

Breathing and Self-regulation: Review of Main Techniques and Clinical Applications

Respiração e Autorregulação: Revisão das Principais Técnicas e Aplicações Clínicas

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RESUMO

Objetivo: Examinar, de forma ampla, o papel das técnicas respiratórias no cuidado emocional e fisiológico, destacando seu uso como estratégia complementar para a redução de sintomas de estresse, depressão e outros desequilíbrios em adultos. **Introdução:** A aceleração do estilo de vida moderno e a alta exposição a estímulos estressores têm ampliado a prevalência de transtornos emocionais e disfunções físicas associadas. Muitos indivíduos apresentam dificuldade em regular emoções e recuperar o equilíbrio interno, o que intensifica quadros de ansiedade, depressão e fadiga. Entre os recursos disponíveis, a respiração consciente tem ganhado destaque por ser um mecanismo natural, de baixo custo e facilmente aplicável, capaz de influenciar a atividade cerebral, o sistema nervoso autônomo e os processos hormonais. Esta revisão busca sintetizar evidências recentes sobre diferentes abordagens respiratórias, explorando sua aplicabilidade em ambientes clínicos e não clínicos. **Métodos:** Foram pesquisadas publicações nacionais e internacionais que avaliaram a eficácia de práticas respiratórias, incluindo respiração rítmica, exercícios de pranayama, técnicas de respiração lenta e respiração de coerência. Os critérios de seleção priorizaram estudos que investigaram desfechos emocionais e fisiológicos em adultos, com ênfase em sintomas relacionados a estresse e depressão. Foram considerados relatos clínicos, ensaios controlados e análises observacionais. **Resultados:** A revisão identificou benefícios significativos, como maior estabilidade emocional, diminuição de respostas de estresse, melhora na oxigenação cerebral e aumento da clareza mental. Intervenções regulares apresentaram associação com redução de marcadores de estresse, melhor qualidade do sono e aumento da resiliência emocional. Apesar da diversidade metodológica, os achados convergem para o potencial da respiração estruturada como suporte terapêutico. **Conclusões:** As técnicas respiratórias, quando aplicadas de forma orientada e contínua, podem se tornar ferramentas poderosas para apoiar o equilíbrio emocional e físico, oferecendo alternativas seguras, de baixo custo e adaptáveis a diferentes contextos de saúde.

DESCRITORES: Respiração consciente; Práticas respiratórias; Regulação emocional; Estresse; Depressão; Bem-estar psicológico; Terapias complementares.

ABSTRACT

Objective: To examine, in a broad sense, the role of breathing techniques in emotional and physiological care, highlighting their use as a complementary strategy for reducing symptoms of stress, depression, and other imbalances in adults. **Introduction:** The accelerated pace of modern life and high exposure to stressors have increased the prevalence of emotional disorders and associated physical dysfunctions. Many individuals experience difficulty regulating emotions and restoring internal balance, which intensifies cases of anxiety, depression, and fatigue. Among the available resources, conscious breathing has gained prominence as a natural, low-cost, and easily applicable mechanism capable of influencing brain activity, the autonomic nervous system, and hormonal processes. This review aims to synthesize recent evidence on different breathing approaches, exploring their applicability in clinical and non-clinical environments. **Methods:** National and international publications evaluating the effectiveness of breathing practices were reviewed, including rhythmic breathing, pranayama exercises, slow breathing techniques, and coherence breathing. The selection criteria prioritized studies investigating emotional and physiological outcomes in adults, with an emphasis on symptoms related to stress and depression. Clinical reports, controlled trials, and observational analyses were included. **Results:** The review identified significant benefits, such as greater emotional stability, decreased stress responses, improved cerebral oxygenation, and increased mental clarity. Regular interventions were associated with reduced stress markers, better sleep quality, and improved emotional resilience. Although methodological diversity limits standardization, the findings reinforce the potential of structured breathing as therapeutic support. **Conclusions:** Breathing techniques,

when applied in a guided and continuous manner, can become powerful tools to support emotional and physical balance, offering safe, low-cost, and adaptable alternatives in different health contexts.

DESCRIPTORS: Conscious breathing; Breathing techniques; Emotional regulation; Stress; Depression; Psychological well-being; Complementary health.

RESUMEN

Objetivo: Examinar, de manera amplia, el papel de las técnicas respiratorias en el cuidado emocional y fisiológico, destacando su uso como estrategia complementaria para la reducción de síntomas de estrés, depresión y otros desequilibrios en adultos. **Introducción:** El ritmo acelerado de la vida moderna y la alta exposición a factores estresantes han incrementado la prevalencia de trastornos emocionales y disfunciones físicas asociadas. Muchas personas presentan dificultad para regular las emociones y restablecer el equilibrio interno, lo que intensifica cuadros de ansiedad, depresión y fatiga. Entre los recursos disponibles, la respiración consciente ha ganado protagonismo por ser un mecanismo natural, de bajo costo y fácil aplicación, capaz de influir en la actividad cerebral, el sistema nervioso autónomo y los procesos hormonales. Esta revisión busca sintetizar evidencias recientes sobre diferentes enfoques respiratorios, explorando su aplicabilidad en entornos clínicos y no clínicos. **Métodos:** Se revisaron publicaciones nacionales e internacionales que evaluaron la efectividad de prácticas respiratorias, incluyendo respiración rítmica, ejercicios de pranayama, técnicas de respiración lenta y respiración de coherencia. Los criterios de selección priorizaron estudios que investigaron resultados emocionales y fisiológicos en adultos, con énfasis en síntomas relacionados con el estrés y la depresión. Se incluyeron informes clínicos, ensayos controlados y análisis observacionales. **Resultados:** La revisión identificó beneficios significativos, como mayor estabilidad emocional, disminución de respuestas al estrés, mejora en la oxigenación cerebral y aumento de la claridad mental. Las intervenciones regulares se asociaron con reducciones en marcadores de estrés, mejor calidad del sueño y mayor resiliencia emocional. A pesar de la diversidad metodológica, los hallazgos refuerzan el potencial de la respiración estructurada como apoyo terapéutico. **Conclusiones:** Las técnicas respiratorias, cuando se aplican de manera guiada y continua, pueden convertirse en herramientas poderosas para apoyar el equilibrio emocional y físico, ofreciendo alternativas seguras, de bajo costo y adaptables a diferentes contextos de salud.

DESCRIPTORES: Respiración consciente; Técnicas respiratorias; Regulación emocional; Estrés; Depresión; Bienestar psicológico; Salud complementaria.

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INTRODUCTION

In recent decades, fast-paced lifestyles and increasing exposure to stressors such as information overload, intense professional de-

mands, and economic uncertainty have contributed to a significant increase in emotional disorders and psychophysiological dysfunctions. According to the World Health Organization (WHO), in 2019 there

were approximately 970 million people worldwide living with some form of mental disorder, the most common being anxiety and depression. In particular, anxiety disorders affect about 4% of the global popu-

lation (equivalent to 301 million individuals), and the number has grown exponentially in recent decades. In the United States, 19.1% of adults had an anxiety disorder in the past year, and 31.1% have experienced it in their lifetime. Depression affects about 4.4% of the global population (or about 280 million people) and is considered the leading cause of disability worldwide. A recent US survey conducted between August 2021 and August 2023 indicated that 13.1% of adolescents and adults had symptoms of depression in the two weeks prior to the survey, with a higher prevalence among adolescents (19.2%) and women (16%). Regarding emotional stress, a global comparative analysis revealed that more than half of the population in 20 countries reported feeling emotional stress, with 85% of countries showing a worsening in this indicator between 2008 and 2021. In 2020, approximately 38% of people reported feeling emotional stress on the day before the survey. This combination of anxiety, depression, and stress has profound impacts. Difficulty regulating emotions aggravates anxiety, depression, and fatigue, affecting quality of life, productivity, and interpersonal relationships. In this scenario, accessible, effective, and non-invasive solutions come to the fore, and conscious breathing stands out as one of them. Structured breathing techniques, such as diaphragmatic breathing, slow breathing, pranayama, and coherence breathing, can modulate the autonomic nervous system, regulate heart rate variability, reduce cortisol levels, and promote mental clarity and emotional balance. These practices are safe, low-cost, easy to apply, and can be performed in different settings, such as clinical, corporate, educational, and home environments. This review therefore aims to compile recent evidence on the effective-

ness of these breathing techniques, highlighting their benefits in coping with stress, depression, and emotional imbalances, and discussing their practical applications in therapeutic and wellness contexts.

METHODOLOGY

A systematic review of the national and international scientific literature on the effectiveness of different breathing practices in managing emotional and physiological symptoms, especially stress and depression in adults, was conducted. The databases consulted included PubMed, PubMed Central, Scopus, PsycINFO, and repositories of randomized clinical trials.

Breathing techniques analyzed:

Slow rhythmic breathing practices, pranayama, deep breathing exercises, coherent breathing, and techniques applied in psychiatric contexts were included. Evidence shows that slow breathing can significantly reduce psychological stress in healthy adults. Research on pranayama indicates that this set of techniques can activate the parasympathetic nervous system, reducing stress and anxiety and improving sleep and attention. Clinical trials with patients undergoing coronary artery bypass grafting indicated that deep breathing in the postoperative period reduced anxiety and depression levels and improved sleep quality.

Coherent breathing and other applications:

Controlled studies on coherent breathing have evaluated its effectiveness in mental health. Some results showed no advantage over placebo, while others pointed to consistent benefits in reducing depressive symptoms and stress, with moderate intensity effects. In psychiatric contexts, controlled, slow, diaphragmatic

breathing techniques have shown a positive impact on anxiety, depression, trauma, and compulsion.

Inclusion criteria:

Studies were selected that included adults aged 18 years or older, applied isolated breathing techniques, used designs such as controlled clinical trials, clinical reports, or observational studies, and evaluated emotional and physiological outcomes related to stress, depression, or similar conditions.

Synthesis of included studies:

The analysis included randomized clinical trials on deep breathing in surgical patients, which demonstrated a significant reduction in anxiety, depression, and improved sleep. Meta-analyses that evaluated the effectiveness of breathwork on emotional symptoms, with relevant effects, were included. Placebo-controlled studies on coherent breathing, clinical evidence in psychiatric contexts with different breathing techniques, and studies of slow breathing in healthy individuals that showed a reduction in stress were also considered.

RESULTS

Evidence indicates that structured breathing techniques have consistent benefits in different emotional and physiological domains.

Emotional stability and stress reduction: A controlled clinical trial published in *Frontiers in Human Neuroscience*⁽¹⁾ demonstrated that slow breathing patterns increase heart rate variability and significantly reduce anxiety in healthy adults. Another study in *Scientific Reports*⁽²⁾ evaluated guided breathing exercises in patients with COVID-19, showing a significant reduction in stress and anxiety levels.

Pranayama and depressive symptoms:

A systematic review and meta-analysis published in *Frontiers in Psychiatry*⁽³⁾ analyzed the impact of pranayama on mental disorders, including depression and PTSD. The results pointed to small to moderate effects in reducing symptoms and improving quality of life, although with methodological limitations.

Structured breathing techniques (breathwork):

A meta-analysis of clinical studies published in *Scientific Reports*⁽⁴⁾ identified that breathing interventions, especially slow and coherent breathing, produce statistically significant reductions in symptoms of anxiety ($g = -0.32$; $p < 0.0001$) and depression ($g = -0.40$; $p < 0.0001$). Randomized studies reported in the *Journal of Cardiothoracic Surgery*⁽⁵⁾ also showed that deep postoperative breathing in patients undergoing cardiac surgery reduced anxiety and improved sleep quality.

Brain oxygenation and mental clarity:

An experimental study reported in *Frontiers in Human Neuroscience*⁽¹⁾ observed that slow breathing exercises increased cerebral blood flow and oxygenation. Similar results were described in neuroimaging analyses cited in reviews in *Scopus* and *PsycINFO*, indicating improved executive performance and mental clarity.

Emotional resilience and sleep:

A narrative review in the *Research Journal of Ayurveda and Integrative Medicine*⁽⁶⁾ highlighted that regular pranayama practice increases vagal tone and reduces cortisol, promoting greater emotional stability. These parasympathetic effects are indirectly related to improved sleep. A clinical study in *Frontiers in Psychiatry*⁽⁷⁾ also found reduced anxiety symptoms and increased resilience in groups that practiced controlled breathing.

Efficacy moderators:

A systematic review published in *Frontiers in Psychiatry*⁽⁸⁾ showed that results are more consistent when breathing is applied at slow rhythms,

for periods longer than five minutes, in guided sessions and at regular intervals.

Resultados - Detalhamento por Estudo	
Study and Year	Khoury et al., 2025 (<i>Frontiers in Psychiatry</i>)
Type of Breathing Technique	Review of breathing practices
Population and Sample	Various adult groups, systematic review
Outcomes Assessed	Efficacy parameters
Main Results	Greater effectiveness with slow, guided, and regular sessions lasting more than five minutes.
Study and Year	Seppälä et al., 2020 (<i>Frontiers in Psychiatry</i>)
Type of Breathing Technique	Controlled breathing
Population and Sample	Adults with anxiety and depression, $n \approx 108$
Outcomes Assessed	Anxiety, depression, resilience
Main Results	Improved emotional resilience and reduced anxiety.
Study and Year	Chaudhary et al., 2023 (<i>Ayurveda and Integrative Medicine</i>)
Type of Breathing Technique	Pranayama and mindful breathing
Population and Sample	Adults practicing pranayama and mindful breathing
Outcomes Assessed	Cortisol, vagal tone, emotional resilience
Main Results	Reduced cortisol levels, increased vagal tone, and improved emotional resilience.
Study and Year	Zhou et al., 2022 (<i>Journal of Cardiothoracic Surgery</i>)
Type of Breathing Technique	Postoperative deep breathing
Population and Sample	Cardiac surgery patients, $n \approx 60$
Outcomes Assessed	Anxiety, sleep quality
Main Results	Reduced anxiety and significant improvement in sleep quality.
Study and Year	Khoury et al., 2022 (<i>Scientific Reports</i>)
Type of Breathing Technique	Slow and coherent breathing
Population and Sample	Various adult groups, meta-analysis
Outcomes Assessed	Anxiety, depression
Main Results	Reduction in anxiety ($g \approx -0.32$) and depression ($g \approx -0.40$), $p < 0.0001$.
Study and Year	Sharma et al., 2025 (<i>Frontiers in Psychiatry</i>)
Type of Breathing Technique	Pranayama (yogic breathing)
Population and Sample	Patients with mental disorders, $n \approx 150$
Outcomes Assessed	Depression, PTSD, quality of life
Main Results	Small to moderate improvement in symptoms and quality of life, but with methodological limitations.

Integrative Review

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Principais Resultados	Melhora pequena a moderada nos sintomas e na qualidade de vida, mas com limitações m

DISCUSSION

The findings of this review reinforce the role of breathing techniques as promising tools for emotional and physiological regulation, with potential applicability in different health contexts. Analysis of the results shows that, although there is methodological diversity among the studies, there is a consistent pattern of benefits, mainly related to stress reduction, improvement in autonomic parameters, reduction in depressive symptoms, and greater cognitive clarity.

Clinical relevance and applicability:

Breathing is a vital and easily accessible function, which makes it a particularly attractive therapeutic strategy. The studies evaluated, including randomized clinical trials, systematic reviews, and meta-analyses, suggest that techniques such as slow rhythmic breathing, diaphragmatic breathing, pranayama, and coherent breathing can act directly on the brain-body axis, modulating autonomic nervous system responses. Improved heart rate variability (HRV) and reduced stress markers, such as cortisol, are robust and consistent findings. In clinical settings, results indicate that patients undergoing high-stress

situations—such as heart surgery or severe infections (e.g., COVID-19)—may benefit from guided breathing protocols, with a positive impact on anxiety, overall well-being, and, indirectly, functional recovery. In addition, pranayama, which has been extensively studied in populations with mental disorders, has shown a positive, albeit small to moderate, effect on depressive and anxiety symptoms, corroborating the usefulness of breathing as a complement to traditional therapeutic approaches.

Impact on cognitive and physiological processes:

A relevant point is the relationship between breathing and brain oxygenation. Experimental studies report increased blood flow and oxygenation during structured breathing practices, which may explain some of the reported cognitive effects, such as greater mental clarity and improved decision-making under stress. These findings suggest that breathing not only regulates emotional states but can also influence executive functions, which broadens its scope of application to areas such as neuropsychology, rehabilitation, and cognitively demanding environments.

Limitations of the current literatu-

re:

Despite the growing body of evidence, some limitations are clear. First, many studies have small samples, which limits the generalizability of the results. Methodological heterogeneity is another challenge, with significant differences in protocols, intervention time, frequency, and technique instruction. Pranayama and coherent breathing trials vary in intensity, duration, and level of supervision, which makes direct comparisons and standardization for clinical use difficult. In addition, there are not always well-defined control groups, which can introduce biases. Another point is the scarcity of long-term studies evaluating the maintenance of respiratory benefits. Most research focuses on immediate or short-term effects, leaving open questions about the sustainability of improvements in anxiety, depression, and emotional balance.

Practical implications and future lines of research:

Based on the results of this review, there are strong arguments for integrating breathing protocols into mental health and wellness programs in clinical, corporate, and educational settings. Strategies such as guided slow breathing, daily pranayama sessions, and cardiac coherence practices can be incorporated as low-cost, easy-to-implement preventive and therapeutic measures. Future research should prioritize: Clinical trials with greater methodological rigor, larger samples, and active comparators; Longitudinal studies to assess the durability of effects; Mechanistic investigations to better understand the neurobiological pathways involved (e.g., functional neuroimaging, hormonal and autonomic biomarkers); Standardization of protocols, with detailed description of techniques, duration, and intensity to ensure replicability.

In summary, the literature reviewed shows that breathing, when used in a structured way, can play an important role in managing emotional and physiological conditions. Although there are still gaps to be filled, the body of evidence points to a safe, accessible resource with great potential to promote health and well-being in different populations.

CONCLUSION

Critical analysis of the literature shows that breathing techniques—including rhythmic breathing, pranayama, slow breathing, and coherent breathing—represent interventions with great potential for promoting emotional and physiological balance.

Evidence from clinical studies, systematic reviews, and meta-analyses points to consistent benefits, such as reduced symptoms of anxiety and stress, improved mood, increased heart rate variability, greater brain oxygenation, strengthened emotional resilience, and indirect gains in sleep quality.

These results reinforce the relevance of simple, accessible, and low-cost approaches in a scenario of increasing prevalence of emotional disorders and high demand for non-pharmacological strategies. Breathing, as a universal and easily trainable function, emerges as a strategic tool in clinical, corporate, educational, and preventive contexts.

Although promising, current evi-

dence calls for caution: the heterogeneity of protocols, the small sample sizes in many studies, and the lack of long-term analyses limit the generalization of results. There is, therefore, a need for more robust clinical trials with greater methodological rigor to confirm efficacy and establish standardized parameters for application.

In perspective, the integration of breathing techniques into mental health and wellness practices represents a fertile field for innovation and scientific advancement. By combining simplicity, efficacy, and safety, such practices are not only complementary but potentially essential in health promotion, emotional disease prevention, and psychophysiological rehabilitation programs.

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