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A mixed-methods systematic review of the effects of mindfulness on nurses

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A mixed-methods systematic review of the effects of mindfulness on nurses

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Abstract

Aim. To review the effects of mindfulness-based interventions on Registered Nurses and nursing students.
Background. Work-related stress among nurses is estimated to be the biggest occupational health problem after musculoskeletal disorders.
Design. A mixed-method systematic review incorporating quantitative and qualitative data was conducted.
Data sources. Studies on the effects of mindfulness-based interventions for nurses and nursing students published between 1980 and 2014 were identified through a systematic search in electronic databases: Medline, Embase, PsycINFO, Cochrane Library and Cinahl.
Review methods. Data analysis was conducted based on the framework of Thomas and Harden (2004).
Results. A total of 32 studies, including 17 controlled designs, 11 pre–post designs and four qualitative designs were reviewed. Meta-analysis suggests that mindfulness-based interventions may be effective in significantly reducing state anxiety and depression at posttreatment and state anxiety and trait anxiety at follow-up. Qualitative studies and uncontrolled studies shed light on benefits overlooked in RCTs, including improvements in the well-being of individuals (e.g. inner state of calmness, awareness and enthusiasm) and improved performance at work (better communication with colleagues and patients, higher sensitivity to patients' experiences, clearer analysis of complex situations and emotional regulation in stressful contexts).
Conclusions. Mindfulness appeared to improve nurses' mental health significantly. It could be used in worksite health promotion programmes. Only a few studies have explored the impact of mindfulness on nurses' professional behaviours and their relationships with patients and colleagues. Future research should further explore the long-term impacts of mindfulness on performance and well-being at work using sound methodological designs.

Keywords: anxiety, depression, health promotion, mindfulness, nurses, nursing students, occupational health, psychological stress, systematic review

Why is this research or review needed?

- Stress is a major challenge for nursing practice. It is estimated to be the biggest occupational health problem after musculoskeletal disorders.
- Mindfulness-based interventions have demonstrated significant positive effects on stress reduction and improvement of well-being for a broad range of individuals facing mental or physical health problems.
- This review is the first to explore the effects of mindfulness-based interventions for both Registered Nurses and nursing students in different practice settings.

What are the key findings?

- Meta-analysis suggests that mindfulness training may decrease nurses' levels of anxiety and depression. Benefits on nurses' psychological well-being and performance at work seem to be observed in qualitative and uncontrolled studies.
- Most quantitative studies included in this review focus on a set of a few psychological variables. Impacts on performance and well-being at work were largely overlooked, particularly in RCTs.

How should the findings be used to influence policy/practice/research/education?

- The findings of this study contribute to the literature on workplace health promotion strategies for nurses.
- Nurse managers may consider mindfulness training to be an evidence-based health promotion programme, which may be easy to implement in the workplace.
- Further evidence is needed on the long-term effects of mindfulness training, in particular on which factors of intervention programmes tend to lead to sustainable benefits.

Introduction

Stress is a major challenge for nursing practice (McVicar 2003, Chang et al. 2005, Golubic et al. 2009). It is estimated to be the biggest occupational health problem after musculoskeletal disorders (Bernal et al. 2015). Persistent high stress has impacts on work activities and performance including personal and professional burnout (Vahey et al. 2004, McHugh et al. 2011), absenteeism (Michie & Williams 2003), lower job satisfaction (Zangaro & Soeken 2007, McHugh et al. 2011) and workplace turnover (Coomber & Louise Barriball 2007, McHugh et al. 2011, Hayes et al. 2012). It also appears to be associated with decreased patient satisfaction (Leiter et al. 1998, Vahey et al. 2004).

Job stress is defined as the harmful physical and emotional response that occurs when the perceived job demands exceed the workers' perceived capabilities and resources (Lazarus & Folkman 1984, Lambert & Lambert 2001). The main sources of stress for nurses are workload; poor relationships with supervisors, co-workers and physicians; the emotional cost of caring; lack of reward and shift rotation (Lambert & Lambert 2001, McVicar 2003). The impact of these stressors can be moderated by organizational factors such as adequate staff, good administrative support and good relations between doctors and nurses (Vahey et al. 2004). Psychosocial factors such as social support, group cohesion, self-esteem and the use of stress-reduction strategies can also play a determining role (Lambert & Lambert 2001).

Systematic reviews of stress-reduction interventions for nurses (Edwards & Burnard 2003, Mimura & Griffiths 2003, Zeller & Levin 2013) and students in nursing (Galbraith & Brown 2011) have demonstrated that the promotion of stress-reduction strategies and improvements in work environments can reduce nurses' stress. Interventions may target individuals (e.g. cognitive behavioural therapy and relaxation), organizations (e.g. human resource practices and support between colleagues) or both. Although the benefits of mindfulness on stress-reduction are becoming increasingly studied (Chiesa & Serretti 2009, Bohlmeijer et al. 2010, Monshat & Castle 2012, Vøllestad et al. 2012, Goyal et al. 2014), the effects of mindfulness on nurses and nursing practices have not yet been the object of a systematic review.

Background

Mindfulness can be defined as a form of mental training through a variety of exercises that involve stilling or emptying the mind or intentionally bringing one's attention to an inner object such as the present moment or the breath (Baer 2003, Chen et al. 2012). It implies an awareness of internal and external experiences at a given moment, a suspension of distraction and an attitude of non-judgmental acceptance (Baer 2003, Kabat-Zinn 2003, Singh et al. 2014). Mindfulness practice produces an enhanced attention to the current experience and an intentional openhearted presence (Brown & Ryan 2003, Kabat-Zinn 2003). It is closely related to meditation defined as 'any of a family of practices where the practitioner trains an individual's consciousness or calms his/her mind to realize some benefit or achieve inner peace or harmony' (Chen et al. 2012, p. 546). Mindfulness practices may include deep-breathing and relaxation exercises focused on the conscious release of muscle and mental tensions (Richardson & Rothstein 2008). In recent years, these practices have become

widespread in clinical settings, particularly through the standardized mindfulness stress-reduction programme (MBSR) proposed by Kabat-Zinn (Kabat-Zinn 1982, Kabat-Zinn & Hanh 2009).

In several systematic reviews, small to moderate effect sizes have been observed for the decrease in anxiety (Bohlmeijer et al. 2010, Chen et al. 2012, Goyal et al. 2014, Orme-Johnson & Barnes 2014), depression (Bohlmeijer et al. 2010, Fjorback et al. 2011, Goyal et al. 2014), pain (Chiesa & Serretti 2011, Goyal et al. 2014) and stress (Smith et al. 2005, Bohlmeijer et al. 2010). Unexpectedly, positive psychological effects such as awareness or empathy are more rarely measured. Mindfulness-based interventions implemented in workplaces have been shown to improve employees' mental health (Chaskalson 2011, Glomb et al. 2011, Wolever et al. 2012, Hülsheger et al. 2013, Hanson & Richardson 2014, Gregoire & Lachance 2015, Virgili 2015). As Gregoire and Lachance (2015) underline, a mindfulness practice has been found to have positive impacts on work-life balance (Allen & Kiburz 2012), work satisfaction (Weiss & Cropanzano 1996, Hülsheger et al. 2013), emotion regulation (Glomb et al. 2011, Allen & Kiburz 2012), empathy and quality of relationships (Brown et al. 2007, Hanson & Richardson 2014), leadership development (Baron & Cayer 2011), readiness for change (Gärtner 2013), work performance (Dane & Brummel 2013, Pezzolesi et al. 2013, Reb et al. 2015), turnover intentions (Dane & Brummel 2013, Reb et al. 2015) and client satisfaction (Gregoire & Lachance 2015).

The review

Aim

The objective of this article is to systematically review the scientific literature on the effects of mindfulness on nurses and nursing practices, given the particular stressors of the nursing profession, such as proximity to death and illness and close contact with patients. More specifically, this review addresses the following research questions: What are the main characteristics of mindfulness-based interventions targeting nurses? What are the impacts of mindfulness-based interventions on nurses and what do nurses perceive the benefits and challenges of mindfulness-based interventions to be? Are these benefits and challenges measured and confirmed by quantitative studies?

Design

This mixed-methods systematic review is based on the framework described by Thomas and Harden (Thomas et al. 2004, Harden & Thomas 2005). It consists in a review of controlled and uncontrolled clinical trials designed to assess the effect of mindfulness-based interventions on nurses. It is followed by a synthesis of qualitative studies that explore nurses' views and perceptions of these interventions during or after their participation in them. The final analysis integrates both quantitative and qualitative findings to explore to what extent benefits or challenges experienced by nurses have been measured and confirmed by quantitative studies.

Search methods

Studies were identified by searching electronic databases (Medline, Embase, PsycINFO, Cochrane Library and Cinahl). The last search was run in January 2014. Studies included were limited to those from 1980 onwards and were confined to the English language. A combination of MeSH-terms and keywords was used: (Nursing Staff OR Nurses OR Nursing) AND (Mindfulness OR Meditation OR MBSR OR Relaxation OR Guided imagery OR Visualization) (Table S1). The leading author and a librarian conducted the initial search. Previous literature reviews and the bibliographies of studies included were checked manually.

The following inclusion criteria were used: (1) The participants in the interventions are Registered Nurses (e.g. nurse specialist and private nurse), auxiliary nurses (e.g. nurse aides) or nursing students. Studies may include other healthcare professionals, but they must report specific data for nurses; (2) The interventions provided are mindfulness-based. Considering that the boundaries between mindfulness, meditation and relaxation techniques can be porous, intervention studies should have at least one component that clearly uses mindfulness, meditation or relaxation techniques. All kinds of mindfulness, meditation and relaxation techniques were included in this study (e.g. mindfulness training, guided relaxation and transcendental meditation). When the main focus of the study is not mindfulness (e.g. yoga and stress-management programme), the use of mindfulness, meditation and relaxation should be clearly stated for the study to be included. When studies include control and intervention groups, then mindfulness components should be found in at least one intervention group. Mindfulness techniques can be used when the subject is still (e.g. lying or in a seated position) or in movement (e.g. walking). (3) The studies included qualitatively or quantitatively examine the effects of interventions. Randomized controlled trials (RCT), quasi-randomized controlled trials (QCT), one-group pre–post studies, mixed-methods studies and qualitative studies were included. Given the lack of existing controlled studies, uncontrolled studies were included to produce a comprehensive survey of the research and to identify promising research avenues (Campbell et al. 1963). Non-intervention studies such as reviews were excluded.

Search outcome

A total of 147 studies were identified through the initial screening; in the end, 32 studies were included. The selection process is presented in Figure 1. After automatically eliminating duplicates, studies were screened to identify potentially relevant studies based on their title and abstract. Studies were then assessed for eligibility based on full-text analysis carried out independently by two research assistants.

Quality appraisal

The quality of the studies was evaluated using the Mixed-Methods Appraisal Tool (MMAT) to document the methodological quality of qualitative studies, RCT, QCT, pre–post one-group studies and mixed-methods studies (Pluye et al. 2009, Pace et al. 2012, Souto et al. 2015). In addition, the risk of bias in RCTs and quasi-experimental studies was assessed with the Cochrane risk of bias tool (Higgins et al. 2011). No study was excluded on the basis of

the quality threshold (see supporting information in Table S3).

Data abstraction

Two research assistants independently extracted data using a data extraction form. The extraction form was pilot-tested and amended prior to beginning the full review so that all members of the team understood it in the same way. The few differences in the extraction of data were discussed during the pilot phase of the study. These differences were very limited, and the definition of each item of the extraction form was clarified to ensure the reliability of the codification process.

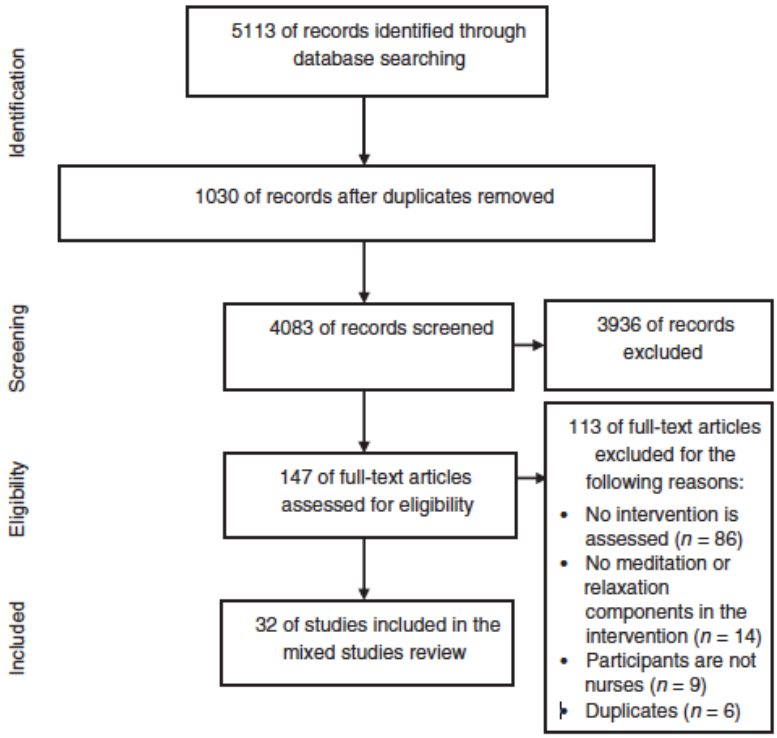

Figure 1 Flow of information through the different phases of a systematic review.

Background information was extracted (authors, year of publication, country, study design, population, intervention context and number of participants). Intervention characteristics were collected for experimental and control groups when appropriate (intervention components, modes of delivery, interventionists, number of sessions, duration of intervention and duration of no-contact follow-up). The mindfulness approach used in the intervention was coded in the intervention components (e.g. guided imagery). If not available, it was coded under the general term used in the study (e.g. 'mindfulness,' 'meditation' or 'relaxation'). Results from quantitative studies (attrition rate, measurement instruments and posttreatment and follow-up results) and findings from qualitative studies (abstract, author-derived themes, results section, nurses' citations, discussion section and conclusion) were systematically extracted (Dixon-Woods et al. 2006).

Synthesis

A four-step process was followed to integrate quantitative and qualitative research in accordance with the framework described by Thomas and Harden (Thomas et al. 2004, Harden & Thomas 2005). The first step consisted of describing the background and intervention characteristics of studies included. Extracted data were categorized and quantified using frequencies. Second, the results of controlled trials were synthesized in a meta-analysis when possible. For each continuous variable, the standardized mean difference was used to estimate the pooled mean difference between intervention and control groups, using a random effects model. Meta-analysis was performed using RevMan 5-3 software (Cochrane Collaboration 2011). Statistical heterogeneity between studies was measured using the chi-square test, its corresponding P value and the I^2 test (Cochrane Collaboration 2008). For one-group pre–post studies, confidence intervals were calculated based on the mean difference. Missing statistical data were sought from authors. Third, thematic analysis of qualitative data was done using QDA Miner 4 software. A mixed approach – inductive and deductive – was used to develop the codes. Two research team members developed a first version of the codebook derived from the research question and the literature. Codes also emerged from the corpus. A final version of the codebook and the coding was reached after the coding of the two coders was compared and debriefed. After summarizing data from each code, main themes and supporting quotes were identified. Fourth, to examine how findings from qualitative studies (step 3) could inform and illuminate the quantitative results (step 2), they were presented alongside each other using a matrix. All the outcomes of the study and the related tables were double-checked during the study and again during the revision of the manuscript.

Results

Background characteristics of the studies included. All studies were published in English between 1981 - 2013. Seventy-five per cent of studies were carried out in the United States. Sample size at baseline varied from 5 to 300. Half of the studies used a randomized controlled trial design. The majority of interventions were implemented at a hospital. Table 1 summarizes the main characteristics of the studies included.

Intervention characteristics

The most frequent intervention components were relaxation, meditation (with no specific approach mentioned) and the MBSR programme. They could be complemented with other components such as yoga or biofeedback. Most interventions were based on group meetings. The number of meetings varied substantially across studies: 16 studies held five meetings or less; 13 studies had 6-10 meetings. Only 5 studies included a follow-up. The interventionists were often experienced instructors or the researchers themselves. More details are provided in Table 2.

Table 1 Summary of included studies.

Authors	Design	Participants	Settings	Interventions	Frequency and duration
Bazarko *et al.* (2013)	Pre–post	41 nurses	Health care	MBSR (Mindfulness-based stress reduction)	2-day retreat. 90 min/week, 6 sess self-practice
Beddoe and Murphy (2004)	Pre–post	18 students	NR	MBSR	2 hrs/sess, 8 sess, 1 sess/week self-practice
Cuneo *et al.* (2011)	Pre–post	26 nurses	Hospital	Reiki	8 hrs/sess, 1 sess self-practice
Cutshall *et al.* (2011)	Pre–post	11 nurses	Critical care	Meditation, biofeedback	30 min/sess, 4 sess/week, 16 sess
Hoolahan *et al.* (2012)	Pre–post	31 nurses	Hospital	Breathing, relaxation, guided imagery	30 min/sess, 4 sess/week, 4 weeks
Kravits *et al.* (2010)	Pre–post	248 nurses	Cancer unit	Relaxation, wellness plan	6 hrs/sess, 1 sess
Malinski and Todaro-Franceschi (2011)	Pre–post	26 students	NR	Meditation	30 min/sess, 1 sess self-practice
Pekala *et al.* (1988), Pekala and Forbes (1990)	Pre–post	300 students	NR	Hypnosis, breathing, relaxation	2 sess, 1 sess/week, 2 weeks
Penque (2009)	Pre–post	61 nurses	Hospital	MBSR	1-day retreat. 2 hrs/sess, 8 sess, 1/week reading
Prato and Yucha (2013)	Pre–post	14 students	NR	Breathing, relaxation, autogenic, biofeedback	4 sess, 1 sess/week, 4 sess self-practice
Tang *et al.* (2010)	Pre–post	26 nurses	Health centre	Healing touch	8·75 hrs/sess 2 sess, 1/day
Cohen-Katz *et al.* (2005a,b)	RCT	38 nurses	Hospital	I: MBSR C: Waiting list	1-day retreat, 2·5 hrs/sess, 1 sess/week, 8 weeks
Donovan (1981)	RCT	24 nurses	Oncology unit	I: Relaxation, guided imagery C: Waiting list	I: 3 sess of 15-20 min, 3 weeks self-practice
Heaman (1995)	RCT	40 students	NR	I: Relaxation, biofeedback C: nothing	90 min/sess, 1 sess/week, 5 sess
Johansson (1991)	RCT	76 students	Nursing school	I: Cognitive restructuring, imagery, autogenic training, relaxation C: Information	I: 50 min/sess 6 sess 2 sess/ week. C = 20 min/sess 1 sess 3 weeks
Kang *et al.* (2009)	RCT	41 students		I: Lecture, mindfulness C: Lecture	I: lecture + 1·5 h/sess, 1/week, 8 sess C: lecture
Kanji *et al.* (2006)	RCT	93 students	Nursing school	I1: Autogenic I2: Laugh therapy C: Nothing	I1:1 hr/sess 1/week, 8 sess. I2: 20 min 1/week 8 sess
Kim *et al.* (2013)	RCT	29 nurses	Hospital	I: Mind-body exercise C1 and C2: Control group	60 min/sess, 2 sess/week, 16 sess
Kwok (2012)	RCT	38 nurses	Emergency	I: Mindfulness C: Waiting list	1·5 hrs/sess, 1 sess/week, 4 weeks
Leggett (2010)	RCT	85 students	Nursing school	I: Mindfulness, class C: Class	90 min/sess, 4 sess/week, 12 sess self-practice
Lewis (1987)	RCT	48 nurses	Hospital	I1: Guided imagery I2: Biofeedback C: music	NR
Mackenzie *et al.* (2006)	RCT	30 nurses	Geriatric unit	I: MBSR C: waiting list	30 min/sess, 1 sess/week, 4 sess self-practice
Murphy (1983)	RCT	42 nurses	Hospital	I1: Biofeedback I2: Relaxation C: Relaxation	Self-practice 20 min/day, 7 days
Scheick (2011)	RCT	22 students	Nursing school	I: Self-awareness C: Nothing	2 semesters
Severtsen and Bruya (1986)	QCT	10 students	Nursing school	I1: Meditation practice I2: Aerobic training	Self-practice 15-20 min/day, 7 weeks
Sullivan (1999)	RCT	67 nurses	Acute care unit	I: Relaxation, quieting C: waiting list	1 sess/week, 4 weeks self-practice
Tsai (1992)	RCT	137 nurses	Hospital	I: relaxation, meditation, imagery C: class	I: 90 min/sess, 2 sess, 2 weeks. C: 2 lectures
Yung *et al.* (2004)	RTC	65 nurses	Hospital	I1: Stretch I2: Cognitive relaxation C: nothing	I1 and I2: 20 min/sess, 1/ week, 4 sess self-practice
Cohen-Katz *et al.* (2005a,b)	Quali	25 nurses	Hospital	MBSR	2·5 hrs/sess 1/week 8 sess 1-day retreat self-practice
Cohen *et al.* (2008)	Quali	5 students	NR	Gurdjieff/Bennett movements meditation	10-day retreat
Raingruber and Robinson (2007)	Quali	49 nurses	Hospital	Yoga, meditation, Tai-Chi, Reiki	1 sess/week, between 6 weeks and 3 months
Richards *et al.* (2006)	Quali	12 nurses	Hospital	Meditation, mantra, reading	1 sess/week, 8 sess

Sess, session; RCT/QCT, randomized/quasi-randomized controlled trial; hr, hour; min, minutes; NR, not reported; I, intervention; C, control.

Results from quantitative studies documented the effects of mindfulness on 13 psychological variables (Table 3). Most studies measured general mental health factors, such as state anxiety, depression and stress, while some others documented expected benefits of mindfulness, such as awareness, serenity or self-acceptance. Unexpectedly, only four work-related variables were documented in a small number of studies: burnout symptoms, work satisfaction, work self-efficacy and work energy. A total of 12 different indicators of physical health were measured; with the exception of blood pressure and pulse rate, most were only measured in a small number of studies.

Table 3 shows standardized mean differences of RCTs, mean differences of one-group pre–post studies and, when performed, meta-analysis of RCTs. Regarding psychological aspects, meta-analyses suggest that mindfulness-based interventions may be effective in reducing state anxiety (-0.78, 95% CI -1.39 to -0.18) and depression (-0.51, 95% CI -0.78 to -0.18) at posttreatment with uncontrolled studies supporting these results. Although significant results were observed in uncontrolled studies for trait anxiety, stress and psychological distress at posttreatment, inconclusive results were observed in RCTs. At follow-up, a significant decrease was observed in state anxiety (-0.80, 95% CI -0.12 to -0.18) and trait anxiety (-0.50, 95% CI -0.95 to -0.04) in RCTs. Although significant results were demonstrated for awareness, serenity, self-acceptance, empathy and perspective taking in nearly all pre–post studies, contradictory results were obtained in the rare RCTs measuring these variables. In the results of meta-analysis reported above, heterogeneity was non-significant, excepting for state anxiety when the posttreatment results of Donovan's study (1981) were included.

Regarding work-related variables, meta-analysis showed no significant impact for work satisfaction (0.23, 95% CI -0.27 to 0.72). RCTs measuring burnout, work self-efficacy and work energy reported inconclusive results even though significant impacts were observed in uncontrolled studies on work energy. Finally, results from meta-analysis indicated no significant impact on blood pressure (systolic or diastolic) and pulse rate. When adequate, subgroup analysis comparing studies with nurses vs. nursing students was performed in meta-analysis and no significant difference was demonstrated. No data were available to perform subgroup analysis for auxiliary nurses. Results from meta-analysis warrant caution due to the small number of studies and the heterogeneity between the results of some studies.

Findings from qualitative studies

Four qualitative studies explored the benefits of mindfulness-based interventions on nurses' experiences at work and their life in general. Characteristics of participants and intervention contexts were similar to those included in quantitative studies. Data analysis led to the identification of four major themes: nurses' stressful work environment, mindfulness fostering inner state of fullness, mindfulness enhancing nursing practice and challenges associated with mindfulness practice.

Table 2 Characteristics of studies included in the review.

Characteristics	No of studies
Year	
1980–1989	5
1990–1999	4
2000–2013	23
Sample size	
5-24	8
25-49	15
50-99	6
100-300	3
Country	
United States	24
China	3
Others: Canada (1), Italy (1), Korea (1), South Africa (1), United Kingdom (1)	5
Design	
Quantitative studies: randomized controlled trial (16), quasi-experimental (1), one-group pre–post test (11)	28
Qualitative studies	4
Participants	
Nurses (19) and nursing aides (1)	20
Nursing student	12
Settings	
Hospital (no specified unit or department)	12
Hospital unit or department: oncology (2), acute care (2), emergency (1), geriatric (1), psychiatry (1)	7
Other: college or university or nursing school (6), healthcare centre (2)	6
Not specified	5
Intervention methods	
Meditation	23
No particular approach specified (9), MBSR programme (6), awareness/ nindfulness (4), guided imagery (4)	
Relaxation	12
Other methods: biofeedback (5), yoga (3),	18
Cognitive restructuration (2), reiki (2), hypnosis (1), physical activity (1), laugh therapy (1), healing touch (1), tai-chi (1), wellness plan (1)	
Delivery mode	
Group meetings	28
Homework assignment	17
CD or audiotape listening	10
Other: face-to-face intervention (6), written documentation (5), phone interview (3) video watching (2)	16
Intervention duration	
7 weeks and less: 1 day to 3 weeks (11), 4-7 weeks (9)	20
8 weeks and more: 2-3 months (10), 12 months (1)	11
Not specified	1
Number of sessions	
Less or equal to 5	5
6-10	13
16	2
Not specified	2

Two studies recalled that the stressful professional context of nursing may cause emotional distress (Cohen-Katz et al. 2005a,b, Richards et al. 2006). For example, one participant reported, 'If you've had a really bad shift, there's not a lot of support and safety problems because there's not a lot of staff or whatever. I really don't want to go back to work' (Richards et al. 2006, p. 236). The main reasons reported for stress were work overload, lack of staff, relationship difficulties with colleagues, facing nervous patients and facing complaints from patients and managers (Cohen-Katz et al. 2005a,b, Richards et al. 2006). For nurses, this context favoured emotions such as frustration, discouragement or anger. Nurses' motivations for practising mindfulness were being calmer at work and having a positive influence on patients and coworkers (Richards et al. 2006).

Nurses mentioned that mindfulness helped them to get into an inner state of calmness more often and more easily (Cohen-Katz et al. 2005a,b, Richards et al. 2006, Raingruber & Robinson 2007, Cohen et al. 2008). As explained by one nurse: 'I have always been kind of tense, overexcited kind of person. Now, it is not like this anymore. Something has changed' (Cohen et al. 2008, p. 67). Mindfulness seems to encourage a closer contact with one's own feelings and needs (Cohen-Katz et al. 2005a,b, Richards et al. 2006, Raingruber & Robinson 2007, Cohen et al. 2008). The benefits mentioned also included having a rested and enlivened body, with a deeper awareness of both the inner and what surrounds them (Cohen et al. 2008, p. 70).

Participants mentioned several benefits of mindfulness for their professional practice. Mindfulness appeared to facilitate communication with patients and colleagues, mainly because it helped participants maintain better emotional balance and experience less frustration and anger at work (Cohen-Katz et al. 2005a,b, Richards et al. 2006, Raingruber & Robinson 2007). It increased participants' ability to feel compassion and empathy towards both patients and coworkers. One participant reported: 'I think I've become smoother. It's helped me be more compassionate [...] realizing that, if something can't get done, it was probably because they were busy too' (Richards et al. 2006, p. 237). Mindfulness increased participants' self-acceptance and their self-awareness of their attitudes and behaviours with others at work (Cohen-Katz et al. 2005a,b, Richards et al. 2006, Raingruber & Robinson 2007). It improved sensitivity to patients' experiences (Richards et al. 2006, Raingruber & Robinson 2007). One participant reported, 'I spend more time noticing my patients. I pick up on how people move and interact. That's not something I did before' (Raingruber & Robinson 2007, p. 1148). Mindfulness also improved capacity to analyse complex care situations and patient needs (Richards et al. 2006, Raingruber & Robinson 2007). Nurses described feeling grounded, feeling calmer and having greater problem-solving capacities when confronted with clinical dilemmas. As summarized by one respondent, 'when I go to work I feel more serene. I'm thinking more clearly too. Solutions to patient problems come to mind more quickly when I'm relaxed' (Raingruber & Robinson 2007, p. 1147). Nurses' mindfulness practice seems, therefore, to be beneficial to patient safety. One nurse explained, 'when I find myself trying to go in nine directions at the same time [...] you can't concentrate, you forget things; really it's a safety issue [...] when you slow down [...] you can accomplish your priorities better and safer' (Richards et al. 2006, p. 237). Finally, participants reported feeling more motivated at work: 'I feel energized and motivated. I have more energy to put into being involved at work' (Raingruber & Robinson 2007, p. 1148).

Table 3 Standardized mean differences and mean differences at posttest and follow-up.

Variables	Design	Studies	*N* exp group	*N* cont group	SMD or MD at post-test* (CI)	SMD or MD at follow-up (CI)
Psychological variables						
Anxiety (state anxiety)	RCT	Donovan (1981)	11	10	0·60 [−0·28, 1·48]	–
		Heaman (1995)	21	19	−1·08 [−1·74, −0·41]	–
		Johansson (1991)	38	38	−0·89 [−1·37, −0·42]	–
		Kanji *et al.* (2006)	21	25	−1·73 [−2·42, −1·04]	−0·43 [−1·13, 0·26]
		Yung *et al.* (2004)	18	30	−0·61 [−1·21, −0·02]	−1·12 [−1·75, −0·49]
		Kang *et al.* (2009)	16	16	nc	–
		Total effect	109	122	−0·78 [−1·39, −0·18]	−0·80 [−1·47, −0·12]
		Heterogeneity (*P* value; I^2)			$P = 0·001$; $I^2 = 77\%$	$P = 0·15$; $I^2 = 51\%$
	One-group pre–post	Cutshall *et al.* (2011)	8	–	−2·3 [−4·2, −0·4]	–
		Malinski and Todaro-Franceschi (2011)	26	–	−14 [−17·6, −10·4]	–
		Prato and Yucha (2013)	13	–	−1·4 [−7·7, −10·5]	–
		Tang *et al.* (2010)	20	–	−1·4 [−3·1, 0·3]	–
		Beddoe and Murphy (2004)	16	–	nc	–
Anxiety (trait anxiety)	RCT	Kanji *et al.* (2006)	21	25	−1·11 [−1·74, −0·48]	−0·70 [−1·41, 0·02]
		Yung *et al.* (2004)	18	30	−0·25 [−0·83, 0·34]	−0·36 [−0·95, 0·23]
		Murphy (1983)	9	9	nc	–
		Total effect	39	55	−0·67 [−1·52, 0·18]	−0·50 [−0·95, −0·04]
		Heterogeneity (*P* value; I^2)			$P = 0·05$; $I^2 = 74\%$	$P = 0·48$; $I^2 = 0\%$
	One-group pre–post	Cutshall *et al.* (2011)	8	–	−0·4 [−0·7, −0·1]	–
		Malinski and Todaro-Franceschi (2011)	26	–	−8 [−11·8, −4·2]	–
Depression	RCT	Donovan (1981)	11	10	−0·03 [−0·89, 0·83]	–
		Johansson (1991)	38	38	−0·72 [−1·19, −0·26]	–
		Kang *et al.*(2009)	16	16	−0·69 [−1·40, 0·03]	–
		Leggett (2010)	42	43	−0·38 [−0·81, 0·05]	−0·57 [−1·01, −0·13]
		Total effect			−0·51 [−0·78, −0·23]	–
		Heterogeneity (*P* value; I^2)			$P = 0·46$; $I^2 = 0\%$	–
	Pre–post	Tang *et al.* (2010)	20	–	−1·1 [−2·1, −0·1]	–
Psychological distress	RCT	Cohen-Katz *et al.* (2005a,b)	12	13	nc	–
	One-group pre–post	Penque (2009)	53	–	−2·2 [−3·4, −0·9]	–
		Beddoe and Murphy (2004)	16	–	nc	–
Stress	RCT	Kim *et al.* (2013)	11	11	−1·53 [−2·51, −0·56]	–
		Murphy (1983)	9	9	0·85 [−0·13, 1·83]	–
		Kang *et al.* (2009)	16	16	nc	–
		Lewis (1987)	16	16	nc	–
		Severtsen and Bruya (1986) (1992)	5 ne	5 ne	nc nc	– –
		Total effect	20	20	−0·34 [−2·67, 1·99]	–
		Heterogeneity (*P* value; I^2)			$P < 0·001$; $I^2 = 91\%$	–

Table 3 (*Continued*).

Variables	Design	Studies	*N* exp group	*N* cont group	SMD or MD at post-test* (CI)	SMD or MD at follow-up (CI)
	One-group pre–post	Bazarko *et al.* (2013)	36	–	−8·28 [−10·5, −6·0]	0·1 [−1·8, 2·0]
		Cuneo *et al.* (2011)	17	–	−5·9 [−5·4, −6·4]	–
		Cutshall *et al.* (2011)	8	–	−2·1 [−3·8, −0·4]	–
		Hoolahan *et al.* (2012)	26	–	−3·8 [−8·8, −1·3]	–
		Tang *et al.* (2010)	20	–	−1·7 [−2·6, −0·7]	–
Awareness/ mindfulness	RCT	Cohen-Katz *et al.* (2005a,b)	12	13	nc	ne
	One-group pre–post	Bazarko	36	–	0·8 [0·5, 1·0]–	0·9 [0·7,1·1]
		Leggett (2010)	42	43	0·12 [−0·30, 0·55]	0·25 [−0·18, 0·68]
		Penque (2009)	53	–	9·7 [7·93,11·5]	–
		Pekala and Forbes (1990)	246	–	nc	–
Serenity/ relaxation	RCT	Mackenzie *et al.* (2006)	16	14	0·24 [−0·48, 0·96]	–
	One-group pre–post	Bazarko *et al.* (2013)	36	–	0·94 [0·7, 1·2]	1·04 [0·8, 1·26]
		Penque (2009)	53	–	0·7 [0·5, 0·9]	–
		Tang *et al.* (2010)	20	–	1·3 [0·4. 2·2]	–
Self-compassion acceptance	RCT	Donovan (1981)	11	10	0·33 [−0·53, 1·20]	–
		Kwok (2012)	6	13	0·70 [−0·30, 1·70]	–
		Total effect	17	23	0·49 [−0·16, 1·14]	–
		Heterogeneity (*P* value; I^2)			P = 0·59; I^2 = 0%	–
	One-group pre–post	Bazarko *et al.* (2013)	36	–	0·9 [0·65, 1·13]	1·0 [,0·8, 1·3]
		Penque (2009)	53	–	1 [0·8, 1·2]	–
Empathy	One-group pre–post	Bazarko *et al.* (2013)	32	–	7 [3·7, 10·3]	6·41 [2·9, 9·9]
		Penque (2009)	53	–	2·3 [0·3, 4·8]	–
		Beddoe and Murphy (2004)	16	–	nc	–
Discernment/ perspective-taking	One-group pre–post	Penque (2009)	53	–	2·2 [0·9, 3·4]	–
		Beddoe and Murphy (2004)	16	–	nc	–
		Pekala *et al.* (1988)	246	–	nc	–
Fantasy	One-group pre–post	Penque (2009)	53	–	0·8 [−0·6, 2·2]	–
		Beddoe and Murphy (2004)	16	–	nc	–
Well-being	RCT	Mackenzie *et al.* (2006)	16	14	−0·13 [−0·85, 0·59]	–
	Pre–post	Tang *et al.* (2010)	20	–	0·8 [−0·6, 2·2]	–
Coherence	RCT	Mackenzie *et al.* (2006)	16	14	0·16 [−0·56, 0·88]	
Work variables						
Work satisfaction	RCT	Kwok (2012)	6	13	0·48 [−0·50, 1·46]	–
		Mackenzie *et al.* (2006)	16	14	0·17 [−0·55, 0·89]	–
		Murphy (1983)	9	9	0·10 [−0·83, 1·02]	–
		Total effect	31	36	0·23 [−0·27, 0·72]	–
		Heterogeneity (*P* value; I^2)			P = 0·84; I^2 = 0%	–
	One-group pre–post	Penque (2009)	53		0·1 [−0·3, 0·5]	–
		Tang *et al.* (2010)	20		0·5 [−0·3, 1·3]	–

Table 3 (*Continued*).

Variables	Design	Studies	*N* exp group	*N* cont group	SMD or MD at post-test* (CI)	SMD or MD at follow-up (CI)
Burnout/ emotional exhaustion	RCT	Cohen-Katz *et al.* (2005a,b)	12	13	nc	–
		Kanji *et al.* (2006)	21	25	nc	–
		Mackenzie *et al.* (2006)	16	14	nc	–
	One-group pre–post	Bazarko *et al.* (2013)	36	–	−11·95 [−17·9, −6·0]	−17·3 [−23, −11,5]
		Penque (2009)	53	–	1·2 [−4·0, 1·6]	–
		Kravits *et al.* (2010)	248	–	nc	–
Work self-efficacy	RCT	Murphy (1983)	9	9	0·85 [−0·13, 1·83]	–
		Scheick (2011)	15	7	nc	–
Work energy/vitality	RCT	Murphy (1983)	9	9	−0·01 [−0·93, 0·92]	–
		Scheick (2011)	15	7	nc	–
	One-group pre–post	Bazarko *et al.* (2013)	36	–	6·4 [4, 8·8]	6·4 [4·1, 8·8]
		Cutshall *et al.* (2011)	8	–	0·64 [0·10, 1·18]	–
		Tang *et al.* (2010)	20	–	1·7 [0·19, 2·15]	–
Health variables						
Blood pressure (systolic)	RCT	Kanji *et al.* (2006)	21	25	−0·19 [−0·77, 0·39]	–
		Leggett (2010)	42	43	−1·70 [−6·11, 2·71]	−0·55 [−0·99, −0·12]
		Total effect	63	68	−0·17 [−0·51, 0·17]	–
		Heterogeneity (*P* value; I^2)			$P = 0·95$; $I^2 = 0\%$	–
	One group pre-post	Malinski and Todaro-Franceschi (2011)	26	–	−3 [−7·4, 1·4]	–
		Tang *et al.* (2010)	20	–	nc	–
Blood pressure (diastolic)	RCT	Donovan (1981)	5	6	0·10 [−1·09, 1·29]	–
		Kanji *et al.* (2006)	21	25	0·06 [−0·52, 0·64]	–
		Leggett (2010)	42	43	0·26 [−0·17, 0·69]	−0·54 [−0·97, −0·11]
		Total effect	68	74	0·18 [−0·15, 0·51]	–
		Heterogeneity (*P* value; I^2)			$P = 0·86$; $I^2 = 0\%$	–
	Pre-post	Malinski and Todaro-Franceschi (2011)	26	–	−2 [−6·1, 2·1]	–
Pulse rate	RCT	Donovan (1981)	12	11	−0·47 [−1·68, 0·74]	–
		Kanji *et al.* (2006)	45	25	−0·47 [−1·06, 0·12]	–
		Leggett (2010)	42	43	0·08 [−0·35, 0·50]	0·05 [−0·37, 0·48]
		Total effect	68	74	−0·17 [−0·56, 0·23]	–
		Heterogeneity (*P* value; I^2)			$P = 0·29$; $I^2 = 19\%$	–
	One-group pre-post	Malinski and Todaro-Franceschi (2011)	26	–	−6 [−8·8, −3·1]	–
		Prato and Yucha (2013)	13	–	−6 [−11·1, −9]	–
		Tang *et al.* (2010)	20	–	−10 [−16·1, −3·9]	–
Respiratory rate	One-group pre-post	Malinski and Todaro-Franceschi (2011)	26	–	−2 [−3·3, −0·7]	–
		Prato and Yucha (2013)	14	–	−2·5 [−3·9, −1·1]	–
Overall health	RCT	Yung *et al.* (2004)	18	30	−0·43 [−1·02, 0·16]	–
		Tsai (1992)	na	na	nc	–

Table 3 (*Continued*).

Variables	Design	Studies	*N* exp group	*N* cont group	SMD or MD at post-test* (CI)	SMD or MD at follow-up (CI)
Skin temperature	RCT	Murphy (1983)	9	9	nc	–
	Pre–post	Prato and Yucha (2013)	14	–	−1·9 [0·4, 3·4]	–
Pain, physical complaints	RCT	Donovan (1981)	11	10	0·73 [−0·16, 1·62]	–
	Pre–post	Tang *et al.* (2010)	20	–	−0·6 [−1·1, −0·1]	–
Cortisol	RCT	Kim *et al.* (2013)	11	11	0·27 [−0·57, 1·11]	–
Urinary potassium	RCT	Heaman (1995)	21	19	nc	–
Plasma ACTH	RCT	Kim *et al.* (2013)	11	11	−0·18 [−1·01, 0·66]	–
Sleep	Pre–post	Tang *et al.* (2010)	20	–	2·5 [1·1, 3·9]	–

*For RCTs, standardized mean differences are reported and confidence intervals were calculated based on the standardized mean difference. For one-group pre–post designs, mean differences are reported and confidence intervals were calculated based on the mean difference.
RCT, randomized controlled trial; SMD, standardized mean difference; MD, mean difference; CI, confidence interval; nc, not calculable; na, non applicable.

However, some challenges associated with the practice of mindfulness were reported (Cohen-Katz et al. 2005a,b, Richards et al. 2006), including not having enough time to get to sessions, being agitated or experiencing discomfort during meditation and having difficulties maintaining a daily practice of mindfulness sessions on one's own to maintain the benefits of mindfulness over time.

Synthesis of quantitative and qualitative findings

Findings from qualitative and quantitative studies were juxtaposed to explore whether quantitative studies measured the benefits and challenges perceived by nurses and whether quantitative results were supported or contradicted by qualitative findings. Several observations emerged from this synthesis. First, some nurses described their stressful work environment, the negative feelings it gives rise to and the potential consequences it may have on their mental health. These aspects appeared to be covered by quantitative studies measuring anxiety, depression, stress, psychological distress and burnout. Unexpectedly, it was possible to estimate the mean decrease in stress in only two RCTs, and the mean decrease in burnout could not be estimated in any study. Considering the importance of these variables to nurses' work experience, RCTs measuring these variables are needed. Second, nurses reported the consequences of stress on their emotions and social relationships but barely on their physical health. In the same perspective, no RCTs demonstrated significant effects on biological variables, such as blood pressure or pulse rate. Nurses reported that they felt their body to be rested and energized and these effects could be further explored in RCTs. Third, nurses indicated that mindfulness-based interventions fostered an inner state of fullness, namely by increasing inner calmness, awareness and one's acceptance of one's own feelings. These aspects were actually measured in quantitative studies through similar variables such as serenity, awareness and self-acceptance. However, they were measured in a very small number of studies and it was almost exclusively uncontrolled studies that provided significant results for these variables. Consequently, an avenue for future research would be to confirm these results in RCTs. Fourth, nurses mentioned dimensions of their nursing practice strengthened by mindfulness-based interventions, especially quality of

communications with patients and colleagues, sensitivity to patients' and colleagues' experiences, problem-solving capacity in complex situations and motivation at work. With respect to motivation at work, a few RCTs measured work satisfaction without significant results, while some uncontrolled studies demonstrated significant results on work energy. The other work dimensions that nurses reported to have been improved by mindfulness have not yet been investigated in quantitative studies, with the exception of a few uncontrolled studies demonstrating positive effects on empathy and discernment. Finally, nurses addressed challenges associated with mindfulness, including the lack of time to attend sessions, discomfort during the suggested activities and difficulties in maintaining a personal daily practice. These issues should be given consideration in the design of interventions and monitored in quantitative studies.

Discussion

The present review is the first to explore the effects of mindfulness-based interventions for both Registered Nurses and nursing students in different practice settings. Mindfulness training seems to be effective in lowering anxiety and depression in the meta-analysis of RCTs. These benefits of mindfulness were observed from interventions as short as 4 weeks, which can easily be implemented in the workplace (Smith 2014). In addition, findings from qualitative studies showed positive benefits of mindfulness on psychological well-being and performance at work (e.g. inner state of calmness and fullness, improved communication and behaviour in complex, and stressful situations with colleagues and patients).

More specifically, significant mean reductions were observed in RCTs in state anxiety at postintervention (-0.78, 95% CI -1.39 to -0.18) and at follow-up (-0.80, 95% CI -0.12 to -0.18), in depression at postintervention (-0.51, 95% CI -0.78 to -0.18) and in trait anxiety at follow-up (-0.50, 95% CI -0.95 to -0.04). However, these results warrant caution due to the small number of studies and the heterogeneity between the results of some studies. These results are nevertheless similar to those from previous systematic reviews, which demonstrate decreases in anxiety, depression and stress in several populations (Smith et al. 2005, Bohlmeijer et al. 2010, Chiesa & Serretti 2011, Fjorback et al. 2011, Chen et al. 2012, Goyal et al. 2014, Orme-Johnson & Barnes 2014). Moreover, as in previous reviews (Brown & Ryan 2003, Moore & Malinowski 2009, Chiesa et al. 2011, Hölzel et al. 2011, Keng et al. 2011, Hülsheger et al. 2013, Khoury et al. 2013, Goyal et al. 2014), significant effects were observed on awareness, serenity, self-compassion, empathy and discernment but only in uncontrolled studies. Although these results were rarely confirmed by the few RCTs measuring these variables, they were strongly supported by qualitative data indicating benefits for nurses' psychological well-being (inner state of calmness, fullness, awareness, compassion and enthusiasm). These positive mental health outcomes (e.g. serenity), although usually correlated to positive clinical outcomes in quantitative studies (Brown & Ryan 2003, Hölzel et al. 2011, Keng et al. 2011, Hülsheger et al. 2013, Khoury et al. 2013, Goyal et al. 2014), were less studied than mental health problems (e.g. state anxiety). In previous reviews, it has been shown that mindfulness practice can increase empathy (Brown et al. 2007, Hanson & Richardson 2014), quality of relationships (Hanson & Richardson 2014, Gregoire & Lachance 2015), emotional regulation in stressful contexts (Glomb et al. 2011, Allen &

Kiburz 2012) and client satisfaction (Gregoire & Lachance 2015). These effects tend to increase the quality of care through significant improvements in how nurses approach their patients and colleagues, provide nursing care and deal with situations of conflict (Shapiro et al. 2006, Glomb et al. 2011, Gregoire & Lachance 2015). Considering that these are fundamental aspects of nurse–patient communication (McCabe 2004, Shattell 2004), they should be further explored in future research.

Although previous literature reviews of mindfulness in the workplace (Chaskalson 2011, Glomb et al. 2011, Hülsheger et al. 2013, Hanson & Richardson 2014, Virgili 2015) reported positive effects on burnout prevention, it was not possible to estimate it in the few RCTs included in the present review. In addition, very few studies measured work-specific variables, mainly because of the use of generic psychological measurement instruments not specific to the work context. Generally speaking, the effects on work performance and work organization were overlooked in quantitative studies, although mindfulness appears to be associated with improved work performance (Dane & Brummel 2013, Gärtner 2013, Pezzolesi et al. 2013, Gregoire & Lachance 2015, Reb et al. 2015) and decreased turnover intentions in various workplaces (Dane & Brummel 2013, Reb et al. 2015). Conversely, results from qualitative studies shed further light on these work-related aspects that have been overlooked in quantitative studies. Qualitative studies provide guidance on the benefits of mindfulness on performance at work that could be further explored (adequate communication with colleagues and patients, improved sensitivity to patients' experiences, clearer analysis of complex situations and emotional regulation in stressful contexts).

Several implications for future research can be deduced from these results. First, quantitative studies included in the review focused mainly on a set of a few psychological variables rather than on the impacts of mindfulness on concrete behaviours. Very little attention has been given to behavioural changes at work (e.g. positive communication with patients and colleagues, expression of anger and irritability) and organizational changes (e.g. patient satisfaction, work satisfaction, turnover and absenteeism). Behavioural changes at work are expected to be especially significant for jobs that involve client relationships and require emotional regulation (Glomb et al. 2011, Hülsheger et al. 2013, Gregoire & Lachance 2015). Although qualitative studies provided a portrait of the salutary effects of mindfulness at work, there is a lack of theoretical developments on its effects on nursing practices and their underlying causal mechanisms. The emerging literature in this area provides interesting avenues for future research, including the effects of mindfulness on the management of complexity, adaptation to different ways of thinking and less egocentric principles of action (Baron & Cayer 2011).

Second, most studies implemented mindfulness-based interventions over a short period of time (for 10 sessions or less) and only documented impacts postintervention. Given that implementing mindfulness in work environments can represent a challenge, due to work overload in particular, programmes tend to be provided over a short period of time (Klatt et al. 2009, Gregoire & Lachance 2015). Future research should explore their long-term impacts on psychology, behaviour and organizations. Future studies should consider how to support nurses in maintaining a regular practice of mindfulness on their own, to maintain its benefits over time (Cohen-Katz et al. 2005a,b). Additional research is needed on the capacity of

refresher training and complementary tools, such as cell phone applications, to promote sustainable results (Gregoire & Lachance 2015). Cost-effectiveness analysis should also be undertaken to convince decision-makers to invest in mindfulness initiatives (Van Gordon et al. 2014, Gregoire & Lachance 2015).

Third, most studies had methodological limitations. Future studies should more precisely describe their intervention approach, the content of the sessions and therapists' background in mindfulness, as these appeared to be potential moderating factors in previous studies (Pradhan et al. 2007, Khoury et al. 2013). In addition, considering the small number of RCTs available and the fact that some innovative variables were only measured in one-group pre–post studies, the decision was made to include uncontrolled studies in this review to produce a comprehensive survey of the research and to identify promising research avenues. However, most of these studies may overestimate their impacts due to self-selection bias. As highlighted by Goyal, 'people who believe in the benefits of mindfulness or who have prior experience with mindfulness are more likely to enrol in a mindfulness programme and to report that they benefited' (Goyal et al. 2014, p. 358). Future research should adopt sound experimental design with adequate random assignment, control groups, measures, sample size and follow-up to control for bias (Hanson & Richardson 2014).

Strengths and limitations

Data from qualitative and quantitative studies were combined using an established methodology to increase the richness and robustness of the synthesis. Providing standardized mean differences and mean differences, for controlled and uncontrolled studies, respectively, appeared to be a useful way to produce a description of patterns. The main limitation comes from the small number of RCTs, which prevented us from doing meta-analysis on several variables or exploring variables moderating the effects of interventions. Moreover, most studies included were conducted in the United States. Future research could analyse the effects of mindfulness training in various countries to shed more light on possible differences related to culture or region.

Conclusion

Mindfulness training seems to be an effective strategy for organizations wishing to improve nurses' mental health, as meta-analysis suggests positive effects on anxiety and depression. Promising results were obtained in uncontrolled studies on qualities that may enhance workplace well-being and performance, such as awareness, serenity or empathy. Qualitative studies showed positive benefits on an inner state of calmness and on the adoption of suited communication styles and behaviours in complex and stressful situations with colleagues and patients. Future research is needed to better understand, through methodologically sound experimental designs, the long-term impacts of mindfulness on work performance and patient satisfaction. Nevertheless, whatever the measurable personal and organizational benefits of mindfulness, mandatory intervention programmes in this area could be perceived as intrusive and have unfavourable effects, although negative outcomes have not been observed in the literature. Mindfulness practice should remain discretionary, based on voluntary participation

and primarily aimed at improving the welfare of individuals.

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- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site.

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