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REVIEW

Application of Fan Therapy in Alleviating Dyspnea

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Abstract: Fan therapy has been shown to alleviate dyspnea effectively. Given its cost-effectiveness, safety, and ease of implementation, this review examines the concept and evolution of fan therapy, its mechanisms of action, implementation methods, applications across various patient populations, and its current advantages and limitations, providing a reference for the management of dyspnea symptoms.

Keywords: fan therapy, review, clinical application, dyspnea

Dyspnea is a common symptom in chronic respiratory and circulatory diseases, as well as in advanced stages of critical illnesses. Patients often experience dyspnea even after simple daily activities, leading to reduced physical activity levels and significantly impaired quality of life.[1] A fan is a common household item known for its portability, affordability, and easy availability. In 1987, researchers discovered that the airflow generated by a fan directed at the face, nasal mucosa, or pharynx could alter ventilation.[2] As of 2025, fan therapy has been systematically applied to address dyspnea in patients.[3–12] Recent high-quality evidence indicates that fan therapy can reduce recovery time following episodes of dyspnea and, to some extent, assist individuals in increasing physical activity.[9] This review aims to summarize the progress of fan therapy in medical applications, providing references for related research and clinical treatment.

Introduction

The Concept and Development of Fan Therapy

Fan therapy is a non-pharmacological treatment that involves directing airflow from a fan onto the face to alleviate the sensation of dyspnea. In 1987, Schwartzstein et al[2] first reported that applying cool air to the face using a fan could alter the perception of dyspnea, whereas applying cool air to the legs had no such effect. This finding sparked interest and subsequent research on fan therapy worldwide.[13] Between 2008 and 2009, Booth and Simon et al[14,15] reported significant effects of fan therapy in patients with Chronic Obstructive Pulmonary Disease (COPD) and cancer. In 2010, Galbraith et al[16] demonstrated through a randomized crossover trial that fan therapy was effective, well-tolerated, and easily accepted by patients in reducing dyspnea. As a result, fan therapy became officially recognized as an evidence-based management strategy for dyspnea. Over the past 40 years, research on fan therapy has made significant progress, with increasing evidence supporting its clinical efficacy. The Cambridge Breathlessness Intervention Service (CBIS) now considers fan therapy an effective, non-invasive intervention for alleviating dyspnea, and it is recommended in multiple clinical guidelines.[17–20] Notably, the 2024 European Respiratory Society's Clinical Practice Guidelines for the Management of Adult Patients with Severe Respiratory Disease emphasized that fan therapy requires minimal training and is thus easily adopted by patients, with widespread potential for use.[21] For caregivers, fan therapy offers an additional measure to ensure patient comfort during their most vulnerable states.[10]

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Mechanism of Action of Fan Therapy

Dyspnea is a subjective experience of respiratory discomfort, consisting of various sensations of varying intensity.[22,23] Although the exact mechanisms underlying the effectiveness of fan therapy in alleviating dyspnea remain unclear, several hypotheses have been proposed:[8]

(1) Induction of the diving reflex: Fan therapy may stimulate receptors on the skin areas innervated by the trigeminal nerve or receptors in the upper respiratory mucosa, which are supplied by the second and third branches of the trigeminal nerve. This stimulation may trigger the diving reflex, reducing central respiratory drive and alleviating the sensation of dyspnea.[2,16,24–26]
(2) Alteration of ventilation: Airflow from the fan directed over the face, nasal mucosa, or pharynx may modify ventilation, potentially increasing air intake, thus reducing dyspnea.[16] Marchetti et al[27] observed in their study that using a fan directed at the face improved diaphragmatic electromechanical coupling, reduced central respiratory drive, and lowered the ratio of diaphragmatic electromyographic activity to tidal volume. In this study, participants were also supplemented with oxygen, suggesting that the mechanisms of fan therapy might not rely solely on increased airflow, as the additional airflow from the fan was much lower than the oxygen supply.[8,16]
(3) Distraction and relaxation: Some participants reported that fan therapy provided a sense of distraction and relaxation, which is commonly recommended as part of self-management strategies.[28] Neuroimaging studies have shown that facial airflow may alter sensory attention related to central respiration, potentially reducing dyspnea.[29]
(4) Perceived increase in ventilation: Another hypothesis is that the airflow from the fan might "trick" the brain into perceiving an increase in ventilation by stimulating receptors on the trigeminal nerve, thus reducing dyspnea.[30,31] Aucoin et al[32] provided more specific neurophysiological evidence for this hypothesis, suggesting that the sensation of dyspnea is closely linked to an increase in central inspiratory neural drive (IND). Cold air may reduce IND through receptors in the trigeminal nerve, thereby alleviating dyspnea. Additionally, stimulating the trigeminal and olfactory nerves may modulate neural activity in brain regions associated with the perception of dyspnea, such as the insular cortex, anterior cingulate cortex, thalamus, and amygdala, further influencing the perception of dyspnea. These mechanisms may act synergistically to reduce dyspnea.
(5) Reduction in facial skin temperature: Argacha et al[33] found that cooling the face enhances peripheral chemical reflex mechanisms, increasing the ventilatory response to hypoxia ($P<0.05$), thus alleviating dyspnea. Brew et al[34] suggested that facial cooling through airflow could activate the insular cortex, anterior cingulate cortex, and amygdala, pathways common to the perception of pain and anxiety, helping patients recover from exercise-induced dyspnea.

Although the mechanisms behind the alleviation of dyspnea through fan therapy are not fully established, a substantial body of literature and experimental studies confirm its significant effects in managing dyspnea symptoms.

Implementation of Fan Therapy

In clinical practice, fan therapy is typically implemented by positioning a fan at a comfortable distance of 15–30 cm from the patient's face, directing airflow over the areas innervated by the second and third branches of the trigeminal nerve for 5–10 minutes. This approach has been shown to effectively alleviate symptoms of dyspnea, with the fan's airflow speed adjusted based on the patient's preferences and needs.[6,8,35]

Smith et al[36] found that in patients with COPD, the preference for handheld fans was strongly correlated with the perceived comfort of airflow, perceived airflow intensity, and airflow velocity at 30 cm, while negatively correlated with fan noise. Brew et al[34] studied healthy volunteers recovering from exercise-induced dyspnea and found that fans with an airflow speed of 1.7 m/s or higher improved the recovery rate from dyspnea. Most participants preferred a preset airflow speed of at least 1.7 m/s. The study by Luckett et al[9] suggests that higher airflow velocities yield better recovery outcomes, with an optimal balance between recovery efficiency and patient comfort recommended at 2.85 m/s.

Therefore, when implementing fan therapy, it is advisable to select fans with higher airflow speeds and lower noise levels for optimal patient comfort and therapeutic effect.

Application of Fan Therapy

Application of Fan Therapy in Patients with Advanced Cancer

Dyspnea is a common symptom in patients with advanced cancer, affecting up to 10–70% of these patients.[15,37] The incidence and severity of dyspnea typically increase in the last weeks to days of life, necessitating appropriate non-pharmacological interventions for management.[5,19,38] Wong et al[39] randomized 30 patients with advanced cancer into an intervention group and a control group. The intervention group used fan therapy for 5 minutes when experiencing dyspnea, while the control group had a caregiver present for 5 minutes. After a 20-month observation, the results showed significant improvement in dyspnea symptoms in the intervention group. Subsequent studies with the control group also applying fan therapy demonstrated that delayed fan therapy did not significantly improve dyspnea. Puspawati et al[40] showed that fan therapy significantly reduced the modified Borg Dyspnea Scale scores in non-hypoxemic lung cancer patients ($P = 0.003$). Furthermore, combining fan airflow stimulation with diaphragmatic breathing was found to enhance the improvement in dyspnea ($P < 0.001$). Ting et al conducted a randomized controlled crossover trial in the Philippines on 48 advanced cancer patients and found significant improvements in the modified Borg Dyspnea Scale scores, respiratory rate, and oxygen saturation. Kako et al[41] reported that fan therapy had a positive effect on dyspnea symptoms in advanced cancer patients, with a lasting effect that might indicate a potential residual benefit, recommending a longer washout period in crossover studies. Three meta-analyses of fan therapy in advanced cancer patients confirmed that fan therapy has an immediate positive effect in alleviating dyspnea symptoms and is a worthwhile non-pharmacological intervention in clinical practice.[41–43]

Application of Fan Therapy in Coughing Patients

Chronic cough not only significantly affects the quality of life of patients but may persist even after optimal interventions. Therefore, a novel treatment approach based on the cough reflex mechanism, suitable for widespread clinical use and effective in relieving symptoms, is needed. Plevkova et al[44] found that cold air stimulation of guinea pig nasal cavities inhibited coughing. Kanezaki et al[45] conducted a randomized, single-blind, crossover study over 2 weeks with 20 volunteers, showing that fan therapy significantly alleviated cough reflex and urges. Sutherland et al[46] tracked the treatment of a 59-year-old female patient with severe coughing symptoms, and found that prior to treatment, the patient was coughing severely, averaging 9 times per minute. After starting fan therapy, the cough frequency dropped nearly continuously to one every 90 seconds after 5 minutes and further reduced to one every 5 minutes after 25 minutes. Sutherland et al suggested that the airflow from the fan may stimulate the trigeminal nerve, possibly alleviating the hypersensitivity of the cough reflex by cooling the nasal mucosa or stimulating nasal mechanoreceptors, thereby reducing cough frequency. These findings suggest that fan therapy may play a role in managing cough.

Application of Fan Therapy in Patients with Interstitial Lung Disease

Dyspnea is a primary symptom of interstitial lung disease (ILD), often associated with decreased quality of life, anxiety and depression, reduced survival rates, and poor prognosis.[47,48] The dyspnea induced by ILD is often intermittent or persistent, typically worsening as the disease progresses to its terminal stages.[49] Khor et al[50] used a mixed-methods approach to randomly divide 30 patients with fibrotic lung disease into intervention and control groups and applied a blinded assessor methodology. The intervention group received fan therapy, while the control group did not. After a 2-week intervention, the results showed that fan therapy was feasible in patients with fibrotic lung disease, and patients found the fan easy to access and convenient to use. Krajnik et al[51] found that fan therapy effectively alleviated dyspnea in patients with interstitial lung disease. Of the 24 patients using a fan, 22 reported symptom relief. This suggests that fan therapy can be useful in alleviating dyspnea symptoms in ILD patients, with positive feedback from some patients. However, the existing studies have limitations such as assessor blinding, small sample sizes, and the duration of the

intervention, making the exact efficacy and optimal strategies for its use unclear. Further research is needed to optimize its application in this disease.

Application of Fan Therapy in Patients with COPD

Dyspnea is a common symptom in patients with advanced COPD, affecting over 90% of patients.[37] Dyspnea imposes a significant burden on COPD patients, severely impacting their quality of life and physical function. Patients often avoid activities that trigger dyspnea, leading to a fear-avoidance cycle, resulting in disuse atrophy and a worsening cycle of dyspnea and disability.[52–54] Gracie et al[55] studied the use of fan therapy during exercise in patients with COPD and found that it reduced dyspnea intensity and shortened the recovery time post-exercise. Long et al[56] randomly assigned 14 COPD patients into a fan intervention group and a control group, and both groups performed a 6-minute walk test. The results showed that fan therapy was acceptable and effective in relieving symptoms during short-duration low-intensity exercise (walking) in COPD patients. Luckett et al[57] suggested that fan therapy, as a non-pharmacological intervention, plays a role in the self-management of dyspnea in patients. In a study with 41 COPD patients receiving dyspnea management services, including fan therapy, 32 patients were interviewed 6 months later. Of these, 17 (53%) continued using fan therapy to alleviate dyspnea, indicating a relatively high acceptance of fan therapy and its ease of access and use in daily life.

Application of Fan Therapy in Lung Transplant Recipients

Sato et al[58] conducted a retrospective observational study of 184 lung transplant recipients in the ICU and found that the prevalence of dyspnea was 63%. An Italian cross-sectional observational study showed that 39% of patients experienced dyspnea 9 months after lung transplantation.[59] Therefore, developing interventions to alleviate dyspnea in lung transplant recipients is crucial. Sato et al[6] selected 8 lung transplant recipients for fan therapy, provided 12 days post-surgery (median), and found that fan therapy was a safe and potentially effective intervention to alleviate dyspnea in ICU patients post-lung transplantation. In summary, while fan therapy has shown promise in alleviating dyspnea symptoms in lung transplant recipients, there is still a lack of sufficient case studies, and its efficacy needs further validation.

Advantages and Limitations of Clinical Application of Fan Therapy

Advantages of Fan Therapy in Clinical Application

1. Simplicity of Operation: Fan therapy is easy to implement and does not require complex medical equipment. It is suitable for various clinical environments, especially in situations where medications cannot be used or are ineffective. As a non-invasive, safe, and economical alternative, fan therapy provides an excellent option for managing dyspnea.[30,60,61] Furthermore, fan therapy is one of the most widely studied supportive care elements, and it is highly recommended in clinical guidelines, including those from the American Society of Clinical Oncology and the European Society for Medical Oncology.[62]
2. Reduced Recovery Time after Exercise:[63] For healthy individuals, cool facial airflow from a fan can alleviate the sensation of breathlessness caused by increased inspiratory load under normal temperature conditions. After exercise, the recovery of heart rate is also faster when using fan therapy for cooling [29]. For patients with diseases, the airflow provided by the fan can reduce the severity of breathlessness, improve exercise capacity, and shorten recovery time post-exercise.[34,55,56,64]
3. Enhances self-efficacy in dyspnea management: Fan therapy can improve the self-efficacy of patients with dyspnea, especially in those receiving palliative care, thereby increasing their initiative and participation in managing their symptoms.[65,66]

Limitations of Fan Therapy in Clinical Application

1. Discomfort for some patients: Some patients report that the cold airflow from the fan may cause discomfort.[67] This can affect the widespread acceptance and use of fan therapy in clinical practice, especially in patients who are more sensitive to cold stimuli.

2. Unclear long-term efficacy: The long-term effects of fan therapy are currently not well-established, and further high-quality evidence is needed. A longitudinal study by Bausewein et al[68] recruited 109 patients from three major hospitals in Munich, Germany, of which 70 patients (64%) participated in a randomized controlled trial. While short-term (3 days) use of hand-held fans proved to be a simple and effective source of airflow for patients, after two months of continuous intervention, there was no significant difference in Borg Dyspnea scores. Possible reasons for this include a small sample size and a high dropout rate (50% in the intervention group and 60% in the control group). After two months, only 48% of patients continued using hand-held fans. Additionally, dyspnea symptoms tend to worsen over time, making it difficult to accurately assess the long-term effects of fan therapy.
3. Limited widespread use: Fan therapy is not yet widely used in clinical practice, and many patients and their families lack trust in its efficacy. Moreover, many hospitals have not yet adopted fan therapy as a standard intervention, which limits its potential for broader application.

Conclusion

Fan therapy is an economical, non-invasive, and easily implemented treatment that has shown unique advantages in alleviating dyspnea symptoms in patients. In recent years, it has garnered increasing attention and demonstrated practical significance in providing immediate relief for dyspnea symptoms, enhancing patients' self-efficacy, and supporting recovery. However, the long-term therapeutic effects of fan therapy remain unverified, and studies often involve small sample sizes. Future research should focus on expanding sample sizes and conducting large-scale, multicenter, and disease-specific prospective randomized controlled trials to further explore and validate the feasibility of fan therapy in alleviating dyspnea symptoms.

Disclosure

The authors report no conflicts of interest in this work.

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