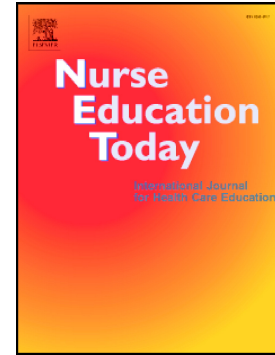


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The effectiveness of mindfulness meditation for nurses and nursing students: An integrated literature review

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Title Page

Manuscript titled : THE EFFECTIVENESS OF MINDFULNESS MEDITATION FOR NURSES AND NURSING STUDENTS: AN INTEGRATED LITERATURE REVIEW

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- PV was responsible for conception and design of the review, acquisition and critical review of articles, and drafting the manuscript.
- TL-J made a substantial contribution to the design of the review, critically reviewing included articles, drafting the manuscript and revising it critically for intellectual content.
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THE EFFECTIVENESS OF MINDFULNESS MEDITATION FOR NURSES AND NURSING STUDENTS:

AN INTEGRATED LITERATURE REVIEW

Introduction

In recent years there has been a great deal of interest in Mindfulness Meditation (MM), particularly in healthcare (Chiesa, 2010). Originating from the spiritual traditions of India, Tibet, China, and Japan over 5000 years ago (Chiesa 2010), MM is a multidimensional construct described as “mental and emotional control practices” (Thomas and Cohen, 2014, p. 1); and “the simple act of carefully paying attention, of experiencing one’s life in the present moment” (Roth and Creaser, 1997, p. 154). MM is frequently referred to as a mind-body therapy that promotes health, aids recovery, and results in a sense of peace and stillness (Hassed and Chambers, 2014). Given the potential impact of MM for nurses and nursing students, critical appraisal of contemporary literature on this topic is warranted. Therefore, this paper presents an integrative review of the literature that examined the effectiveness of MM programs for nurses and nursing students.

Background

Meditation is a tool for developing mindfulness. Mindfulness refers to engagement in or curiosity about the present moment, which encourages an attitude of non-judgemental openness and acceptance, so as to cultivate equanimity and stillness (Hassed and Chambers, 2014). There are many types of meditation, for example: Transcendental Meditation® (Maharishi, 2001), Tibetan meditation, Zen, Mindfulness-Based Stress Reduction (MBSR) (Platt et al., 2016), and MM, sometimes referred to as Vipassana (Kabat-Zinn, 1990).

MBSR uses intensive MM and yoga practices. Yoga is said to cultivate health and wellbeing through regular practice of specific bodily postures, breath control and simple meditation. Yoga has been reported to increase brain-wave activity; creating neuroplastic effects with subsequent improvement in cognition, memory, mood, and anxiety (Desai et al., 2015). The practice of Vipassana is derived from the Eastern culture of Buddhist meditation. The word Vipassana has been

translated to mean insight that encourages the cultivation of nonjudgmental, moment-to-moment awareness both during the formal meditation practice and in everyday life (Kabat-Zinn, 1990).

A rapidly growing body of literature has identified a range of beneficial outcomes from the regular practice of MM. Physiological changes, including reduction in cortisol levels, improved immune response and reduced blood pressure have been reported (Creswell et al., 2009; Fang et al., 2010). Chronic pain, and in particular back pain, has also improved from the regular practice of MM (Michalsen et al., 2016). There are also psychological benefits from MM reported such as reduced anxiety, stress, depression, (Escuriex and Labbé, 2011; Kiken and Shook, 2012, Platt et al., 2016, Yazdanimehr et al., 2016), improved mood regulation, and sense of well-being (Sears et al., 2011; Shapiro et al., 2008).

Neuroscientific investigations of MM have increased markedly in the last 20 years. Brain imaging studies have discovered physical and functional brain alterations in adults who have practiced 30 minutes of MM daily for eight weeks (Warriner et al., 2013). Some of the reported outcomes include decreased amygdala response to emotional stimuli, greater grey matter density, and cortical thickness in insula and prefrontal cortices (Krieger et al. 2013), and larger gyrification in meditators (Luders et al., 2012).

For healthcare professionals, it is suggested that MM is an effective strategy for preventing and managing stress, anxiety, and burnout, and enhancing resilience (Epstein, 2003; Richards et al., 2010; Taylor et al., 2016). Recent studies have also identified that MM improves health science and nursing students' memory when involved in academic and clinical tasks (Joice and Ramkumar, 2015; van der Riet et al., 2015). Given the often stressful and demanding nature of nursing in contemporary healthcare settings (Todaro-Francheschi, 2013; Shaban et al., 2012) and the reported attrition resulting from burnout (Glerean et al., 2017), an exploration of the potential benefits of MM for nurses and nursing students is warranted.

The Review

Aim

The aim of this integrative review of the literature was to examine the effectiveness of MM programs for nurses and nursing students.

Design

The review was conducted using Whittemore and Knafl's (2005) framework for integrated reviews. This approach was selected as it allows for review and critique of both quantitative and qualitative research papers, thus providing a comprehensive review of the topic of interest (Whittemore and Knafl, 2005).

Search methods

Databases were searched in March 2017 to identify primary research articles that explored the effectiveness of MM programs for nurses and nursing students. A search of CINAHAL (327 articles), Medline (203 articles), PsycINFO (190 articles), EMBASE (164 articles), EMCARE (103 articles), ERIC (409 articles), and SCOPUS (307 articles) was undertaken using combinations of the following terms: 'mindfulness', 'mindfulness-based-stress reduction', 'Vipassana'*, 'nurses', 'nurse education'*. Hand searching of reference list of included studies was also conducted. A senior librarian assisted with the searching process.

Search limits

The search was limited to research related to humans and published in English. The search was not restricted to specific dates of publications.

Inclusion criteria

Articles were included if they reported on English language primary studies of the effectiveness of mindfulness meditation for nurses and/or nursing students.

Exclusion criteria

Articles were excluded if they did not report on primary studies of the effectiveness of mindfulness meditation for nurses and/or nursing students, written in a language other than English, or if they were systematic or literature reviews, discussion, or descriptive papers.

Search outcomes

The initial search resulted in 1703 articles. Two additional records were identified through other sources and 50 duplicates were removed. The remaining 1655 papers were screened for relevance by the first author (PV) based on the inclusion criteria. The outcomes of this stage of the process were then discussed with the other authors (CA-R and TL-J). After review of titles and abstracts for eligibility 1567 were excluded, leaving 88 full text articles to be assessed. Sixty-eight did not meet inclusion criteria and the remaining 20 were then critically appraised. Four final articles were removed following critical appraisal leaving 16 articles for inclusion in the review (see Figure 1 - PRISMA flowchart).

< Insert Figure 1 about here >

Figure 1: PRISMA flowchart of study selection

Quality appraisal

Quantitative papers were critically appraised using the McMaster critical review form (Law et al, 1998) for quantitative studies and the Critical Appraisal Skills Program (CASP, 2013) checklist for qualitative studies (CASP, 2013). The McMaster critical review form includes the following elements: study purpose, literature, design, sample, outcomes, intervention, results, conclusions, and implications; five of the fields also involve sub-questions. We used a modified approach to CASP and McMaster's appraisal in that we scored the papers. For each element we allocated one point and the maximum score was 15. The CASP tool addresses ten components including: aim, methodology, research design, recruitment strategy, data collection, consideration of the relationship between the researcher and the participants, ethical issues, data analysis, findings; and overall value. The ten

questions in the CASP tool are displayed in a 'yes' or 'no' format. We allocated one point per question, providing a maximum rating score of 10.

In the majority of the quantitative studies included in the review the methodological quality was satisfactory. However, the most common weakness was small sample sizes and the lack of a control groups which limited statistical power and generalisability. Three quantitative and one qualitative article were excluded on the basis of inadequate description of the intervention and the outcomes.

Data abstraction

Data abstraction was undertaken by PV and TL-J. It was an iterative process with each study being read and re-read in detail followed by abstraction and analysis of relevant information. The details of each included article are provided in Table 1.

Data synthesis

A descriptive coding process was used to organise and synthesise the results (Whittemore and Knafl, 2005). These initial codes were then organised into tentative themes by the first author and confirmed by the other authors (TL-J, CA-R). This transparent process was undertaken to enhance the rigour of the review.

< Insert Table 1 about here >

Table 1: Summary of the included studies

Results

Characteristics of included studies

Eight of the studies were undertaken in the United States, two in Australia, and one each in Canada, Mexico, Brazil, Malaysia, Korea, and Iran (see Table 1). Twelve of the studies were quantitative, one

qualitative, and three used mixed methods. The dominant MM modality used was Mindfulness-Based Stress Reduction (MBSR) ($n = 5$). All but two of the MM programs were conducted face-to-face. The duration of the programs was variable and ranged from five minutes prior to each shift to an hour per week for 24 weeks; a number of the programs relied on participants' willingness to independently practice MM outside of the structured sessions.

Participant characteristics

The majority of the participants in the included studies were nurses ($n = 9$) and nursing students ($n = 6$); two of the studies were interprofessional in nature, and five also included midwives, nurse aides, allied health and axillary staff in addition to nurses. Sample sizes were generally small; in four of the studies the sample size was less 20; in seven it was 40 or less; only three studies had 40-100 participants.

Outcome measures

The included papers reported multiple outcomes with the most common being stress reduction ($n = 11$), depression and anxiety ($n = 5$), and burnout ($n = 7$). Other related outcomes focused on sense of well-being and empathy. A wide range of instruments were used to measure outcomes; most had evidence of psychometric integrity but a number were developed for the purpose of the study and reliability and validity were not reported.

Data analysis

In this review the significant areas of impact were identified as stress reduction, depression and anxiety; burnout and lastly a sense of well-being.

Stress reduction

Four of the five studies (Beddoe and Murphy, 2004; Foureur et al, 2013; Hallman et al, 2014; Lan, Subramanian, Rahmat, and Kar, 2014) that utilised Mindfulness Based Stress Reduction (MBSR) demonstrated positive outcomes pre and post intervention. It should be noted that although MBSR

is generally conducted as an 8-week intensive training program, two of the included MBSR studies were only four weeks long (Hallman et al, 2014; Mackenzie et al., 2006).

Foureur et al.'s (2013) mixed method study included 40 nurses and midwives attending a one day MBSR workshop, following which they were required to independently practise MM 20 minutes per day for eight weeks. The results demonstrated a significant decrease in participants' stress, anxiety, and depression, measured using the Depression, Anxiety, and Stress Scale (Lovibond and Lovibond, 1995).

Hallman et al.'s (2014) MBSR program was undertaken with staff working in a high acuity child and adolescent mental health unit. The 13 participants included nurses (n=6), teachers (n=2), personal care workers (n=1), a social worker, an activity therapist, and a physician. Outcomes measured using the Perceived Stress Scale (Cohen et al., 1983) indicated a significant reduction in levels of stress. Additionally, in the open ended survey, participants' comments indicated that the program reduced their absenteeism.

A quasi-experimental study with 41 critical care nurses in Malaysia (Lan, et al., 2014) identified that a five week MBSR program which included 5-10 minutes independent daily practice also resulted in a significant reduction in levels of perceived stress, depression, and anxiety when measured using the Perceived Stress Scale (Cohen et al., 1983) and Depression Anxiety Stress Scale (Lovibond and Lovibond, 1995).

The only MBSR program to include nursing students was conducted by Beddoe and Murphy (2004). The 16 students participated in a two hour program X 8-weeks, as well as 30 minutes of independent MM practice for five days per week. Exposure to the MBSR program significantly reduced participants' stress levels, as measured by the Derogatis Stress Profile (Derogatis, 1987). Participants' journal entries also indicated attitudinal and behavioural changes, for example, increased patience, appreciation of 'small things' in life, and acceptance of thoughts and feelings.

Three studies reported on the impact of self-care and stress reduction programs using different MM techniques. Drew et al.'s (2016) quasi experimental MM study involved the introduction of a 15 week self-care program designed to reduce and regulate students' stress. The intervention group (n = 50) participated in hour long sessions that included yoga, aromatherapy, Reiki, and mindful breathing. The control group (n = 64) received a pamphlet on stress management. The results identified a significant decrease in Perceived Stress Scale scores (Cohen et al., 1983) for the intervention group compared to the control group. A mixed methods study of nurses, nursing assistants and technicians (n = 13) enrolled in a 24 week stress reduction program in Brazil (Santos et al., 2016) focused on the use of mindfulness and loving kindness meditation. Results revealed a significant post intervention reduction in Perceived Stress Scale (Cohen et al., 1983) scores. In addition, focus group data suggested that participants experienced enhanced attention to and awareness of their attitudes and actions which positively influenced the quality of their nursing care. Kang et al.'s (2009) study described the impact of a 90 minute X 8 weeks stress coping program that incorporated MM techniques for Korean nursing students. The results indicated a significant reduction in stress levels for the experimental group compared to the control group.

Two studies described pragmatic approaches to MM programs. Gauthier and Greffe (2015) implemented a brief intervention with paediatric ICU nurses receiving five minutes of mindfulness instruction prior to morning and night shifts facilitated by a Buddhist priest. There was significant reduction in stress levels, measured by the Nursing Stress Scale (Gray-Toft and Anderson, 1981) pre post intervention and one month later. Spadaro and Hunker (2016) explored the impact of an 8-week asynchronous online program which included a range of MM techniques such as mindful breathing, body scan, sitting and walking meditations, loving kindness meditation, and hatha yoga. Twenty-six nursing students participated and the results demonstrated a significant reduction in Perceived Stress Scale Scores (Cohen et al., 1983).

Depression and anxiety

Five studies examined the effectiveness of MM on depression and/or anxiety (Foureur et al., 2013; Lan et al., 2014; Kang et al., 2016; Sontos et al., 2016; Spadaro and Hunker, 2016). The two studies that used the Depression, Anxiety, and Stress Scale (Lovibond and Lovibond, 1995) identified a significant reduction in depression and anxiety following the MM program (Foureur et al., 2013; Lan et al., 2014). Kang et al. (2016) and Sontos et al. (2016) both used Beck Depression Inventory (Beck et al., 1961). Kang et al. identified no significant difference in depression while the reduction in Sontos et al.'s study was significant. In both of these studies a significant reduction in anxiety occurred following the MM intervention, measured using the Spielberger's State Anxiety Inventory (Spielberger, 1979). Finally, Spadaro and Hunker (2016) noted a significant decrease in Hospital Anxiety and Depression Scale scores (Zigmond and Snaith, 1983) following participation in the MM intervention.

Burnout

Seven studies (Gauthier and Greffe, 2015; Hevezi, 2016; Horner, 2014; Mackenzie et al., 2006; Motaghedi et al., 2016; Santos, 2016; Steinberg et al., 2017) from a range of countries described the impact of MBSR and other MM initiatives on nurses' levels of burnout. Burnout was considered to be an issue of particular relevance as most of the participants from the included studies were working in clinical areas likely to be highly demanding, for example, intensive care, paediatrics, cardiac units, and oncology settings. In five studies burnout was measured using the Maslach Burnout Inventory (MBI) (Maslach and Jackson 1983) and three studies used the Professional Quality of Life Survey (reference unidentified by authors); both of these instruments have evidence of psychometric integrity. All but one of the studies demonstrated that the MM intervention had a significant impact on nurses' level of burnout. In the study by Horner (2014), the improvement was non-significant.

Sense of well-being and empathy

Three studies (Foureur, et al., 2013; Hevezi, 2016; Lan et al., 2014) indicated that the MM intervention resulted in a greater sense of well-being and happiness using instruments such as the

General Health Questionnaire (Goldberg et al., 1997), the Subjective Happiness Scale (reference, unidentified by authors Lan et al.), and qualitative data from open ended questions. Additionally, empathy was a reported outcome of the MBSR program in a study by Beddoe and Murphy (2004).

In the only qualitative study considered eligible for the review (van der Riet, et al, 2015), ten first year nursing and midwifery students participated in a one hour X seven weeks stress management and mindfulness program that consisted of a sitting meditation, walking meditation, and body scan. Focus group interviews revealed that participants believed that the MM program enhanced their self-awareness, sleep, and concentration; it reduced their stress, negative thoughts and feelings, and helped them to be 'fully present' with their patients. However, the results were limited by students' irregular attendance at the MM programs due to other commitments and the need for regular independent practice which could not be ensured.

Discussion

In studies spanning more than 30 years the multiple benefits of MM have been demonstrated (Day and Horton-Deutsch, 2004; Praissman, 2008). This integrative literature review sought to examine the effectiveness of MM specifically for nurses and nursing students. Overall, the results of the review identified that engagement in MM programs, especially when accompanied by regular practice, has a significant impact on stress, depression, anxiety, burnout, and well-being. These results are relevant both to the working lives of nurses and the learning experiences of nursing students.

A number of previous studies have identified that nurses experience multiple sources of workplace stress, often on a daily basis (Todaro-Francheschi, 2013; Aquino-Russell, 2015). High levels of stress, anxiety and depression can diminish the satisfaction that nurses derive from their work and the quality of care they provide to patients (Nieuwenhuys and Oudejans, 2012). Combined with low levels of self-care, stress and anxiety can also contribute to nurses' emotional exhaustion and burnout (Killam and Heerschap, 2013). A number of studies have also identified that nursing

students frequently experience high levels of stress and anxiety during their undergraduate studies, particularly when undertaking clinical placements (Sendir and Acaroglu, 2008; Shaban, et al., 2012), and that these feelings can negatively impact their sleep patterns, well-being, learning, performance, and professional growth (Khater et al., 2014).

While complete eradication of stress and anxiety is not be possible, enhancing the capacity for emotional regulation may improve nurses' and nursing students' emotional well-being and ability to maintain satisfying therapeutic relationships with their patients. MM has proven to be a protective strategy that builds emotional regulation, leading to enhanced resilience and self-care, and reduced stress, anxiety and depression (Foureur et al, 2013; Nieuwenhuys and Oudejans, 2012). Learning and practising MM has the potential to develop important skill sets that could serve nurses and nursing students well, both during their studies and throughout their professional careers. However, White (2014) advocates that MM remains underutilised in nursing, despite the potential benefits for both registered nurses and nursing students'.

Limitations

The relatively small sample sizes in each of the included studies limit generalisability and representativeness of the results. Additionally, the requirement for independent MM practice which could not be mandated or monitored, may also be a limitation. Lastly, the review only included studies published in English; this may have excluded other relevant studies, particularly those from Eastern countries where MM is commonly practiced.

Conclusion

The complex and demanding nature of contemporary healthcare underscores the need for strategies such as MM that have the potential to build resilience and enhance health professionals' well-being. We recommend MM programs involving mindful breathing body scan, meditation and yoga be introduced early in the curriculum for nursing students in the

first year of a Bachelor of Nursing program. This review identified that implementation of MM programs is both achievable and worthwhile, even within finite resources. However, although the results suggest that MM may have a number of beneficial outcomes for nurses and nursing students, further research is required. It is hoped that the outcomes from this review will provide the impetus for broader utilisation of this relatively cost-effective approach supported by a rigorous body of both qualitative and quantitative research. Additionally, research exploring the impact of MM programs on nurses' capacity to provide person-centred and empathic care would also make a valuable contribution to the literature.

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Table 1: Included Studies

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
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Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Beddoe & Murphy (2004)</p> <p>California, USA</p> <p>Quality rating: 3/10 (CASP)</p> <p>6/15 (McMaster)</p>	<p>To identify whether an 8-week X 2 hours Mindfulness-Based Stress Reduction (MBSR) program:</p> <ul style="list-style-type: none"> decreased stress improved empathy levels improved positive attitude and behaviour change 	<p>Mixed methods design, pre-post-test</p> <p>Instruments:</p> <ul style="list-style-type: none"> Interpersonal Reactivity Index (IRI) Derogatis Stress Profile (DSP) Homework Questionnaire (HQ) and journal. 	<p>Convenience sample (n=16) of baccalaureate nursing students from one US university.</p>	<p>After the MBSR program participants had a greater sense of well-being, improved coping skills, improved ability to cope with stress and respond empathically to patients.</p> <p>Exposure to the MBSR program significantly reduced students' anxiety levels ($p > 0.05$) according to the DSP.</p> <p>Participants' journal entries indicated attitudinal and behavioural changes, for example patience, appreciation of 'small things' in life, acceptance of thoughts and feelings. 63% of participants reported changes to thoughts and feelings; 75% reported greater self-confidence; 88% were more hopeful; and 69% were more assertive.</p>	<p>Single site, small sample size and absence of control group.</p> <p>Level of details in statistical reporting was poor – results converted to percentages (only one p-value reported).</p> <p>Qualitative data not thematically analysed.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Drew et al. (2016)</p> <p>USA</p> <p>Quality rating: 11/15 (McMaster)</p>	<p>To evaluate a 15 week X 1 hour self-care program (yoga, mindful breathing, Reiki, and essential oil therapy).</p>	<p>Quasi-experimental design.</p> <p>Instruments:</p> <ul style="list-style-type: none"> Stress and mindfulness (Perceived Stress Scale [PSS]) Mindful Attention Awareness Scale [MAAS]) Health-Promoting Lifestyle Profile II (HPLP) <p>Data was collected at 4 time points – week 1, week 8, week 15 and 3 months follow up.</p>	<p>Entry level nursing students from three US universities:</p> <p>(n=50) in the intervention group</p> <p>(n=64) in the control group</p> <p>Control group offered a 4-hour program on completion of study.</p>	<p>The self-care program resulted in improved stress management in intervention group.</p> <p>Statistically significant decrease in PSS scores for the intervention group compared to the control group (p=0.009).</p> <p>No statistical difference in MAAS and HPLP scores at different time points for either group.</p>	<p>Limited statistical power because of the modest sample size may have played a role in limiting the significance of statistical comparisons conducted.</p> <p>Missing data due to drop out rate.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Foureur, et al. (2013)</p> <p>Australia</p> <p>Quality rating: 9/10 (CASP)</p> <p>10/15 (McMaster)</p>	<p>To examine the effectiveness of an 8-week MBSR program on psychological wellbeing.</p> <p>The program consisted of a one day workshop and participants were required to practise mindfulness 20 minutes per day.</p>	<p>Mixed methods design, pre-post-test</p> <p>Instruments:</p> <ul style="list-style-type: none"> • General health questionnaire (GHQ-12) • Sense of Coherence (SOC) • Orientation to Life • Depression, Anxiety, and Stress Scale (DASS). <p>Focus group interview to explore experiences of the program and ongoing mindfulness practice.</p>	<p>Midwives and nurses (n=40) from two metropolitan teaching hospitals in Australia.</p> <p>A subgroup (n=10) participated a focus group.</p>	<p>Researchers concluded that the results support short term benefits of MBSR programs on stress reduction, cognition, emotions and behaviour and suggest that MBSR holds promise for increasing resilience for individuals in the workplace.</p> <p>Significant improvements on the GHQ-12 ($p<0.05$), SOC ($p<0.05$) and the Stress subscale of the DASS ($p<0.05$).</p> <p>Qualitative data described enablers and barriers to mindfulness practice.</p>	<p>Small sample size limits generalisability and no control group.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
Gauthier & Grefe (2015) USA Quality rating: 10/15 (McMaster)	To explore the feasibility of a mindfulness meditation for paediatric ICU nurses 5-minute before each shift; and to investigate changes in stress, burnout, self-compassion, mindfulness, and job satisfaction.	Cross sectional survey using self-report. Pre-post-test design Instruments: <ul style="list-style-type: none"> Nursing Stress Scale (NSS) Maslach Burnout Inventory (MBI) Mindfulness Attention Awareness Scale (MAAS) Self-Compassion Scale (SCS) Pre-post-test design and 1 month follow up.	Paediatric ICU nurses (n=38) from an urban paediatric hospital in the US.	The intervention was found to be feasible for paediatric ICU nurses. Significant decreases in stress from baseline to post intervention (p=0.006) and maintained 1 month following intervention. Significant positive correlations were found between mindfulness and self-compassion (SCS p<0.001), and negative correlations between mindfulness and stress (NSS p<0.001).	Lack of control group; self-report questionnaire; participant lack of understanding of the intervention and concern over confidentiality due to methods of data collection used.

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
Hallman, et al. (2014) USA Quality rating: 6/15 (McMaster)	To examine the effectiveness of a MBSR program (45 mins X 4) on perceived levels of stress for interprofessional staff on a child and adolescent mental health unit; and to improve patient and staff safety on a high acuity psychiatric inpatient unit.	One-group repeated measure single case design Instruments: <ul style="list-style-type: none">• Toronto Mindfulness Scale (TMS)• Perceived Stress Scale (PSS)• Open-ended survey questions Pre-post-test design and 2 month follow up	Staff (n=13) on a 14-bed child/adolescent and psychiatric inpatient unit: <ul style="list-style-type: none">• nurses (n=6)• teachers (n=2)• personal care workers (n=1)• social worker (n=1)• activity therapist (n=1)• physician (n=1)	The MBSR training program was effective in decreasing stress and increasing mindfulness. TMS scores increased significantly pre (m=28.75, SD=9.6) to post (m=35.08, SD=8.34). There was a significant decrease on the PSS (p<0.05) over time. Data from open-ended questions indicated that participants perceived that the MBSR program resulted in improved staff and patient safety and reduced absenteeism.	Single site, small sample size and absence of control group.

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Hevezi (2016)</p> <p>Mexico</p> <p>Quality rating: 9/15 (McMaster)</p>	<p>To evaluate whether short structured meditations (5 days per week for 4 weeks) decrease compassion fatigue and improve compassion satisfaction.</p>	<p>Non-randomized pre-post-test design</p> <p>Instruments:</p> <ul style="list-style-type: none"> Professional Quality of Life Survey (PROQOL) V5 with supplementary questions. 	<p>Oncology nurses (n=15) from one unit in Mexican hospital.</p>	<p>Short breathing and meditation exercises were effective in enhancing nurses' feelings of wellbeing, decreasing burnout, and increasing level of compassion satisfaction.</p> <p>Statistically significant decrease in burnout (PROQOL, $p=0.003$) and increase in compassion satisfaction (PROQOL, $p=0.027$) pre-post intervention. All participants reported increased feelings of relaxation and wellbeing.</p>	<p>Single site, small sample size and absence of control group.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Horner (2014)</p> <p>USA</p> <p>Quality rating: 7/15 (McMaster)</p>	<p>To explore the impact of 10-week X 30 minutes mindfulness training on levels of mindfulness, compassion satisfaction, burnout and stress.</p>	<p>Mixed methods, pre-post-test quasi-experimental study.</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Mindful Attentive Awareness Scale (MAAS) • Professional Quality of Life Scale (PQLS) V5. • Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey 	<p>Nurses and ward secretaries (n=43) working on one medical/surgical unit in a US hospital.</p>	<p>Non-significant improvement in levels of mindfulness, burnout and stress for the experimental group.</p> <p>MAAS - non-significant increase for intervention group ($p = .037$); no change for control group. PQLS (burnout) - Non-significant improvement for intervention group ($p = .055$); no change for control group. PQLS (compassion) - Non-significant improvement for both groups.</p> <p>HCAHPS results indicated a 32 point improvement in patient satisfaction pre-post intervention.</p>	<p>Single site, small sample size, inconsistent participation in mindfulness training sessions.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Kang et al (2009)</p> <p>Korea</p> <p>Quality rating: 13/15 (McMaster)</p>	<p>To examine the effectiveness of a 8 week X 90 minute stress coping program based on mindfulness meditation on stress, anxiety, and depression</p>	<p>A non-equivalent, control group, pre-post-test design.</p> <p>Instruments:</p> <ul style="list-style-type: none"> Stress was measured with the PWI-SF b(5-point). Anxiety was measured with Spielberger's State Anxiety Inventory (SSAI). Depression was measured with the Beck Depression Inventory (BDI) 	<p>Experimental group (n=21)</p> <p>Control Group (n=20)</p> <p>Junior and senior nursing students from one Korean university.</p>	<p>A stress coping program founded on mindfulness meditation is an effective tool for reducing nursing students' stress and anxiety.</p> <p>Stress (PWI-SFb) and anxiety (SSAI) scores decreased significantly for the experimental group ($p=0.020$) and ($p=0.013$). No significant differences in BDI scores.</p>	<p>Single site, small sample size. Sample limited to younger and older students so not representative of the entire nursing program</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Lan, Subramanian, Rahmat & Kar (2014)</p> <p>Malaysia</p> <p>Quality rating: 13/15 (McMaster)</p>	<p>To evaluate the effectiveness of 5 week X 2 hour Mindfulness Based Training Program (MBTP) in reducing stress and promoting well-being.</p>	<p>A quasi-experimental, single-group, pre-post-test design</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Perceived Stress Scale (PSS) • Depression Anxiety Stress Scale (DASS), • Mindfulness Attention and Awareness Scale, (MAAS) • Subjective Happiness Scale (SHS) 	<p>Critical care nurses (n=37) from a tertiary referral hospital in Malaysia.</p>	<p>MBTP was effective in reducing stress and anxiety and promoting wellbeing, mindfulness and happiness.</p> <p>Significant reduction in PSS levels ($p < .001$), DASS-S anxiety ($p = .002$) and DASS-S depression ($p < .001$). Significant improvements in MAAS ($p < .001$) SHS ($p = .028$), with a moderate to large effect size.</p>	<p>Single site, small sample size with no control group, no follow-up and self-fulfilling effect in answering questionnaires.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Mackenzie, et al. (2006)</p> <p>Canada</p> <p>Quality rating: 11/15 (McMaster)</p>	<p>To evaluate the efficacy of a brief version of 4 week X 30 minute MBSR program (with 10 min practice per day).</p>	<p>Quasi-experimental pre-post-test design</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Maslach Burnout Inventory (MBI) • Smith Relaxation Dispositions Inventory (SRDI) • Intrinsic Job Satisfaction subscale from the Satisfaction With Life Scale (IJS) • 13-item version of Antonovsky's Orientation to Life Questionnaire (OLQ) 	<p>Control group (n=14)</p> <p>Intervention (n=16)</p> <p>Nurses and Nurse Aides from continuing care units in a large urban geriatric teaching hospital in Canada.</p>	<p>This study highlights the potential of MBSR programs to treat and prevent stress and to promote coping and health.</p> <p>Following MBSR program the control and intervention groups did not differ in most of the outcomes. However, the intervention group had improved relaxation levels SRDI ($p<0.05$), burnout (MBI $p<0.05$), depersonalisation (MBI $p<0.05$), and life satisfaction OLQ ($p<0.01$) post training.</p>	<p>Single site, small sample size</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Motaghedi, Donyavi & Mirzaian (2016)</p> <p>Iran</p> <p>Quality rating: 10/15 (McMaster)</p>	<p>To investigate the effects of Mindfulness-Based Cognitive Therapy (MBCT) on distress tolerance and job burnout. Eight sessions (two hours twice a week)</p>	<p>Quasi-experimental pre-post-test design.</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Maslach Burnout Inventory (MBI) • Simons and Gaher's Distress Tolerance Scale (DTS). 	<p>Nurses (n=30) from a cardiac centre in an Iranian hospital who were deemed to have burnout.</p>	<p>MBCT positively affected participants' distress tolerance scores.</p> <p>Significant DTS improvement ($p < 0.001$) post intervention.</p> <p>Higher level of depersonalisation in MBI in the experimental group; other components of the MBI did not differ between groups.</p>	<p>Single site, small sample size. Only females included in study.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Sanko, McKay & Rogers (2016)</p> <p>USA</p> <p>Quality rating: 11/15 (McMaster)</p>	<p>To explore the impact of an 8 week online mindfulness training on mindfulness and ethical decision making.</p>	<p>A time series, two group interventional design with pre-post and comparison analysis.</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Freiburg Mindfulness Inventory (FMI) • Defining Issues Test (DIT) of moral judgment version 	<p>Pre-licensure nursing students (n = 34) and post-graduate nurses (n = 11) from one US nursing school.</p>	<p>Mindfulness training improved mindfulness and some parts of ethical decision-making in pre-licensure and post graduate nurses.</p> <p>Post intervention FMI scores were not significantly different for the pre-licensure group, but were for the post grad group (p=0.0004). Some aspects of decision making (DIT,) following training program improved (p=0.039).</p>	<p>Single site, small sample size, and high dropout rate reported.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Santos (2016)</p> <p>Brazil</p> <p>Quality rating: 10/15 (McMaster) 7/10 (CASP)</p>	<p>To evaluate the effectiveness of a 24 week X 60-minute group Stress Reduction Program (SRP) including mindfulness and loving kindness meditation.</p>	<p>Mixed methods design. Data collected pre-post and 6 weeks post intervention.</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Perceived Stress Scale (PSS) • Maslach Burnout Inventory (MBI) • Beck Depression Inventory (BDI) • State-Trait Anxiety Inventory (STAI) • Satisfaction with Life Scale (SWLS) • Self-Compassion Scale (SCS) • WHOQOL-BREF Quality of life assessment • Work Stress Scale (WSS). <p>Qualitative data collected via focus group interviews.</p>	<p>Nurses, technicians and nursing assistants (n=13) working at a teaching hospital in Brazil.</p>	<p>A stress reduction program may be feasible and effective in assisting with problems associated with stress, burnout, depression and quality of life in hospital staff.</p> <p>A significant post intervention reduction in depression – BDI ($p < 0.007$), stress - PSS ($p = 0.001$), burnout – MBI ($p = 0.020$), and anxiety – STAIT ($p = 0.049$). Psychological and physical quality of life – improved (QOL.PHY, $p = 0.002$, QOL.PSY, $p = 0.007$).</p> <p>Qualitative data analysis identified that as a result of the SRP, participants experienced enhanced attention, awareness of actions, and attitudes, which positively influenced their nursing care and relationships.</p>	<p>Single site, small sample size with no control group.</p>

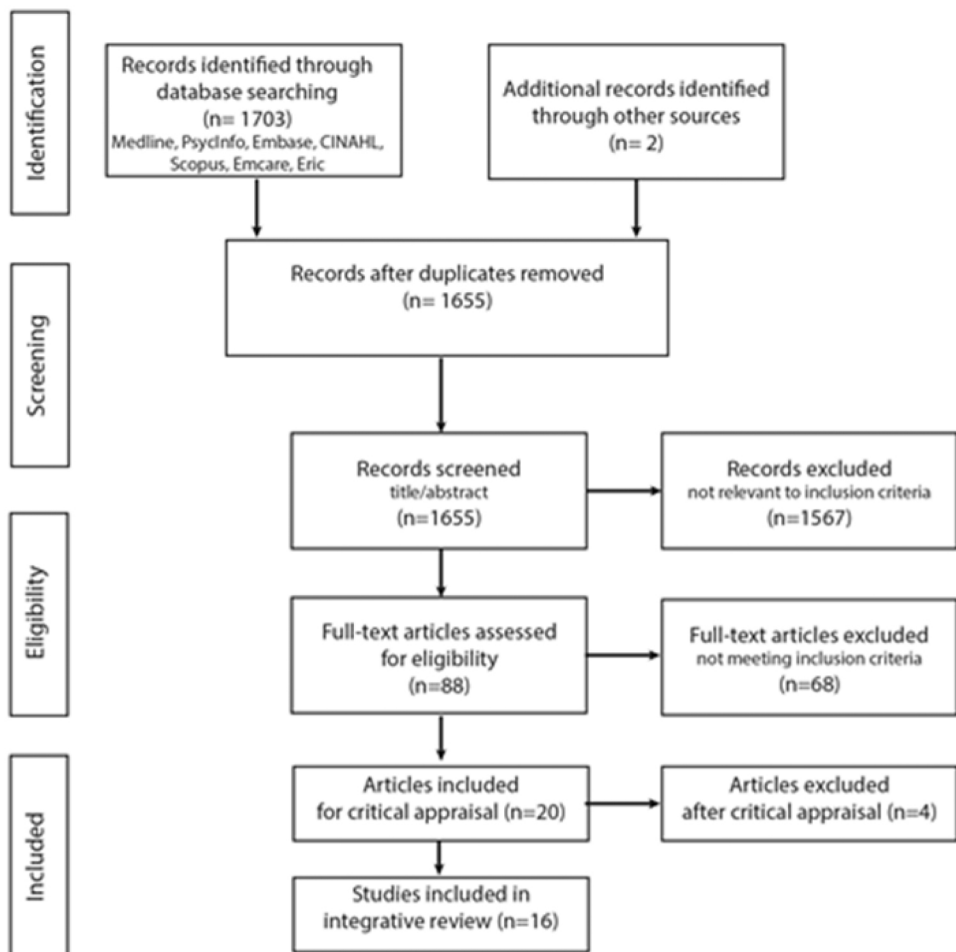
Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Spadaro & Hunker (2016)</p> <p>USA</p> <p>Quality rating: 11/15 (McMaster)</p>	<p>To explore the effect of an 8-week asynchronous online mindfulness meditation intervention on stress, mood, and cognition.</p>	<p>Descriptive pre-post-test design</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Perceived Stress Scale (PSS) • Hospital Anxiety and Depression Scale (HADS) • Attention Network Test (ANT) <p>Data collection pre-post and 24 weeks follow up.</p>	<p>Undergraduate and graduate nursing students (n=26) from distance education programs at three nursing programs at a US university.</p>	<p>The mindfulness e-study offered to students decreased participants' stress levels. Significant reductions in PSS scores (PSS, $p=0.019$). HADS scores trended down significantly ($p=0.015$). Non-significant improvements in ANT (cognition, including concentration and attention) scores.</p>	<p>Small sample size impacted effect size and generalisability of the study, together with absence of a control group.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
<p>Steinberg, Klatt, & Duchemin (2017)</p> <p>USA</p> <p>Quality rating: 10/15 (McMaster)</p>	<p>To evaluate the feasibility and effectiveness of a 1 hour X 8 weeks workplace intervention (meditation, mild yoga movement and music) on resilience to stress in ICU units.</p>	<p>Randomised Controlled Trial</p> <p>Instruments:</p> <ul style="list-style-type: none"> • Utrecht Work Engagement Scale (UWES) • Maslach Burnout Inventory (MBI) • Professional Quality of Life scale (PROQOL) 	<p>Staff (n=32) from a surgical ICU in a large US academic medical centre.</p> <p>75% of participants were nurses; other participants included care assistants, family support coordinator, chaplain, janitor, pharmacist, and unit clerk.</p>	<p>The intervention was welcomed by participants and raised awareness about stress. Despite barriers this type of intervention may be effective in high-stress work settings such as an ICU.</p> <p>Work satisfaction increased significantly in the intervention group (UWES, $p=0.006$). Negative correlations were found between vigour and work engagements subscale scores on the UWES; emotional exhaustion (MBI) and burnout scores (PROQOL).</p>	<p>Small sample size from one ICU limits generalisability.</p>

Citation / Location / Quality	Aim	Methods Study Design	Sample / Context	Results	Limitations
van der Riet, P. et al (2014) Australia Quality rating: 10/10 (CASP)	To explore the impact of a 1 hour X 7-week stress management and mindfulness program	A descriptive qualitative design with semi-structured focus group interviews. Qualitative data was thematically analysed	First year female nursing and midwifery students (n= 10) from one Australian university	Themes: attending to self; attending to others; and attending to program related challenges. Data indicated a positive impact on sleep, concentration, clarity of thought and a reduction in negative cognitions.	Female participants only and variable program attendance.

Highlights

- The demanding nature of healthcare underscores the need for strategies that can reduce stress and build resilience.
- This review attests to the beneficial outcomes of mindfulness meditation for nurses and nursing students.
- Mindfulness meditation programs have a significant impact on stress, depression, anxiety and burnout.



Adapted from: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(6): e1000097. doi: 10.1371/journal.pmed1000097

Figure 1