Nurturing doctors: A systematic review of interventions to reduce stress and distress

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Background

What is already known about the topic?

Within the UK, 27% of university students disclose a mental health problem [1], indeed mental health conditions accounted for 17% of disability disclosed by first-year students in 2015/16 [2]. The context is that the majority of students are in their adolescence and early adulthood, a peak period for the onset of a range of mental health conditions [3]. The student population may be particularly vulnerable to mental health issues, having to adapt to stressors such as new physical and social environments, academic demands, and self-directed learning [4].

Medical students undoubtedly experience additional stressors, to the extent that 87% of UK medical students report a stressful event within their student role in the last month [5]. The most significant stressor is academic, in particular the vast theoretical workload coupled with a strong internal motivation to perform well [6,7,8,9,10]. The poor quality of student-faculty relationships [9,11]; the competitive nature of medical school [6,9,12]; the stoic attitude encouraged within medicine [13]; communicating with patients [5]; and dealing with death and suffering [5,13] were also reported as stressful. Within UK medical students, depression has been reported in 2.7 [14] to 48.8% [15], a probable psychiatric disorder is in 46% [16], with just fewer than 15% having considered suicide during their studies [17].

Previous reviews of stress reduction strategies in medical students have supported their effectiveness [18,19,20], interventions included support groups, relaxation training, mindfulness, mentoring programs and grading changes. A meta-analysis found positive effects on their psychological health of a moderate effect size [21]. Reviews have however noted the sparsity of high-quality research, including lack of controls, heterogeneous interventions and variable outcome measures making it difficult to draw firm conclusions. Despite tentative support for the effectiveness of interventions, 80% of medical students within the UK describe the wellbeing support available as poor, or only moderately adequate [17] and the process of accessing support as 'a series of closed doors' with inadequate university services and lengthy waits to access psychological support through primary care [22].

What this paper adds

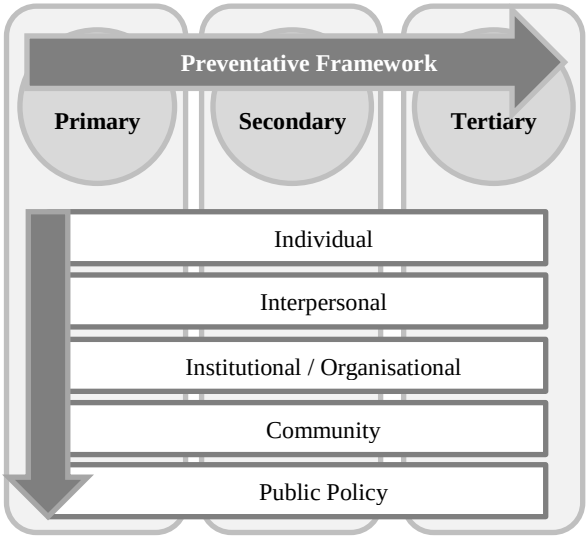
Within the context of the recent expansion of UK medical schools [23] and as medical students are reporting additional stressors related to the COVID-19 pandemic [24], this is a salient time to reconsider how best to support their mental health. This systematic review not only considers the current evidence for interventions to reduce stress and support the wellbeing of medical students, but also proposes a structure for implementing these interventions. We combined preventative and ecological paradigms of health promotion to develop a conceptual framework [25] to understand the complexity of stress in medical students, and inform future interventions to support their wellbeing.

The preventative framework for health is based on reducing an individual's exposure to known risk factors and strengthening their protective factors [26]. Three components are central [27]: Primary prevention targets risk factors and promotes protective factors in a whole population group not identified as being at increased risk (universal prevention), a

subpopulation known to be at increased risk (selective prevention), or individuals already showing detectable signs or symptoms of a disorder but who do not yet meet diagnostic criteria (indicated prevention) [26,27]; secondary prevention seeks to reduce the prevalence of disorder through early detection and treatment of diagnosable conditions [26,27]; tertiary prevention aims to reduce impairments that may result from a disorder, to restore function and prevent relapses and recurrences [26,27]. Limitations exist when such prevention strategies focus solely on personal responsibility, negating the impact of sociocultural factors on behaviour [28]. An ecological framework for health prevention highlights an individual's interaction with their physical and sociocultural environment. It recognises multiple levels of influence on health behaviours: individual, interpersonal, institutional/organisational, community and public policy factors. It also considers the reciprocal nature of these factors interacting; that individuals both influence and are influenced by others and their environment [29].

Figure 1

Relationship between preventative and ecological paradigms



The origin of most mental health conditions is multifactorial, the cumulative effects of multiple small effect size risk factors (both genetic and environmental) that interact in complex ways to progressively increase vulnerability [30,31]. Protective factors can mitigate these risks and include resilience, an individual's long-term ability to respond to adversity in a healthy and adaptive manner [32], with resilient individuals 'not only (being) born' but 'raised' [33]. Mental health thus lends itself to a preventative framework and outcomes are promising and can be cost-effective [34]. The role of preventative interventions may be even greater during sensitive developmental periods such as adolescence through early adulthood [35].

Method

This systematic review was carried out according to a review protocol [36] and reporting follows the Preferred Reporting Items for Systematic Reviews and MetaAnalyses (PRISMA) statement [37].

Objectives

We carried out a systematic review to identify interventions that could effectively reduce stress and support medical students' wellbeing.

Search strategy

We developed the search strategy to answer the defined objective. The following three electronic databases were searched from their inception until July 2019: Medline, Psycinfo and CINAHL Only studies in English were included in the search. This was supplemented by reference searching of full-text articles identified in the database search to identify articles not retrieved by electronic searches. We used the following keywords: "medical student" OR "medical undergraduate" AND stress OR distress OR "mental illness" OR psychiatr* OR depression OR mood OR anxiety OR schizophrenia OR psychosis OR suicid*. The keywords were chosen to ensure a comprehensive search of studies.

Study eligibility

Eligibility was assessed according to pre-defined Inclusion and exclusion criteria:

- Study types: Published primary research, written in English was eligible for inclusion. This included both quantitative and qualitative studies with and without a comparator. Editorials or review articles were excluded.
- Types of participants and setting: Medical students who were currently in training within any

public or private medical school were eligible for inclusion. Any other students were excluded.

- Types of intervention: Interventions were included if they targeted medical students with the objective of reducing stress and/or promoting the wellbeing during their time in training. No specific intervention types were excluded.
- Types of outcome measures: Studies were eligible that reported a wellbeing outcome.

Study selection

Studies were selected in two steps. First, eligibility criteria were applied to titles and abstracts of studies identified from the literature search. Studies were screened and reviewed by two independent reviewers. If the title and/or abstract provided insufficient information to assess the relevance we assessed the full article. Second, full texts of articles selected in the first stage were independently reviewed for final inclusion by the two reviewers. Any discrepancies and/or disagreement in study selection were resolved by discussion or by consultation with a third reviewer if indicated. The PRISMA flow diagram provides detailed information regarding the selection process of studies (Figure 1. diagram of study selection).

Data extraction

Data was collected using a standardised form that was finalised during pilot extraction. Data were extracted by one reviewer and checked for accuracy and completeness by a second reviewer. The following information was extracted from each included study:

a) publication (author(s), year, country of origin)

b) sample characteristics (sample size, year of training)

c) characteristics of intervention(s) and control intervention(s) (enrolment and attrition of participants, provider and mode of delivery, content)

d) study design and methods

e) outcome measures of interest

Table 1 provides detailed information regarding the study, sample characteristics, study characteristics and empirical findings.

Dealing with different study designs

Due to the heterogeneity in study design and interventions evaluated it was not possible to conduct a meta-analysis.

Risk of bias assessment

Each item was judged independently by two reviewers. Any disagreement was resolved through discussion with a third reviewer.

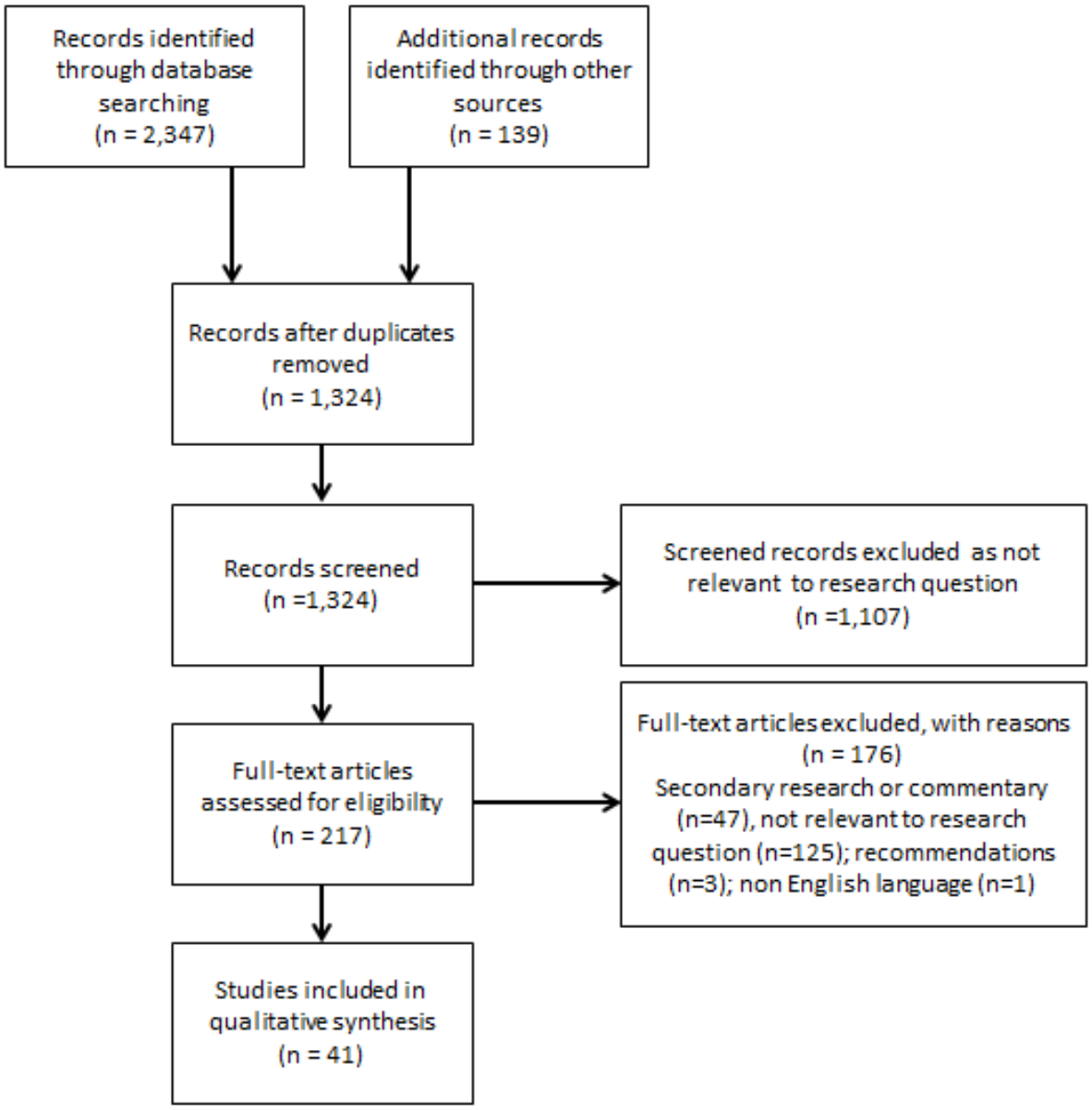
Heterogeneity

An exploration was made for any heterogeneity that existed between studies to consider how these might alter the conclusions drawn by the review.

Statistical analysis

A narrative approach was used to synthesize the findings because the studies were heterogeneous in terms of design, methods, interventions and outcome measure.

Figure 2
Diagram of study selection



Results

Curriculum and Grading

Two studies considered outcomes in successive cohorts following the introduction of a pass/fail system that replaced a five-interval grading system across the medical programme, with the aim of reducing perceived competition between peers. The pass/fail class exhibited a significant reduction in stress [38] and increased well-being [39], compared to their five-interval graded peers. Mood improvement did not reach significance [38].

Two studies considered outcomes in successive cohorts following transition from a traditional lecture based pre-clinical curriculum to a problem-based learning (PBL) curriculum. The first PBL curricula had a focus on easing the transition to clinical sciences with communication and procedural skills training; students of the PBL curricula had significantly less anxiety for clinical skills (suturing, phlebotomy) however experienced significantly higher anxiety for communication (dealing with colleagues, and

abusive/intoxicated/psychiatric patients) despite receiving communication skills training [40]. The second PBL curricula, described as a 'faculty guided, student directed' approach, resulted in a reduced likelihood of depression (OR 0.42, 95% CI 0.14, 1.21) but this did not meet significance [41].

Mindfulness and Yoga

Eight studies reported on mindfulness-based stress reduction interventions within small group settings over four [42] to nineteen [43] weeks. Outcomes were positive with significant reductions in anxiety and depression [44,45] stress [46] and distress [42,47]. Reflective comments were striking "as a medical student, I am constantly thinking of problems and solutions, my mind feels like it is running a marathon…by the last week I felt that I had created some space in my mind" [48]. Both peer led mindfulness interventions reported reductions in stress [43,49] and depression [49]. An audio guided intervention also resulted in a significant reduction in stress and anxiety [50]. Yogic interventions were considered in two studies with intensity ranging from three [51] to six [52] sessions weekly; significant improvements in wellbeing were found post intervention [52] including a reduction in baseline and 'examination day' anxiety compared to control [51].

Stress Management/Relaxation

More broadly defined stress management and relaxation interventions were considered in thirteen studies. Six interventions had favourable outcomes; these included a significant reduction in stress [53], distresses [42] and depression [54]. All but one [54] were optional and they were predominately within small group settings [42,53,55] with a strong emphasis on practicing skills rather than a didactic approach [42,53,56]. Two interventions were predominantly didactic but these also included a small group component [54,57]. One intervention was peer led [55] and one highlighted role modelling by a senior physician [56]. Qualitative feedback stated that the intervention gave students 'permission' to engage in self-care without the burden of guilt associated with activities that they previously perceived as 'self-indulgent' [56].

Other stress management and relaxation outcomes failed to show significance [58,59,60]. Outcomes were mixed following a classroom-based intervention; whilst 67% reported less stress, 21.1% reported an increase [61]. Neither a didactic [60,62,63] approach nor interventions with a very broad agenda [63] resulted in favourable outcomes. A compulsory small group intervention resulted in a significant reduction in mental quality of life; this intervention being added onto existing curricular demands was perceived as counterproductive by some, taking time away from studying or activities of greater personal interest [64].

Behavioural Interventions

Group based physical activity was significantly associated with reduced stress [65]. No such changes were observed when exercising alone or with no exercise beyond as a means of transportation.

A 'behavioural change' intervention in which participants selected a personal behaviour to change by setting a goal, tracking progress, and self-assessing their success found that of students choosing an emotional health theme, 66.7% met their goal, however this did not reach significance [66].

Benefits of expressive writing were dependent on individuals' coping styles. Students with a coping style with high levels of emotional expression demonstrated a reduction in depression when writing on emotional topics, whilst those with low levels of emotional expression benefited from writing about their 'best possible self' as if their future goals were achieved; there were no such changes in the control writing group [67].

Cognitive & Self-awareness Interventions

A web based cognitive-behavioural therapy (CBT) intervention included topics of behavioural activation, cognitive restructuring and managing anxiety. Participants increased their use of cognitive and behavioural coping skills, which resulted in a reduction in stress of borderline

significance. Participants reported that it may have been of greater benefit at the beginning of medical school to establish healthy habits early in training [68].

A 'self-awareness' intervention in which students received individual feedback on mood and health habit survey results and attended a self-care lecture group, found no significant change in mood [69].

Mentorship

Mentorship by faculty was considered in two studies, and by peers in another. Outcomes of a faculty led programme to facilitate students' initiation and thereafter meeting weekly, were mixed compared to controls from an institution without formal mentorship; whilst mentored students were significantly more able to overcome anxiety they had worse emotional wellbeing [70]. A faculty led programme providing academic counsel and onward referral to university support services had negative outcomes; despite 95% of students supporting such a scheme, only 18.4% rated this intervention as successful [71]. Success was associated with tutors actively engaging with students and regular meetings [71]. A peer led 'buddy programme' linking first year students with second year peers to support induction and academic, social and personal needs resulted in a reduction of stress at enrolment [72].

Education, Screening and Access to care

Two studies considered the impact of a multi-pronged intervention comprising of education to destigmatise mental illness, confidential and anonymous on-line screening for depression and suicidality, with those at risk being offered on-line counselling and thereafter referral for treatment. Both appeared to support students accessing services; only 23% of students identified through screening as being of high risk of suicide were currently receiving mental health support [73] and 71% referred for treatment, stated that they would not have sought support without the programme [74]. A third intervention which reduced barriers to care by ensuring readily available, low cost, confidential therapy resulted in a significant decline in depression and suicidal ideation [75].

Multifaceted Interventions

An intervention implemented in phases included a pass/fail grading system; rationalising curricular demands; compulsory resilience and mindfulness programme; regular sessions to pursue interests and mentorship; confidential mental health screening and follow up; and a peer led coping strategy programme for clinical students. There was a clear trend of improved stress, anxiety and depression outcomes reaching significance by the second year [76,77] post intervention; results were however less favourable for senior classes [77]. A second intervention included a peer led mentorship programme; a wellness committee addressing ongoing mentorship, physical fitness, social activities, community wellbeing, and emotional support (including an anonymous on-line mental health forum with a psychiatrist); and an annual reflective workshop with modelling of self-care - 95% of students rated their experience as positive [78].

Table 1

Study, sample characteristics, study characteristics and empirical findings

Study	N	Population (age (years); gender; ethnicity)	Intervention (modality; length)	Comparator	Outcome (p values and effect sizes where available)	Research design
Austenfeld JL et al [67]	64	Third year medical students; mean age- 26.4; female- 45%; white- 84% Hispanic- 11%	Expressive writing ('emotional topic' vs. 'best possible self'); three weekly sessions	Control group writing about their day without emotion	Reduction in depression (CES-D) in the 'emotional topic' group for those with a coping style of high emotional expression/ reduction in depression in the 'best possible self' group in those with coping style of low emotional expression and processing compared to other group and control	RCT (un-blinded)
Ball S et al [69]	64	First year medical students; mean age- 24; female-40.7%	Self-awareness (feedback on mood and health habit scores/one off self-care lecture)	Control group without intervention	No significant changes in depression (BDI-II) compared to controls following either feedback (F 0.33) or self-care lecture (F 2.4)	RCT (un-blinded)
Bloodgood RA et al [39]	281	First and second year medical students; mean age- 22; Female- 46-62%	Pass/fail grading system	Control class with 5-interval grading system	Significant increase in wellbeing (GWB), including anxiety and depression sub scores in pass/fail class compared to 5-interval graded peers in first 3 semesters ($p < 0.008$)	Cohort
Bond AR et al [48]	27	First and second year medical students	Mindfulness; 11 weeks	No control	Reduction in stress (PSS), not reaching significance (p 0.7)	Cohort
Camp DL et al [41]	275	First year medical student; Female- 33.8%; white- 86.5%	'Problem based' curricula (PBL) (faculty guided, student directed approach to generate learning in basic and clinical sciences)	Control year with traditional lecture-based learning (LBL)	Reduction in depression (SDS) in PBL (OR 0.42, 95% CI 0.14,1.21) compared to LBL, not meeting significance (p 0.74)	Cohort
Danilewitz M et al [49]	30	First and second year medical students; Female- 73%	Mindfulness (peer led); 8 weeks	Waiting list control	Significant reduction in stress (DASS) post intervention. Between group effect size 0.7 (p 0.019)	RCT (un-blinded)
Downs N et al [73]	1008	Medical students; mean age 24.7-26.3; female- 52-63%; white 37-47%, Asian 26-44%, Hispanic 2-16%	Education to destigmatise mental illness/ confidential on-line screening for depression (PHQ-9) and suicidality/ with 'at risk' students being offered on-line counselling and referral for treatment; 4 year	No control	72 interacted with an on-line counsellor, 23 were referred for treatment. Of the 13 students whom the counsellor identified as being a high suicide risk, only 3 were currently receiving mental health care	Cohort

Drolet BC et al [78]	>200	First and second year medical students	Multifaceted intervention with peer led mentorship /student wellness committee/ on-line mental health forum /annual small group workshop with a focus on reflection and modelling self-care	No control	Promising feedback with 95% rating their experience as positive	Cohort
Dyrbye LN et al [64]	105	First year medical students; age <25 77-80%; female- 58-59%	Stress management and resilience training within a small group setting, with individual meetings with facilitators; year long	No control	Significant reduction in mental quality of life (SF-8), ($p < 0.001$) and increase in stress ($p < 0.05$) in intervention group	Cohort
Erogul M et al [45]	58	First year medical students; mean age- 23.5; female- 45.6%	Mindfulness; 8 weeks	Control group without intervention	Significant reduction in stress (PSS) (p 0.03)	RCT (un-blinded)
Finkelstein C et al [59]	184	Second year medical students, mean age 24.6-25.4, female 61.1-77.3%	Stress management, 10 weeks	Control- no intervention	Reduction in anxiety (SCL 90) and stress (PSMS) in intervention group, not reaching significance (p 0.1 and 0.26)	Cohort
Hassed C et al [54]	148	First year medical students over >18 years	Stress management; semester	No control	Significant reduction in depression (SCL-90) (p 0.01), not reaching significance for anxiety (p 0.11)	Cohort
Holtzworth-Munroe A et al [53]	40	First and second year medical students	Progressive muscular relaxation; six weeks	Control- no intervention	Significant reduction in stress (Likert scale) in intervention group compared to control ($p < 0.04$), this did not reach significance for depression	RCT (un-blinded)
Jain S et al [42]	83	Medical students (n=17), others premedical, pre-health and nursing); mean age- 25; female- 80.7%, white- 16%, Hispanic- 21%	Mindfulness vs somatic relaxation; 4 weeks	Waiting list control	Significant reduction in distress (BSI) for mindfulness and somatic relaxation group compared with control ($p < .05$) with an effect size/ $d = 1.36$, and 0.91 respectively	RCT (un-blinded)
Kelly JA et al [60]	48	Medical students (80%)/ nursing students and residents; female- 33%	Stress management; six weeks	Waiting list control	Reduction in anxiety (STAI) post intervention, not meeting significance	Cohort
Klamen DL [57]	30	First year medical students	Stress management seminars; three	No control	Students feedback reported that 81% improved their stress management, no statistical analysis	Cohort

Kushner RF et al [66]	343	Second year medical students; age 24-26 63.5%; white- 47.3%, Asian- 28.6%, Black- 7.4%	Behavioural change programme; six weeks	No control	66.7% of students with a mental health plan met their goal however this did not reach significance	Cohort
Lattie EG et al [68]	16	Medical students; mean age- 25.4; female- 50%	CBT; six weeks	No control	Reduced stress (PSS) following intervention borderline significance (p 0.058, d =0.53)	Cohort
Lee J et al [56]	66	First and second year medical students; female- 66.7%	Stress management emphasising role modelling by senior physicians; six weeks	No control	Students feedback reported an increased awareness of the importance of their personal wellbeing	Qualitative study
Malathi A et al [51]	50	First year medical students	Yoga, x 3 weekly; three months	Control- no intervention	Significant reduction in baseline and 'examination day' anxiety (STAI) in the intervention group ($p < 0.001$)	RCT (un-blinded)
Malik S [71]	172	Second and third year medical students and faculty	Faculty member led mentorship	No control	18.4% rated intervention as successful, success significantly associated with active engagement by tutors	Cohort/ Qualitative
Mehta M et al [52]	36	First year medical students; age 17-21- 100%; female- 41.7%	Yoga, x 6 weekly; four weeks	No control	Significant improvement in wellbeing (PGWBI) (p 0.000)	Cohort
Mitchell RE et al [62]	38	First year medical students	Non-directive stress management group for 7 weeks/ one off stress management and study skills lecture	Control- no intervention	No significant reduction in in depression (BDI) or anxiety (STAI) for either intervention groups	RCT (un-blinded)
Moir F et al [43]	275	Second and third year medical students; mean age- 20.9; female- 54%	Mindfulness (peer led); 19 weeks	Control- not invited to attend intervention however, were not excluded	Improved mental health (PHQ- 9, GAD-7) in the intervention group, not reaching significance	RCT (un-blinded)
Mouret GM [72]	412	First year medical students	Peer led mentorship	Control class pre-intervention	Reduced stress (Likert scale) at enrolment, less consistent at six months post intervention, no statistical analysis	Cohort

Moutier C et al [74]	2860	medical students (n=498), pharmacy students and medical residents	Education to destigmatise mental illness/ confidential on-line screening for depression (PHQ-9) and suicidality/ those 'at risk' being offered on-line counselling and referral for treatment	No control	42 interacted with an on-line counsellor, 15 were referred for treatment. Of the cohort referred for treatment, 71% would not have sought treatment without the programme	Cohort
Pereira MA & Barbosa MA [63]	33	Third and fourth year medical students; ages 19-26; Female- 58%	Stress management; semester	No control	Post course feedback- 3.2% enhanced relaxation, 16.1% enhanced quality of life	Cohort
Pereira MA, Barbosa MA et al [61]	76	Second, third and fourth year medical students; mean age- 21; female- 53%	Stress management; semester	No control	Post course feedback-67% less stress however 21.1% reported an increase in stress, no statistical analysis	Cohort/ Qualitative
Redwood SK et al [55]	1,111	First year medical students	Stress management (peer led); 7 weeks	No control	Post course feedback-considered valuable by 72%, 97% positive about peer leaders, no specific outcomes on stress/ anxiety	Cohort
Rehman R et al [70]	1000	First year medical students; mean age- 20; females- 61-65%	Faculty member led mentorship	Control school without mentorship programme	Significant increase in ability to overcome anxiety (Likert scale) compared to non-mentored ($p<0.001$) however non-mentored students significantly better emotional wellness (Likert scale) than mentored ($p <0.028$)	Cohort
Rohe DE et al [38]	81	First and second year medical students, mean age 22.7-24.3, female 50-63%	Pass/fail grading system	Control class with 5-interval grading system	Significant reduction in stress (PSS) in pass/fail class than their 5-interval graded peers (p 0.01), improved mood (POMS) did not significance	Cohort
Rosenzweig S et al [45]	302	Second year medical students	Mindfulness; 10 weeks	Active control group (didactic seminars on complementary medicine)	Significantly improved mood state (POMS) post intervention period ($p < .05$) not apparent in control	Cohort

Sarikaya O et al [40]	201	First year medical students; mean age 21.7-22	'Problem based' curriculum - allowing for a smooth transition from basic to clinical sciences	Control class with traditional lecture based curriculum	Control students had significantly more anxiety (Likert scale) for clinical skills such as phlebotomy and suturing ($p < 0.001$). Despite receiving communication skills training students within the 'problem based' curricula had significantly more anxiety for communication, such as dealing with nurses ($p < 0.05$) and psychiatric patients ($p < 0.005$)	Cohort
Scholz M et al [58]	42	Medical students; mean age- 24.9; female- 88%	Progressives muscular relaxation/autogenic training; 13 weeks	No control	Reduced depression (BDI-II) post intervention not meeting significance (effect size 0.07)	Cohort
Shapiro SL et al [44]	200	Premedical, first and second year medical students, 20 other students	Mindfulness; 8 weeks	Waiting list control	Significant reduction in anxiety (STAI) (F 4.11 $p<0.05$) and depression (SCL-90-R) (F 8.18, $p<0.006$)	RCT (un-blinded)
Slavin SJ, Schindler DL et al [76] Slavin SJ, Chibnall JT [77]	Approx. 875	Medical students	Multifaceted intervention with Curricular and grading change/ learning communities/ resilience and mindfulness curriculum/ confidential mental health screening/ peer led clinical coping strategy programme	Control pre-intervention classes	Significant reduction in anxiety (STAI) and depression (CES-D) post intervention ($p < 0.001$, effect size of 0.18). No data available regarding senior class outcomes, however noted to be less favourable	Cohort
Thompson D et al [75]	120	Third year medical students	Reducing barriers to care through ensuring easily available, affordable and confidential therapy services	Control pre-intervention class	Significant reduction in depression (CES-D) ($p<0.01$) and suicidal ideation ($p<0.001$) post intervention	Cohort
de Vibe M et al [47]	288	Medical and psychology students; mean age- 23; female- 76%	Mindfulness; 7 weeks	Control- no intervention	Significant reduction in distress (GHQ-12) post intervention (Hedges'g 0.65, 95% CI 0.41, 0.88)	RCT (un-blinded)
Warnecke E et al [50]	66	Final two year medical student; mean age- 23.9; female 65%	Mindfulness (audio guided); 8 weeks	Control- no intervention	Significant reduction in stress (PSS) ($p < 0.05$) and anxiety (DASS) ($p < 0.05$) post intervention	RCT (single - blind)
Yorks DM et al [65]	69	First and second year osteopathic medical students	Group fitness class/exercising alone; 12 weeks	Control- no exercise beyond as a means of transportation	Significantly decrease in stress (PSS) (p 0.038) in the group fitness class compared to other groups	Cohort

CES-D, Center for Epidemiological Studies Depression Scale; BDI, Beck Depression Inventory; GWB, General Wellbeing Schedule; PSS, Perceived Stress Scale; SDS, Zung Self-Rating depression Scale; DASS, Depression Anxiety Stress Scales; SF-8, Medical Outcomes Study Short Form; SCL-90-R, Symptom Checklist-90-R; PSMS, Perceived Stress of Medical School Scale; BSI, Brief Symptom Inventory; STAI, State-Trait Anxiety Inventory; PGWBI, Psychological General Wellbeing Schedule; PHQ- 9, Patient Health Questionnaire; GAD-7, Generalized Anxiety Disorder Scale; POMS, Profile of Mood States Scale; GHQ-12, General Health Questionnaire

Discussion

High levels of academic pressure without the supportive scaffolding of wellbeing can cause distress and mental health difficulties. Within this review interventions to reduce academic stress through changing the grading system [38,39] resulted in significant improvements in well-being. Changing the curriculum to support the smooth transition into clinical training [40] reduced anxiety for procedural skills, however insights gained into the challenges of communication may have heightened anxiety in this area.

Many interventions focused on enhancing resilience. Studies in this review revealed that effective strategies include mindfulness [42,44,45,47,50] yoga [51,52] CBT [68], group based physical activity [65] and broader stress management/relaxation programmes [42,53,54,55,56,57]. Favourable outcomes are often associated with practice-based learning and a group setting [42,44,45,47,53,55,56]. Relational aspects with a group setting seem to have a role in an interventions success [65]. The review found that that interventions embedded within the curriculum can empower students to engage in self-care without guilt [56]. However compulsory interventions can impact negatively on wellbeing [64] possibly through not being responsive to individuals' needs and coping style; the latter having been shown to impact on outcomes [67]. The lack of sustained benefit at six months [45] suggests that students may benefit from an ongoing programme to support them adopting sustainable wellbeing practices; practice predicting favourable outcomes [47].

In this review peer support is shown to negatively correlate with depression [55], and its value was highlighted through peer led interventions [43,49,55,76,77,78] and mentorship [72]. The success of faculty mentorship is associated with mentor engagement [71].

Many medical students experiencing mental health issues do not seek support. This review revealed that 21% would not seek treatment if depressed [79] and 43% were not using mental health services despite feeling the need to [80]. Barriers include time [80,81,82] and financial [82] constraints, concerns about confidentiality in particular of diagnoses appearing on academic records [80,81,82,83] and stigma [79,80,81,82,83,84]. Stigmatised views are prominent, with 28.8% believing that seeking help for depression would make them feel less intelligent [79] and 66.1% that their application for posts would be less competitive if they sought treatment for depression [79]. Positively, interventions that reduced stigma through education, improved detection of 'at risk' students through screening and improved access to confidential treatment showed favourable outcomes [63,74].

Outcomes of multi-faceted interventions within the review were positive [76,77,78], however clinical year students had less favourable outcomes, suggesting that resilience enhancing interventions in pre-clinical years may not be sufficient to combat stressors encountered in clinical settings thereafter [77].

Strengths and Limitations

The review's broad inclusion criteria allowed both quantitative and qualitative studies to be reported, these being complementary in understanding the impact of wellbeing interventions. Despite this, only [41] studies were identified; one within the UK [71]. Due to the heterogeneity of studies, data was not always easily comparable. Some studies may not have been identified due to chosen keywords, exclusion of studies in languages other than English, and relevant unpublished studies may have been overlooked.

The primary research posed limitations. The often-self-selected nature of participants may constitute a group that is more likely to gain benefit due to their level of interest or need. The majority of outcomes were self-reported and thus open to recall bias and outcomes were predominately assessed with screening tools which may not accurately reflect symptoms meeting diagnostic criteria. Studies without a comparative group failed to control for confounding variables such as natural adjustment to university life and timings of key academic stressors. Where the control group was an alternative institution, confounding factors such as curricula, grading systems, and other formal and non-formalised wellbeing programmes were not controlled for. Generalisability may be impacted when students with acute and chronic illnesses were excluded [70] or when participants were studying osteopathic medicine, which may bring somewhat different challenges [65].

Conclusion

Whilst the availability of high-quality research is limited, there is evidence that a preventative framework to reduce risk factors and strengthen protective factors is effective in reducing stress and distress in medical students during their training.

Primary prevention strategies include modifying causes of excessive academic stress by rationalising curriculum content, non-competitive grading systems, smoothing transition to clinical experience and providing supportive clinical placements. Strengthening of protective factors include actively engaged mentorship and resilience interventions embedded within both pre-clinical and clinical curricula, with students having autonomy to choose interventions that resonate with their own beliefs and needs. Resilience has a social component [33] thus peer support to enable social integration should be in place, being mindful that additional systems may be required for minority groups at higher risk of marginalisation and depression [85]. Brief and easily accessible interventions for students with distressing symptoms not meeting diagnostic criteria are helpful to avoid progression to established mental health disorders [86]. All students should be supported to access care, including cohorts that may under-report their struggles such as minority ethnic and international students [87].

Secondary prevention focuses on the early detection and treatment of diagnosable mental health conditions. Strategies to aid early detection include training medical school staff and screening programmes. Access to effective treatment for established conditions requires clear referral pathways and external partnerships with the national health services and third sector agencies. Where difficulties in accessing treatment within local settings arise due to peers being on clinical placement, reciprocal agreements are needed to allow treatment outside of the local area. Students need reassurance that care is confidential through clear information sharing policies that promote the inclusion of their support networks in times of crisis.

Tertiary prevention reduces impairment that can be associated with mental health disorder, allowing resumptions of medical studies. Occupational health services advise on reasonable adjustments, and systems are needed to communicate these within rotating clinical placements.

The preventative framework aligns with an ecological model, recognising that medical students require a range of interventions at multiple levels to reduce stress, promote their wellbeing and to manage the spectrum of mental health difficulties they may encounter. Individual level strategies focus on promoting resilience; interpersonal level interventions on role modelling and mentorship; institutional level strategies highlight curriculum and grading, staff training, screening programmes, referral pathways and occupational health provision; community level factors include the creation of a destigmatising medical school environment where mental health is openly explored; national level interventions include pre-admission policies on disclosing mental health needs [88]. This multi-level 'whole university' approach is endorsed in the University Mental Health Charter [89] and General Medical Council guidance on the responsibilities of medical schools [90].

Co-production is the contribution of service users to the design and provision of services [91]. As interventions 'prescribed' by faculty do not

always align with medical students views on what would best support them [92], their involvement in the design of wellbeing strategies is crucial. The reciprocal nature of students being both influenced by, and being able to influence their environment is in keeping with the ecological model.

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