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BURNOUT IN EUROPEAN MEDICAL STUDENTS: A SYSTEMATIC REVIEW OF QUANTITATIVE EVIDENCE

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ABSTRACT

Background: The high prevalence of burnout in medical students has been associated with an increasing likelihood of dropping out of medical school. Consequences include lower financing and quality indices for the university, personal and psychological consequences such as a sense of inadequacy and self-doubt, and a misallocation of resources and money. Therefore, there is an urgent need to develop a better understanding of the key factors associated with medical student burnout to inform the implementation of prevention and early intervention strategies. Differences in cultural, socioeconomic, and medical education settings could have a significant influence on the factors contributing to the burnout of medical students. The focus of this systematic review is to explore the context-specific key factors associated with burnout syndrome in undergraduate students studying at European medical schools and the recommendations for interventions.
Methods: A systematic review was conducted using the Joanna Briggs Institute (JBI) manual for systematic reviews and was reported following the PRISMA guidelines. CINAHL Ultimate, PubMed and Scopus were searched for studies published in English in the last six years (2018–2024). The JBI critical appraisal checklist for analytical cross-sectional studies guided the screening, data extraction and quality appraisal processes.
Results: 20 studies of 615 articles met the inclusion criteria. Through textual narrative synthesis, five themes were identified as factors associated with burnout of undergraduate students at European medical schools: gender, academic performance, the learning environment, health, and support.
Conclusion: The findings largely affirm previous research on factors associated with burnout in medical students. Four strategies are suggested to decrease burnout rates in European medical students: remove sex-specific biases regarding burnout; improve students' self-efficacy; increase the quality and

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access to extracurricular activities; and increase the quality and access to wellbeing and mindfulness workshops.

Keywords: burnout, psychology, mental health, medical students, medical education

BACKGROUND

Occupational burnout is "a syndrome conceptualised as resulting from chronic workplace stress" (World Health Organization, 2019). The implications of burnout in medical students include reduced medical student and doctor retention, an increase in maladaptive coping mechanisms, and distress (Abreu Alves et al., 2022; Dyrbye et al., 2010; Fitzpatrick et al., 2019; Rudman, Gustavsson and Hultell, 2014).

The prevalence of burnout in medical students globally is high. A meta-analysis found that 44.2% of medical student participants reported signs and symptoms of burnout. However, higher burnout prevalence was found in Oceania and the Middle East when compared to other continents (Frajerman et al., 2019). Other meta-analyses have found that the prevalence of burnout varies from 7–75.2% depending on the country (Erschens et al., 2018), and by 37.32% across 22 countries across all continents (Almutairi et al., 2022). These figures highlighted the importance of country-specific factors, such as differences in healthcare systems, educational environments, socio-economic and lifestyle factors, attitudes towards mental health, and geopolitical influences, for the prevalence differences between countries. Therefore, it is important to deliver tailored interventions to promote the prevention, recognition and reduction of burnout in medical students effectively.

The cultural context in which medical education takes place could highly influence the prevalence of burnout (Frajerman et al., 2019). For example, Lebanese medical students experience very high burnout rates compared to other countries such as Spain, the United States, and Sweden, as culture-specific pressures create a high-stress environment where competition is high to apply for residency positions abroad (Fares et al., 2016). Geopolitical influences, for example, conflict and regional instability were also suggested to contribute to higher burnout in Lebanese medical students compared to Spanish, North American, and Swedish medical students where these stressors are not as pervasive. Though overall perceived stress did not vary between countries, the sources of stress that were contributing the most in each country varied significantly, for example, finance as the highest stressor in Italian medical students compared to studies as the highest stressor in Moroccan students (Molodynski et al., 2020).

The varying lifestyle patterns and habits of students in different countries should also be considered, as burnout can show through different behaviours across cultures (Kadhum et al., 2022). Studies investigating associations between burnout and substance use in medical students found differences in

the levels of drug and substance abuse between countries (Lee et al., 2020; Newbury-Birch, Walshaw and Kamali, 2001). Therefore, this systematic review focuses on European medical schools which will allow for cultural, systemic, and socio-economic considerations to be further explored. The findings will inform context-specific interventions to be implemented in practice.

European medical students tend to migrate to other European countries to study medicine and return to their home nation to practise. 4.3% of doctors on the United Kingdom (UK) General Medical Council's register qualified from medical schools in eastern and central European countries, of which 22% are UK nationals (Limb, 2022). Reasons for studying in other European countries include widely recognised accreditation across Europe and internationally, allowing for professional mobility, potentially lower tuition fees, and opportunities for new cultural and personal experiences. European medical schools adopt a curriculum used in 49 countries that aligns with the Bologna process, which facilitates a unified European system of university education and mutual recognition of qualifications across European countries. This allows the transfer of accreditation between universities and regulatory bodies (Zunic and Donev, 2016). With such movement across the continent and similarities in medical education across institutions, data on medical students from one European country and the factors that may be associated with burnout that can be applied to other European medical students. It would be harder to apply this data to medical students in other continents that do not utilise such frameworks like the Bologna process. This further supports the focus of this systematic review on European medical schools, as they are likely to share greater similarities which will enhance the relevance and applicability of the findings to this population.

This systematic review aims to develop a deeper understanding of the key factors associated with burnout in European medical students which will facilitate the development and implementation of context-specific interventions for this population of medical students. The objective is to identify the factors associated with burnout syndrome in medical students studying at European medical schools.

METHODS

This systematic review was conducted following the JBI manual for systematic reviews of aetiology and risk (Aromataris and Munn, 2024) and was reported following the PRISMA guidelines for reporting of systematic reviews (Page et al., 2021).

ELIGIBILITY CRITERIA

TYPES OF STUDIES

Quantitative, qualitative and mixed-methods studies assessing burnout and factors associated with burnout were included in this review.

TYPES OF PARTICIPANTS

The included studies had a sample of only full-time medical students. Studies with other students and healthcare professionals included as participants were excluded as the education of other healthcare professions could have different structures, curricula, and pressures compared to those in medical schools (Rusticus et al., 2021). Qualified practitioners were excluded as factors contributing to burnout for qualified professionals are likely to be different (Hariharan and Griffin, 2019).

The included studies were undertaken in European medical schools due to the transferability of data as discussed above (Limb, 2022; Zunic and Donev, 2016). Studies that include participants across multiple countries, including those outside of Europe, were excluded as summary statistics and the study's conclusions on relationships between factors and burnout are likely to be impacted by burnout in countries outside of Europe.

TYPES OF MEASURES

The included studies employed a validated measure of burnout to ensure that the factors investigated were related to a validated, pre-defined concept of burnout.

Studies that did not report quantitative relationships between factors for which the author(s) have gathered data for and burnout were ineligible for inclusion. Studies that investigated the effect of interventions, for example, mindfulness workshops, on burnout in medical students were excluded as they did not pertain to the research question of this review.

Studies investigating the impact of the COVID-19 pandemic on medical students were excluded as the effect of the COVID-19 pandemic would have a large impact on medical student burnout (Brooks, 2022; Darien Alfa Cipta et al., 2022; Forycka et al., 2022). This would underestimate the impact of other factors contributing to burnout, especially if study periods overlapped the height of COVID-19 related restrictions and lockdowns which played a large role in deteriorating mental health.

LANGUAGE OF REPORT

The included studies were published in English to avoid misinterpretation of terminology.

PUBLICATION DATE

The included studies have been undertaken in the past 6 years (2018–2024) to review the most recent literature on the topic.

SEARCH STRATEGY

An initial search of CINAHL Ultimate was undertaken and relevant keywords were identified to develop the full search strategy, including MeSH terms and synonyms as appropriate. The final search strategy was developed in consultation with a university librarian (Table 1). A search of CINAHL Ultimate, PubMed and Scopus was completed, with limitations applied to find studies published in the last 6 years (2018–2024) and published in English with no restriction on the study designs. The databases were initially searched on 03/10/2023 and again on 12/07/2024.

SELECTION PROCESS

The search results were imported onto EndNote 20.5, with most duplicates removed by the software and the rest removed manually. The records were screened by the title and abstract against the eligibility criteria. Those included after screening were retrieved and assessed for eligibility using the full text against the inclusion and exclusion criteria. The search strategy and study selection process were recorded using a PRISMA diagram with reasons for exclusion.

DATA EXTRACTION

Data from relevant studies were collected using a data extraction tool based on key information related to the research question, including the year of study, country of study, study methods, burnout measurement tool, results, and conclusions.

Table 1. Search strategy

Database	Search Strategy	Limiters
PubMed	((“medical student”[Title/Abstract] OR “students, medical”[MeSH Terms]) AND (“burnout”[Title/Abstract] OR “burn-out”[Title/Abstract] OR “burn-out”[Title/Abstract] OR “burnout, psychological”[MeSH Terms] OR “burnout, professional”[MeSH Terms]))	English, from 2018–2024
CINAHL Ultimate	((TI (“med* student*”) AND AB (“med* student*”)) OR (MH “Students, Medical”)) AND (TI (“burnout” OR “burn-out” OR “burn out”) AND AB (“burnout” OR “burn-out” OR “burn out”) OR (MH “Burnout, Professional”))	Published Date: 2018-01-01–2024-12-31 Narrow by Language: - English
Scopus	TITLE-ABS-KEY (burnout OR “Burn-out” OR “Burn Out”) AND TITLE-ABS-KEY (“med* student*”) AND PUBYEAR > 2017 AND PUBYEAR < 2025 AND (LIMIT-TO (LANGUAGE , “English”))	

RISK OF BIAS ASSESSMENT

An assessment of methodological quality was carried out for each study eligible for inclusion in this review. The JBI critical appraisal checklist for analytical cross-sectional studies was utilised (Moola et al., 2020). Each study was given a percentage score based on the answers to the checklist. A low risk of bias was determined when positive answers were above 70%; moderate risk of bias was determined when positive answers were between 50–69%; high risk of bias was determined when positive answers were below 49% (Franco et al., 2020).

The first author was an intercalating medical student at the time when this systematic review was conducted and led the screening, data extraction and risk of bias assessment process with support and checks from the supervisor.

DATA SYNTHESIS

A textual narrative synthesis (Figure 1) was conducted to identify recurring factors associated with burnout in European medical students within the included studies (Aromataris and Munn, 2020; Lucas et al., 2007). The identified recurring factors were used to define the sub-themes. The scope of each study, and the differences and similarities among studies were used to draw conclusions across studies in each sub-theme. These sub-themes were grouped into themes.

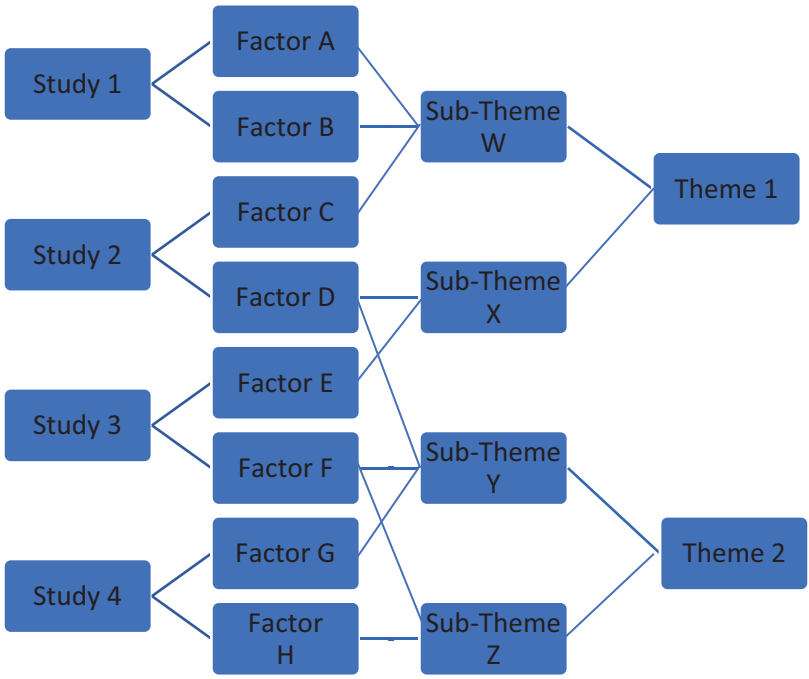

Figure 1. Diagram depicting textual narrative synthesis in this review

RESULTS

STUDY SELECTION

Records were screened using the title and abstract, then using full text records against the eligibility criteria. Reasons for exclusion were recorded. A total of 63 papers were excluded after full text retrieval during screening, resulting in 20 papers included in this systematic review (Figure 2).

STUDY CHARACTERISTICS

17 studies utilised a cross-sectional anonymous questionnaire. Studies 9 (Thun-Hohenstein et al. 2021), 14 (Carrard et al. 2024), and 18 (Schneider et al. 2023) were longitudinal studies that administered an anonymous questionnaire at different points within the participants' undergraduate medical studies. Table 2 summarises the study characteristics of 20 included studies.

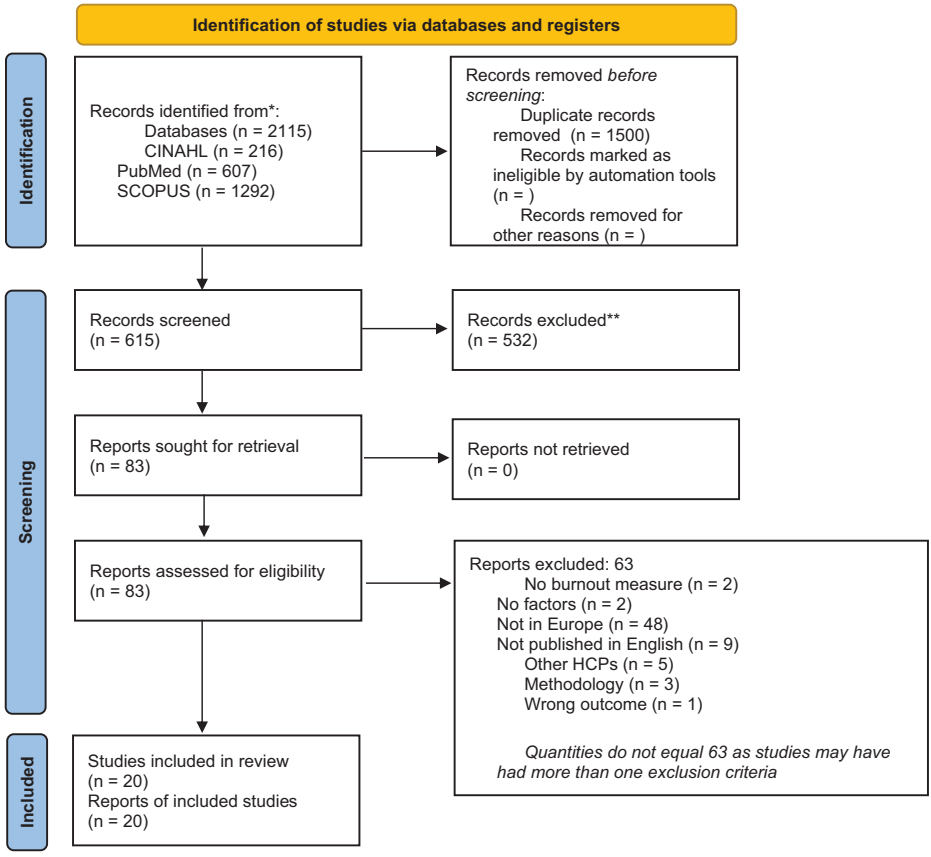

Figure 2. PRISMA flowchart of study inclusion and exclusion

Table 2. Study characteristics

Study Number	Country	Author (Year)	Title	Sample Size	Burnout Measure
1	Spain	Atienza-Carbonell et al. (2022)	Screening of substance use and mental health problems among Spanish medical students: A multicenter study	1265	IUBA
2	Turkey	Aker and Şahin, (2022)	The relationship between school burnout, sense of school belonging and academic achievement in preclinical medical students	601	SBI
3	Switzerland	Carrard et al. (2022)	The relationship between medical students' empathy, mental health, and burnout: A cross-sectional study	886	MBI-SS
4	Ireland	Fitzpatrick et al. (2019)	Prevalence and relationship between burnout and depression in our future doctors: A cross-sectional study in a cohort of preclinical and clinical medical students in Ireland	269	MBI-SS
5	Serbia	Ilic et al. (2021)	High risk of burnout in medical students in Serbia, by gender: A cross-sectional study	760	MBI-SS
6	Spain	(Capdevila-Gaudens et al., 2021)	Depression, anxiety, burnout and empathy among Spanish medical students	5216	MBI-SS
7	Croatia	(Ilić Živojinović et al., 2020)	Correlates of burnout syndrome among belgrade medical students-a cross-sectional study	769	MBI-SS
8	Spain	Gil-Calderón et al. (2021)	Burnout syndrome in Spanish medical students	1073	MBI-SS
9	Austria	Thun-Hohensteinet al. (2021)	Burnout in medical students	135	MBI-SS
10	Ireland	Macilwrait and Bennett (2018)	Burnout and physical activity in medical students	383	MBI-SS
11	Cyprus	Nteveros et al. (2020)	Burnout among medical students in Cyprus: A cross-sectional study	182	MBI-SS

(Continued)

Table 2. (Continued)

Study Number	Country	Author (Year)	Title	Sample Size	Burnout Measure
12	Belgium	Kilic et al. (2021)	Academic burnout among medical students: respective importance of risk and protective factors	342	MBI-SS
13	Spain	Esquereda et al. (2024)	Relationship between academic climate and burnout in Spanish medical schools	4433	MBI-SS
14	Switzerland	Carrard et al. (2024)	Mental health and burnout during medical school: Longitudinal evolution and covariates	2601	MBI-SS
15	Netherlands	Scheepers, Hilverda and Vollmann (2024)	Study demands and resources affect academic well-being and life satisfaction of undergraduate medical students in the Netherlands	371	Utrecht Burnout Scale for Students
16	Serbia	Ilic and Ilic (2023)	The relationship between the burnout syndrome and academic success of medical students: a cross-sectional study	760	MBI
17	Serbia	Ilic, Zivanovic Macuzic and Ilic (2024)	High risk of burnout syndrome and associated factors in medical students: A cross-sectional analytical study	760	MBI-SS
18	Germany	Schneider et al. (2023)	Vulnerable in the end – Longitudinal study among medical students on mental health and personal and work-related resources over a 5.5-year-period	530	Burnout Screening Scales II (BOSS-II)
19	Switzerland	Gaume et al. (2024)	Substance use and its association with mental health among Swiss medical students: A cross-sectional study	886	MBI-SS
20	Portugal	(D'Alva-Teixeira, Picó-Pérez and Morgado, 2023)	Determinants of Poor Mental Health of Medical Students in Portugal-A Nationwide Study	767	MBI-SS

RISK OF BIAS IN STUDIES

18 studies were found to be at low-risk of bias, with two studies at moderate-risk of bias according to the JBI checklist for cross-sectional studies (Table 3).

Table 3. Risk of bias assessed by the JBI critical appraisal checklist for analytical cross-sectional studies (Moola et al., 2020)

Study Number	Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	% Yes	Risk
1	Atienza-Carbonell et al. (2022)	√	√	N/A	√	√	√	√	√	87.5	Low
2	Aker and Şahin, (2022)	√	√	N/A	√	--	√	√	√	75	Low
3	Carrard et al. (2022)	√	√	N/A	√	--	√	√	√	75	Low
4	Fitzpatrick et al. (2019)	√	--	N/A	√	--	√	√	√	62.5	Mod
5	Ilic et al. (2021)	√	√	N/A	√	√	√	√	√	87.5	Low
6	(Capdevila-Gaudens et al., 2021)	√	√	N/A	√	√	√	√	√	87.5	Low
7	(Ilić Živojinović et al., 2020)	√	√	N/A	√	--	√	√	√	75	Low
8	Gil-Calderón et al. (2021)	√	√	N/A	√	--	√	√	√	75	Low
9	Thun-Hohensteinet al. (2021)	√	√	N/A	√	√	√	√	√	87.5	Low
10	Macilwrait and Bennett (2018)	√	√	N/A	√	--	√	√	√	75	Low
11	Nteveros et al. (2020)	√	√	N/A	√	√	--	√	√	75	Low
12	Kilic et al. (2021)	√	√	N/A	√	--	√	√	√	75	Low
13	Esquereda et al. (2024)	√	√	N/A	√	--	√	√	√	75	Low
14	Carrard et al. (2024)	√	√	N/A	√	√	√	√	√	87.5	Low
15	Scheepers, Hilverda and Vollmann (2024)	√	√	N/A	√	√	√	√	√	87.5	Low
16	Ilic and Ilic (2023)	√	√	N/A	√	--	√	√	√	75	Low
17	Ilic, Zivanovic Macuzic and Ilic (2024)	√	√	N/A	√	√	√	√	√	87.5	Low
18	Schneider et al. (2023)	√	√	N/A	√	--	--	√	√	62.5	Mod
19	Gaume et al. (2024)	√	√	N/A	√	√	√	√	√	87.5	Low
20	D'Alva-Teixeira, Picó-Pérez and Morgado (2023)	√	√	N/A	√	--	√	√	√	75	Low

Q1. Were the criteria for inclusion in the sample clearly defined?
Q2. Were the study subjects and the setting described in detail?

Q3. Was the exposure measured in a valid and reliable way?
Q4. Were objective, standard criteria used for measurement of the condition?
Q5. Were confounding factors identified?
Q6. Were strategies to deal with confounding factors stated?
Q7. Were the outcomes measured in a valid and reliable way?
Q8. Was appropriate statistical analysis used? √ - Yes; -- - No; U – Unclear; N/A – Not Applicable.

Item 3 was marked as 'N/A' for all studies as defined exposures were not determined due to the nature of the research question. Studies were most likely to answer 'No' to items Q5 and Q6. Studies that scored 'No' on these items nevertheless scored a low risk of bias.

All included studies utilise a validated burnout measure in the country of its use (Table 4).

Table 4. Validity studies for burnout measures used in each country included

Burnout Measure	Validated for use in	Validity Study
MBI/MBI-SS Maslach Burnout Inventory (MBI) (Maslach, Jackson and Leiter, 1997, pp.191–218) or the Maslach Burnout Inventory-Student Survey (MBI-SS) (Schaufeli et al., 2002)	Spain	Schaufeli et al.,2002 Raimundo Aguayo-Estremera et al., 2023
	Switzerland and Belgium (French Version)	Faye-Dumanget et al., 2017 Gorter et al., 1999
	Ireland	Yavuz and Dogan, 2014
	Serbia	Ilic et al., 2016
	Croatia	Pintarić Japec et al., 2019
	Austria	Unterholzer R., 2008
	Cyprus	Galanakis et al., 2009
	Portugal	Campos and Maroco, 2012
IUBA (Fernández-Arata, Dominguez-Lara and Merino-Soto, 2017)	Spain	Fernández-Arata et al., 2017
SBI (Salmela-Aro et al., 2009)	Turkey	Salmela-Aro et al., 2009 Secer et al., 2013
Utrecht Burnout Scale for Students (Gusy, Lesener and Wolter, 2019)	Netherlands	Schaufeli, Desart and De Witte, 2020
Burnout Screening Scales II (Werner et al., 2022)	Germany	Werner et al., 2022

NARRATIVE DESCRIPTION OF STUDIES

The narrative description of each of the studies is presented in Table 5.

Table 5. Narrative description of the included studies

Study Number	Narrative Description
1	Higher burnout in females ($p < 0.008$), pre-clinical years ($p = 0.000$), students with higher academic performance ($p < 0.001$), and substance use ($p < 0.001$)
2	Higher burnout rates if repetition of a year ($p < 0.001$), extrinsic pressure to study medicine ($p < 0.002$). Lower burnout rates correlate with a greater sense of belonging ($p < 0.001$).
3	Higher burnout in female students, and students in the earlier years of the degree; empathy significantly affects burnout rates ($p < 0.001$ for all).
4	Higher burnout in the clinical years ($p = 0.012$). Identified a positive correlation between burnout severity and depression ($p < 0.001$).
5	Higher burnout rates in males ($p = 0.024$). Burnout rates peak in the third year of study ($p = 0.011$ for males, and $p = 0.002$ for females), with gradually declining burnout in subsequent years, reflecting a change in curriculum in the later years.
6	Higher burnout rates in the later years of study (OR(95%CI) = 3.77(3.242–4.385), $p < 0.001$), depression (OR(95%CI) = 3.77(3.242–4.3), $p = <0.001$), anxiety ($p = 0.034$), and problems with academic engagement (OR(95%CI) = 0.785(0.682–0.904), $p = 0.001$) and performance (OR(95%CI) = 2.163(1,851–2.528), $P < 0.001$).
7	Higher burnout rates in earlier years of the degree ($p < 0.001$), younger medical students ($p < 0.01$), worse mental ($p < 0.01$) and physical health ($p < 0.01$), whilst higher academic performance was strongly associated with lower burnout.
8	Inverted the MBI-SS subscale of AE so that high scores for each domain would determine burnout. Lower burnout rates with increased family support ($p < 0.001$) and vocational motivation to study medicine ($p = 0.004$ and $p < 0.001$ for EE and AE respectively). Higher burnout rates with increased number of years in the degree ($p < 0.004$).
9	Lower burnout rates associated with lower workload, high control (autonomy in their work), high reward, high community (social interaction), high sense of fairness, high values (motivation), (all $p < 0.01$), and a romantic relationship (OR(95%CI) = 15.10(1.50–28.70), $p = 0.03$). Higher burnout rates in female students (OR(95%CI) = 16.50(1.50–31.40), $p = 0.031$).
10	Lower burnout rates associated with higher academic performance ($p = 0.03$ and $p < 0.001$ for EE and PE respectively) and physical activity ($p < 0.01$ for PE).
11	Higher burnout rates associated with students in clinical years (OR(95%CI) = 3.23(1.44–7.26), $p = 0.006$), students who have poor sleep quality (OR(95%CI) = 4.33(1.26–14.9), $p = 0.023$), and worse mental health ($p < 0.001$).
12	Higher burnout rates were associated with female students ($p = 0.006$), students with lower perceived social support ($p < 0.05$ for all subscales), high perceived stress ($p < 0.001$ for all subscales), and higher empathy ($p < 0.01$ for all subscales).

(Continued)

Table 5. (Continued)

Study Number	Narrative Description
13	Higher burnout rates associated with worse academic climate, including perception of teachers, teaching, and the learning environment, increased age and being female ($p < 0.001$ for all).
14	Higher burnout rates were associated with the end of medical school ($p < 0.001$). Emotion-focused coping was associated with higher burnout in all 3 domains ($p < 0.001$). Lower burnout rates were associated with social support and satisfaction with health ($p < 0.001$).
15	Higher burnout rates were associated with increased workload ($p < 0.001$). Peer support, life satisfaction, and growth opportunities were associated with lower academic burnout ($p < 0.001$).
16	Higher burnout rates were associated with male students with a lower grade point average (GPA) (adjusted OR 2.44, 95% CI 1.14–5.23, $p = 0.022$), and students with a high GPA who used sedatives (adjusted OR 6.44, 95% CI 1.80–22.99, $p = 0.004$).
17	Higher burnout rates associated with pre-clinical female students (adjusted OR 0.41, 95% CI 0.19–0.91, $p = 0.028$) and pre-clinical cigarette smokers (adjusted OR 2.47, 95% CI 1.05–5.78, $p = 0.038$) were associated with higher burnout. No significant association between year of study and burnout ($p > 0.05$).
18	Higher burnout rates associated with worsening of physical, cognitive, and emotional burnout in the final year of study compared to the first year of study within the same cohort ($p = 0.000$ for all).
19	An Exploratory Structural Equation Modeling framework to test the association between mental health measures (M1-4) and substance use (S1-3). M1 is related to depression, suicidal ideation, and anxiety; M2 is related to stress due to financial situation; M3 is related to stress due to studies and work/life balance; M4 is related to higher EE, higher CY and lower AE. S1 is related to alcohol, tobacco and cannabis risk level; S2 is related to stimulant and cocaine risk level; S3 is related to sedative risk level. Higher burnout rates associated with alcohol, tobacco and cannabis use (S1; $p = 0.002$), stimulant and cocaine use (S2; $p = 0.02$), poorer mental health (M1; $p < 0.001$), increased stress related to financial situation (M2; $p = 0.007$), and increased stress related to studies and work/life balance (M3; $p < 0.001$).
20	Higher burnout rates were associated with depression ($p < 0.001$) and anxiety ($p < 0.001$).

RESEARCH SYNTHESIS

Five themes were identified to answer the research question: gender, academic performance, the learning environment, health, and support.

GENDER

Fifteen studies investigated the relationship between gender and burnout. Nine studies showed higher burnout in females, one study showed higher burnout in

males, one study showed mixed findings, and four studies showed that gender was not significantly associated with burnout rates in medical students.

Studies 1 (Atienza-Carbonell et al., 2022) ($p < 0.008$), 9 (Thun-Hohensteinet al., 2021) (OR 16.50, 95% CI 1.5–31.4, $p = 0.031$), 12 (Kilic et al., 2021) (F = 4.26, $p = 0.006$), and 17 (Ilic et al., 2024) (pre-clinical $p = 0.061$) found statistically significant higher rates of burnout in females. Study 5 (Ilic et al., 2021) reported statistically significant higher burnout in males ($p = 0.024$).

Emotional exhaustion (EE) was found to be higher in females when compared to males in Study 3 (Carrard et al., 2022) ($B = 0.15$, $p < 0.001$), Study 5 (Ilic et al., 2021) ($p < 0.05$), Study 8 (Gil-Calderón et al., 2021) ($B = 2.33$, 95% CI 1.23–3.44, $p < 0.001$), Study 10 (Macilwrait and Bennett, 2018) ($p = 0.02$), Study 12 (Kilic et al., 2021) ($B = 1.31$, $p = 0.038$), Study 13 (Esquereda et al., 2024) ($p = 0.002$), and Study 14 (Carrard et al., 2024) ($p < 0.05$).

Academic effectiveness (AE)/ Personal accomplishment (PA) was found to be lower in females when compared to males in Study 7 (Ilić Živojinović et al., 2020) ($p < 0.05$) and Study 13 (Esquereda et al., 2024) ($p < 0.001$). However, AE was found to be lower in males in Study 14 (Carrard et al., 2024) ($p < 0.05$). AE/PA was found to be non-significantly associated with gender in Studies 3 (Carrard et al., 2022) (p-value not provided), 8 (Gil-Calderón et al., 2021) ($B = 0.9$, 95% CI -0.16–1.9, $p = 0.1$), 10 (Macilwrait and Bennett, 2018) (p-value not provided), and 12 (Kilic et al., 2021) ($B = –0.27$, $p = 0.629$).

Depersonalisation (DP)/ Cynicism (CY) was found to be non-significantly associated with gender in Study 3 (Carrard et al., 2022) (p-value not provided), Study 8 (Gil-Calderón et al., 2021) ($B = –0.59$, 95% CI –1.65–0.46, $p = 0.27$), Study 10 (Macilwrait and Bennett, 2018)(p-value not provided), and Study 12 (Kilic et al., 2021) ($B = 0.01$, $p = 0.984$).

Study 2 (Aker and Şahin, 2022) ($p = 0.352$), Study 6 (Capdevila-Gaudens et al., 2021) ($p > 0.05$), Study 11 (Nteveros et al., 2020) ($p = 0.525$) and Study 15 (Scheepers, Hilverda and Vollmann, 2024) ($p > 0.05$) found no significant associations between gender and burnout.

ACADEMIC PERFORMANCE

11 included studies investigated the relationship between academic performance and burnout rates in medical students. Overall, students who achieved higher academic performance and were more satisfied with their performance tend to experience lower burnout rates. Objective academic performance in the included studies is defined by examination results, deciles, and average grades.

Five studies indicated that higher academic performance was associated with increased burnout. Studies 1 (Atienza-Carbonell et al., 2022) ($r = –0.242$, $p < 0.001$), 2 (Aker and Şahin, 2022) ($r = –0.39$, $p < 0.001$), and 6 (Capdevila-Gaudens et al., 2021) (OR(95%CI) = 2.163(1.851–2.528), $p < 0.001$), found that medical students with objectively higher academic performance were less likely to experience burnout. Study 7 (Ilić Živojinović et al., 2020) found that a

higher average grade was associated with significantly decreased DP (r_s = –0.094, $p < 0.05$), and increased PA (r_s = 0.121, $p < 0.01$), and a higher number of passed exams was associated with lower EE (r_s = –0.201, $p < 0.01$) and DP (r_s = –0.144, $p < 0.01$). Study 16 (Ilic and Ilic, 2023) found that male students with a low average grade experienced higher burnout (OR(05%CI) = 2.44(1.14–5.23), $p = 0.022$). Study 10 (Macilwrait and Bennett, 2018) found that medical students who have never failed a summative examination are likely to experience increased EE ($p = 0.03$), though also higher PE ($p < 0.001$).

Four studies indicated that overall academic performance did not affect burnout significantly. Study 5 (Ilic et al., 2021) found that total average grade did not affect student burnout in male (OR(95%CI) = 0.60(0.33–1.12), $p = 0.109$) or female (OR(95%CI) = 0.77(0.45–1.32), $p = 0.337$) medical students. Study 11 (Nteveros et al., 2020) found that academic performance did not affect student burnout (U = 1688.5, z = 86, $p = 0.391$). Study 16 (Ilic and Ilic, 2023) found that GPA, number of passed exams, or class attendance were not associated with burnout ($p > 0.05$ for all). Similarly, Study 17 (Ilic, Zivanovic Macuzic and Ilic, 2024) found that high total average grade in pre-clinical (OR(95%CI) = 0.69(0.33–1.12), $p = 0.109$) and clinical (OR(95%CI) = 0.77(0.45–1.32), $p = 0.337$) students was not associated with burnout.

Student dissatisfaction with their academic performance showed significant increases in burnout in Study 1 (Atienza-Carbonell et al., 2022) ($p < 0.001$), Study 6 (Capdevila-Gaudens et al., 2021) (OR(95%CI) = 1.713(11.496–1.961), $p < 0.001$), regardless of their actual academic performance, and Study 13 (Esquereda et al., 2024) ($p < 0.001$ for all subscales).

The effect of repeating an academic year is inconclusive as Study 2 (Aker and Şahin, 2022) (t = 3.62, $p < 0.001$) and Study 17 (Ilic, Zivanovic Macuzic and Ilic, 2024) (OR(95%CI) = 1.7(0.95–3.03), $p = 0.073$ in clinical students) found significantly increased burnout in repeating medical students. However, Study 5 (Ilic et al., 2021) found no statistically significant difference in burnout rates between repeating and non-repeating students (OR(95%CI) = 1.62(0.84–3.10), $p = 0.148$ for males and OR(95%CI) = 1.70(0.95–3.03), $p = 0.073$ for females), along with Study 16 (Ilic and Ilic, 2023) (OR(95%CI) = 1.51(0.75–5.36), $p = 0.244$).

LEARNING ENVIRONMENT

Five studies investigated the relationship between the learning environment and burnout. An increased sense of community and belonging is associated with decreased burnout rates in medical students, though associations between participation in recreational social activities and burnout are inconsistent.

Study 2 (Aker and Şahin, 2022) and Study 9 (Thun-Hohensteinet al., 2021) showed that students with an increased sense of belonging and community at

their school experienced lower burnout ($r = –0.25$, $p < 0.001$ and $p < 0.01$ respectively).

Studies 2, 5, and 6 investigated the relationship between involvement in extracurricular and social activities and burnout. Study 2 (Aker and Şahin, 2022) found that membership of a student club was not significantly associated with burnout rates (t = 1.86, $p = 0.066$). Study 5 (Ilic et al., 2021) showed that participation in recreational activities is not significantly associated with burnout (OR(95%CI)–0.68(0.25–1.85), $p = 0.452$ for males and OR(95%CI) = 1.71(0.99–2.95), $p = 0.055$ for females). However, Study 6 (Capdevila-Gaudens et al., 2021) found that students who have low satisfaction with such social activities are associated with higher levels of burnout (OR(95%CI) = 1.667(1.411–1.969), $p < 0.001$).

Study 19 (Gaume et al., 2024) found that M3, the domain associated with studies and work-life balance, was significantly associated with higher EE ($p < 0.0001$), and with M4, the domain comprised mainly of the burnout subscales ($p < 0.001$).

HEALTH

MENTAL HEALTH: ANXIETY, DEPRESSION, STRESS

Nine studies investigated the relationship between anxiety, depression, stress and burnout rates. The presence of depression, anxiety, stress, and worse overall mental health was found to be significantly associated with experiencing burnout in medical students.

Depression was found to be associated with higher rates of burnout in Study 4 (Fitzpatrick et al., 2019) ($p < 0.001$), Study 6 (Capdevila-Gaudens et al., 2021) (OR(95%CI) = 3.77(3.242–4.385), $p < 0.001$), and Study 20 (D'Alva-Teixeira, Picó-Pérez and Morgado, 2023) ($p < 0.001$). Study 20 (D'Alva-Teixeira, Picó-Pérez and Morgado, 2023) also found that anxiety was significantly associated with higher burnout ($p < 0.001$). Anxiety trait ($p = 0.034$) (i.e. the anxiety level as a personality characteristic), as opposed to anxiety state ($p = 0.55$) (i.e. the anxiety level in response to an event), was found to be associated with higher rates of burnout in Study 6 (Capdevila-Gaudens et al., 2021).

Study 12 (Kilic et al., 2021) found that increased levels of perceived stress are associated with higher EE ($B = 0.41$, $p = 0.001$), CY ($B = 0.37$, $p < 0.001$) and lower rates of AE ($B = –0.18$, $p = 0.001$). Study 7 (Ilić Živojinović et al., 2020) found that a worse mental health score was associated with higher EE ($r_s = 0.381$, $p < 0.01$) and DP ($r_s = 0.296$, $p < 0.01$) and a lower AE ($r_s = –0.211$, $p < 0.01$). Mental health was found to be significantly associated with EE (OR(95%CI) = 1.50 (1.13–1.98), $p = 0.005$) and DP (OR(95%CI) = 1.40 (1.03–1.92), $p = 0.034$), but not with AE (OR(95%CI) = 1.13 (0.36–1.48), $p = 0.368$). Study 11 (Nteveros et al., 2020) found that worse mental health scores were

significantly associated with higher burnout rates (U = 1002, z = 5.33, $p < 0.001$). Study 19 (Gaume et al., 2024) found that M1, the factor associated with depression, suicidal ideation, and anxiety, was significantly associated with M4, the factor associated with higher EE and CY and lower AE ($p < 0.001$).

Study 14 (Carrard et al., 2024) found that students who utilised emotion-focused coping demonstrated significantly higher EE (OR(95%CI) = 0.42 (0.37–0.47), $p < 0.001$), higher CY (OR(95%CI) = 0.28 (0.23–0.32), $p < 0.001$), and lower AE(OR(95%CI) = –0.30 (–0.34 – –0.25), $p < 0.001$). Students who utilised problem-focused (OR(95%CI) = 0.36 (0.27–0.44), $p < 0.001$) and help-focused (OR(95%CI) = 0.12 (0.05–0.18), $p < 0.001$) coping demonstrated significantly lower AE.

Study 15 (Scheepers, Hilverda and Vollmann, 2024) found that students with higher life satisfaction showed significantly lower burnout overall ($p < 0.001$).

PHYSICAL HEALTH: EXERCISE AND PHYSICAL ACTIVITY

Four studies investigated associations between physical activity and burnout. Most studies found no significant associations between physical activity levels and burnout rates overall.

Study 5 (Ilic et al., 2021) found that male and female students partaking in sports activities experienced no differences in burnout rates when compared to students not partaking in sports activities (OR(95%CI) = 1/36(0.74–2.52), $p = 0.321$ for males and OR(95%CI) = 1.12(0.60–2.08), $p = 0.719$ for females). In Study 11 (Nteveros et al., 2020), no significant associations were found between regular exercise and burnout rates (F = 0.24, $p = 0.624$), or any of the burnout domains ($p = 0.352$ for EE, $p = 0.8$ for CY, and $p = 0.462$ for EF). Total exercise per week (U = 649.5, z = 0.06, $p = 0.95$), weight (U = 2307.5, z = 0.5, $p = 0.621$), and BMI (U = 2304.5, z = 0.51, $p = 0.613$) were also shown to have no statistically significant associations with burnout.

Physical activity was found to increase PE ($p < 0.01$) only in Study 10 (Macilwrait and Bennett, 2018). Study 14 (Carrard et al., 2024) found that physical activity was significantly associated with reduced EE only (OR(95%CI) = –0.07(–0.14 – –0.01), $p < 0.05$).. Study 11 (Nteveros et al., 2020) ($p = 0.613$) and Study 14 (Carrard et al., 2024) ($p > 0.05$ for all subscales) found that BMI is not associated with burnout.

SUPPORT

Of the seven studies investigating the association between perceived support and burnout, all found a significant relationship between lower perceived social or familial support and higher levels of burnout.

Study 6 (Capdevila-Gaudens et al., 2021) found that students with ‘problems’ in their relationships with family reported higher burnout rates

(OR(95%CI) = 1.181(1.020–1.366), p = 0.026). Study 8 (Gil-Calderón et al., 2021) found that increased family support was significantly associated with lowered EE (B(95%CI) = –0.40(–0.64 – –0.15), p = 0.002), DP (B(95%CI) = –0.59(–0.83 – –0.35), p < 0.001), and higher AE (B(95%CI) = –0.46(–0.72 – –0.24), p < 0.001).

Increased social support was found to be significantly associated with lower levels of burnout. Study 9 (Thun-Hohensteinet al., 2021) found that students with a higher AWLS value of 'community' demonstrated lower levels of burnout (p < 0.01), and Study 15 (Scheepers, Hilverda and Vollmann, 2024) found that students with higher peer support showed lower burnout (p < 0.001).

An increased sense of perceived social support significantly decreased EE (B = –0.05, p = 0.023) and CY (B = –0.06, p = 0.001) and increased AE (B = 0.07, p < 0.001) in Study 12 (Kilic et al., 2021). Study 14 (Carrard et al., 2024) also found students with increased social support demonstrated lower EE (OR(95%CI) = –0.21(–0.31 – –0.12), p < 0.001) and CY (OR(95%CI) = –0.23(–0.32 – –0.14), p < 0.001), and higher AE (OR(95%CI) = 0.34(0.25–0.42), p < 0.001).

DISCUSSION

This review identified gender, academic performance, the learning environment, mental health, and support as factors with significant associations with burnout rates in European medical schools. The discussion will outline four strategies based on the findings of this review that could mediate the effect of the identified factors to reduce burnout in medical students.

STRATEGY ONE: REMOVE SEX-SPECIFIC BIASES REGARDING BURNOUT

This systematic review found inconsistent associations between gender and burnout rates but generally found that female medical students experience more burnout, particularly higher EE, than male medical students.

Gender is an important factor as gendered expectations can contribute to increased workload, stress, and burnout in healthcare (Linzer and Harwood, 2018; Sharp and Whitaker-Worth, 2020). Previous research has shown that females tend to have higher burnout rates than males (Muzafar et al., 2015; Purvanova and Muros, 2010; Stewart et al., 1997). Burnout is expressed differently between males and females. Females are more likely to report EE than males, whereas males are more likely to report DP and CY (Cecil et al., 2014; Costa et al., 2012; Purvanova and Muros, 2010). Women are more likely to have been socialised to utilise support and confide in others (Ptacek, Smith and Zanas, 1992), whereas males are more likely to have been socialised to be independent and minimise emotional displays (Misra and McKean, 2000; Stokes & Wilson, 1984).

Stereotypical beliefs about differences in gender experiences of burnout can be detrimental to all (Hyde, 2005). Females may be passed over for more challenging or stimulating roles within the workplace or higher education environments, and burnout in males may go unnoticed, thus they may not receive the appropriate care when they experience burnout (Lu et al., 2019; Purvanova and Muros, 2010).

IMPLICATION FOR PRACTICE

Both male and female medical students are likely to develop, experience and display burnout differently. Recognising and adjusting for these differences will allow burnout to be identified sooner to provide adequate support for all, which cultural changes from within the educational institution are critical. For females, the culture in medicine must work towards education on how such biases affect women in the workplace (Templeton et al., 2019). For males, the culture must emphasise the importance and opportunities to debrief, discuss and reflect upon the stresses they encounter and increase the utilisation of social support circles in the workplace.

STRATEGY TWO: IMPROVE STUDENTS' SELF-EFFICACY

This review found that students who achieve higher academic performance and are more satisfied with their academic performance tend to have lower burnout rates, whilst students who have had to repeat an academic year are likely to have higher burnout rates. High academic grades can be an antecedent for low student burnout, and students with lower academic performance and lower engagement can experience more CY and feel a sense of inadequacy at school (Paloș, Maricuţoiu and Costea, 2019; Shadid et al., 2020; Salmela-Aro, Kiuru and Nurmi, 2008). University students experience a high amount of stress from an increased demand on time, academic stressors and fear of failure (Cahir & Morris, 1991; Ross, Niebling and Heckert, 1999). High burnout has been shown to be a predictor of poor academic performance (Burr and Dallaghan, 2019; Rana, 2016).

IMPLICATION FOR PRACTICE

Improving academic performance and increasing students' PE could protect medical students from burnout. A strategy to reduce burnout in students with lower, or less satisfaction with, academic performance is to enhance self-efficacy which is the "capabilities to organise and execute the courses of action required to produce given [academic] attainments" (Bandura, 1997, p.3). When students believe they can succeed, they become motivated to engage in tasks to a higher level (Linnenbrink and Pintrich, 2003; Pressley, 2003). A high PE is

associated with an intention to stay in the degree, good academic performance, and expectations of success (Costa et al., 2012).

Students use enactive mastery to influence their sense of self-efficacy, which refers to how students recognise the degree of success on academic tasks (Margolis and Mccabe, 2006). When students have a higher sense of self-efficacy, academic performance improves which is associated with decreased student burnout. Thus, an effective strategy to improve self-efficacy and personal achievement could be to encourage educators to design level-appropriate formative assignments to build students' self-efficacy in preparation for larger summative assessments.

STRATEGY THREE: INCREASE QUALITY AND ACCESS TO EXTRACURRICULAR ACTIVITIES

Students who have a greater sense of belonging to their school, have strong social relationships and an increased sense of community are associated with decreased burnout rates in medical students. The significance of the findings of this review is that fostering a sense of school community should be encouraged.

Fostering a sense of belonging can be used to enhance student wellbeing and reduce burnout (Dopmeijer et al., 2022; Pongtong Puranitee et al., 2022; Xie and Xiao, 2018). A loss of 'social connectedness' has been suggested as a major contributor to burnout in doctors (Southwick and Southwick, 2020). Problems with interpersonal relationships are a common source of stress and contribute to burnout experienced by university students (Bolatov et al., 2022; Cahir & Morris, 1991; Ross, Neibling and Heckert, 1999; Salam, 2014). Poor interpersonal relationships have also been identified as a factor that contributes to burnout in doctors (IsHak et al., 2009).

IMPLICATION FOR PRACTICE

All aspects of university life are critical in affecting and improving student health and wellbeing (Baik, Larcombe and Brooker, 2019). A strategy to improve the learning environment at medical school is to increase the quality and access to extracurricular activities that support students' wellbeing, providing opportunities for socialising and increasing students' sense of belonging to their school.

Students who are not involved in extracurricular activities, due to personal choice, lack of availability, or lack of sufficient time off, tend to experience higher perceived stress and burnout (Shadid et al., 2020; Bolatov et al., 2022; Muzafar et al., 2015). Extracurricular activities, like sports clubs, provide opportunities to maintain communication with like-minded people and provide students with opportunities to find supportive relationships and communities (Cecil et al., 2014). However, burnout level is not necessarily associated with the frequency of involvement, but with the quality of extracurricular activities,

and the quality of engagement with these activities (Bolatov et al., 2022; Sepede et al., 2021).

With the busy medical curriculum, it is important that students have sufficient time to partake in quality extracurricular activities that provide them with the benefits of community and social support, which may encourage a sense of belonging and contribute to decreasing burnout rates.

STRATEGY FOUR: INCREASE QUALITY AND ACCESS TO WELLBEING AND MINDFULNESS WORKSHOPS

Students with depression, anxiety traits, higher levels of stress, worse overall mental health, and who chose not to seek mental health support tend to experience higher burnout rates.

Most medical students and doctors with burnout are unlikely to seek help for their mental wellbeing due to the negative stigma of mental illness and the negative implications of seeking help (Dyrbye et al., 2015; Dyrbye et al., 2020). Students should be encouraged to seek help when experiencing burnout and emotional distress (Dahlin and Runeson, 2007).

The significance of these findings highlights that there is room for increased support for medical students and doctors, and a need to facilitate a healthier environment to discuss mental health and improve access to mental health services.

IMPLICATION FOR PRACTICE

A strategy to improve mental health in medical students is to implement wellbeing workshops that are readily and regularly available to attend throughout the academic year. A lack of university support resources and help has long been associated with higher burnout in medical students (Costa et al., 2012; Roh et al., 2010; Muzafar et al., 2015). There is an unmet need for counselling and support for doctors (Ro et al., 2008).

Studies have found that burnout scores significantly improve after educational courses on mindfulness-based stress reduction for healthcare professionals (Goodman and Schorling, 2012; Wald et al., 2016). Mindfulness based interventions have shown to significantly reduce anxiety and stress in university and medical students (Gallego et al., 2014; Prakash et al., 2016; Smith, 2019; Warnecke et al., 2011) and can also reduce the craving for and subsequent consumption of substances (Abramovitch, Schreier and Koren, 2000; Chiesa and Serretti, 2014).

Programmes teaching stress-prevention strategies should be implemented at early stages to ensure junior doctors are well-equipped for stressors (Abdulghani et al., 2011; Niemi and Vainiomäki, 2006; Tyssen et al., 2005). Many existing wellbeing programs are voluntary and face low student participation rates. Therefore, such preventative wellbeing programs should be

integrated into the medical school curriculum for all years (Lee and Graham, 2001; Wolf, Randall and Faucett, 1988).

IMPLICATIONS FOR FUTURE RESEARCH

Future research into burnout in medical students should focus on conducting longitudinal studies that define and follow identified antecedents, outcomes, and mediators of burnout to contribute to a further systematic review with meta-analysis. Qualitative studies on the factors associated with burnout in medical students would be beneficial in providing richer data that could identify novel factors that the quantitative studies may have missed.

STRENGTHS

One of the main strengths of this systematic review is that all included studies utilise a validated burnout measure in the country of its use (Table 4).

LIMITATIONS

Studies utilise a cross-sectional questionnaire methodology. This methodology ranks low in the hierarchy of evidence as it limits directional causality between the associated factors and burnout. However, the research question of this review does not align with a randomised control trial methodology. It also invites selection bias as students who are struggling with burnout or poor mental health are more likely to respond to such questionnaires. However, with the large overall sample across all included studies, it is expected that the effect of selection bias will be mediated.

The results of this review may not be generalisable to medical students globally.However, this was not the intended purpose of this study. The research question pertains to factors associated with burnout in European medical students only. This is because previous research has acknowledged the significant effect of country and region-specific factors that contribute to burnout in specific populations.

CONCLUSION

The key factors associated with burnout in medical students at European medical schools include academic performance, motivation for studying, the learning environment, mental health, and interpersonal relationships. These modifiable factors should be addressed to prevent the development and reduce the impact of burnout. The implications for practice and recommended strategies are: removing sex-specific biases; improving students' self-efficacy; increasing quality and access to extracurricular activities; and, increasing quality and access to wellbeing and mindfulness workshops.

DECLARATIONS

ETHICAL APPROVAL

An ethical approval is not required for undertaking a systematic review.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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AUTHORS CONTRIBUTIONS

The screening, data extraction and risk of bias assessment process were undertaken predominantly by the first author, who was an intercalating medical student, with support and checks from the supervisor at the time when this systematic review was conducted, adhering the university's guidelines for undertaking a dissertation to obtain course credit for the Masters in Clinical Education.

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