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Application of mindfulness techniques in patients with asthma or COPD

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ABSTRACT

Objective: Mindfulness is the ability to pay attention to the present moment without judgment. Mindfulness interventions have proved to be effective in improving the management of psychological symptoms of chronic patients. The objective of this work is to update the evidence about the effects of mindfulness interventions on psychological symptoms in patients with asthma and chronic obstructive pulmonary disease (COPD).

Methodology: Data sources were PubMed and PsycInfo. From a first set of 109 articles, 12 about mindfulness-interventions in adult populations with asthma or COPD were finally included in the review.

Results: Of the total of 12 studies included, 5 were qualitative and 6 quantitative (5 randomized controlled trials). One quantitative study reported long-term psychological effects in asthma patients, two studies reported short-term psychological effects in COPD patients. Relevant themes identified in qualitative studies included increased awareness, development of new relationships with dyspnea, including new cognitive strategies, and slowing down.

Conclusions: Mindfulness interventions could increase psychological resources in situations related to asthma and COPD symptoms. More randomized control trials are needed.

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Asthma; chronic obstructive pulmonary disease; mindfulness; stress; quality of life

Introduction

Asthma is a chronic inflammatory disease that frequently presents exacerbations and generates a high level of physical and psychological burden (1). Chronic obstructive pulmonary disease (COPD) shares some characteristics of asthma, such as the inflammatory nature (although with different characteristics), its chronicity, or the frequent presence of exacerbations. In fact, in recent years, the concept of asthma-COPD overlap syndrome (ACOS) has been established to identify patients who share characteristics of both diseases (1–3). Some factors that contribute to the impact of the disease on patients are also common, such as bronchiectasis, poor adherence to treatment, involvement of small-airways, or cardiovascular disease (4–7). Another common aspect is the high impact that environmental conditions have on these diseases, since the respiratory system is in permanent contact with the atmosphere, as well as being the main entry point for environmental toxins (8–10). Finally, asthma and COPD are conditions that, due to

their chronic characteristics, involve a significant psychological burden for the lives of those affected (11–16).

In adults with asthma, the presence of anxiety symptoms causes an increase in the asthma manifestations, which leads to worse control of the disease, greater use of medications, more visits to the Emergency Room, a decrease in QOL, or a greater probability of developing a clinically significant depression syndrome (17–18). Similarly, patients with COPD show a higher prevalence of depressive and anxious symptoms compared to people without chronic lung disease (15), and this psychological symptomatology is related to more hyperventilation and air-hunger, and therefore to worse management of dyspnea. Patients with asthma and COPD overlap have higher risk of depression and anxiety than patients with COPD alone (19). In these populations, the evidence-based interventions that are most successful in the treatment of psychological symptoms are behavioral therapies, cognitive therapies, cognitive

behavioral therapies, relaxation techniques, biofeedback, and mindfulness interventions (14,20–22).

Mindfulness is the ability to pay attention to the present moment without judgment (23). The two most relevant mindfulness intervention programs are the Mindfulness-Based Stress Reduction (MBSR) and the Mindfulness-Based Cognitive Therapy (MBCT) (24). The MBSR starts with the importance of being attentive to the body sensations, and expanding this attention from the body sensations to the emotions and thoughts. In MBCT, mindfulness training is combined with elements of cognitive-behavioral therapy, focusing on the acceptance of thoughts as they are, and on the negative effects of thoughts in physical functioning. Both programs include three somatically focused meditation techniques (body scan, sitting meditation, and mindful yoga). In body scan, the participants learn to move their attention to and from different parts of their bodies, observing fluctuations in body sensations. Furthermore, both programs share a group-based structure over 8-weeks of weekly face-to-face sessions, and that complementarily include the practice of guided formal exercises that patients must perform at home (25). The key aspects of these mindfulness interventions are the moment-by-moment non-judgmental awareness of thoughts, feelings and body sensations and the use of breathing as the focus of attention, teaching the participants to control their breathing through a kind attitude and accepting their breathing pattern as it is.

Mindfulness-based interventions have been found effective in the psychological effects of chronic diseases (26–28). Implemented as a non-pharmacological approach complementary to the usual treatment, mindfulness promotes self-knowledge, self-care, and coping with stress situations, thus presenting a potential for the development of control and wellbeing in chronic diseases. The objective of this work is to update the evidence of the effects of mindfulness techniques on psychological symptoms in asthma and COPD. It has been hypothesized that mindfulness skills may not directly improve the physiological symptoms associated with asthma, but rather improve how a patient reacts to these symptoms, and impacting daily functioning (29). Accordingly, our hypothesis is that the application of mindfulness-based intervention in patients with asthma and COPD will produce effects in their psychological symptoms. Secondarily, mindfulness-based intervention could have also have effects at the respiratory level and health-related QOL.

Material and methods

This systematic review has been carried out with PubMed and PsycInfo, using the combination of key words “mindfulness” and “asthma,” “mindfulness” and “chronic obstructive disease,” “mindfulness” and “respiratory disease.” These terms were selected in order to create an exhaustive search strategy. All those articles published until 2018 were included, with no time restrictions. A total of 151 articles were identified after the search. Figure 1 illustrates the selection process of articles applying inclusion and exclusion criteria.

The inclusion criteria were (a) adults 18 years-old and over; (b) patients diagnosed with asthma or COPD; and (c) mindfulness intervention studies. The exclusion criteria were (d) patients with other pulmonary diseases different from asthma or COPD; and (e) interventions other than mindfulness interventions.

A total of 42 duplicate papers were identified and excluded, leaving a total of 109 papers to be reviewed. The review of the title and abstract was carried out by the first author (BL), and discussed with the rest of the authors (FJGB and DF). Exclusion of other pulmonary disease except asthma or COPD (i.e. lung cancer) was discussed between BL and FJGB, and exclusion of patients not including adults (i.e. adolescent populations) was mainly discussed between BL and DF. After examining the titles and abstracts of these documents, 65 articles were excluded (48 did not refer to patients with asthma or COPD, and 17 did not refer to the application of mindfulness techniques). The remaining 44 articles were fully read and analyzed, and another 32 articles were excluded (26 were not empirical studies, and 6 were not studies with adults). Finally, 12 articles were included in the review (see Figure 1). In this full-text detailed analysis, BL and DF analyzed the aspects related to the psychological intervention, and BL and FJGB analyzed the clinical aspects of the studies. DF carried out a thematic analysis of the qualitative studies, considering the analyzed papers as secondary sources of information, and selecting themes present in at least two studies.

Results

In total, the papers included in the review assessed the effect of mindfulness interventions in 100 patients with asthma and 309 patients with COPD (see Table 1). Of the total of 12 studies included, 5 were qualitative studies (including one secondary analysis of

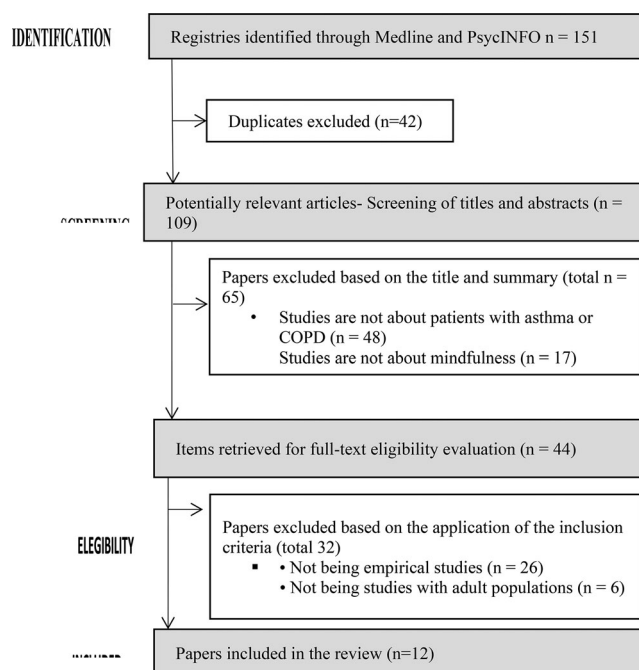


Figure 1. Flow diagram representing the study selection process.

previous presented data (30)), 6 were quantitative studies, and one study used mixed methods. From the 6 quantitative studies, 5 were randomized controlled trials. The mean number of participants was 59.66 (SD = 31.42) in quantitative studies and 15.60 (SD = 13.39) in qualitative studies.

Most of the articles included relate a positive impact of mindfulness on psychological factors such as coping skills, motivation, or anxiety. However, the positive impact on respiratory outcomes is less relevant, with only 3 authors showing improvement on asthma control, dyspnea or respiratory rate (16,31,33).

One quantitative study reported long-term psychological effects in asthma patients (29), one reported short-term psychological and respiratory effects in COPD patients (31), and one reported short-term psychological effects in COPD patients (32). Lack of significant effects were related to high attrition rates (33) and floor effects (34). Only one study explored the moderating role of age and gender, with age showing significant effects on the Hamilton Anxiety Depression Scale (younger participants obtained better results), and gender not reaching statistical significance (32).

In qualitative studies, a thematic analysis was performed on the effects of interventions reported by the participants. Using the reviewed articles as secondary sources of information (30,35–39), the following themes were identified: 1) Increased awareness,

including awareness of the self and awareness to physical and emotional cues (35,37–39); 2) development of new relationships with dyspnea through detecting early signs of breathlessness and feelings of panic, distancing themselves from these negative experiences, and actively coping with a variety of stressors (30,35,36,38); 3) development of cognitive strategies to better process ruminant thoughts and feelings of worry, fear and pain, and to separate them from breathing difficulties (30,35,37); 4) slowing down, and pausing, physically and mentally, before responding (35,36,39); 5) increased acceptance of the respiratory illness and decreased sense of stigma (30,37,39); 6) increased attentional flexibility (37,39); and 7) sense of illness as an opportunity for self-knowledge and personal growth (30,35). In general, the qualitative evidence about mindfulness interventions in asthma or/and COPD is positive (30,35–39). Some negative aspects refer to the time needed to include mindfulness in daily routines (36) and the difficulty defining and explaining it (37).

Most of the studies include variations in the techniques applied, including reduced duration, reducing the focus on the breath and inclusion of other relaxation and meditation techniques. Although 2 h is the standard duration of the sessions in MBSR and MBCT programs, shorter sessions are suggested to avoid fatigability (31,32,34). The focus of the intervention can be moved from the breathing process to

Table 1. Intervention studies using mindfulness techniques in asthma and/or COPD patients.

Authors & years	Design	Sample	Socio-demographics	Respiratory disease	Respiratory measures	Psychological and quality-of-life measures	Mindfulness-intervention program	Main results
Quantitative studies								
Muljinski et al., 2009 (33)	Quantitative, randomized-controlled study.	86 participants randomized at completion of pretesting battery in two groups, control (n = 42) and intervention (n = 44).	Old males, average age 67 years old. 49% nonwhite. 47% education greater than high school.	Patients with COPD.	6-minute-walk test (6MWT), Borg dyspnea assessment, exacerbation rates.	Health-related QOL; stress; mindfulness ability measured using the 5-Factor Mindfulness Questionnaire.	Mindfulness-based breathing therapy (MBBT): 8-weeks mindfulness-based approach aimed at breath, abatement and relaxation (MBSR + training during the first 2 weeks).	No group differences were found using t tests for Dyspnea Rest Visual Analog Scale ($p = 0.81$), Dyspnea Activity Visual Analog Scale ($p = 0.82$), or Self-Report Exacerbations ($p = 0.69$).
Pbert et al., 2012 (29)	Quantitative, randomized-controlled study.	83 participants in two randomized groups, controls (n = 41) and intervention (n = 42).	56 women and 27 men with a mean age of 52.8 years. 93.8% White. 68.8% have college or advanced degree.	Patients with asthma.	Lung function measured through spirometry, asthma control test.	Perceived stress, asthma related QOL.	8-week MBSR intervention with weekly meetings of 2.5 hours and a 6-hour session in week 6, integrating the participants into the usual classes of MBSR.	After twelve months, mixed-models showed differential changes of the group with MBSR in total QOL score (0.66, $p < 0.001$) and in three of the four QOL areas -activity limitations (0.66, $p 0.0003$), symptoms (0.63, $p 0.002$) and emotional function (0.81, $p 0.002$), and a differential decrease in perceived stress (-4.5, $p 0.001$). No significant improvements in pulmonary function or in asthma control.
Chan et al., 2015 (31)	Quantitative, randomized controlled trial.	41 participants in two randomized groups, waiting-list control (n = 22) and intervention (n = 19).	Participants mostly females, 27/41, with a mean age of 69.5 years.	Patients with COPD.	Respiratory frequency, respiratory frequency variability, expiration time, abdomen / chest movement synchronization. COPD symptom burden measured with the CRQ, that includes subscales for common daily activities, fatigue, mastery of self-care and emotional function.	Anxiety sensitivity measured with the ASI-3; mindfulness skills measured with FMI.	Modified 8-week version of MBSR consisting on 1-hour classes (due to the fatigability of patients with COPD), with adaptations centered in reducing the focus on the breath (i.e. using heart beat or visual imagination instead of the sensations of the breath), plus Qigong as mindfulness movement activity, Ujjayi breathing and labyrinth walking.	One-way ANOVAs showed significant changes in respiratory rate in the intervention group compared with the waiting-list group ($p = 0.05$, partial eta-squared $\eta^2 = 0.13$) and mindfulness skills ($p = 0.02$, $r^2 = 0.15$), and a trend to significant improvements in emotional function ($p = 0.06$, $r^2 = 0.12$). Good feasibility and acceptability in COPD patients.

Farver-Vestergaard et al. 2018 (32)	Quantitative, cluster randomized controlled trial.	84 participants Control group (only pulmonary rehabilitation) = 45 Intervention group (MBCT + pulmonary rehabilitation) = 39.	57.1% women, mean age 67.2 years; 75.3% lower education; 90% retired.	COPD patients receiving pulmonary rehabilitation.	Physical health status measured with the COPD Assessment Test (CAT).	Anxiety and depression measured with HADS.	8-week MBCT treatment adapted to COPD patients (focus on heartbeat, blood flow and feet's sensations instead of in breath; reduced duration and intensity of the exercises).	Mixed linear models, with effect sizes expressed as Cohen's d, showed that the combination of MBCT and pulmonary rehabilitation significantly improved anxiety – depression (d = 0.62). Age present a significant effect on this relationship (F = 4.3, p = 0.040; d = 0.38), with younger patients obtaining more improvements.
Perkins-Porras et al. 2018 (34)	Quantitative, randomized controlled trial.	50 participants. Control group n = 26 Intervention group n = 24.	21/40 males, with a mean age of 71.3 years. 72/80 retired. 76/80 Caucasian. 11 mean years of full-time education.	Hospitalized patients because of COPD exacerbation.	Borg dyspnea 0 to 10 scale at baseline, and a single item measuring dyspnea pre- and post-treatment.	At baseline, mindfulness-trait was measured with the PHLMS and anxiety-depression with HADS. Pre- and post-treatment, single-items measures of anxiety, depression, happiness, stress and mindfulness. Acceptability measured with single item about usability and will-to-recommend the intervention.	3-days brief mindfulness intervention (10 min) based on body scan. Applied using earphones in a MP3 player, with assessment immediately before and after the intervention.	Non-significant improvements using Mann-Whitney tests. 83% of the intervention group will recommend the intervention (chi-squared = 0.03; p = 0.03).
Qualitative studies Malpass et al. 2015 (30)	Qualitative study.	12 participants.	–	Patients with asthma or COPD.	–	Qualitative input from in-depth interviews about mindfulness practices, home practices, group context, and respiratory changes, two months after finishing the intervention.	Modified 8-week version of MBSR with adaptations centered on patients with dyspnea (i.e. using feet sensations as an alternative focus for guided attention).	Interviews were analyzed thematically in-depth. The main themes were the increased acceptance and sense of control over breathing limitations, the greater perception of body sensations to detect early warning signs of breathlessness and feelings of panic, the elimination of psychological barriers for participation, the reduced sense of disease-related stigma

(Continued)

Table 1. Continued.

Authors & years	Design	Sample	Socio-demographics	Respiratory disease	Respiratory measures	Psychological and quality-of-life measures	Mindfulness-intervention program	Main results
Benzo, 2013 (35)	Qualitative study.	10 participants.	57% male, mean age of 67 years.	Patients with COPD.	–	Perceived benefits and behavior changes informed through interviews.	Mindfulness for Health Program, a modified 8-week version of MBSR consisting on 2-hour weekly classes plus a monthly meeting for 1 year.	and the ability of being more creative around breathing limitations. Using standard qualitative methodology triangulated analysis and reflexive narrative, the themes found in the interviews included connectedness (learning from others, sharing experiences), increased mindfulness (living in the moment, awareness of the self) and enjoying life.
Howarth et al. 2017 (36)	Qualitative study.	5 participants with COPD.	Two females (aged 31 and 63) and three males (aged 55, 65 and 78).	Chronic illness patients including patients with COPD.	–	Qualitative input from semi-structured interviews and focus groups about acceptability, usefulness and feasibility of the intervention.	Brief mindfulness audio intervention based on body scan, administered face-to-face and then loaded onto an MP3 that patients take home.	Using thematic analysis, the main themes found were reported benefits (including relaxation, positive mood, coping skills and increased motivation), perceived barriers and improvements suggested (audios longer than 15 minutes, and more time to include it in daily routines). Difficulties defining and explaining mindfulness. Expected effects in preventing psychological symptoms and promoting acceptance, awareness and concentration on bodily sensations, which facilitates breathing control. Meditation. Shorter sessions are preferred.
Harrison et al. 2017 (37)	Qualitative study.	20 health care professionals and 19 patients with COPD.	Health care professionals were mostly females, 12/20, with a mean age of 44.5 years. Patients were mostly males, 11/19, with a mean age of 67.8	Patients with moderate to severe COPD.	–	Qualitative face-to-face interviews.	–	Qualitative analysis based on the multidimensional dyspnea model showed changes in broad attention, informative attention (related with
Malpass et al. (2018) (38)	Qualitative study (additional analysis of data presented in Malpass et al., 2015).	12 participants.	–	Patients with asthma or COPD.	Focus on dyspnea, based on a multidimensional dyspnea model.	Changes in bodily sensations, emotional responses, behavioral responses and	Same of Malpass et al (2015).	

Mixed-methods and pilot trials Sanchez Paquini & Pilot trial Moreno Coutiño 2017 (16)	11 participants.	8 women and 3 men; mean age 40 year; 2 primary, 6 secondary, 3 university education.	-	Anxiety (BAI), QOL (Saint George Questionnaire), asthma control.	10-week ad-hoc compassion and mindfulness therapy.	Wilcoxon tests showed improvements in anxiety ($z = -2.314$, $p = 0.021$), QOL ($z =$ -2.667 , $p = 0.008$) and control ($z = -2.675$, $p = 0.007$), and mid- term maintenance of the effects ($z = -2.193$, $p = 0.02$; $z = -2.934$, $p = 0.003$; and $z =$ -2.533 , $p = 0.011$ respectively).	awareness) and attentional flexibility influences dyspnea perception.
Farver-Vestergaard et al. 2018 (39)	Mixed-methods (measuring change with questionnaires and semi- structured interviews).	8 participants.	50% female, mean age 72.6 years; 87.5% were retired.	COPD patients.	Tele-based MBCT treatment adapted to COPD patients, provided through video-conference.	t-tests showed no quantitative differences; through interviews, participants report improvements in relating to unpleasant psychological symptoms, including increasing attentional flexibility, taking pauses and increasing acceptance. High rates of participation.	

other physical sensations, including heartbeat, blood flow, or foot sensations in patients with dyspnea (30–32). Only one study integrated the participants into usual mindfulness classes for the general population (29), the other studies conducted in specific groups for asthma/COPD patients. Two studies used technologies to personalize the delivery of the intervention, using earphones in a MP3 player (34), and tele-conference (35), respectively.

Discussion

Evidence has been found about the effect of mindfulness interventions on the psychological symptoms of asthma and COPD patients, although there is a lack of evidence of effects on respiratory symptoms. If mindfulness skills do not directly improve the physical symptoms of asthma and COPD, but rather improve how patients manage the psychological symptoms associated with these chronic conditions (29), high-quality quantitative studies with bigger and more diverse samples and longer follow-up periods are needed in order to reflect potential indirect changes. The design and management of this type of study is highly complex, since the interventions are demanding, the patients can be physically and socially frail, and, accordingly, the sample sizes must be large, and retention strategies are needed in order to minimize attrition. Absence of effects in quantitative interventions has been related to the difficulties in recruitment and allegiance of respiratory patients in interventions that are relatively long and that require a personal and practical involvement, both in the mindfulness sessions and at home. The effect of mindfulness interventions on psychological symptoms through the increased attention to body sensations, emotions and coping strategies is supported by positive evidence, whereas the positive effect on respiratory symptoms was found only in 3 studies, and it is limited to improvements in dyspnea, asthma control and respiratory rate. Although laboratory induced stress using both active and passive stressors is associated with an increased activation of the sympathetic nervous system (40), longer-term life stress impacts in lung function is more complex and need to be further examined, studying underlying mechanism operating in pulmonary function through chronic diseases in different environmental, socioeconomic and psychological conditions (41,42). Accordingly, to obtain positive evidence of respiratory effects with mindfulness intervention is complex and require highly elaborated, long-term studies, whereas the evidence in

psychological symptoms can be more directly studied and it has effects on the well-being of patients and their health-related behaviors.

Different studies have focused on the effects of the intervention at a qualitative level, through interviews and also, in some cases, through focus groups (36). Contrary to quantitative studies, the qualitative evidence is almost entirely positive. In line with the differentiation between psychological and physiological symptoms of asthma and COPD, these studies highlight the importance of awareness and early detection and management of emotional cues (i.e. feelings of panic or fear) and body sensations (i.e. early signs of breathlessness). This type of approach is very valuable in bringing knowledge about the effect of mindfulness interventions, both in the change of respiratory patterns in daily life activities and in the pattern of coping with the disease, and it also highlights the need for high-quality quantitative studies measuring these effects (43).

Some variations in the techniques applied have been included in the literature, including shorter interventions and use of the technology to avoid displacement and maximize connectedness, but these variations need to be empirically validated on the basis of strong evidence. In addition, age could have a specific role in the effectiveness of interventions (32), which would pose a specific challenge in adapting this type of intervention to older respiratory patients, who could potentially be a specific target (44). Not only the age of the participants, but other demographic characteristics such as education level, socioeconomic status, religion, or ethnicity could have a moderating role. Nevertheless, these variables have not been analyzed in the studies included in this review. Expanded and reinforced evidence must also study the moderating role of sociodemographic factors in order to discuss the potential value of mindfulness interventions across populations.

In summary, the current evidence points out that the mindfulness interventions could have an effect on the psychological symptoms of asthma and COPD patients. These interventions could increase their coping resources in situations related to respiratory disease that compromise personal well-being, eliminate barriers to social participation, improve the emotional state, and can, potentially produce indirect effects on the physical state of the patients. However, more empirical studies and a clearer theoretical model are necessary to consolidate these effects.

Declaration of interest

The authors report no conflict of interests

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