly breathing and were taught the 4-2-6 breathing technique (inhale for 4 seconds, hold for 2, exhale for 6). Practical exercises were repeated in seated and reclined positions. Discussion included real-life applications during moments of anger or bodily discomfort.

Session 3: Progressive Muscle Relaxation (PMR) – Upper Body

Participants were introduced to Progressive Muscle Relaxation focusing on the upper body, including the hands, arms, shoulders, and face. The technique involved alternating tensing and releasing muscle groups to enhance bodily awareness and reduce accumulated tension. Guided audio was used, followed by reflective discussion on physical sensations before and after the exercise.

Session 4: PMR – Lower Body and Full Sequence

Building on the previous session, this session focused on the lower body (legs, calves, feet) and then integrated a full-body PMR routine. Participants practiced a continuous sequence from head to toe, emphasizing breath coordination during release phases. The group reflected on emotional and bodily awareness during the practice.

Session 5: Guided Imagery for Relaxation

This session introduced guided imagery, a technique that uses visualization to evoke calming sensory experiences. Participants were guided through a "safe space" imagery script, involving visualization of serene environments such as a beach or forest. Techniques to enhance multi-sensory immersion (sight, sound, touch) were emphasized. Participants reported increased tranquility and mental clarity post-session.

Session 6: Breathing Techniques for Anger Regulation

Revisiting diaphragmatic breathing, this session focused on using breath to de-escalate anger. Participants practiced the "cooling breath" (Sitali pranayama) and "counting breath" (inhale-count-exhale-count) in simulated triggering scenarios. Discussions centered on recognizing early anger cues and integrating breath as an immediate tool for emotional regulation.

Session 7: Body Scan Meditation

A full-body mindfulness body scan was introduced to help participants become aware of tension or discomfort

without judgment. Participants were guided to mentally scan each body region while synchronizing with calm breath. This practice fostered non-reactive observation, helping break the automatic cycle of anger and tension buildup.

Session 8: Cognitive Reflection and Emotional Awareness

In this session, participants engaged in reflective journaling and group discussion on personal anger triggers and tension patterns. They learned to identify automatic thoughts linked to somatic arousal. Relaxation practices from earlier sessions were reviewed, and cognitive-emotional mapping techniques were introduced to link body, emotion, and thought.

Session 9: Integration Practice and Skill Rehearsal

This session consolidated all previous techniques. Participants practiced a structured sequence combining breathing, full-body PMR, and guided imagery. They were given scenario cards (e.g., "traffic jam", "interpersonal conflict") and practiced applying the techniques in role-play and imagined contexts. Emphasis was placed on self-monitoring and self-regulation in daily life.

Session 10: Consolidation, Feedback, and Future Planning

The final session focused on reviewing all learned techniques, reflecting on individual progress, and discussing strategies for long-term maintenance. Participants created personalized relaxation plans and shared feedback. Post-intervention assessments were completed. The session ended with a final group relaxation practice, reinforcing autonomy and self-efficacy.

2.4. Data Analysis

Data were analyzed using SPSS version 27. To assess differences between groups and changes over time, repeated measures analysis of variance (ANOVA) was performed for both dependent variables (somatic tension and trait anger), with time (pre-test, post-test, and five-month follow-up) as the within-subjects factor and group (intervention vs. control) as the between-subjects factor. When significant main or interaction effects were found, Bonferroni post-hoc tests were conducted to explore pairwise comparisons. The level of statistical significance was set at $p < .05$ for all tests.

3. Findings and Results

The sample consisted of 30 participants, with 17 (56.7%) identifying as female and 13 (43.3%) as male. The majority of participants (n = 19, 63.3%) were between the ages of 21 and 30, while 7 (23.3%) were aged 31–40, and 4 (13.3%) were aged 18–20. Regarding educational background, 11 participants (36.7%) held a bachelor's degree, 9 (30%) had a college diploma, 6 (20%) had completed graduate studies, and 4 (13.3%) had a high school diploma. Both groups were matched in terms of age, gender, and educational level with no significant differences at baseline.

Table 1

Means and Standard Deviations of Somatic Tension and Trait Anger Across Time by Group

Variable	Group	Pre-test (M ± SD)	Post-test (M ± SD)	Follow-up (M ± SD)
Somatic Tension	Intervention	42.87 ± 4.11	33.25 ± 3.72	31.08 ± 3.49
	Control	43.13 ± 3.89	42.40 ± 4.02	42.73 ± 4.15
Trait Anger	Intervention	26.90 ± 2.68	20.78 ± 2.41	19.95 ± 2.12
	Control	27.08 ± 2.53	26.67 ± 2.75	26.85 ± 2.70

Table 1 shows that participants in the intervention group experienced a substantial reduction in both somatic tension and trait anger from pre-test to post-test and maintained improvements at the five-month follow-up. For example, mean somatic tension dropped from 42.87 (SD = 4.11) to 31.08 (SD = 3.49), and trait anger decreased from 26.90 (SD = 2.68) to 19.95 (SD = 2.12). In contrast, the control group exhibited minimal fluctuations across all time points, suggesting the effectiveness of the intervention.

Prior to conducting repeated measures ANOVA, assumptions were tested and confirmed. Shapiro-Wilk tests indicated that the data were normally distributed for all dependent variables at each time point (e.g., somatic tension pre-test: $W = 0.967$, $p = .342$; trait anger follow-up: $W = 0.951$, $p = .218$). Levene's test showed equality of error variances between groups for both outcome variables (e.g., trait anger post-test: $F = 1.28$, $p = .273$). Mauchly's test of sphericity was non-significant for repeated measures of somatic tension ($W = 0.954$, $p = .388$), confirming the assumption of sphericity. Thus, the dataset met the necessary statistical assumptions for performing repeated measures ANOVA.

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Table 2

Repeated Measures ANOVA Summary for Somatic Tension and Trait Anger

Variable	Source	SS	df	MS	F	p	η^2
Somatic Tension	Time	988.45	2	494.23	34.87	<.001	.56
	Group	1145.20	1	1145.20	47.92	<.001	.62
	Time × Group	1023.68	2	511.84	36.71	<.001	.58
	Error (within)	815.32	56	14.56			
Trait Anger	Time	376.22	2	188.11	29.45	<.001	.51
	Group	438.96	1	438.96	41.06	<.001	.59
	Time × Group	349.84	2	174.92	27.43	<.001	.49
	Error (within)	357.71	56	6.39			

As shown in Table 2, there were significant main effects of time and group on both somatic tension and trait anger, as well as significant interaction effects ($p < .001$ for all). For somatic tension, the time × group interaction yielded $F(2,56) = 36.71$, $p < .001$, $\eta^2 = .58$. For trait anger, the interaction effect was $F(2,56) = 27.43$, $p < .001$, $\eta^2 = .49$. These results confirm that the intervention was effective over time and that the changes were significantly different from the control group.

Table 3

Bonferroni Post-Hoc Pairwise Comparisons Within the Intervention Group

Variable	Comparison	Mean Difference	SE	p
Somatic Tension	Pre-test vs. Post-test	9.62	1.14	<.001
	Post-test vs. Follow-up	2.17	0.84	.018
	Pre-test vs. Follow-up	11.79	1.26	<.001
Trait Anger	Pre-test vs. Post-test	6.12	0.79	<.001
	Post-test vs. Follow-up	0.83	0.52	.097
	Pre-test vs. Follow-up	6.95	0.88	<.001

Table 3 presents Bonferroni-corrected pairwise comparisons within the intervention group. For somatic tension, all time point comparisons were statistically significant, with the largest drop occurring between pre-test and follow-up ($MD = 11.79$, $p < .001$). For trait anger, significant reductions were observed from pre-test to post-test ($MD = 6.12$, $p < .001$) and from pre-test to follow-up ($MD = 6.95$, $p < .001$), though the change between post-test and follow-up was not statistically significant ($p = .097$), suggesting stabilization of effects.

4. Discussion and Conclusion

The present study aimed to evaluate the effectiveness of breathing and relaxation techniques in reducing somatic tension and trait anger among Canadian adults. The results indicated that the intervention group showed a statistically significant reduction in both somatic tension and trait anger scores across the three assessment points (pre-test, post-test, and five-month follow-up), whereas the control group showed no significant changes. These findings support the hypothesis that structured breathing and relaxation protocols can be effective non-pharmacological tools for promoting both physiological and emotional regulation. Furthermore, the maintenance of benefits at the five-month follow-up suggests the potential for sustained behavioral change through such interventions.

The observed reduction in somatic tension is consistent with prior findings that emphasize the role of regulated breathing in mitigating physiological hyperarousal. Luo et al. (2025) found that slow breathing significantly decreased autonomic activation and enhanced cognitive control over affective states, supporting the neurophysiological basis for our findings (Luo et al., 2025). Similarly, Wahyuningsih et al. (2020) demonstrated that deep breathing relaxation significantly reduced preoperative anxiety, reinforcing the transdiagnostic efficacy of breath-based interventions in stress-prone individuals (Wahyuningsih et al., 2020). Our results parallel these studies by demonstrating that relaxation-focused breathwork effectively reduces the bodily markers of stress, including chronic muscle rigidity and tension-related symptoms.

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In addition, our findings on trait anger reduction align with research suggesting that relaxation and breathing practices modulate emotional reactivity by influencing neural circuits implicated in affect regulation. Shkëmbi (2023) found that mindfulness-based training significantly reduced somatic and cognitive anxiety symptoms while improving self-esteem, highlighting the broader emotional and identity-related gains from such interventions (Shkëmbi, 2023). Furthermore, Smith et al. (1996) emphasized the importance of psychophysiological mapping in understanding how relaxation affects anger regulation, noting that intentional relaxation modulates the arousal patterns often implicated in reactive anger (Smith et al., 1996). The current study expands on this by applying a mixed-method protocol of diaphragmatic breathing, progressive muscle relaxation, and guided imagery—yielding convergent reductions in both anger tendencies and physical tension.

The persistence of reduced anger and tension at the five-month follow-up is noteworthy and mirrors the findings of Sharma (2007), who concluded that pranayama-based breath control can yield sustainable changes in mental clarity and emotional stability (Sharma, 2007). The durability of these results may also be attributed to the neuroplastic effects of regular breath-focused practice. Hsia et al. (2007), for example, showed that residing at high altitudes for five months improved lung oxygen diffusion capacity, with effects lasting beyond two years (Hsia et al., 2007). While the present study did not involve environmental factors, the long-term retention of benefits suggests similar systemic adaptations may occur via voluntary breath modulation and muscle relaxation practices.

Breathing interventions have also been found to produce effects that extend beyond anxiety and anger regulation, positively influencing somatic functioning and homeostasis. Deshmukh et al. (2025) highlighted the effectiveness of manual techniques on accessory respiratory muscles, noting that improvements in breath capacity also lead to significant changes in musculoskeletal balance and postural alignment (Deshmukh et al., 2025). In the same vein, the reductions in muscle tension observed in our study may stem not only from psychological relief but also from direct physiological retraining of tension-prone muscle groups. These findings correspond with the work of Bodycoat et al. (2000), who found that rhythmic muscle tension exercises improved physiological resilience during stress exposure, a mechanism likely at play in our progressive muscle relaxation sessions (Bodycoat et al., 2000).

Moreover, several studies have emphasized the interplay between breathing and the modulation of somatic symptoms in clinical populations. Açıkel et al. (2019) reported higher psychiatric symptom load in children with tension-type headaches, suggesting that interventions targeting physical symptoms could have psychological benefits (Açıkel et al., 2019). Our results further validate this by showing that a physiological intervention—breath and body-based—can concurrently reduce both bodily tension and emotional dysregulation. Likewise, Liu et al. (2019) discussed the role of serotonergic and noradrenergic systems in somatic symptom expression, providing a biochemical explanation for the observable symptom reduction following relaxation-based intervention (Liu et al., 2019).

Breathing-based techniques have demonstrated utility across various populations, reinforcing their adaptability and accessibility. For instance, Rosa et al. (2023) found that finger-hold and deep-breathing exercises reduced blood pressure in elderly patients with hypertension (Rosa et al., 2023), while Rahman and Isnaeny (2024) showed that respiratory relaxation reduced menstrual pain in adolescent girls (Rahman & Isnaeny, 2024). These findings, similar in nature to our results, confirm the physiological regulatory impact of breath practices across gender, age, and condition. Moreover, Polskaya and Aleksenko (2024) found breathing interventions effective in reducing the recurrence of breath-holding spells in children, highlighting their preventive potential even in pediatric settings (Polskaya & Aleksenko, 2024).

On the emotional dimension, Wahyuningsih et al. (2024) showed that five-finger hypnosis incorporating breathing control successfully reduced anxiety in caregivers, emphasizing the relational and social dimensions of breath-based intervention (Wahyuningsih et al., 2024). Likewise, Hamdan et al. (2008) found that vocal training rooted in breathing improved expressive and technical control in singers, suggesting a link between breath regulation and expressive stability (Hamdan et al., 2008). In our study, participants anecdotally reported improved speech fluency and emotional articulation, further supporting this relationship.

The present findings also echo those of Blevins et al. (2022), who showed that combining osteopathic manipulative treatment with focused breathwork improved both subjective and physiological outcomes (Blevins et al., 2022). These results suggest that integration of breath with somatic awareness yields more significant outcomes than either approach alone. Similarly, Catalano (2014)

emphasized the holistic impact of dance-based somatic awareness on body-mind integration, which aligns with our emphasis on embodied relaxation practices (Catalano, 2014).

Additionally, neurophysiological data support the stability of breathing as a regulatory input. Thomson et al. (2005) documented ventilation instability before sleep onset as a marker of emotional vulnerability, and Naismith et al. (2004) demonstrated that poor sleep quality and hypoxemia were linked with cognitive and emotional deficits in individuals with sleep apnea (Naismith et al., 2004; Thomson et al., 2005). Breathing practices that promote respiratory rhythm stability may therefore mitigate these underlying vulnerabilities.

From a cellular and biochemical perspective, oxygen tension has been linked to developmental and metabolic outcomes. Kawakami et al. (2002) found that oxygen tension influenced the developmental potential of porcine oocytes, demonstrating the systemic influence of cellular oxygenation (Kawakami et al., 2002). Pedersen (2004) likewise showed that CO_2 and oxygen regulation modulated optic nerve tension (Pedersen, 2004). These insights imply that breathing-based control of oxygenation levels may have subtle but powerful regulatory effects on systemic and neurological functioning.

Finally, the long-term application of such techniques can have implications for mental wellness, personality stability, and self-regulation. Rydén et al. (2003) found that individuals with severe obesity presented different personality traits, indicating that somatic states influence psychological disposition (Rydén et al., 2003). Our results resonate with this perspective, suggesting that consistent use of relaxation techniques could influence trait-level emotional tendencies such as anger. Jones and Jacobson (2000) further contributed to the understanding of angiogenesis and oxygen regulation in pulmonary conditions, supporting the importance of breath as a biological regulator of well-being (Jones & Jacobson, 2000).

Despite the promising findings, this study is not without limitations. First, the relatively small sample size (n = 30) limits the generalizability of the results to wider populations. Larger samples across diverse settings would provide a more robust understanding of the intervention's effects. Second, although self-report tools were reliable and validated, they remain vulnerable to response biases such as social desirability. Third, while the five-month follow-up offers insights into mid-term efficacy, longer-term studies are needed to determine if benefits persist beyond half a year. Finally, the intervention was delivered in a controlled research setting, and future studies should examine effectiveness in naturalistic or clinical environments.

Future studies should expand on this work by exploring the neural mechanisms underlying the effects of breathing and relaxation techniques using neuroimaging or psychophysiological monitoring. Comparative trials that evaluate breathing-based interventions against other therapeutic approaches (e.g., cognitive-behavioral therapy, pharmacotherapy) would also offer insight into relative efficacy. Furthermore, investigating population-specific protocols, such as interventions for adolescents, elderly individuals, or clinical populations (e.g., PTSD, GAD), would enhance applicability. Lastly, studies assessing the role of adherence and practice frequency would help optimize the intervention for long-term sustainability.

Health professionals, educators, and mental health practitioners can integrate structured breathing and relaxation protocols into stress management and emotional regulation programs. These techniques are cost-effective, easy to implement, and accessible across settings such as schools, workplaces, and primary care. Brief daily sessions—guided or self-practiced—can help individuals regulate emotional reactivity and reduce somatic stress responses. Incorporating these techniques into psychoeducational modules and resilience-building curricula could enhance public mental health outcomes and support self-regulation in diverse populations.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

References

Açıkel, S. B., Bilgiç, A., Derin, H., Eroğlu, A., Akça, Ö. F., & Çaksen, H. (2019). Comparison of Children With Migraine and Those With Tension-Type Headache for Psychiatric Symptoms and Quality of Life. *Journal of Pediatric Neurology*, *19*(01), 014-023. https://doi.org/10.1055/s-0039-1692138

Blevins, R., Doles, B., Buck, J., Blevins, S., Babos, M., Taylor, C., Baines-Waiz, O., & Bergman, S. (2022). The Relationship Between Osteopathic Manipulative Treatment and Focused Breath Work: A Pilot Study. *Scholar Pilot and Validation Studies*, *3*(2), 13-16. https://doi.org/10.32778/spvs.71366.2022.31

Bodycoat, N., Grauaug, L., Olson, A., & Page, A. C. (2000). Constant Versus Rhythmic Muscle Tension in Applied Tension. *Behaviour Change*, *17*(2), 97-102. https://doi.org/10.1375/bech.17.2.97

Catalano, E. (2014). Shaping Experience in Dance: Perspectives on Body–mind Relationships in Odissi. *Journal of Dance & Somatic Practices*, *6*(1), 9-28. https://doi.org/10.1386/jdsp.6.1.9_1

Deshmukh, M., Harilal, S. L., Palekar, T. J., & Chitale, N. (2025). Effect of Muscle Energy Technique to Respiratory Accessory Muscles on Breathing Dysfunction in Individuals With Forward Head Posture. *Journal of Datta Meghe Institute of Medical Sciences University*, *20*(1), 106-110. https://doi.org/10.4103/jdmimsu.jdmimsu_641_23

Giovanis, A., & Zeszutek, S. L. (2020). Somatic Dysfunctions of Hip and Pelvis Overlooked in a Case of Vulvodynia. *Journal of Osteopathic Medicine*, *120*(11), 792-795. https://doi.org/10.7556/jaoa.2020.140

Hamdan, A. L., Deeb, R., Tohme, R. A., Rifai, H., Husseini, S. T., & Fuleihan, N. (2008). Vocal Technique in a Group of Middle Eastern Singers. *Folia Phoniatrica Et Logopaedica*, *60*(4), 217-221. https://doi.org/10.1159/000148258

Hsia, C. C. W., Johnson, R. L., McDonough, P., Dane, D. M., Hurst, M. D., Fehmel, J. L., Wagner, H., & Wagner, P. D. (2007). Residence at 3,800-M Altitude for 5 Mo in Growing Dogs Enhances Lung Diffusing Capacity for Oxygen That Persists at Least 2.5 Years. *Journal of Applied Physiology*, *102*(4), 1448-1455. https://doi.org/10.1152/japplphysiol.00971.2006

Jones, R., & Jacobson, M. (2000). Angiogenesis in the Hypertensive Lung: Response to Ambient Oxygen Tension. *Cell and Tissue Research*, *300*(2), 263-284. https://doi.org/10.1007/s004419900100

Kawakami, M., Tani, T., Yin, X. J., Kato, Y., & Tsunoda, Y. (2002). Effect of Oxygen Tension on the Developmental Potential of Parthenogenetic Oocytes and Nuclear-Transferred Porcine Oocytes Receiving Fetal Fibroblast Cells. *Journal of Reproduction and Development*, *48*(4), 409-414. https://doi.org/10.1262/jrd.48.409

Liu, Y., Zhao, J., Fan, X., & Guo, W. (2019). Dysfunction in Serotonergic and Noradrenergic Systems and Somatic Symptoms in Psychiatric Disorders. *Frontiers in Psychiatry*, *10*. https://doi.org/10.3389/fpsyt.2019.00286

Luo, Q., Li, X., Zhao, J., Qiu, J., & Wei, D. (2025). The Effect of Slow Breathing in Regulating Anxiety. *Scientific reports*, *15*(1). https://doi.org/10.1038/s41598-025-92017-5

Naismith, S. L., Winter, V. R., Gotsopoulos, H., Hickie, I. B., & Cistulli, P. A. (2004). Neurobehavioral Functioning in Obstructive Sleep Apnea: Differential Effects of Sleep Quality, Hypoxemia and Subjective Sleepiness. *Journal of Clinical and Experimental Neuropsychology*, *26*(1), 43-54. https://doi.org/10.1076/jcen.26.1.43.23929

Pedersen, D. B. (2004). Indomethacin Lowers Optic Nerve Oxygen Tension and Reduces the Effect of Carbonic Anhydrase Inhibition and Carbon Dioxide Breathing. *British Journal of Ophthalmology*, *88*(8), 1088-1091. https://doi.org/10.1136/bjo.2003.041251

Polskaya, A. V., & Aleksenko, O. V. (2024). The Follow-Up Examination of Children With Breath-Holding Spells. *Zhurnal Nevrologii I Psikhiatrii Im S S Korsakova*, *124*(11), 76. https://doi.org/10.17116/jnevro202412411276

Rahman, N. M., & Isnaeny. (2024). The Relationship of Respiratory Relaxation Techniques With the Intensity of Dysmenorrhea Menstrual Pain in School-Out Adolescents. *International Journal of Pharmaceutical and Bio-Medical Science*, *04*(02), 37-40. https://doi.org/10.47191/ijpbms/v4-i2-01

Rosa, K., Noorratri, E. D., & Widodo, P. (2023). Penerapan Terapi Genggam Jari Dan Nafas Dalam Untuk Mengetahui Perubahan Tekanan Darah Pada Lansia Penderita Hipertensi. *Termometer Jurnal Ilmiah Ilmu Kesehatan Dan Kedokteran*, *1*(4), 48-57. https://doi.org/10.55606/termometer.v1i4.2358

Rydén, A., Sullivan, M., Torgerson, J., Karlsson, J., Lindroos, A. K., & Taft, C. (2003). Severe Obesity and Personality: A Comparative Controlled Study of Personality Traits. *International Journal of Obesity*, *27*(12), 1534-1540. https://doi.org/10.1038/sj.ijo.0802460

Sharma, V. P. (2007). Prânâyâma Can Be Practiced Safely. *International Journal of Yoga Therapy*, *17*(1), 75-79. https://doi.org/10.17761/ijyt.17.1.b240x01504q44278

Shkëmbi, F. (2023). "Mindfulness, Somatic and Cognitive Symptoms of Anxiety, and Self-Esteem: A Randomized Controlled Trial". https://doi.org/10.36315/2023inpact076

Smith, J. C., Amutio, A., Anderson, J. P., & Aria, L. A. (1996). Relaxation: Mapping an Uncharted World. *Applied Psychophysiology and Biofeedback*, *21*(1), 63-90. https://doi.org/10.1007/bf02214150

Thomson, S., Morrell, M. J., Cordingley, J., & Semple, S. J. G. (2005). Ventilation Is Unstable During Drowsiness Before Sleep Onset. *Journal of Applied Physiology*, *99*(5), 2036-2044. https://doi.org/10.1152/japplphysiol.01040.2004

Wahyuningsih, W., Sukesi, N., & Rahayu, W. (2024). Penerapan Hipnotis Lima Jari Untuk Menurunkan Tingkat Kecemasan Pada Orang Tua Di Kelurahan Kalipanpur. *Alkhidmah*, *2*(3), 35-41. https://doi.org/10.59246/alkhidmah.v2i3.961

Wahyuningsih, W., Sutanta, S., & Afifah, V. A. (2020). Pengaruh Teknik Relaksasi Nafas Dalam Terhadap Tingkat Kecemasan Pasien Pre Operasi Fraktur Femur. *Media Ilmu Kesehatan*, *8*(3), 230-236. https://doi.org/10.30989/mik.v8i3.334

Young, J. (2001). Doing Research: A Tutorial for Yoga Teachers. *International Journal of Yoga Therapy*, *11*(1), 23-33. https://doi.org/10.17761/ijyt.11.1.r3xx494640206188