REVIEW

Mindfulness Interventions and Surveys as Tools for Positive Emotional Regulation During COVID-19: A Scoping Review

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Abstract

Objectives The COVID-19 pandemic has caused high mortality rates worldwide, as well as consequent psychological and physical stress. The present study aimed to review the main existing scientific research studies conducted since the onset of the COVID-19 that have used mindfulness-based interventions (MBIs) as tools for emotional regulation, aiming to improve individuals' ability to cope with general stress caused by pandemic periods and their consequences (e.g., contagion, confinement, loss of loved ones or job stability) especially related with anxiety, stress, depression, or emotional dysregulation.
Method To this aim, six databases (i.e., PubMed, Medline, Embase, Scopus, Web of Science, and Science Direct) were consulted and analyzed following PRISMA-Sc guidelines.
Results Of the 16 studies selected, 7 are clinical trials that used MBIs, and 9 are online surveys in which mindfulness and emotional regulation variables were assessed to explore their interrelations. Generally, the analysis suggested that the cultivation of MBI strategies for treating anxiety and depression during COVID-19 confinement periods resulted in improved psychological well-being.
Conclusions MBI techniques can be considered useful intervention tools in current and future worldwide changing situations, in which personal development and resilience should be considered an urgent issue for both educational and preventive health practices. Conversely, there are also some limitations that arose from the field of MBI research that hopefully might be addressed in future research (such as the diversity of intervention techniques used across studies).
Pre registration This study is not preregistered.

Keywords COVID-19 · Mindfulness · Stress · Anxiety · Emotional regulation · Scoping review

The current COVID-19 (SARS-CoV-2) pandemic has caused high mortality rates worldwide and considerable concomitant psychological and physical stress (Ceban et al., 2022; Jungmann & Witthöft, 2020; Liu et al., 2020; Rosenbaum, 2020; Sohrabi et al., 2020; Tanne et al., 2020; Wang et al., 2021). In this context of increasing anxiety and situations requiring constant adaptation to unpredictable circumstances, the available emotional regulation tools that people have for coping with changing situations may be a key response to deal with adversity both in general populations and in at-risk groups (Liu et al., 2020; Yang et al., 2020). In this sense, a clear association has been reported between

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psychological well-being increases and the concomitant reduction in mental illness symptoms when specific therapeutic mindfulness tools can be mastered by participants (e.g., Chennapragada et al., 2022; Pappa et al., 2020).

The relationships between anxiety, depression, and other emotional symptoms have already been extensively documented in recently published scientific studies (e.g., Cao et al., 2020; Ceban et al., 2022; Huang & Zhao, 2020; Lai et al., 2020; Pappa et al., 2020; Qiu et al., 2020; Rosenbaum, 2020; Sohrabi et al., 2020; Xiao et al., 2020; Zhang & Ma, 2020). In this sense, comprehensive reviews emerged during the COVID-19 pandemic (e.g., such as the one by Nicola et al., 2020) that showed that the use of mindfulness-based interventions (MBIs), which can also serve as emotional self-management tools, might help people improve their coping abilities in situations such as contagion, confinement, loss of loved ones, and loss of job stability.

Mindfulness training results in a state of mind that can be characterized as intentional and non-judgmental or awareness of experience in the present moment (Baer et al., 2008; Kabat-Zinn, 2003, 2012). In general, it refers to a mental state at the present moment, including a constant observant monitoring of sensations, perceptions, and cognitions (Anālayo, 2020). The state of mind that emerges during any mindfulness-based practice can be contrasted with mental states in which the attentional focus is dissociated from the experience of the present moment, such as the constant mental shifting and jumping that occurs throughout fantasies and self-projections into the past or future, which often occur automatically and without full awareness of the actions or thoughts we are experiencing at any given time (Brown & Ryan, 2003).

A mindful state of mind can be cultivated through formal meditation and informal practice in everyday life. Mindfulness and the ability to enhance them through meditation seem to reflect the innate human capacity to deliberately pay mindful attention to the present moment and to learn from it (Hick & Bien, 2010). In recent years, structured mindfulness-based programs have emerged as possible approaches to address a range of clinical and subclinical difficulties, such as stress, chronic pain, anxiety, or recurrent depression (e.g., Brenton-Peters et al., 2021; Piet & Hougaard, 2011; Taylor et al., 2021). In addition, several neuroscientific studies have reported adaptive changes in brain function and structure (i.e., functional and neural plasticity) related to mindfulness training (e.g., Chen et al., 2022; Hölzel et al., 2011; Tang et al., 2012). With regard to the cultivation of mindfulness competence, it should be noted that attentional training skills play a central role in achieving mastery in meditation practices (e.g., Malinowski, 2013). As a consequence, a specific set of cognitive competencies has been identified as playing a crucial role in mindfulness-based practices (see Lutz et al., 2008): (a) skills of concentration and attention maintenance,

(b) attention regulation skills for distraction inhibition and attentional control, (c) ability to detect distraction and consequently return to the previous point where the source of distraction intervened, and (d) re-engage with the meditation object. In fact, several behavioral and neural studies have shown how attentional processes improve after participants are exposed to meditation and mindfulness training and how this is also evidenced by their neural correlates (for reviews, see Cahn & Polich, 2006, 2009; Raffone & Srinivaran, 2010; Wong et al., 2022). It is worth noting that MBIs enhance focusing attention skills and awareness, which consequently contributes to strengthening self-regulation skills and helping individuals effectively cope with life challenges (e.g., González-García et al., 2016; Tang et al., 2015; Van Gordon et al., 2015; Zhao & Zhou, 2020). Additionally, recent scientific literature (e.g., Kuehner et al., 2023) strongly states that cognitive processing (i.e., mostly related to attention focusing; e.g., Mao et al., 2023) can be enhanced as a result of MBI training, and accordingly, it might help in health improvement (e.g., Dunn & Dimolareva, 2022) and emotional regulation (e.g., Ch et al., 2023).

During the COVID-19 global pandemic period, while citizens were confined to their homes and had little or no possibility of attending regular psychological or medical services, there was an urgent need to develop psychological treatments, and mental health measures were taken all over the globe (Luykx et al., 2020; Otu et al., 2020; Shigemura et al., 2020). For example, as reported in Wang et al. (2020), during the initial phase of the COVID-19 outbreak, respondents showed, in general terms, a psychological impact (i.e., higher levels of stress, anxiety, and depression). Pre-pandemic research (e.g., Tang et al., 2015) has shown how MBIs can be effective in reducing psychological symptoms of depression (Ma et al., 2019), anxiety (de Abreu Costa et al., 2019), or chronic disease (e.g., González-García et al., 2016). Given the emerging research on the significant impact of COVID-19 on mental health, there has been a substantial increase in the number of scientific publications that have been able to support MBIs for treating symptomatology derived from stress (e.g., Villalón et al., 2023), and mindfulness has been shown to be effective using self-reported and online treatments (e.g., González-García et al., 2021). Mindfulness implies attention training for gaining greater awareness (i.e., thoughts, emotions, bodily sensations, and behavior) and research carried out during the COVID-19 pandemic period (e.g., Dai et al., 2022) has shown the role of MBIs in physical symptoms caused by COVID-19 recovery, possibly as a consequence of mediating psychological variable improvement (i.e., related to anxiety reduction, stress, and possible symptoms of sadness and depression reduction) (Bhattacharya & Hofmann, 2023; Hao et al., 2020).

To this end, the present study aimed to review some existing research studies conducted since the onset of the

COVID-19 pandemic. We reviewed scientific literature that have used mindfulness surveys or MBIs in relation to positive emotional regulation, and for coping with stress caused by pandemic periods and their consequences (e.g., contagion, confinement, hospitalization recovery, loss of loved ones, loss of job stability). Other interesting reviews have been released on similar matters (e.g., Brenton-Peters et al., 2021; Ceban et al., 2022; Chennapragada et al., 2022; Renaud-Charest et al., 2021; Taylor et al., 2021) but were not aimed at the same scope as the present study. This review specifically aimed to examine whether mindfulness can serve as a simple and powerful coping tool for anxiety, posttraumatic stress, or depression symptoms in health emergency periods. It is worth noting that our goal is coherent with a scoping review approach because we present a set of knowledge syntheses, based on a systematic approach, with the ultimate goal of identifying and synthesizing an emerging body of research on a specific topic that has not been summarized before. We believed that a detailed review of the research conducted since COVID-19 onset could give us a unique and relevant opportunity for analyzing the use of MBIs and mindfulness surveys for improving an individual's mental health and well-being in social emergency conditions or any other infectious diseases.

Method

The methods and results were performed guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009; Page et al., 2021; Tricco et al, 2018) for search and screening methods.

Search Strategy

A systematic search was performed in PubMed, Medline, Embase, Scopus, Web of Science, and Science Direct. In addition, a manual search was performed in Google Scholar to identify additional significant studies, and an alert was created to keep the search updated until the time of acceptance of the paper for publication (Table 1).

The following terms were used to perform the search procedure: (COVID-19 OR SARS-CoV-2 OR Severe Acute Respiratory Syndrome coronavirus); -AND- Mindfulness OR Self Compassion OR Mindfulness based OR Meditation OR MBIs; (2)-AND Emotional Regulation OR Depression OR Anxiety. Only research studies published from 2020 onwards on psychology and psychiatry research were selected. In Fig. 1, we showed the study assortment flowchart of the reporting documents chosen for the systematic reviews and meta-analyses we conducted.

We also used the PICO method (i.e., Population Intervention Comparison Outcome; Fineout-Overholt & Johnston, 2005) to perform additional, more detailed searches. PICO is a mnemonic method used to describe the key concepts of a research clinical question to be formulated prior to starting research for building a well-structured question. In the present study, we considered research articles with participants from adolescence onwards (i.e., adolescents, young adults, and adults), (P) those that participated in a mindfulness research study during the COVID-19 pandemic (i.e., not only MBIs but also mindfulness surveys), (I) studies that compared either MBIs (i.e., pre/post, using surveys to compare the effects of the intervention on emotional psychological variables such as emotional regulation, depression, and anxiety) or mindfulness surveys (i.e., when relating mindfulness questionnaires with affective variables such as emotional regulation, depression, and anxiety), and (C) studies with the aim of analyzing either the effectiveness of MBIs on an affective psychological variable improvement or their relations (i.e., mostly correlations or predictions) between mindfulness surveys (e.g., trait mindfulness) and affective psychological variables (O).

The database search following the PICO strategy was as follows: (a) search 1 (P): children OR adolescents OR young adults OR adults; (b) search 2 (I): Mindfulness Based Interventions -MBIs- OR Mindfulness Based Stress Reduction -MBSR- OR Compassion OR mindfulness surveys OR MINDFULNESS questionnaires, (c) search 3 (C) intervention OR pre/post OR control group OR significant differences OR statistical correlations OR statistical predictions; and (d) search 4 (O): effectiveness of an MBIs OR improvement of emotional regulation.

Study Selection and Eligibility Criteria

As shown in Fig. 1, in Step 4, the titles and abstracts of each publication were screened for relevance, and in Step 6, the full-text articles were accessed for eligibility after initial screening. As a result, studies were eligible for inclusion if they (1) followed a cross-sectional study design and (2) assessed the mental health status of the general population during the COVID-19 pandemic period related to emotional regulation (i.e., studies that focused on emotional regulation or stress, depression, anxiety, and other aspects that may be related to emotional regulation).

We excluded studies that (1) focused on particular subgroups of the population (e.g., specific clinical samples not related to depression or stress, health care workers, or school teachers); (2) were not peer-reviewed; (3) did not have full-text availability; or (4) were scientific work performed before the beginning of the COVID-19 worldwide pandemic.

Table 1 Data extraction results from articles reviewed

(1) Article	(2) Country	(3) Study design	(4) Sample size	(5) Mindfulness-based interventions (MBIs)	(6) Mindfulness assessment tools	(7) Other assessment tools	(8) Main results and conclusions
1. (Bäuerle et al., 2020c)	Germany	- Longitudinal bi-centric - Four measures were taken (baseline, post-intervention, and follow-up 3 and 6 months later - No control groups	- 110 adults (over 18 years of age)	- CoPE It Program CBT and Mindfulness - Duration: consists of four 30 min modules, conducted every other day	-	- PSQ[1] - GAD 7[1] - PHQ-2[1] - GSE[1] - EQ-5D-3L[1] - DT-distress thermometer - COVID-19-related fear	Difference between pre- and posttest revealed clear benefits on stress and anxiety reduction
2. (Belen, 2021)	Turkey	- Descriptive and correlational	355 adults (18–41 years old)	- No MBIs	- MAAS[1]	- SCL 90-R[1]	- Mindfulness mediated the relationship between fear of COVID-19 and depression and anxiety
3. (Dai et al., 2022)	China	Descriptive	4122 adults	- No MBIs	- FFMQ-SF[1]	- GAD-7[1] - RSQ[1] - IES-R[1] - PHQ-9[1]	-Participants who had recovered from COVID-19 showed symptoms related to psychological distress and that the cultivation of mindfulness practices implied a relief from depressive symptoms and post-traumatic stress
4. (Difonte et al., 2020)	USA	Descriptive	309 adults	- No MBIs	- MAAS[1]	- GAD-7[1] - PHQ-9[1]	- Improving mental health
5. (Dillard & Meier, 2021)	USA	Two groups	Study 1: 248 college students (young adults) Study 2: 300 adults	- No MBIs	- CAMS-R[1]	- PSS[1] - STAI[1] - SF-36[1]	- Improving mental health by reducing anxiety, depression, posttraumatic stress in COVID-19 recovered participants - Those who think and act more mindfully are less stressed and anxious and can be less likely to develop depression symptoms

Table 1 (continued)

(1) Article	(2) Country	(3) Study design	(4) Sample size	(5) Mindfulness-based interventions (MBIs)	(6) Mindfulness assessment tools	(7) Other assessment tools	(8) Main results and conclusions
6. (Dubey et al., 2020)	India	Descriptive	402 adolescents/adults	- No MBIs	- FFMQ-SF[1]	- DASS-21[1] - CERQ-Short[1] - AAQ-II[1] - Interview for assessing their COVID-19 knowledge	- Improving mental health by reducing anxiety, depression - Increased emotional adjustment difficulties appeared more in participants with a low level of psychological flexibility - Participants with greater COVID-19 awareness were more adaptive and showed lower levels of stress
7. (Hong et al., 2020)	China	Descriptive	439 adolescents and young people (16 to 26 years)	- No MBIs	- CAMM[1]	- SMEQ[1] - ERRI[1], - KPDS[1]	- Mindfulness as a useful tool against stress during confinement - The higher is the person's ability on mindfulness skills, the greater is the acceptance of the situation and is the lower the manifestation of symptoms linked to emotional dysregulation - The stress and anxiety increase consequent of media exposure was related to an increase in negative thoughts in ruminants
8. (Jiménez et al., 2020)	Spain	Descriptive	412 adults	- No MBIs	- SCS-SF[1]	- DASS-21[1] - IES[1]	Meditation was not found to be a protective factor, but self-compassion was related to better coexistence during confinement

Table 1 (continued)

(1) Article	(2) Country	(3) Study design	(4) Sample size	(5) Mindfulness-based interventions (MBIs)	(6) Mindfulness assessment tools	(7) Other assessment tools	(8) Main results and conclusions
9. (Michel et al., 2020)	USA	Descriptive	302 adolescents/adults	- No MBIs	- MAAS-15–[1]	- DJGLS[1] - PHQ-9–[1]	MIFU previous training could be beneficial in decreasing emotional dysregulation caused by forced loneliness
10. (O'Donnell et al., 2020)	USA	Randomized controlled trial - Compared pre-intervention to post 30 days of app usage	150 adults (over 18 years old)	Insight Timer Meditation App	- WHO-5[1]	- GAD7[1]	- Found associations between trait mindfulness and mental health factors related to (COVID-19). They found that those who think and act more mindfully are less stressed and anxious - Reduced anxiety as assessed by survey questions adapted from the GAD7, comparing pre-intervention to post 30 days of app usage and - Well-being improvement as assessed by survey questions
11. (Sturgill et al., 2021)	USA	Two groups (i.e., intervention and control)	- 99 young people and adults (18 to 29 years old) on the intervention group - Control group of 55 students	Artificial intelligence conversational platform Ajivar - Minimum twice a week frequency of use of the Ajivar platform	- MAAS-15[1] - MSBS[1]	- TWWI[1] - GAD-7[1] - PHQ-9[1] - SRMD[1] - MSRS[1] - Well-Being Questionnaire SWLS[1]	- Results indicated that the intervention group reported fewer symptoms of anxiety, stress, and depression than the control group, as well as a significant improvement in emotional intelligence skills

Table 1 (continued)

(1) Article	(2) Country	(3) Study design	(4) Sample size	(5) Mindfulness-based interventions (MBIs)	(6) Mindfulness assessment tools	(7) Other assessment tools	(8) Main results and conclusions
12. (Waterschoot et al., 2021)	Belgium	- Descriptive - Online interviews	1455 young adults (over 18)	- No MBIs	- MAAS-15–[1]	- MSBS[1] - SRMD[1] - MSRS[1]	People with a high level of mindfulness showed less boredom and a higher degree of satisfaction with their lives, as well as being more mindful and exhibiting autonomy-oriented strategies
13. (Wei et al., 2020)	China	- Two groups (13 intervention group, 13 control group)	26 adolescents/adults with mild to moderate depression - Aged 18–65, laboratory-confirmed COVID-19 patients	- MBIs were focused on relaxation, self-care, and sense of safety - The intervention were 2 weeks long		- PHQ-9 - GAD-7	- Results showed anxiety and depression reduction in the intervention group
14. (Yu et al., 2020)	China	- Descriptive - Two groups (with and without intervention)	- 332 students	Integrated internet-based intervention (intervention group) or supportive care only (control group)	- CAMS-R - MLQ	- DASS-21	- Mindfulness and meaning in life are important protective factors of mental health and meaning in life can serve as a mediator during the current outbreak of COVID-19 in China
15. (Yuan, 2021)	China, Sichuan	- Survey, correlation study - Two groups (intervention and control)	- 84 adolescents (intervention group) - 90 adolescents (control group)	- Listen to 15-min MIFU recordings, with a daily frequency, for 24 weeks' period		- CD-RISC[1] - IES	- MIFU-trained group showed a significant improvement in their resilience and emotional intelligence skills, as well as an increase in positive thoughts, which resulted in a decrease in their associated stress symptoms

Table 1 (continued)

(1) Article	(2) Country	(3) Study design	(4) Sample size	(5) Mindfulness-based interventions (MBIs)	(6) Mindfulness assessment tools	(7) Other assessment tools	(8) Main results and conclusions
16. (Zheng et al., 2020)	China and UK	Two groups: (1) MBI group, (2) mind-wandering condition A group of 110 participants	Study 1:110 adults (60 participants tuned to the mindfulness group and 50 to the mind-wandering condition) Study 2: 140 adults, 84 adolescents	-Listen to the 15-min mindfulness recording diary - Practice 10 min of mental wandering daily for ten consecutive days	- Connor and Davidson[1] - RSEIS[1] - MAAS[1]	- COVID-19 stressors[1]	- Increase resilience Reducing the stressful effects of the pandemic - MBIs improved the quality and duration of sleeping in employees during confinement

[1]Table references: Acceptance and Action Questionaire-II (Bond et al., 2011); CAMM Adolescent Mindfulness Measure (Liu et al., 2019); CAMS-R—Cognitive and Affective Mindfulness Scale-Revised (Chan et al., 2016); CD-RISC—Connor-Davidson Resilience Scale (Yu & Zhang, 2007); CERQ-Short Cognitive Emotion Regulation Questionnaire-Short Form (Garnefski & Kraaij, 2006); DASS-21 (Lovibond & Lovibond, 1995a, b); DAS-21-Spain-Spanish versions of the Depression, Anxiety and Stress Scale (Daza et al., 2002); DJGLS—DeJong Gierveld Loneliness Scale-(De Jong Gierveld & Van Tilburg, 2006); EQ-5D-3L, European Quality of Life 5 Dimensions, 3 Level Version questionnaire (The EuroQol Group, 1990); ERRI The Event Related Rumination Inventory (Zhou & Wu, 2016); FFMQ-SF-Five Facets Mindfulness Questionnaire-Short Form (Baer et al., 2008); GAD 7-Generalized Anxiety Disorder Scale (Spitzer et al., 2006); GSE General Self-Efficacy Scale(Schwarzer & Jerusalem, 1995); IES—Emotional Intelligence Scale (Shi & Wang, 2007); IES Impact of Events Scale (Alonso et al., 1995); IES-R (Sharif et al., 2021); KPDS The Kessler Psychological Stress Scale (K10; Andrews & Slade, 2001); MAAS-15—15-item Mindful Attention Awareness Scale (Brown & Ryan, 2003); MLQ Meaningfulness of Life Questionnaire (Wang & Dai, 2008); MSBS Multidimensional State Boredom Scale (Fahlman et al., 2013); MSRS Motivational Self-Regulation Strategies Questionnaire (Waterschoot et al., 2021); PHQ-8 Patient Health Questionnaire Depression Scale(Kroenke et al., 2009); PHQ-9—Patient Health Questionnaire-9 (Kroenke et al., 2001); PSQ Perceived Stress Questionnaire (Levenstein, et al., 1993); PSS Perceived Stress and Anxiety Scale (Cohen et al., 1994); RSQ Resilience Style Questionnaire (Mak et al., 2019); SCS-SF-Self-Compassion Scale-Short Form (García-Campayo et al., 2014); The Social Media Exposure Questionnaire (Gao et al., 2020); SRMD Self-Report Measure of Decentering (Fresco et al., 2007); STAI SF-36-State and Trait Anxiety Inventory Short Form-36 Items (Panteleeva et al., 2017); Well-Being Inventory SWLS (Owen, 1999); WHO-5—WHO-5 Well-Being Index (Topp et al., 2015)
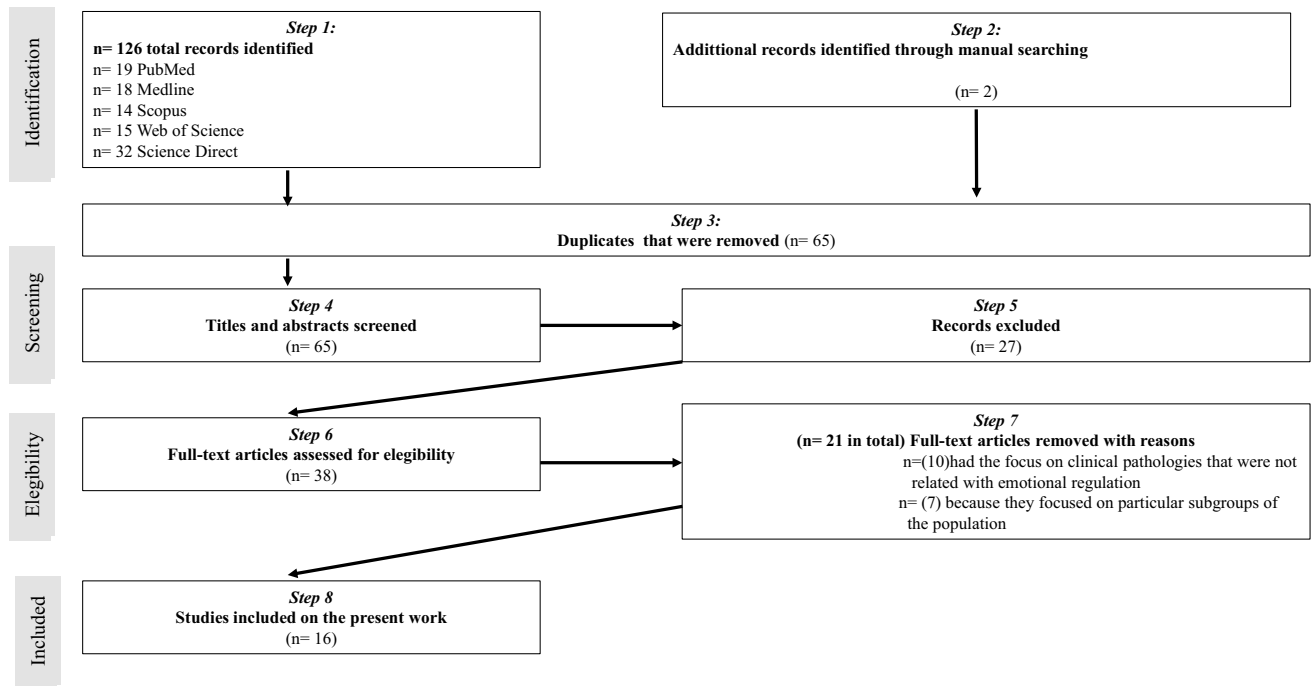
Fig. 1 Chosen reporting papers for Systematic Reviews and Meta-Analyses (PRISMA) study assortment flow diagram (we followed Xiao et al. (2020) flow chart structure)

Data Extraction

The data extraction table summarized the relevant data: (1) primary author and year of publication; (2) country/region of the population studied; (3) study design; (4) sample size; (5) mindfulness-based intervention used; (6) mindfulness assessment tools (if used); (7) other assessment questionnaires used; and (8) main results and conclusions. In Table 1, we show the results of the data extraction from the articles reviewed.

Results

In the present section, we described the characteristics and main results of the selected studies (i.e., synopsized in Table 1), and we presented them in two main subsections. In the first section, we appraised the studies that proposed MBIs online. In the second subsection, we summarized some of the selected studies in which participants were assessed on mindfulness variables by self-administered questionnaires (i.e., participants do not participate in MBIs), and the mindfulness measures were analyzed in relation to other variables of emotional dysregulation (e.g., anxiety in general, COVID-19 anxiety, stress, posttraumatic stress, depression, emotional intelligence, positive thoughts). The reviewed articles focused on observing the positive emotional regulation aspects that might be related to the cultivation of MBIs (i.e., subsection, effects of mindfulness interventions during the time of confinement) or with the variables or personality traits more often related to mindfulness (i.e., Subsection 2, descriptive studies that focused on the relations between mindfulness self-report measures and other emotional dysregulation measures) that were performed during confinement or post-COVID-19 hospitalization recovery. We additionally included a summary of the results at the end of this section.

Effects of Mindfulness Interventions During the Time of Confinement

Bäuerle et al. (2020a, 2020b) designed an online intervention that was self-administered and was able to be played by smartphone. The four intervention modules consisted of four 30 min modules conducted every other day for 2 weeks. Bäuerle et al. (2020c) carried out a clinical trial by assessing several questionnaires (Table 1) and applying learning mindfulness techniques (i.e., CoPE It Program CBT and Mindfulness). This study was limited by the lack of a control group. However, the results (i.e., difference between pre- and posttest) revealed clear benefits on stress and anxiety reduction.

Wei et al. (2020) also examined the efficacy of a mindfulness intervention but focused on adults with mild to moderate depression. Specifically, 26 adults were divided into two groups (i.e., intervention and support), and they showed an increased level of psychological stress caused by the COVID-19 pandemic. The MBIs were 2 weeks long and

were focused on relaxation, self-care, and sense of safety. The results showed anxiety and depression reduction in the intervention group.

Zhang and Ma (2020) published two parallel studies that are worth mentioning. The first was conducted in Wuhan City (China) in February 2020. Recruitment was done through social networks, soliciting the participation of working adults who were experiencing confinement. A group of 110 participants (i.e., 60 participants in the mindfulness group and 50 in the mind-wandering condition-control group) received a daily short survey and instructions including audio for mindfulness practice. The second study was conducted on a sample of 140 UK adult workers who were recruited in two groups. In general terms, the results from both studies showed that mindfulness practice reduces the stressful effects of COVID-19, improving the quality and duration of sleeping in employees during confinement in the group that received MBIs in comparison to the control group.

Sturgill et al. (2021) evaluated the effectiveness of an MBI on 99 students (i.e., aged 19–29) who used the artificial intelligence conversational platform Ajivar (Sturgill et al., 2021) with a minimum frequency of twice a week. After using this platform, the participants in both the intervention and control groups were asked to complete a set of questionnaires (Table 1). The results indicated that the intervention group reported fewer symptoms of anxiety, stress, and depression than the control group, as well as a significant improvement in emotional intelligence skills. Additionally, O'Donnell et al. (2020) performed a randomized controlled trial comparing pre- and post-MBIs (i.e., after 30 days) in 150 adults (over 18 years old) who were asked to use a mindfulness app (i.e., Insight Timer Meditation App) and found reduced anxiety and well-being improvement.

Yuan (2021) evaluated adolescent students (i.e., aged from 12 to 14) who were asked to listen to 15-min MBI recordings (i.e., with a daily frequency for a 24-week period) with the aim of increasing their resilience and thereby decreasing their anxiety and stress symptoms. The mindfulness training effects were measured using resilience and emotional intelligence measures (Table 1) and were compared with the results in a control group. Participants from the intervention group showed a significant improvement in their emotional intelligence skills, an increase in positive thoughts, and a decrease in their associated stress symptoms.

In summary, the studies reviewed in this subsection (i.e., Bäuerle et al., 2020c; Sturgill et al., 2021; Wei et al., 2020; Yuan, 2021; Zhang & Ma, 2020) delivered online treatments during the confinement period and obtained benefits in terms of stress, depression, and anxiety reduction and improvements in the sleep quality and emotional intelligence skills of the participants.

Descriptive Studies That Focused on the Relations Between Mindfulness Self-report Measures and Other Emotional Dysregulation Measures

In this subsection, we summarized some of the selected studies in which participants did not participate in MBIs but were assessed on mindfulness variables by self-administered questionnaires.

Two descriptive studies, addressed in adolescent populations, analyzed relations between mindfulness measures and anxiety, stress, or depression measures. First, in Yu et al. (2020), emotional dysregulation was assessed in 332 students using the Depression, Anxiety, Meaningfulness of Life and Stress Scales (Table 1). They found significant correlations between resilience measures and the variables of self-esteem, life satisfaction, and personality trait factors. Hong et al. (2020) assessed the stress generated by media exposure during quarantine and emotional dysregulation in 439 adolescents who were studying in Wuhan, China. These students were asked to complete the Adolescent Mindfulness Measure, a rumination inventory, a psychological stress scale, and a social media questionnaire (Table 1). The results indicated that the higher the person's mindfulness skills are, the greater the acceptance of the situation and the lower the manifestation of symptoms linked to emotional dysregulation. They also found that stress and anxiety increased as a consequence of media exposure, and it was also related to an increase in negative thoughts and ruminations.

Another study by Michel et al. (2020) focused on aspects that could affect people's emotional dysregulation in times of social uncertainty and analyzed the role of mindfulness variables in reducing negative feelings related to self-perceived loneliness and sadness in 302 adults. Participants completed several online questionnaires (Table 1). The results showed that people with previous mindfulness training evidenced better adaptation skills to loneliness and therefore had less negative depression-related feelings.

In another recent study, Waterschoot et al. (2021) analyzed the negative effects of boredom resulting from this time of social isolation. Online interviews were collected from 1455 individuals over 18 years of age. These participants were asked to complete several questionnaires (Table 1). The results showed that people with a high level of mindfulness had less boredom and a higher degree of satisfaction with their lives, as well as being more mindful and exhibiting autonomy-oriented strategies.

Dubey et al. (2020) aimed to analyze the relationship between users' levels of mindfulness and anxiety and assessed the degree of psychological flexibility shown during quarantine in India. For this purpose, 402 participants (i.e., aged between 18 and 64) completed a group of online questionnaires (i.e., depression, anxiety, stress, mindfulness

facets; emotional regulation, acceptance, and COVID-19 knowledge; see Table 1). The results showed that increased emotional adjustment problems appeared more in participants with less psychological flexibility, but participants with greater COVID-19 awareness were more adaptive and showed less stress. In this sense, Difonte et al. (2020) performed a similar descriptive online study (i.e., 309 adults) and mentioned the benefits of mindfulness practice in reducing emotional regulation problems, particularly anxiety- and stress-related symptoms.

In a different recent study, Dai et al. (2022) aimed to identify the prevalence of common mental health problems among patients who recovered from COVID-19 and explore the potential mechanism through which MBIs could be valid tools for relieving depression and posttraumatic stress. They used several surveys and questionnaire assessments (Table 1) and found that mindfulness was negatively associated with depressive symptoms through the mediating effect of resilience and that anxiety-related symptoms were negatively associated with posttraumatic stress through the mediating effect of anxiety symptoms. They concluded that people who had recovered from COVID-19 showed symptoms related to psychological distress and that the cultivation of mindfulness practices implied relief from depressive symptoms and posttraumatic stress directly or indirectly, suggesting that mindfulness-based interventions could also improve mental participants' well-being. Similarly, Belen (2021) explored the relationship between COVID-19 fear and aspects of mental health and analyzed whether mindfulness can act as a mediational variable. They found that mindfulness mediated the relationship between fear of COVID-19 and depression and anxiety.

In the same line of argumentation, Dillard and Meier (2021) used several surveys (i.e., assessed trait mindfulness scale, stress, anxiety, trait anxiety, and depression; see Table 1). The findings indicated that individuals who rated higher in trait mindfulness also reported less stress and anxiety while staying at home. Additionally, higher mastery of MBIs was associated with less worry about the virus. Additionally, trait mindfulness was negatively related to depression, and numerous associations between mindfulness and coping emerged (e.g., higher trait mindfulness was associated with healthier strategies in coping with coronavirus).

Additionally, Jiménez et al. (2020) compared the results of surveys completed by 412 participants from various provinces in Spain and analyzed the relationships between some emotional regulation variables and self-compassion (SC). They used several assessment measures (i.e., depression, anxiety, stress, and self-compassion; see Table 1). The results showed that the cultivation of SC improved participants' quality of life and can also be considered a determinant factor for predicting lower levels of anxiety, depression, and stress. Regarding posttraumatic stress symptoms, the

youth factor (i.e., found to be associated with mindfulness therapy practice) was linked to better insight and coping strategies.

Results Summary

In the first subsection, we observed that the studies reviewed (e.g., Bäuerleet al., 2020c; Zhang & Ma, 2020) delivered several online treatments during the confinement period. In this group of interventions, we detected that mindfulness scientists quickly tried to respond to the emergency situation (i.e., confinement and general difficulty in accessing health services) and provided citizens with MBI tools but adapted them to the unique needs of the pandemic and confinement, thus obtaining very promising results in psychological aspects that are key in the prevention of mental and physical diseases (i.e., benefits on stress, depression, and anxiety reduction; improving sleep quality and emotional intelligence skills). In the second results subsection, we summarized the selected studies in which mindfulness variables were assessed by self-administered questionnaires and related to emotional variables. In this sense, we observed that mindfulness mediated the relationship between fear of COVID-19 and depression and anxiety (e.g., Belen, 2021), improving mental health (i.e., stress, anxiety and depression, resilience; e.g., Hong et al., 2020; Difonte et al., 2020; Dubey et al., 2020; Dillard & Meier, 2021; O'Donnell et al., 2020; Zhang & Ma, 2020). They also found associations between trait mindfulness and mental health factors related to COVID-19 (e.g., O'Donnell et al., 2020); a high level of mindfulness traits was related to less boredom, a higher degree of life satisfaction, and more autonomy-oriented strategies (O'Donnell et al., 2020). They also obtained results that revealed increasing emotional adjustment difficulties in participants with a low level of psychological flexibility and found that participants with greater COVID-19 awareness were more adaptive and showed lower levels of stress and emotional dysregulation (Dubey et al., 2020; Hong et al., 2020; O'Donnell et al., 2020). Additionally, stress, anxiety, and negative thoughts increased as a consequence of COVID-19 media exposure (Hong et al., 2020). Additionally, self-compassion was related to better coexistence during confinement (Jiménez et al., 2020); previous mindfulness training was found to reduce emotional dysregulation caused by forced loneliness (Michel et al., 2020). Finally, participants who had recovered from COVID-19 showed that MBIs were important tools for coping with depressive symptoms and posttraumatic stress (Dai et al., 2022; Dillard & Meier, 2021), and mindfulness and life meaning might operate as important protective factors of mental health (Yu et al., 2020). Seen together, the studies that have focused on analyzing the existing relationships between variables of mindfulness (i.e., registered from self-administered

questionnaires) in relation to variables of emotional regulation showed improvements in emotional regulation, the avoidance of consequent symptoms of anxiety, depression and stress, and posttraumatic stress, better resilience and adaptive capacity, greater ability to find autonomous and creative solutions to forced loneliness and isolation, and an improvement of participants' well-being and life quality.

Discussion

In situations of great emotional stress, such as COVID-19 confinement, the use of MBIs (i.e., proprioceptive awareness of bodily sensations and observation of mental flow) can be a practical tool to help individuals cope with fear, anxiety, and depression (e.g., Roy et al., 2020; Spijkerman et al., 2016). The MBIs were useful and pertinent to the COVID crisis because of the potential benefits of meditative breathing for lung function and meditation for alleviating pain during illness. Additionally, MBIs can be general tools of self-management to address stress. Even before the COVID-19 pandemic, the benefits of MBIs on respiratory health had already been tested (e.g., Paudyal et al., 2018; Wu et al., 2018) based primarily on the fact that meditative movement of breathing may have the potential to improve lung function and physical activity in any patient with lung disease. In this sense, the inner nature of MBIs was very pertinent for this crisis. Another outstanding aspect of MBIs that were coherent with the COVID-19 global crisis is the fact that MBIs are self-management tools that can be useful for coping with concerns and constant ruminations that worry people affected by respiratory problems and those who fear being infected (e.g., Blanck et al., 2018). In this sense, mindfulness practice might be a useful emotional regulation instrument that can be self-administered and can intervene before the onset of fear or anxiety (e.g., mindfulness focused on breathing as part of whole body awareness; Anālayo, 2020). Additionally, benefits of MBIs for alleviating pain during illness in different populations were found (e.g., Hilton et al., 2017). For instance, Khoo et al. (2019) found that MBSR training can enhance physical functioning and reduce pain intensity and distress in patients with chronic pain.

It should be noted that due to the COVID-19 situation, most mindfulness studies used online tools, either for data collection or for the application MBIs. In this sense, the benefits on well-being derived from the use of online mindfulness applications have already been demonstrated in previous studies (e.g., Champion et al., 2018; Howells et al., 2014; Ly et al., 2014). The existence of mindfulness-based interventions, yoga, or other emotional regulation MBI programs distributed online has, in many cases, facilitated access to them in situations of confinement as a result of the isolation measures proposed by many governments around the world. Authors such as Liu et al. (2020) also noted an increase in the number of online psychological therapies due to the easy usage of new technologies and their consistency with pandemic limitations. In this vein, the meta-analysis performed by Andersson et al. (2014) showed that the effectiveness of online therapies was similar to that of face-to-face therapies.

In the present review, we described a group of online MBIs that were performed during confinement. In this sense, it is worth noting that there are some studies that reported the effects of direct interventions (i.e., those that have applied targeted therapy in a programmed way) and those that have used indirect interventions (i.e., using computer applications or listening to recordings). In particular, in the present study, a summary analysis of the results of the first subsection suggested that training in mindfulness techniques can clearly be a useful and accessible tool to mitigate the stressful effects of the pandemic situation (e.g., fear of contagion, economic uncertainty, or social isolation) both in the general population and in at-risk populations (e.g., Bäuerle et al., 2020c; Sturgill et al., 2021; Wei et al., 2020; Yuan, 2021; Zhang & Ma, 2020). We observed that the studies that used MBIs (i.e., Bäuerle et al., 2020c; Sturgill et al., 2021; Wei et al., 2020; Yuan, 2021; Zhang & Ma, 2020) delivered online treatments during the confinement period and obtained benefits in stress and anxiety reduction (i.e., Bäuerle et al., 2020c; Sturgill et al., 2021; Wei et al., 2020; Yuan, 2021), depression reduction (i.e., Sturgill et al., 2021; Wei et al., 2020), stress reduction specifically identified as COVID-19 consequences (i.e., Zhang & Ma, 2020), improvement in sleep quality (i.e., Zhang & Ma, 2020), improvement in emotional intelligence skills (i.e., Sturgill et al., 2021; Yuan, 2021), and positive thoughts (i.e., Yuan, 2021).

Due to quarantine periods, social interaction has been limited, and in many cases, the population has had to face a new isolation and loneliness situation, and a series of descriptive studies that are of interest emerged. They focused on analyzing possible relationships between mindfulness self-report measures and other emotional regulation measures, that is, measuring mindfulness traits and their mutual relationships. For it, in the present study, a group of studies were revised in the second subsection of the results. As a general conclusion, the authors found that those who think and act more mindfully and show more self-compassion are less stressed and anxious and can be less likely to develop depression symptoms. Specifically, more mindful participants showed (a) more acceptance of the COVID-19 situation and lower manifestation of symptoms linked to emotional dysregulation (e.g., Dai et al., 2022; Difonte et al., 2020; Dillard & Meier, 2021; Dubey et al., 2020; Hong et al., 2020; Michel et al., 2020); (b) fewer depressive and

anxiety symptoms (through the mediating effect of resilience, Dai et al., 2022); (c) less boredom (Waterschoot et al., 2021); (d) more satisfaction with their lives (e.g., Waterschoot et al., 2021); (e) more autonomy-oriented strategies (e.g., Waterschoot et al., 2021); (f) more psychological flexibility (i.e., less rumination, self-punishment, or catastrophic thinking; e.g., Difonte et al., 2020; Dubey et al., 2020); and (g) less worry about the virus and anticipating less negative effects if one gets the virus (Dillard & Meier, 2021). In general, the revised studies showed that the pre-existence of mindful and self-compassion auto-administered strategies or related mindful personality traits might be truly positive during uncertain and changing situations and that people can overcome stressful periods with fewer negative psychological consequences and with more positive thoughts and resilience.

Some studies found that stress, fear, and anxiety tend to diminish resistance to infectious diseases (e.g., Jones & Drummond, 2022; McEwen, 2016). Therefore, the cultivation of MBI tools (i.e., based on the development of attentional capacities) can be a key instrument to strengthen the immune system in a self-managed way, including periods of isolation and confinement or post-hospitalization recovery (e.g., Conklin et al., 2019; Dillard & Meier, 2021; Kaliman, et al., 2014). The cultivation of MBI attentional techniques of any kind may strengthen participants' set of tools to cope with any other changing, stressful, or baffling situation that requires great amounts of resilience and emotional self-regulation abilities, such as wars, economic falls, illnesses, or dealing with the loss of a loved one.

Limitations and Future Directions

Inferences regarding the multiple applications of MBIs in many aspects related to well-being improvement in actual societies (i.e., characterized by rapid and constant changes on multiple levels) are incredibly wide and can be anticipated to be productive (e.g., Chennapragada et al., 2022). However, there are also many limitations that arose from the mindfulness research field that hopefully might be fixed and addressed in future lines of research.

First, a limitation of the mindfulness research field is the wide scope of techniques that are available, not only regarding mindfulness relaxation and self-compassion intervention research lines but also the existence of a wide range or variations that includes yoga, tai-chi, or cognitive therapies at different degrees. In the area of self-administered mindfulness questionnaires, there is a similar situation, ranging from tools that assessed mindfulness traits to others that are more focused on phenomenological feelings of the present moments and could also be more centered on awareness as a state of mind, attention as a way of focusing cognitive resources, or self-esteem reassurance (i.e., more related to

self-compassion cultivation). As observed in the results described (i.e., in the subsection on online MBIs and in the subsection on self-administered questionnaires), it is worth noting the role of appraisal instruments and the limitations also observed in the studies that were analyzed in the present work, which were used for measuring MBI effectiveness in relation to well-being improvement and psychological variables. The main challenge facing today's mindfulness therapy research area is not only the great MBI approach diversity that makes it difficult to address one unique mindfulness construct operationalization (e.g., commented extensively in Goldberg et al., 2022) but also the existence of different ways to build the appraisal instruments used to measure it. It is worth noting that all the ranges covered by MBIs and self-assessment surveys are incredibly valid and useful for human integrative growth. It is also worth pointing out that mindfulness, being a young research discipline with incredible growth in recent decades, will ultimately lead to more accurate delimitation of its subareas of research. For instance, the two most commonly used MBIs are mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) (Alsubaie et al., 2017). Both promote mindfulness skills by generating awareness of bodily sensations as a way to regulate emotional reactivity, but there are many more that integrate interventions that are diametrically opposed, and all are called "mindfulness" but are focused on promoting other skills (e.g., such as self-compassion techniques or yoga). In this sense, a recent consensus of specialized researchers in this area highlighted important conceptual problems related to how the construction of the "full attention concept" has been defined and multiple methodological problems in its empirical appraisal (Van Dam et al., 2018). Additionally, in terms of validity, the situation is similar, and there are numerous limitations. Zhang et al. (2021) reviewed in detail the validity of the MBIs and concluded that the most frequent limitations found were (a) low quality in the study design, (b) small sample size, (c) poor provision of monitoring, and (d) inconsistent terminology and measurement tools. In this sense, the articles reviewed in this paper reflect the same difficulties and challenges that mainly come from the mindfulness research area. In this sense, we think that part of the limitations in the present research moment of the mindfulness area is the diversity of intervention techniques and questionnaires, which in a way are difficult sometimes to make comparable because they are like dissecting the psychological mindfulness phenomenon in different facets and sharp or rounded edges; all of them shining with different lights of importance to the exploration of human mind and body potential.

As has been explained extensively in the present work, much has been published about how COVID affected our perception and ways of coping with stress, depression, and anxiety in periods of uncertainty and confinement and how

the MBIs proved to be a possible set of valid tools to face unknown and adverse situations such as those experienced globally during the COVID-19 pandemic (e.g., Boekhorst & Duijndam, 2023; Mueller et al., 2022). Recent literature has shown post-COVID-19 medical consequences, mainly related to other acquired infectious diseases (Kuodi et al., 2023); cardiac sequelae (Marimuthu et al., 2023); post-COVID cognitive dysfunction (Quan et al., 2023); and postacute COVID-19 syndrome, "long COVID," and post-COVID-19 vaccination syndrome (Scholkmann & May, 2023). In contrast, little has been said about the consequences of post-COVID conditions (e.g., people who continued to be affected by COVID-19 and other viral infections) and how MBIs could also be used to address the postpandemic stage. In other words, although this group of post-COVID pathologies has been clearly defined by the literature (e.g., Rufai et al., 2023), little has yet been published about the possible transfer of findings and interventions performed during the COVID-19 period to the treatment or post-COVID pathologies (i.e., those that have been created as a result of the pandemic and are currently a new global health problem). Therefore, we believe that future lines of research should focus more on the improvement of psychological variables (i.e., depression, anxiety, and emotional regulation, which could be affected as a consequence of post-COVID pathologies) by transferring all the findings obtained in relation to all emerging MBI therapies during the COVID pandemic period. In this sense, all the MBI treatments that have proven effective during the COVID-19 period can be applied to these new groups of pathologies, but new research has to be done mostly because of the long-term duration that these new illnesses have, in contrast to COVID-19. For instance, a recent review publication (e.g., Liu et al., 2022) analyzed the effectiveness of online mindfulness-based interventions for improving mental health in patients with physical health conditions. In these publications, the authors interestingly analyzed articles on MBIs for illnesses such as human immunodeficiency virus and acquired immunodeficiency syndrome, and some of its findings around MBIs can be successfully transferred to post-COVID pathologies. Long-term pathologies present new challenges to patients mostly because of the frustration that emerges from the fact that recovery is not always that immediate, and in some cases, even the MBIs have to be more focused on the acceptance of an illness that can stay permanent and may not show any recovery in the future. For all these new challenges that post-COVID illnesses present, it is necessary to adjust what we already have known during the pandemic period to these new needs. For this reason, and above all the already mentioned limitations, we think that the incorporation of MBIs (i.e., addressing mindfulness-based coping strategies) has already shown its usefulness for overcoming uncertain and changeable situations such as those that occurred during the pandemic (i.e., those that provoked stress, anxiety, depression, and all types of emotional dysregulation symptoms). In the actual and

future world, it is possible that these life-changing situations will continue to occur, and because of that, the development of resilience should be incorporated both in educational curricula and in preventive practices developed in workplaces and in all day life.

Declarations

Use of Artificial Intelligence Artificial intelligence (AI) was used for editing the manuscript to improve English grammar only at the last stage of the review process.

Ethics Approval The University of Valencia provided IRB approval for the study.

Consent to Participate Informed consent was not required because the manuscript does not contain clinical studies or patient data.

Conflict of Interest The authors declare no competing interests.

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