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UK Medical students' mental health and their intention to drop-out: a longitudinal study

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Abstract

Objective: Attrition of medical students is an incredibly important problem feeding into healthcare workforce issues. This study seeks to explore the relationships between various mental health issues and dropout.

Design: This is a longitudinal study where medical students completed an online questionnaire between November 2020 and February 2021 and those who took part were invited (February-May 2021) to complete the questionnaire again three months later.

Settings: Students from nine geographically spread medical schools in the UK took part in this study.

Participants: 792 (71.16%) participants filled in the baseline questionnaire and 407 (51.39%) from these students completed the follow-up survey (385 participants were lost to follow-up).

Outcome measures: Drop-out intentions.

Exposures: Various mental ill-health symptoms using validated scales: emotional exhaustion, insomnia, somatization, hazardous drinking, anxiety /depression, anorexia tendencies, obsessive-compulsive disorder, paranoia, bipolar.

Results: A large number of students met criteria for mental health disorders (e.g., 54.1% insomnia, 37.9% anxiety/depression, 19.4% paranoia) and 19.4% (79) said that they considered dropping out from medical school. Those students who were more emotionally exhausted ($B_{adjusted}$=0.94, p<0.0001), expressed higher anxiety/depression symptoms ($B_{adjusted}$=1.12, p<0.0001), insomnia symptoms ($B_{adjusted}$=0.69, p<0.0001), somatization symptoms ($B_{adjusted}$=0.77, p<0.0001), anorexia tendencies ($B_{adjusted}$=-0.83, p<0.0001), OCD symptoms ($B_{adjusted}$=0.61, p<0.0001), paranoia symptoms ($B_{adjusted}$=0.52, 95% p<0.0001), expressed significantly stronger intentions to leave their medical education. Hazardous drinking and bipolar symptoms did not predict students' intention to drop-out (p>0.05).

Conclusions: A substantial number of UK medical students experienced mental ill-health symptoms, about one in five medical students consider leaving medical school, and mental ill-health symptoms contributed to students' intentions to leave their medical education. Medical schools should improve the learning environment for students and encourage them to seek help to reduce the stigma of mental ill-health symptoms (e.g. through education, signposting). It may be useful for medical schools to help applicants/medical students to understand whether medical school is the right decision for them and provide them with resources should they wish to leave.

Strengths and limitations of this study

- A strength of the study is the elaborate data collection approach, which used inclusive recruitment materials both spoken and written and disseminated across various platforms.
- The various mental health conditions represented in this study bring new insights to the existing discourse in this field.

- Limitation of this survey study is the inability to calculate a response rate due to the recruitment strategy
- The work relies on self-reported data by students.

Introduction

The ever-increasing doctor shortages are a huge cause for concern, with the current shortfall reported as being over 6.4 million doctors worldwide.[1,2] A recent survey of The National Health Service (NHS) in the UK, which has experienced a chronic shortage of doctors over the past decade, reported that four in ten junior doctors wanted to leave the NHS as soon as possible.[3] Doctor shortages have an undeniable impact on healthcare systems – resulting in increased workload, decreased doctors' wellbeing, and a lower quality of care.[4] These environments of chronic stress and decreased morale that occur due to doctors being unable to provide optimal care for patients, in turn increase pressure on existing staff, resulting in them leaving the NHS and further contributing to staff shortages.[5–7] In other words: the continuous shortfall of doctors and increase in vacancies has created a vicious cycle within the workplace.

A complete resolution of the staffing crisis has been deemed to be unlikely for the near future, due to the health and social care sector facing the most acute recruitment and retention crisis in its history. To combat this workforce crisis, medical students – as our future doctors - play a pivotal role. Medical students' attrition rates are reported to vary from 3.8% to 26% in different countries, such as the UK, Pakistan, Saudi Arabia, and Nigeria.[8] Attrition of medical students is therefore an incredibly important problem feeding into healthcare workforce issues. To be better able to address the worldwide doctor shortages, we must understand the reasons why certain students are more likely to leave their medical training, so that we may retain these valuable individuals and prevent future students from dropping out.

There are many similarities between doctors and medical students, specifically their work environments; both populations are subjected to high levels of competition, insufficient support systems and isolation.[9,10] Evidence-based theoretical occupational health psychology models such as the job demands and resources (JD-R) model demonstrate how such a stressful work environment that is high in demands and scarce in resources can trigger stress reactions and hamper motivation and productivity.[11] Thus, the work environment of an individual has a strong impact on their well-being,[12] which may be why around 30-78% of medical students worldwide have been reported to be suffering from mental health issues.[13–15] Despite it being evidenced that medical students are highly likely to face mental health issues and burnout, little research has been conducted into the influence this has on students' drop-out rates. It is particularly uncertain which specific mental health issues have a larger influence on students dropping out of medical school. Therefore, the aim of this study is to explore the relationships between various mental health issues and dropout. This can help us ascertain which medical students need to be prioritised for mental health support with the aim of preventing them from dropping-out of medical school.

Methods

Study setting

This study is a part of a larger research project funded by the British Medical Association (BMA) consisting of a survey, documentary analysis, and interviews.[15–17] The current study will focus on the data obtained through the survey. The reporting follows STROBE reporting guidelines

Data collection

For this study, we selected nine geographically spread medical schools from England, Scotland, Wales and Northern Ireland varying in size and type of curriculum (integrated combining pre-clinical and clinical study years vs non-integrated separating pre-clinical and clinical study years). Students from all study years were invited to fill in a web-based survey (platform: *Online surveys*) between November 2020 and February 2021 and those who took part were invited (February-May 2021) to complete the questionnaire again three months later. Recruitment material was distributed through various channels by medical school staff (e.g., newsletter or lecture announcement). As recruitment strategies varied per school depending on their policies and preferences, it was not possible to calculate response rates. From the 1113 medical students who consented to take part in the study, 310 did not fill in the questionnaire and another 11 were ineligible (9 duplicates, 1 from unparticipating university, 1 missing more than 50% of answers). 792 (71.16%) participants filled in the baseline questionnaire and 407 (51.39%) from these students completed the follow-up survey (385 participants were lost to follow-up).

Patient and Public Involvement statement

The survey was piloted with five medical student volunteers who filled in the survey and provided us with their feedback. After amendments the survey was discussed with advisory group members which consisted of medical students, doctors, other academics, researchers, and practitioners working at organisations responsible for medical education provision and student support. The survey was then finalised based on their feedback.

Questionnaire

The survey included previously validated questionnaires where possible. The survey consisted of demographic variables that were considered empirically or theoretically relevant to the study, a drop-out measure asking medical students about their intention to drop-out in the recent past (i.e. the past month), and mental ill-health measures (see table 1 for a detailed description of the operationalisation of these measures).

Table 1. Overview of variables and measures used in the current study.

Variables	Measure/ Author	No of items/ Scoring	Example item	Cronbach α
Drop-out	Created by authors	1 item (*yes/no*)	Have you considered dropping out of medical school in the past month?	-
Emotional exhaustion	Maslach burnout inventory – General survey for students [18]	5 items, 0 (*never*) to 6 (*every day*)	I feel emotionally drained by my studies	0.894
Insomnia	The Insomnia Severity Index [19]	7 items, 0 *(scores showing no insomnia)* to 4 *(showing severe insomnia)*	How SATISFIED/ dissatisfied are you with your current sleep pattern?	0.866
Somatization	The Somatic Symptom Scale–8 [20]	8 items, 0 (*not at all*) to 4 (*very much*)	During the past 7 days, how much have you been bothered by stomach or bowel problems?	0.770
Hazardous drinking	The Alcohol Use Disorders Identification Test – C [21]	3 items,0 (*never; 1 or 2*) to 4 (*daily or mostly daily; 10 or more*)	How often do you have a drink containing alcohol?	0.780
Anxiety /depression	The Patient Health Questionnaire-4 [22]	4 items, 0 (*not at all*) to 3 (*nearly every day*)	Over the last 2 weeks, how often have you been bothered by little interest or pleasure in doing things?	0.852
Anorexia tendencies	The Eating Disorder Diagnostic Scale [23]	3 items, 0 *(not at all)* and 6 *(extremely)*	Have you had a definite fear that you might gain weight or become fat?	n/a
Obsessive-Compulsive disorder	Obsessive-Compulsive Inventory – Revised [24]	3 items, 0 (*not at all*) to 4 (*extremely*)	I find it difficult to control my own thoughts.	0.916
Paranoia	The persecution and deservedness scale [25]	10 items, 0 (*not at all*) to 4 (*certainly true*)	There are times when I worry that others might be plotting against me.	0.883
Bipolar	Hypomanic Personality Scale [26]	6 items, 0 (*false*) and 1 (*true*)	There have often been times when I had such an excess of energy that I felt little need to sleep at night.	0.713
Demographic characteristics	Self-developed items by the authors of this paper	9 items, Variety of question types (described in Table 2)	Which of the following best describes your gender identity?	n/a

Note. Cronbach α calculated for all baseline participants

Ethics

The project received ethical permission from the UCL Research Ethics Committee (REF: 14983/002).

Analysis

SPSS V26.0 was used for the analysis. Participants were allowed to miss up to 1/3 of data for each scale and mean scores were computed over the remaining items. All scales were approximately normally distributed (skewness and kurtosis between -2 and 2; no extreme outliers). Internal consistency (Cronbach's α) deemed sufficient (>0.7). Exploratory statistics were performed to gain insight in associations between main constructs (see Appendix 1 for results).

Longitudinal data were used to investigate what mental ill-health symptoms were associated with students' drop-out intentions. Unadjusted and adjusted Generalized Estimating Equations (GEE) were performed to investigate what mental ill-health symptoms were associated with students' drop-out intentions. Adjusted models included demographic characteristics. GEE were considered appropriate for handling the longitudinal data as they allowed us to include data from both timepoints and specify dependency between the data from similar subjects. The best fit for the covariance matrix for each analysis was determined by comparing the Fisher scoring of an unstructured covariance matrix to the simpler independent matrix. Missing data were automatically removed from the analysis (<5%). P values <0.05, <0.01, and <0.001 for two-sides tests were calculated and reported, as were the regression coefficient and the 95% confidence interval. We also present results corrected for multiple testing (9 tests, *p* value with Bonferroni correction equals 0.006).

Results

Participants

Please refer to Table 2 for more details on study characteristics.

Table 2. Study characteristics

Variables	**407 Participants N (%) or M (SD)**
Gender (female)	305 (74.9%)
Missing	3 (0.7%)
Age	21.49 (3.24)
Ethnicity (white)	263 (64.6%)
Missing	5 (1.2%)
Sexuality (heterosexual)	311 (76.4%)
Missing	13 (3.2%)
Relationship status (single/never married)	362 (88.9%)
Widening Participation student (yes)	62 (15.2%)
Parents/Guardians/Carers occupation (higher managerial)	324 (79.6%)
University year	
First	121 (29.7%)
Second	74 (18.2%)
Third	58 (14.3%)
Fourth	75 (18.4%)

Fifth	56 (13.8%)
Sixth	22 (5.4%)
Missing	1 (0.2%)
University (UNI)	
UNI1	38 (9.3%)
UNI2	3 (0.7%)
UNI3	127 (31.2%)
UNI4	92 (22.6%)
UNI5	30 (7.4%)
UNI6	16 (3.9%)
UNI7	39 (9.6%)
UNI8	28 (6.9%)
UNI9	34 (8.4%)

19.4% (79) of medical students said that they considered dropping out from medical school. Table 3 presents the prevalence of students meeting screening criteria for mental ill-health in our sample. Over 1 in 2 students were drinking hazardously (60.2%), experienced insomnia symptoms (clinical or subthreshold; 54.1%), somatisation symptoms (medium-very high; 52.1%), had OCD symptoms (51.8%). Nearly half of our participants expressed having anorexia tendencies (44.7%). Approximately 1 in 3 students were emotionally exhausted (36.1%) and had anxiety/depression symptoms (37.9%). 19.4% of students had paranoia symptoms and 2.9% bipolar symptoms.

Table 3. Prevalence of mental ill-health symptoms

		Prevalence	**Cut-off points**
Emotional exhaustion	High	36.1% (147)	The lower, middle and higher tertiles represent 'low', 'moderate' or 'high' emotional exhaustion
	Moderate	34.6% (141)	
	Low	29.2% (119)	
Anxiety/depression symptoms	Severe	12.8% (52)	Severe symptoms: 9–12 Moderate symptoms: 6–8 Mild symptoms: 3–5 No symptoms: 0–2
	Moderate	25.1% (102)	
	Mild	31.2% (127)	
	No symptoms	30.7% (125)	
Insomnia symptoms	Clinical insomnia (severe insomnia)	1.5% (6)	Clinical insomnia (severe insomnia): ≥22 Clinical insomnia (moderate severity): 15–21 Subthreshold insomnia: 8–14 No signs of insomnia: 0–7
	Clinical insomnia (moderate severity)	17% (69)	
	Subthreshold insomnia	35.6% (145)	
	No signs of insomnia	44% (179)	
Somatisation symptoms	Very high	14.7% (60)	Very high: 16–32 High: 12–15 Medium: 8–11 Low: 4–7 No to minimal symptoms: 0–3
	High	13.8% (56)	
	Medium	23.8% (97)	
	Low	30.2% (123)	
	No to minimal symptoms	16.5% (67)	
Hazardous drinking	Yes	60.2% (245)	"Yes" was coded if 3-4 or more drinks are consumed containing alcohol on a
	No	39.6% (161)	

			typical day of drinking or consumptions of 6 or more drinks on one occasion
Anorexic tendencies	Yes	44.7% (182)	"Yes" was coded if scoring 4 or more on expressing a definite fear of gaining weight or becoming fat and 4 or more aspects around weight/body shape influencing self-evaluation
	No	55% (224)	
OCD symptoms	Yes	51.8% (211)	Yes: ≥4
	No	47.9% (195)	
Paranoia symptoms	Yes	19.4% (79)	Yes: >mean+1 SD No: < mean+1 SD
	No	80.6% (328)	
Bipolar symptoms	Yes	2.9% (12)	Yes: > 6 No: < 6
	No	96.8% (394)	

Predicting students' intentions to drop-out

All except two measures mental ill-health symptoms predicted medical students' drop-out intentions. Those students who were more emotionally exhausted ($B_{adjusted}$= 0.94, 95% CI: 0.68 to 1.21, p<0.0001), expressed higher anxiety/depression symptoms ($B_{adjusted}$=1.12, 95% CI: 0.84 to 1.39, p<0.0001), insomnia symptoms ($B_{adjusted}$=0.69, 95% CI: 0.43 to 0.94, p<0.0001), somatization symptoms ($B_{adjusted}$=0.77, 95% CI: 0.48 to 1.06, p<0.0001), anorexia tendencies ($B_{adjusted}$=-0.83, 95% CI: -1.29 to -0.38, p<0.0001), OCD symptoms ($B_{adjusted}$=0.61, 95% CI: 0.44 to 0.79, p<0.0001), paranoia symptoms ($B_{adjusted}$=0.52, 95% CI: 0.31 to 0.73, p<0.0001), expressed significantly stronger intentions to leave their medical education. Hazardous drinking and bipolar symptoms did not predict students' intention to drop-out (p>0.05).

Table 4. Association between intentions to drop out and mental ill-health symptoms (controlling for socio-demographic characteristics).

Emotional exhaustion	**0.94 (0.68 to 1.21)*****sg**								
Anxiety/depression symptoms		**1.12 (0.84 to 1.39)***** sg**							
Insomnia symptoms			**0.69 (0.43 to 0.94)***** sg**						
Somatisation symptoms				**0.77 (0.48 to 1.06)***** sg**					
Hazardous drinking *(yes)*					-0.36 (-0.81 to 0.10)				
Anorexic tendencies *(yes)*						**-0.83 (-1.28 to -0.38)***** sg**			
OCD symptoms							**0.61 (0.44 to 0.79)***** sg**		
Paranoia symptoms								**0.52 (0.31 to 0.73)***** sg**	
Bipolar symptoms									0.51 (-0.27 to 1.28)
Gender *(Female)*	0.06 (-0.54 to 0.65)	0.011 (-0.46 to 0.68)	-0.08 (-0.60 to 0.45)	0.14 (-0.41 to 0.69)	-0.19 (-0.71 to 0.34)	0.14 (-0.41 to 0.69)	0.10 (-0.43 to 0.64)	-0.08 (-0.61 to 0.45)	0.46 (-0.66 to 0.39)
Ethnicity (*BME*)	0.50 (-0.02 to 1.02)	0.49 (-0.01 to 0.99)	**0.53 (-0.03 to 1.03)***	0.42 (-0.08 to 0.92)	0.31 (-0.17 to 0.80)	0.47 (-0.01 to 0.95)	**0.66 (0.27 to 1.16)****	0.45 (-0.43 to 0.73)	0.46 (-0.03 to 0.94)
Sexual orientation (*LGBTQ*)	0.17 (-0.42 to 0.76)	0.25 (-0.35 to 0.85)	0.25 (-0.36 to 0.86)	0.23 (-0.36 to 0.81)	0.03 (-0.54 to 0.61)	0.15 (-0.44 to 0.74)	0.13 (-0.48 to 0.74)	**-0.71 (-1.35 to -0.07)***	0.09 (-0.49 to 0.66)
Relationship status (*Married/co-habiting/civil partnership*)	-0.53 (-1.11 to 0.05)	-0.44 (-1.15 to 0.26)	-0.72 (-1.33 to -0.11)	**-0.72 (-1.36 to -0.09)***	**-0.72 (-1.34 to -0.15)***	**-0.72 (-1.34 to -0.10)***	**-0.67 (-1.32 to -0.02)***	0.61 (0.02 to 1.20)	**-0.69 (-1.29 to -0.09)***
Widening participation (*No*)	0.51 (-0.10 to 1.12)	0.52 (-0.11 to 1.15)	**0.59 (0 to 1.17)***	0.58 (-0.02 to 1.18)	**0.72 (0.13 to 1.32)***	**0.74 (0.15 to 1.33)***	0.57 (-0.01 to 1.14)	**0.61 (0.02 to 1.20)***	**0.69 (0.10 to 1.28)***
Medical school year	**-0.25 (-0.39 to -0.11)*****sg**	**-0.18 (-0.33 to -0.03)***	**-0.17 (-0.30 to -0.04)***	-0.13 (-0.27 to 0)	**-0.16 (-0.29 to -0.03)***	**-0.16 (-0.29 to -0.02)***	**-0.17 (-0.31 to -0.03)***	**-0.14 (-0.28 to -0.01)***	**-0.15 (-0.28 to -0.01)***

Note: Drop out *ref* group 0=no; *** $p<0.0001$; ** $p<0.001$; *$p<0.05$; Bonferroni correction indicates *sg* (9 tests, p value with Bonferroni correction equals 0.006)

Discussion

The pressure on health services is bound to increase in the future: considering the ageing population the NHS Long Term Plan foresees a healthcare shortage of 260,000-360,000 staff by 2036/37.[27] Dropout across the medical training pathway, alongside practising healthcare professionals leaving the NHS early in their careers, is contributing to the staffing concerns and service pressures.[28] To better understand why medical students are dropping out of medical school, this study aimed to explore to what extent mental ill-health symptoms lead to medical student attrition intentions. The study revealed that a substantial number of UK medical students experienced mental ill-health symptoms, about one in five medical students consider leaving medical school, and that mental ill-health symptoms contributed to students' intentions to leave their medical education.

The prevalence for each of the mental health conditions varied in our sample, but results showed that a substantial number of medical students met screening criteria for mental ill-health. Over half of the students were drinking hazardously (60.2%), experienced insomnia (54.1%), somatization (52.3%), or OCD symptoms (51.8%). Over one in five students were experiencing anorexia tendencies, emotional exhaustion, or depressive or anxiety symptoms. These results may partly be attributed to the study demographic; medical students are young adults that face significant life challenges and often prioritise socialising over healthy life-choices.[29,30] Drinking and staying up late are therefore behaviours often seen amongst students. In fact, studies show that undergraduate students in the UK and Ireland consume similar amounts of alcohol as our study population.[31] However, the pressures from medical school and students' learning environments may exacerbate mental ill-health symptoms.[15]

This study additionally revealed that 19.4% of medical students considered dropping out from medical school. This is a higher number than actual medical student attrition, which has been estimated to be around 5%.[32] However, following the principles of the Theory of Planned Behaviour, we know that intentions are proxy to action [33] and considering the recent challenges of the pandemic and the difficulties after, the percentage of actual attrition might potentially have increased. Furthermore, the fact that students are considering leaving medical school is a sign that students may be unhappy during their education, even when staying in medical school. Students that complete medical school whilst doubting about their career trajectory, may be more inclined to drop-out in postgraduate training. This feeds into an already existing problem of attrition in postgraduate training: the number of doctors that pause their training after completing Foundation training has doubled from 34% in 2011/12 to 70% in 2020/21.[28] From this cohort of students pausing training, it is thought that 12% will not return to practice.[28] This is not only problematic for healthcare systems, but also for the medical students themselves. Dropping out of medical school can have significant personal, financial and psychological consequences for the individual. There is also the financial cost to the taxpayer, and the time and effort wasted by educators.[34]

To combat the loss of trainees and support the workforce in the future, the NHS Long Term Plan ambitiously sets out to double the number of medical school training spots, with the intention of achieving 15,000 places in 2031/32.[27] Furthermore, plans are to shorten the curriculum from the current 5 and 6-years to 4 years and to introduce medical school apprenticeships, with a focus on attracting those from underrepresented backgrounds. These measures may seem promising at first glance, but the workload of medical students is already

concerning in the current 5 and 6 year curricula,[16] so adding pressure by shortening training may lead to increased dropout rates.

This reasoning can be further supported by our study results, but also by occupational health psychology theories. Our study linked mental ill-health to increased intentions to drop-out and specifically those students that were emotionally exhausted, had anxiety/depression symptoms, insomnia, somatisation symptoms, anorexia tendencies, obsessive-compulsive or paranoia symptoms were more likely to consider dropping out from medical school. Using occupational health psychology theories such as the JDR model can help to better understand the results of this study. According to the JDR model, the higher the job demands and the lower the resources in a work environment, the more likely is the occurrence of stress and a lack of work engagement and general well-being.[35] In turn, this can impact employees' productivity and potentially their decision to stay in or leave their workplace.[36,37] Although this model is rarely used in the medical undergraduate setting,[38] similarly to workplace students' learning environment brings on demands and resources that can impact students' wellbeing. From a JDR model perspective, increasing demands such as the proposed curriculum change without offering sufficient resources to handle these demands can be detrimental to medical students.

The approach taken in this study – exploring a variety of specific mental ill-health symptoms – is novel and differs from studies linking more generic mental health indicators to drop-out, such as a recent longitudinal study of Thai medical students.[39] Authors collected medical students' self-reported mental health screening data upon admission and found a significant association between students' mental health and drop-out. Our specific approach allows for differentiation between the various mental health conditions, bringing insight in which student groups might be most benefitted by support. Those mental ill-health issues not related to drop-out, such as hazardous drinking and experiencing bipolar symptoms, might require a different approach or policy when trying to reduce attrition in medical school.

Implications

The findings of this study suggest that medical students' mental health is an important contributor to students dropping out and reinforces the importance of supporting students at medical school. Mental health symptoms can be difficult to pinpoint, like emotional exhaustion, somatization symptoms and insomnia, due to students actively trying to conceal their problems. To combat this, regular well-being checks can be implemented through meetings with personal tutors. The various mental health symptoms that have been found to predict drop out are particularly difficult to recognise in medical students, due to the "toxic" and competitive work culture of medical school normalising the idea of individuals experiencing them. We know the context in which medical students learn impacts their wellbeing.[15,40] Medical schools should improve the learning environment for students and encourage them to seek help to reduce the stigma of mental health symptoms. This can be through educating students on warning signs of mental decline through workshops or courses, and signposting clearly where they can go for help. Medical schools should also actively clarify that seeking help will not jeopardise their careers, rather improve their chances of completing their degree. There should be no discrimination against individuals with these diagnoses, as with appropriate interventions and more supportive learning environments many students can flourish.

While medical schools can take action to improve their environment, it is important to acknowledge that medical school is not for everyone and to provide resources for those medical students who are deciding whether to continue and those who choose to leave. It may be useful for medical schools to have systems in place that can help new applicants (and existing medical students) consider whether medical training is for them by setting realistic expectations of the demands of medical training.

Strengths and limitations

The sample in this study may be skewed as students with mental health issues may be keener to respond. Although the researchers tried their best to work with medical schools to guarantee a representative sample, due to the role of medical schools in the recruitment process the researchers were unable to fully control recruitment strategy. A strength of the study is the elaborate data collection approach, which used inclusive recruitment materials both spoken and written and disseminated across various platforms. Furthermore, the geographical and demographic spread represented in the sample is more likely to contribute to the generalisability of results.

The various mental health conditions represented in this study bring new insights to the existing discourse of similar work in this field. However, some of the conditions, such as experiencing bipolar symptoms, were only prevalent for a small subset of the sample. This means that analysis conducted for these conditions were less reliable and this may explain why we did not find any significant links for those experiencing bipolar symptoms.

Furthermore, the work relies on self-reported data by students. Considering the sensitive nature of the research, this may mean that students underreported their mental ill-health symptoms. In terms of the drop-out measure, we were only able to ask about students' intentions. We consider this relevant as even having the intention to leave medical school is an important measure in of itself and an indication that students are unhappy. However, for future research, it is key to consider actual drop-out statistics to get a better sense of the true scale of the problem.

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Competing interests

None.

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Data sharing

The data generated and analysed during the current study are not available as consent for this has not been granted by participants.

Author contribution

Concept and design: AM, MS, AR.
Acquisition, analysis, or interpretation of data for the work: AM, MS, NL.
Drafting and critical revision of the manuscript: all authors.
Critical revision of the manuscript: all authors.
Final approval: all authors.

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APPENDIX 1.

TABLE 1. Differences in mental health (Time-1: left; Time-2: right) between students with and without intentions to drop out (Time-2)

	Drop out (M/SD or N/%)			Drop out (M/SD or N/%)		
	No	Yes	Statistics	No	Yes	Statistics
Emotional exhaustion	**3.61 (1.33)**	**4.58 (1.02)**	**t(404)= -6.959, *p*<0.001**	**3.80 (1.28)**	**4.96 (1.23)**	**t(404)= -7.972, *p*<0.001**
Depression/anxiety symptoms	**1.09 (0.76)**	**1.58 (0.86)**	**t(404)= -4.934, *p*<0.001**	**1.03 (0.79)**	**1.86 (0.93)**	**t(403)= -7.956, *p*<0.001**
Insomnia symptoms	**1.19 (0.82)**	**1.59 (0.83)**	**t(404)= -3.782, *p*<0.001**	**1.16 (0.79)**	**1.71 (1.01)**	**t(404)= -4.383, *p*<0.001**
Somatization symptoms	**1.06 (0.71)**	**1.42 (0.81)**	**t(403)= -3.897, *p*<0.001**	**1.01 (0.70)**	**1.52 (0.91)**	**t(404)= -4.793, *p*<0.001**
Hazardous drinking (Yes)	200 (81.6%)	45 (18.4%)	$\chi^2(1,405) = 0.147$, $p=0.701$	193 (82.1%)	42 (17.9%)	$\chi^2(1,402) = 0.001$, $p=0.981$
Anorexia tendencies (Yes)	**137 (75.7%)**	**44 (24.3%)**	**$\chi^2(1,405) = 8.748$, $p=0.003$**	**129 (73.3%)**	**47 (26.7%)**	**$\chi^2(1,404) = 15.708$, $p<0.001$**
Obsessive compulsive symptoms	**1.23 (1.09)**	**1.81 (1.19)**	**t(404)= -4.089, *p*<0.001**	**1.08 (1.20)**	**1.88 (1.28)**	**t(404)= -4.965 *p*<0.001**
Paranoia symptoms	**1.11 (0.88)**	**1.60 (1.01)**	**t(404)= -4.171, *p*<0.001**	**1.05 (0.90)**	**1.74 (1.10)**	**t(404)= -5.728, *p*<0.001**
Bipolar symptoms	**0.25 (0.26)**	**0.34 (0.32)**	**t(404)= -2.142, *p*=0.008**	**0.23 (0.27)**	**0.29 (0.30)**	**t(404)= -1.690, *p*=0.046**

TABLE 2. Link between sociodemographic characteristics and students' intentions to drop out (Time 2).

		N(%) or M/SD		Statistics
		Drop out (no)	Drop out (yes)	
Gender	Male	80 (80.8%)	19 (19.2%)	χ^2 (1,403) = 0.224, p=0.636
	Female	252 (82.9%)	52 (17.1%)	
Ethnicity	White	211 (80.2%)	52 (19.8%)	χ^2 (1,401) = 1.712, p=0.191
	Ethnic minority	118 (85.5%)	20 (14.5%)	
Age		21.51 (3.11)	21.41 (3.82)	U=11550.5, p=0.503
Sexual orientation	Heterosexual	257 (82.9%)	53 (17.1%)	χ^2 (1,393) = 0.932, p=0.334
	LGBTQ	65 (20.2%)	18 (21.7%)	
Relationship status	Single	**303 (83.9%)**	**58 (16.1%)**	**χ^2 (1,406) = 8.089, p=0.004**
	In relationship	**30 (66.7%)**	**15 (33.3%)**	
Parental occupation	Higher managerial	**273 (84.5%)**	**50 (15.5%)**	**χ^2 (1,406) = 6.698, p=0.010**
	Other	**60 (72.3%)**	**23 (27.7%)**	
Widening Participation	Yes	**44 (71%)**	**18 (29.0%)**	**χ^2 (1,406) = 6.061, p=0.014**
	No	**289 (84.0%)**	**55 (16.0%)**	
Year of medical school		**2.92 (1.65)**	**2.46 (1.36)**	**t(403)= 2.533, p=0.006**
University	UNI 1	32 (84.2%)	6 (15.8%)	χ^2 (8,406) = 9.624, p=0.292
	UNI 2	3 (100%)	0 (0.0%)	
	UNI 3	105 (83.3%)	21 (16.7%)	
	UNI 4	72 (78.3%)	20 (21.7%)	
	UNI 5	22 (73.3%)	8 (26.7%)	
	UNI 6	15 (93.8%)	1 (6.3%)	
	UNI 7	30 (76.6%)	9 (23.1%)	
	UNI 8	27 (96.4%)	1 (3.6%)	
	UNI 9	27 (79.4%)	7 (20.6%)	

TABLE 3. Link between sociodemographic characteristics and students' intentions to mental health (Time 1).

		Emotional exhaustion		Depression/anxiety symptoms		Insomnia symptoms		Somatization symptoms		OCD symptoms	
		M(SD)	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**
Gender	Male	**3.50 (1.30)**	**t(402)= -2.442, *p*=0.008**	**0.96 (0.78)**	**t(402)= -2.931, *p*=0.002**	1.20 (0.82)	t(402)= -0.862, *p*=0.195	**0.77 (0.60)**	**t(401)= -6.141, *p*<0.001**	**1.04 (1.05)**	**t(402)= -2.980, *p*=0.002**
	Female	**3.87 (1.32)**		**1.23 (0.79)**		1.28 (0.84)		**1.23 (0.75)**		**1.42 (1.14)**	
Ethnicity	White	3.83 (1.36)	t(400)= -0.843, *p*=0.200	1.20 (0.80)	t(400)= 1.056, *p*=0.146	1.24 (0.82)	t(400)= -1.032, *p*=0.151	1.16 (0.77)	t(399)= 1.431, *p*=0.077	**1.26 (1.12)**	**t(400)= -1.900, *p*=0.029**
	Ethnic minority	3.71 (1.26)		1.12 (0.80)		1.33 (0.87)		1.05 (0.68)		**1.48 (1.15)**	
Age		$r_s(407)$ = 0.062, *p*=0.215		$r_s(407)$ = 0.020, *p*=0.692		$r_s(407)$ = -0.011, *p*=0.825		$r_s(407)$ = -0.081, *p*=0.102		$r_s(407)$ = -0.043, *p*=0.383	
Sexual orientation	Heterosexual	3.75 (1.32)	t(392)= -1.160, *p*=0.123	**1.11 (0.79)**	**t(392)= -3.399, *p*<0.001**	**1.20 (0.82)**	**t(392)= -2.772, *p*=0.003**	**1.06 (0.72)**	**t(391)= -3.124, *p*<0.001**	**1.26 (1.14)**	**t(392)= -2.081, *p*=0.019**
	LGBTQ	3.94 (1.36)		**1.44 (0.79)**		**1.47 (0.83)**		**1.34 (0.79)**		**1.55 (1.07)**	
Relationship status	Single	3.76 (1.30)	t(405)= -1.058, *p*=0.145	**1.15 (0.79)**	**t(405)= -1.866, *p*=0.031**	1.27 (0.85)	t(405)= 0.016, *p*=0.494	1.12 (0.74)	t(404)= -0.099, *p*=0.461	1.34 (1.13)	t(405)= 0.010, *p*=0.496
	In relationship	3.99 (1.51)		**1.38 (0.85)**		1.26 (0.73)		1.13 (0.74)		1.33 (1.10)	
Parental occupation	Higher managerial	3.79 (1.31)	t(405)= -0.120 *p*=0.452	1.15 (0.79)	t(405)= -1.393, *p*=0.082	1.25 (0.84)	t(405)= -0.687, *p*=0.246	1.10 (0.73)	t(404)= -1.231, *p*=0.109	**1.27 (1.10)**	**t(405)= -2.253, *p*=0.012**
	Other	3.80 (1.42)		1.32 (0.82)		1.32 (0.82)		1.21 (0.80)		**1.58 (1.20)**	
Widening Participation	Yes	**4.15 (1.25)**	**t(405)= 2.326 *p*=0.010**	**1.41(0.83)**	**t(405)= 2.553, *p*=0.006**	**1.54 (0.86)**	**t(405)= 2.864, *p*=0.002**	**1.29 (0.80)**	**t(404)= 1.937, *p*=0.027**	**1.76 (1.11)**	**t(405)= 3.249, *p*=0.001**
	No	**3.72 (1.33)**		**1.13 (0.79)**		**1.22 (0.82)**		**1.09 (0.73)**		**1.26 (1.12)**	

		Emotional exhaustion		Depression/anxiety symptoms		Insomnia symptoms		Somatization symptoms		OCD symptoms	
		M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic
University year		**$r_p(406) = 0.099$, $p=0.046$**		$r_p(406) = -0.014$, $p=0.785$		$r_p(406) = -0.028$, $p=0.577$		**$r_p(405) = -0.134$, $p=0.007$**		$r_p(406) = -0.018$, $p=0.721$	
University	UNI 1	4.06 (1.41)	**$F(8,406)= 0.741$, $p=0.655$**	1.39 (0.93)	$p=0.201$	1.52 (0.90)	$F(8,406) = 4.116$, $p<0.001$	1.31 (0.89)	$F(8,405) = 0.897$, $p=0.519$	1.42 (1.29)	$F(8,406) = 1.514$, $p=0.150$
	UNI 2	4.80 (0.20)		1.58 (0.72)		3.14 (0.38)[a]		.46 (.58)		2.89 (0.38)	
	UNI 3	3.72 (1.29)		1.04 (0.76)		1.24 (0.83)[a]		1.09 (0.74)		1.40 (1.09)	
	UNI 4	3.89 (1.25)		1.23 (0.76)		1.32 (0.80)		1.02 (0.67)		1.34 (1.09)	
	UNI 5	3.68 (1.33)		1 (0.68)		0.91 (0.71)[a]		1.03 (0.77)		1.18 (1.12)	
	UNI 6	3.54 (1.40)		1.36 (0.47)		1.66 (0.88)		1.30 (0.80)		1.60 (0.88)	
	UNI 7	3.63 (1.34)		1.15 (0.85)		1.10 (0.76)[a]		1.14 (0.76)		1.17 (1.18)	
	UNI 8	3.90 (0.51)		1.30 (0.88)		1.25 (0.81)		1.25 (0.75)		1.42 (1.22)	
	UNI 9	3.70 (1.47)		1.26 (0.92)		1.10 (0.77)[a]		1.17 (0.68)		.99 (1.09)	

		Paranoia symptoms		Bipolar symptoms		Hazardous drinking (yes)		Anorexic tendencies (yes)	
		M(SD)	**Statistic**	**M(SD)**	**Statistic**	**N(%)**	**Statistic**	**N(%)**	**Statistic**
Gender	Male	1.08 (0.84)	t(402)= -1.426, *p*=0.077	0.23 (0.23)	t(402)= -1.335, *p*=0.091	63 (63.6%)	χ^2 (1, 403) = 1.204, *p*=0.402	**20 (20.2%)**	**χ^2 (1, 403) = 32.391, *p*<0.001**
	Female	1.23 (0.93)		0.27 (0.28)		179 (58.9%)		**161 (63%)**	
Ethnicity	White	1.19 (0.93)	t(400)= 0.127, *p*=0.449	0.28 (0.28)	t(400)= 1.226, *p*=0.111	**183 (69.8%)**	**χ^2 (1, 401) = 22.879, *p*<0.001**	118 (44.9%)	χ^2 (1, 401) = 0.023, *p*=0.881
	Ethnic minority	1.18 (0.91)		0.25 (0.26)		**60 (43.2%)**		63 (45.7%)	
Age		r_s(407) = -0.086, *p* = 0.082		**r_s(407) = -0.251, *p*<0.001**		**U=17302, *p*=0.035**		U=18486.5, *p*=0.104	
Sexual orientation	Heterosexual	**1.11 (0.91)**	**t(392)= -2.874, *p*=0.002**	**0.24 (0.25)**	**t(392)= -3.735, *p*<0.001**	181 (58.4%)	χ^2 (1, 393) = 2.931, *p*=0.089	**130 (41.9%)**	**χ^2 (1, 393) = 5.708, *p*=0.017**
	LGBTQ	**1.44 (0.92)**		**0.37 (0.31)**		57 (68.7%)		**47 (56.6%)**	
Relationship status	Single	1.20 (0.93)	t(405)= .273, *p*=0.393	**0.27 (0.28)**	**t(405)= 1.863, *p*=0.034**	219 (60.7%)	χ^2 (1, 406) = 0.139, *p*=0.709	166 (46.05)	χ^2 (1, 406) = 1.759, *p*=0.185
	In relationship	1.16 (0.88)		**0.21 (0.22)**		26 (57.8%)		16 (35.6%)	
Parental occupation	Higher managerial	1.16 (0.91)	t(405)= -1.773, *p*=0.038	0.27 (0.28)	t(405)= -0.413, *p*=0.340	198 (61.3%)	χ^2 (1, 406) = 0.603, *p*=0.438	139 (43.0%)	χ^2 (1, 406) = 2.055, *p*=0.152
	Other	1.36 (0.94)		0.28 (0.22)		47 (56.6%)		43 (51.8%)	
Widening Participation	Yes	**1.42 (0.97)**	**t(405)= 2.086, *p*=0.019**	0.31 (0.29)	t(405)= 1.393, *p*=0.082	38 (61.3%)	χ^2 (1, 406) = 0.027, *p*= 0.869	29 (46.8%)	χ^2 (1, 406) = 0.112, *p*=0.738
	No	**1.16 (0.91)**		0.26 (0.27)		207 (60.2%)		153 (44.5%)	
University year		**r_p(406) = -0.130, *p*=0.009**		**r_p(406) = -0.240, *p*<0.001**		t(403)= 1.623, *p*=0.053		**t(403)= 1.731, *p*=0.042**	

		Paranoia symptoms		Bipolar symptoms		Hazardous drinking (yes)		Anorexic tendencies (yes)	
		M(SD)	Statistic	M(SD)	Statistic	N(%)	Statistic	N(%)	Statistic
University	UNI 1	1.16 (1.01)	$F(8,406) = 0.742$, $p=0.539$	0.54 (0.29)	$F(8,406) = 2.623$, $p=0.008$	**16 (42.1%)**	**χ^2 (8, 406) = 35.691, $p<0.001$**	19 (50.0%)	χ^2 (8, 406) = 5.436, $p=0.710$
	UNI 2	1.93 (1.31)		0.11 (0.19)		**1 (33.3%)**		3 (100%)	
	UNI 3	1.18 (0.88)		0.27 (0.26)		62 (48.8%)		53 (41.7%)	
	UNI 4	1.20 (0.97)		0.24 (0.27)		74 (81.3%)		40 (43.5%)	
	UNI 5	1.02 (0.92)		0.14 (0.21)		24 (80.0%)		15 (50%)	
	UNI 6	1.27 (0.79)		0.45 (0.33)		9 (56.3%)		8 (50.0%)	
	UNI 7	1.29 (0.84)		0.29 (0.27)		20 (51.3%)		17 (43.6%)	
	UNI 8	1.45 (0.88)		0.37 (0.26)		20 (71.4%)		11 (40.7%)	
	UNI 9	1.02 (0.99)		0.29 (0.27)		19 (55.9%)		16 (47.1%)	

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UK Medical students' mental health and their intention to drop-out: a longitudinal study

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Abstract

Objective: Attrition of medical students is an incredibly important problem feeding into healthcare workforce issues. This study seeks to explore the relationships between various mental health issues and dropout.

Design: This is a longitudinal study where medical students completed an online questionnaire between November 2020 and February 2021 and those who took part were invited (February-May 2021) to complete the questionnaire again three months later.

Settings: Students from nine geographically spread medical schools in the UK took part in this study.

Participants: 792 (71.16%) participants filled in the baseline questionnaire and 407 (51.39%) from these students completed the follow-up survey (385 participants were lost to follow-up).

Outcome measures: Drop-out intentions.

Exposures: Various mental ill-health symptoms using validated scales: emotional exhaustion, insomnia, somatization, hazardous drinking, anxiety/depression, anorexia tendencies, obsessive-compulsive disorder, paranoia, bipolar.

Results: A large number of students met criteria for mental health disorders (e.g., 54.1% insomnia, 37.9% anxiety/depression, 19.4% paranoia) and 19.4% (79) said that they considered dropping out from medical school. Those students who were more emotionally exhausted ($B_{adjusted}$=0.94, p<0.0001), expressed higher anxiety/depression symptoms ($B_{adjusted}$=1.12, p<0.0001), insomnia symptoms ($B_{adjusted}$=0.69, p<0.0001), somatization symptoms ($B_{adjusted}$=0.77, p<0.0001), anorexia tendencies ($B_{adjusted}$=-0.83, p<0.0001), OCD symptoms ($B_{adjusted}$=0.61, p<0.0001), paranoia symptoms ($B_{adjusted}$=0.52, 95% p<0.0001), expressed significantly stronger intentions to leave their medical education. Hazardous drinking and bipolar symptoms did not predict students' intention to drop-out (p>0.05).

Conclusions: A substantial number of UK medical students experienced mental ill-health symptoms, about one in five medical students consider leaving medical school, and mental ill-health symptoms contributed to students' intentions to leave their medical education. Medical schools should improve the learning environment for students and encourage them to seek help to reduce the stigma of mental ill-health symptoms (e.g. through education, signposting). It may be useful for medical schools to help applicants/medical students to understand whether medical school is the right decision for them and provide them with resources should they wish to leave.

Strengths and limitations of this study

- A strength of the study is the elaborate data collection approach, which used inclusive recruitment materials both spoken and written and disseminated across various platforms.
- The various mental health conditions represented in this study bring new insights to the existing discourse in this field.

- Limitation of this survey study is the inability to calculate a response rate due to the recruitment strategy
- The work relies on self-reported data by students.

Introduction

The ever-increasing doctor shortages are a huge cause for concern, with the current shortfall reported as being over 6.4 million doctors worldwide.[1,2] A recent survey of The National Health Service (NHS) in the UK, which has experienced a chronic shortage of doctors over the past decade, reported that four in ten junior doctors wanted to leave the NHS as soon as possible.[3] Doctor shortages have an undeniable impact on healthcare systems – resulting in increased workload, decreased doctors' wellbeing, and a lower quality of care.[4] These environments of chronic stress and decreased morale that occur due to doctors being unable to provide optimal care for patients, in turn increase pressure on existing staff, resulting in them leaving the NHS and further contributing to staff shortages.[5–7] In other words: the continuous shortfall of doctors and increase in vacancies has created a vicious cycle within the workplace.

A complete resolution of the staffing crisis has been deemed to be unlikely for the near future, due to the health and social care sector facing the most acute recruitment and retention crisis in its history[8]. To combat this workforce crisis, medical students – as our future doctors - play a pivotal role. Medical students' attrition rates are reported to vary from 3.8% to 26% in different countries, such as the UK, Pakistan, Saudi Arabia, and Nigeria.[9] Attrition of medical students is therefore an incredibly important problem feeding into healthcare workforce issues. To be better able to address the worldwide doctor shortages, we must understand the reasons why certain students are more likely to leave their medical training, so that we may retain these valuable individuals and prevent future students from dropping out.

There are many similarities between doctors and medical students, specifically their work environments; both populations are subjected to high levels of competition, insufficient support systems and isolation.[10,11] Evidence-based theoretical occupational health psychology models such as the job demands and resources (JD-R) model demonstrate how such a stressful work environment that is high in demands and scarce in resources can trigger stress reactions and hamper motivation and productivity.[12] Thus, the work environment of an individual has a strong impact on their well-being,[13] which may be why around 20-78% of medical students worldwide have been reported to be suffering from mental health issues.[14–18] Despite it being evidenced that medical students are highly likely to face mental health issues and burnout, little research has been conducted into the influence this has on students' drop-out rates. It is particularly uncertain which specific mental health issues have a larger influence on students dropping out of medical school. Therefore, the aim of this study is to explore the relationships between various mental health issues and dropout intentions. This can help us ascertain which medical students need to be prioritised for mental health support with the aim of preventing them from dropping-out of medical school.

Methods

Study setting

This study is a part of a larger research project funded by the British Medical Association (BMA) consisting of a survey, documentary analysis, and interviews.[16,19,20] The current study will focus on the data obtained through the survey. The reporting follows STROBE reporting guidelines.

Data collection

For this study, we selected nine geographically spread medical schools from England, Scotland, Wales and Northern Ireland varying in size and type of curriculum (integrated combining pre-clinical and clinical study years vs non-integrated separating pre-clinical and clinical study years). Students from all study years were invited to fill in a web-based survey (platform: *Online surveys*) between November 2020 and February 2021 and those who took part were invited (February-May 2021) to complete the questionnaire again three months later. Recruitment material was distributed through various channels by medical school staff (e.g., newsletter or lecture announcement). As recruitment strategies varied per school depending on their policies and preferences, it was not possible to calculate response rates. From the 1113 medical students who consented to take part in the study, 310 did not fill in the questionnaire and another 11 were ineligible (9 duplicates, 1 from unparticipating university, 1 missing more than 50% of answers). 792 (71.16%) participants filled in the baseline questionnaire and 407 (51.39%) from these students completed the follow-up survey (385 participants were lost to follow-up). There were no substantial differences between those who completed the follow-up survey (407) and those who did not (385) (see [16])

Patient and Public Involvement statement

The survey was piloted with five medical student volunteers who filled in the survey and provided us with their feedback. After amendments the survey was discussed with advisory group members which consisted of medical students, doctors, other academics, researchers, and practitioners working at organisations responsible for medical education provision and student support. The survey was then finalised based on their feedback.

Questionnaire

The survey included previously validated questionnaires where possible. The survey consisted of demographic variables that were considered empirically or theoretically relevant to the study, a drop-out measure asking medical students about their intention to drop-out in the recent past (i.e. the past month), and mental ill-health measures (see table 1 for a detailed description of the operationalisation of these measures). Identical questionnaires were collected at both time points.

Table 1. Overview of variables and measures used in the current study.

Variables	Measure/ Author	No of items/ Scoring	Example item	Cronbach α
Drop-out	Created by authors	1 item (*yes/no*)	Have you considered dropping out of medical school in the past month?	-
Emotional exhaustion	Maslach burnout inventory – General survey for students [21]	5 items, 0 (*never*) to 6 (*every day*)	I feel emotionally drained by my studies	0.894
Insomnia	The Insomnia Severity Index [22]	7 items, 0 *(scores showing no insomnia)* to 4 *(showing severe insomnia)*	How SATISFIED/ dissatisfied are you with your current sleep pattern?	0.866
Somatization	The Somatic Symptom Scale–8 [23]	8 items, 0 (*not at all*) to 4 (*very much*)	During the past 7 days, how much have you been bothered by stomach or bowel problems?	0.770
Hazardous drinking	The Alcohol Use Disorders Identification Test – C [24]	3 items,0 (*never; 1 or 2*) to 4 (*daily or mostly daily; 10 or more*)	How often do you have a drink containing alcohol?	0.780
Anxiety /depression	The Patient Health Questionnaire-4 [25]	4 items, 0 (*not at all*) to 3 (*nearly every day*)	Over the last 2 weeks, how often have you been bothered by little interest or pleasure in doing things?	0.852
Anorexia tendencies	The Eating Disorder Diagnostic Scale [26]	3 items, 0 *(not at all)* and 6 *(extremely)*	Have you had a definite fear that you might gain weight or become fat?	0.922
Obsessive-Compulsive disorder	Obsessive-Compulsive Inventory – Revised [27]	3 items, 0 (*not at all*) to 4 (*extremely*)	I find it difficult to control my own thoughts.	0.916
Paranoia	The persecution and deservedness scale [28]	10 items, 0 (*not at all*) to 4 (*certainly true*)	There are times when I worry that others might be plotting against me.	0.883
Bipolar	Hypomanic Personality Scale [29]	6 items, 0 (*false*) and 1 (*true*)	There have often been times when I had such an excess of energy that I felt little need to sleep at night.	0.713
Demographic characteristics	Self-developed items by the authors of this paper	9 items, Variety of question types (described in Table 2)	Which of the following best describes your gender identity?	n/a

Note. Cronbach α calculated for all baseline participants

Ethics

The project received ethical permission from the UCL Research Ethics Committee (REF: 14983/002).

Analysis

SPSS V26.0 was used for the analysis. Participants were allowed to miss up to 1/3 of data for each scale and mean scores were computed over the remaining items. All scales were approximately normally distributed (skewness and kurtosis between -2 and 2; no extreme outliers). Internal consistency (Cronbach's α) deemed sufficient (>0.7). Exploratory statistics were performed to gain insight in associations between main constructs (see Appendix 1 for results).

Longitudinal data were used to investigate what mental ill-health symptoms were associated with students' drop-out intentions. Unadjusted and adjusted Generalized Estimating Equations (GEE) were performed to investigate what mental ill-health symptoms were associated with students' drop-out intentions. Adjusted models included demographic characteristics. GEE were considered appropriate for handling the longitudinal data as they allowed us to include data from both timepoints and specify dependency between the data from similar subjects. The best fit for the covariance matrix for each analysis was determined by comparing the Fisher scoring of an unstructured covariance matrix to the simpler independent matrix. Missing data were automatically removed from the analysis (<5%). P values <0.05, <0.01, and <0.001 for two-sides tests were calculated and reported, as were the regression coefficient and the 95% confidence interval. We also present results corrected for multiple testing (9 tests, *p* value with Bonferroni correction equals 0.006).

Results

Participants

Please refer to Table 2 for more details on study characteristics.

Table 2. Study characteristics

Variables	**407 Participants N (%) or M (SD)**
Gender (female)	305 (74.9%)
Missing	3 (0.7%)
Age	21.49 (3.24)
Ethnicity (white)	263 (64.6%)
Missing	5 (1.2%)
Sexuality (heterosexual)	311 (76.4%)
Missing	13 (3.2%)
Relationship status (single/never married)	362 (88.9%)
Widening Participation student (yes)[1]	62 (15.2%)
Parents/Guardians/Carers occupation (higher managerial)	324 (79.6%)
University year	
First	121 (29.7%)
Second	74 (18.2%)
Third	58 (14.3%)
Fourth	75 (18.4%)

Fifth	56 (13.8%)
Sixth	22 (5.4%)
Missing	1 (0.2%)
University (UNI)	
UNI1	38 (9.3%)
UNI2	3 (0.7%)
UNI3	127 (31.2%)
UNI4	92 (22.6%)
UNI5	30 (7.4%)
UNI6	16 (3.9%)
UNI7	39 (9.6%)
UNI8	28 (6.9%)
UNI9	34 (8.4%)

[1]Widening participants is a scheme that aims to support and encourage students from underrepresented backgrounds to study in higher education

19.4% (79) of medical students said that they considered dropping out from medical school. Table 3 presents the prevalence of students meeting screening criteria for mental ill-health in our sample. Over 1 in 2 students were drinking hazardously (60.2%), experienced insomnia symptoms (clinical or subthreshold; 54.1%), somatisation symptoms (medium-very high; 52.1%), had OCD symptoms (51.8%). Nearly half of our participants expressed having anorexia tendencies (44.7%). Approximately 1 in 3 students were emotionally exhausted (36.1%) and had anxiety/depression symptoms (37.9%). 19.4% of students had paranoia symptoms and 2.9% bipolar symptoms.

Table 3. Prevalence of mental ill-health symptoms

		Prevalence	**Cut-off points**
Emotional exhaustion	High	36.1% (147)	The lower, middle and higher tertiles represent 'low', 'moderate' or 'high' emotional exhaustion
	Moderate	34.6% (141)	
	Low	29.2% (119)	
	Missing	0	
Anxiety/depression symptoms	Severe	12.8% (52)	Severe symptoms: 9–12 Moderate symptoms: 6–8 Mild symptoms: 3–5 No symptoms: 0–2
	Moderate	25.1% (102)	
	Mild	31.2% (127)	
	No symptoms	30.7% (125)	
	Missing	0.3% (1)	
Insomnia symptoms	Clinical insomnia (severe insomnia)	1.5% (6)	Clinical insomnia (severe insomnia): ≥22 Clinical insomnia (moderate severity): 15–21 Subthreshold insomnia: 8–14 No signs of insomnia: 0–7
	Clinical insomnia (moderate severity)	17% (69)	
	Subthreshold insomnia	35.6% (145)	
	No signs of insomnia	44% (179)	
	Missing	2% (8)	
Somatisation symptoms	Very high	14.7% (60)	Very high: 16–32 High: 12–15
	High	13.8% (56)	

	Medium	23.8% (97)	Medium: 8–11 Low: 4–7 No to minimal symptoms: 0–3
	Low	30.2% (123)	
	No to minimal symptoms	16.5% (67)	
	Missing	1% (4)	
Hazardous drinking	Yes	60.2% (245)	"Yes" was coded if 3-4 or more drinks are consumed containing alcohol on a typical day of drinking or consumptions of 6 or more drinks on one occasion
	No	39.6% (161)	
	Missing	0.3% (1)	
Anorexic tendencies	Yes	44.7% (182)	"Yes" was coded if scoring 4 or more on expressing a definite fear of gaining weight or becoming fat and 4 or more aspects around weight/body shape influencing self-evaluation
	No	55% (224)	
	Missing	0.3% (1)	
OCD symptoms	Yes	51.8% (211)	Yes: ≥4
	No	47.9% (195)	
	Missing	0.3% (1)	
Paranoia symptoms	Yes	19.4% (79)	Yes: >mean+1 SD No: < mean+1 SD
	No	80.6% (328)	
	Missing	0	
Bipolar symptoms	Yes	2.9% (12)	Yes: > 6 No: < 6
	No	96.8% (394)	
	Missing	0.3% (1)	

Predicting students' intentions to drop-out

All mental ill-health symptoms predicted medical students' drop-out intentions except for hazardous drinking and bipolar symptoms (see Table 4a and 4b). Those students who were more emotionally exhausted ($B_{adjusted}$= 0.94, 95% CI: 0.68 to 1.21, p<0.0001), expressed higher anxiety/depression symptoms ($B_{adjusted}$=1.12, 95% CI: 0.84 to 1.39, p<0.0001), insomnia symptoms ($B_{adjusted}$=0.69, 95% CI: 0.43 to 0.94, p<0.0001), somatization symptoms ($B_{adjusted}$=0.77, 95% CI: 0.48 to 1.06, p<0.0001), anorexia tendencies ($B_{adjusted}$=-0.83, 95% CI: -1.29 to -0.38, p<0.0001), OCD symptoms ($B_{adjusted}$=0.61, 95% CI: 0.44 to 0.79, p<0.0001), paranoia symptoms ($B_{adjusted}$=0.52, 95% CI: 0.31 to 0.73, p<0.0001), expressed significantly stronger intentions to leave their medical education. Hazardous drinking and bipolar symptoms did not predict students' intention to drop-out (p>0.05).

Table 4A. Association between intentions to drop out and emotional exhaustion, anxiety/depression, insomnia, somatisation symptoms and hazardous drinking (controlling for socio-demographic characteristics).

Emotional exhaustion	**0.94 (0.68 to 1.21)*****sg**				
Anxiety/depression symptoms		**1.12 (0.84 to 1.39)***** sg**			
Insomnia symptoms			**0.69 (0.43 to 0.94)***** sg**		
Somatisation symptoms				**0.77 (0.48 to 1.06)***** sg**	
Hazardous drinking *(yes)*					-0.3[illegible] (-0.81 to 0.10)
Gender *(Female)*	0.06 (-0.54 to 0.65)	0.011 (-0.46 to 0.68)	-0.08 (-0.60 to 0.45)	0.14 (-0.41 to 0.69)	-0.1[illegible] (-0.71 to 0.34)
Ethnicity (*BME*)	0.50 (-0.02 to 1.02)	0.49 (-0.01 to 0.99)	**0.53 (-0.03 to 1.03)***	0.42 (-0.08 to 0.92)	0.31 (-0.[illegible]7 to 0.80)
Sexual orientation (*LGBTQ*)	0.17 (-0.42 to 0.76)	0.25 (-0.35 to 0.85)	0.25 (-0.36 to 0.86)	0.23 (-0.36 to 0.81)	0.03 (-0.[illegible]4 to 0.61)
Relationship status (*Married/co-habiting/civil partnership*)	-0.53 (-1.11 to 0.05)	-0.44 (-1.15 to 0.26)	-0.72 (-1.33 to -0.11)	**-0.72 (-1.36 to -0.09)***	**-0.74 (-1.34 to -0.15)***
Widening participation (*No*)	0.51 (-0.10 to 1.12)	0.52 (-0.11 to 1.15)	**0.59 (0 to 1.17)***	0.58 (-0.02 to 1.18)	**0.72 (0.13 to 1.32)***
Medical school year	**-0.25 (-0.39 to -0.11)*****sg**	**-0.18 (-0.33 to -0.03)***	**-0.17 (-0.30 to -0.04)***	-0.13 (-0.27 to 0)	**-0.1[illegible] (-0.29 to -0.03)***

Note: Drop out *ref* group 0=no; *** $p<0.0001$; ** $p<0.001$; *$p<0.05$; Bonferroni correction indicates *sg* (9 tests, p value with Bonferroni correction equals 0.006)

Table 4b. Association between intentions to drop out and anorexic tendencies, OCD, paranoia, and bipolar symptoms (controlling for socio-demographic characteristics).

Anorexic tendencies *(yes)*	**-0.83 (-1.29 to -0.38)*** sg**			
OCD symptoms		**0.61 (0.44 to 0.79)*** sg**		
Paranoia symptoms			**0.52 (0.31 to 0.73)*** sg**	
Bipolar symptoms				0.51 (-0.27 to 1.28)
Gender *(Female)*	0.14 (-0.41 to 0.69)	0.10 (-0.43 to 0.64)	-0.08 (-0.61 to 0.45)	0.46 (-0.66 to 0.39)
Ethnicity (*BME*)	0.47 (-0.01 to 0.95)	**0.66 (0.27 to 1.16)****	0.45 (-0.43 to 0.73)	0.46 (-0.03 to 0.94)
Sexual orientation (*LGBTQ*)	0.15 (-0.44 to 0.74)	0.13 (-0.48 to 0.74)	**-0.71 (-1.35 to -0.07)***	0.09 (-0.49 to 0.66)
Relationship status (*Married/co-habiting/civil partnership*)	**-0.72 (-1.34 to -0.10)***	**-0.67 (-1.32 to -0.02)***	0.61 (0.02 to 1.20)	**-0.69 (-1.29 to -0.09)***
Widening participation (*No*)	**0.74 (0.15 to 1.33)***	0.57 (-0.01 to 1.14)	**0.61 (0.02 to 1.20)***	**0.69 (0.10 to 1.28)***
Medical school year	**-0.16 (-0.29 to -0.02)***	**-0.17 (-0.31 to -0.03)***	**-0.14 (-0.28 to -0.01)***	**-0.15 (-0.28 to -0.01)***

Note: Drop out *ref* group 0=no; *** p<0.0001; ** p<0.001; *p<0.05; Bonferroni correction indicates *sg* (9 tests, p value with Bonferroni correction equals 0.006)

Discussion

The pressure on health services is bound to increase in the future: considering the ageing population the NHS Long Term Plan foresees a healthcare shortage of 260,000-360,000 staff by 2036/37.[30] Dropout across the medical training pathway, alongside practising healthcare professionals leaving the NHS early in their careers, is contributing to the staffing concerns and service pressures.[31] To better understand why medical students are dropping out of medical school, this study aimed to explore to what extent mental ill-health symptoms lead to medical student attrition intentions. The study revealed that a substantial number of UK medical students experienced mental ill-health symptoms, about one in five medical students consider leaving medical school, and that mental ill-health symptoms contributed to students' intentions to leave their medical education.

The prevalence for each of the mental health conditions varied in our sample, but results showed that a substantial number of medical students met screening criteria for mental ill-health. Over half of the students were drinking hazardously (60.2%), experienced insomnia (54.1%), somatization (52.3%), or OCD symptoms (51.8%). Over one in three students were experiencing anorexia tendencies, emotional exhaustion, or depressive/anxiety symptoms. These results may partly be attributed to the study demographic; medical students are young adults that face significant life challenges and often prioritise socialising over healthy life-choices.[32,33] Drinking and staying up late are therefore behaviours often seen amongst students. In fact, studies show that undergraduate students in the UK and Ireland consume similar amounts of alcohol as our study population.[34] However, the pressures from medical school and

students' learning environments may exacerbate mental ill-health symptoms.[16] Research shows that high prevalence of mental ill-health also applies to nursing students. Meta-analyses of nursing students globally show that they also have similarly high levels of emotional exhaustion (41.1%)[35] and depression (34%).[36] Nursing and medical students share similarities in studying a healthcare curriculum. For instance, they may encounter stressful interactions with patients and other clinicians and responsibilities in clinical work which they feel unprepared for. A further similarity is that both medical students and student nurses report unwillingness to seek help for their own mental health because of fears of stigma and confidentiality.[37,38] This may act as a considerable barrier to seeking help for both groups and may be partly responsible for the high levels of mental ill-health.

This study additionally revealed that 19.4% of medical students considered dropping out from medical school. This is a higher number than actual medical student attrition, which has been estimated to be around 5%.[39] However, following the principles of the Theory of Planned Behaviour, we know that intentions are proxy to action [40] and considering the recent challenges of the pandemic and the difficulties after, the percentage of actual attrition might potentially have increased. Furthermore, the fact that students are considering leaving medical school is a sign that students may be unhappy during their education, even when staying in medical school. Students that complete medical school whilst doubting about their career trajectory, may be more inclined to drop-out in postgraduate training. This feeds into an already existing problem of attrition in postgraduate training: the number of doctors that pause their training after completing Foundation training has doubled from 34% in 2011/12 to 70% in 2020/21.[31] From this cohort of students pausing training, it is thought that 12% will not return to practice.[31] This is not only problematic for healthcare systems, but also for the medical students themselves. Dropping out of medical school can have significant personal, financial and psychological consequences for the individual. There is also the financial cost to the taxpayer, and the time and effort wasted by educators.[41]

To combat the loss of trainees and support the workforce in the future, the NHS Long Term Plan ambitiously sets out to double the number of medical school training spots, with the intention of achieving 15,000 places in 2031/32.[30] Furthermore, plans are to shorten the curriculum from the current 5 and 6-years to 4 years and to introduce medical school apprenticeships, with a focus on attracting those from underrepresented backgrounds. These measures may seem promising at first glance, but the workload of medical students is already concerning in the current 5 and 6 year curricula,[19] so adding pressure by shortening training may lead to increased dropout rates.

This reasoning can be further supported by our study results, but also by occupational health psychology theories. Our study linked mental ill-health to increased intentions to drop-out and specifically those students that were emotionally exhausted, had anxiety/depression symptoms, insomnia, somatisation symptoms, anorexia tendencies, obsessive-compulsive or paranoia symptoms were more likely to consider dropping out from medical school. Using occupational health psychology theories such as the JDR model can help to better understand the results of this study. According to the JDR model, the higher the job demands and the lower the resources in a work environment, the more likely is the occurrence of stress and a lack of work engagement and general well-being.[42] In turn, this can impact employees' productivity and potentially their decision to stay in or leave their workplace.[43,44] Although this model is rarely used in the medical undergraduate setting,[45] similarly to workplace students' learning environment brings on demands and resources that can impact students' wellbeing. From a

JDR model perspective, increasing demands such as the proposed curriculum change without offering sufficient resources to handle these demands can be detrimental to medical students.

The approach taken in this study – exploring a variety of specific mental ill-health symptoms – is novel and differs from studies linking more generic mental health indicators to drop-out, such as a recent longitudinal study of Thai medical students.[46] Authors collected medical students' self-reported mental health screening data upon admission and found a significant association between students' mental health and drop-out. Our specific approach allows for differentiation between the various mental health conditions, bringing insight in which student groups might be most benefitted by support. Those mental ill-health issues not related to drop-out, such as hazardous drinking and experiencing bipolar symptoms, might require a different approach or policy when trying to reduce attrition in medical school.

Implications

The findings of this study suggest that medical students' mental health is an important contributor to students dropping out and reinforces the importance of supporting students at medical school. Mental health symptoms can be difficult to pinpoint, like emotional exhaustion, somatization symptoms and insomnia, due to students actively trying to conceal their problems. To combat this, regular well-being checks can be implemented through meetings with personal tutors. The various mental health symptoms that have been found to predict drop out are particularly difficult to recognise in medical students, due to the "toxic" and competitive work culture of medical school normalising the idea of individuals experiencing them. We know the context in which medical students learn impacts their wellbeing.[16,47] Medical schools should improve the learning environment for students and encourage them to seek help to reduce the stigma of mental health symptoms. This can be through educating students on warning signs of mental decline through workshops or courses, and signposting clearly where they can go for help. Medical schools should also actively clarify that seeking help will not jeopardise their careers, rather improve their chances of completing their degree. There should be no discrimination against individuals with these diagnoses, as with appropriate interventions and more supportive learning environments many students can flourish.

While medical schools can take action to improve their environment, it is important to acknowledge that medical school is not for everyone and to provide resources for those medical students who are deciding whether to continue and those who choose to leave. It may be useful for medical schools to have systems in place that can help new applicants (and existing medical students) consider whether medical training is for them by setting realistic expectations of the demands of medical training.

Strengths and limitations

The sample in this study may be skewed as students with mental health issues may be keener to respond. Although the researchers tried their best to work with medical schools to guarantee a representative sample, due to the role of medical schools in the recruitment process the researchers were unable to fully control recruitment strategy. A strength of the study is the elaborate data collection approach, which used inclusive recruitment materials both spoken and written (e.g., newsletter or lecture announcement) and disseminated across various platforms.

Furthermore, the geographical and demographic spread represented in the sample is more likely to contribute to the generalisability of results.

The various mental health conditions represented in this study bring new insights to the existing discourse of similar work in this field. However, some of the conditions, such as experiencing bipolar symptoms, were only prevalent for a small subset of the sample. This means that analysis conducted for these conditions were less reliable. In addition, despite bipolar symptoms potentially affecting students' time at university, they might not deliberate leaving medial school because of their mental state (grandiose ideation) due to this condition. This may explain why we did not find any significant links for those experiencing bipolar symptoms.

We did not measure action of dropping out but measured intentions with one item. However, we believe that the findings are valuable as (i) intentions are a proxy of action; and (ii) findings provide insight into various signs of drop out intensions, including students contemplating leaving as well as students having serious considerations of leaving. This is a strength as it allows to understand what factors contribute to students' intentions to leave medical school and plan for early interventions to help retain these students.

Furthermore, the work relies on self-reported data by students. Considering the sensitive nature of the research, this may mean that students underreported their mental ill-health symptoms. In terms of the drop-out measure, we were only able to ask about students' intentions. We consider this relevant as even having the intention to leave medical school is an important measure in of itself and an indication that students are unhappy. However, for future research, it is key to consider actual drop-out statistics to get a better sense of the true scale of the problem.

We also acknowledge that the relationships between different mental ill-health issues and students' personal/medical school circumstances are complex and might have an impact on their drop out intentions. We encourage future researchers to investigate this topic in more depth, using quantitative and qualitative methods.

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Competing interests

None.

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Data sharing

The data generated and analysed during the current study are not available as consent for this has not been granted by participants.

Author contribution

Concept and design: AM, MS, AR.
Acquisition, analysis, or interpretation of data for the work: AM, MS, NL.
Drafting and critical revision of the manuscript: all authors.
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APPENDIX 1.

TABLE 1. Differences in mental health (Time-1: left; Time-2: right) between students with and without intentions to drop out (Time-2)

	Drop out (M/SD or N/%)			Drop out (M/SD or N/%)		
	No	Yes	Statistics	No	Yes	Statistics
Emotional exhaustion	**3.61 (1.33)**	**4.58 (1.02)**	**t(404)= -6.959, *p*<0.001**	**3.80 (1.28)**	**4.96 (1.23)**	**t(404)= -7.972, *p*<0.001**
Depression/anxiety symptoms	**1.09 (0.76)**	**1.58 (0.86)**	**t(404)= -4.934, *p*<0.001**	**1.03 (0.79)**	**1.86 (0.93)**	**t(403)= -7.956, *p*<0.001**
Insomnia symptoms	**1.19 (0.82)**	**1.59 (0.83)**	**t(404)= -3.782, *p*<0.001**	**1.16 (0.79)**	**1.71 (1.01)**	**t(404)= -4.383, *p*<0.001**
Somatization symptoms	**1.06 (0.71)**	**1.42 (0.81)**	**t(403)= -3.897, *p*<0.001**	**1.01 (0.70)**	**1.52 (0.91)**	**t(404)= -4.793, *p*<0.001**
Hazardous drinking (Yes)	200 (81.6%)	45 (18.4%)	$\chi^2(1,405) = 0.147$, $p=0.701$	193 (82.1%)	42 (17.9%)	$\chi^2(1,402) = 0.001$, $p=0.981$
Anorexia tendencies (Yes)	**137 (75.7%)**	**44 (24.3%)**	**$\chi^2(1,405) = 8.748$, $p=0.003$**	**129 (73.3%)**	**47 (26.7%)**	**$\chi^2(1,404) = 15.708$, $p<0.001$**
Obsessive compulsive symptoms	**1.23 (1.09)**	**1.81 (1.19)**	**t(404)= -4.089, *p*<0.001**	**1.08 (1.20)**	**1.88 (1.28)**	**t(404)= -4.965 *p*<0.001**
Paranoia symptoms	**1.11 (0.88)**	**1.60 (1.01)**	**t(404)= -4.171, *p*<0.001**	**1.05 (0.90)**	**1.74 (1.10)**	**t(404)= -5.728, *p*<0.001**
Bipolar symptoms	**0.25 (0.26)**	**0.34 (0.32)**	**t(404)= -2.142, *p*=0.008**	**0.23 (0.27)**	**0.29 (0.30)**	**t(404)= -1.690, *p*=0.046**

TABLE 2. Link between sociodemographic characteristics and students' intentions to drop out (Time 2).

		N(%) or M/SD		Statistics
		Drop out (no)	Drop out (yes)	
Gender	Male	80 (80.8%)	19 (19.2%)	χ^2 (1,403) = 0.224, p=0.636
	Female	252 (82.9%)	52 (17.1%)	
Ethnicity	White	211 (80.2%)	52 (19.8%)	χ^2 (1,401) = 1.712, p=0.191
	Ethnic minority	118 (85.5%)	20 (14.5%)	
Age		21.51 (3.11)	21.41 (3.82)	U=11550.5, p=0.503
Sexual orientation	Heterosexual	257 (82.9%)	53 (17.1%)	χ^2 (1,393) = 0.932, p=0.334
	LGBTQ	65 (20.2%)	18 (21.7%)	
Relationship status	Single	**303 (83.9%)**	**58 (16.1%)**	**χ^2 (1,406) = 8.089, p=0.004**
	In relationship	**30 (66.7%)**	**15 (33.3%)**	
Parental occupation	Higher managerial	**273 (84.5%)**	**50 (15.5%)**	**χ^2 (1,406) = 6.698, p=0.010**
	Other	**60 (72.3%)**	**23 (27.7%)**	
Widening Participation	Yes	**44 (71%)**	**18 (29.0%)**	**χ^2 (1,406) = 6.061, p=0.014**
	No	**289 (84.0%)**	**55 (16.0%)**	
Year of medical school		**2.92 (1.65)**	**2.46 (1.36)**	**t(403)= 2.533, p=0.006**
University	UNI 1	32 (84.2%)	6 (15.8%)	χ^2 (8,406) = 9.624, p=0.292
	UNI 2	3 (100%)	0 (0.0%)	
	UNI 3	105 (83.3%)	21 (16.7%)	
	UNI 4	72 (78.3%)	20 (21.7%)	
	UNI 5	22 (73.3%)	8 (26.7%)	
	UNI 6	15 (93.8%)	1 (6.3%)	
	UNI 7	30 (76.6%)	9 (23.1%)	
	UNI 8	27 (96.4%)	1 (3.6%)	
	UNI 9	27 (79.4%)	7 (20.6%)	

TABLE 3. Link between sociodemographic characteristics and students' intentions to mental health (Time 1).

		Emotional exhaustion		Depression/anxiety symptoms		Insomnia symptoms		Somatization symptoms		OCD symptoms	
		M(SD)	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**
Gender	Male	**3.50 (1.30)**	**t(402)= -2.442, *p*=0.008**	**0.96 (0.78)**	**t(402)= -2.931, *p*=0.002**	1.20 (0.82)	t(402)= -0.862, *p*=0.195	**0.77 (0.60)**	**t(401)= -6.141, *p*<0.001**	**1.04 (1.05)**	**t(402)= -2.980, *p*=0.002**
	Female	**3.87 (1.32)**		**1.23 (0.79)**		1.28 (0.84)		**1.23 (0.75)**		**1.42 (1.14)**	
Ethnicity	White	3.83 (1.36)	t(400)= -0.843, *p*=0.200	1.20 (0.80)	t(400)= 1.056, *p*=0.146	1.24 (0.82)	t(400)= -1.032, *p*=0.151	1.16 (0.77)	t(399)= 1.431, *p*=0.077	**1.26 (1.12)**	**t(400)= -1.900, *p*=0.029**
	Ethnic minority	3.71 (1.26)		1.12 (0.80)		1.33 (0.87)		1.05 (0.68)		**1.48 (1.15)**	
Age		$r_s(407)$ = 0.062, *p*=0.215		$r_s(407)$ = 0.020, *p*=0.692		$r_s(407)$ = -0.011, *p*=0.825		$r_s(407)$ = -0.081, *p*=0.102		$r_s(407)$ = -0.043, *p*=0.383	
Sexual orientation	Heterosexual	3.75 (1.32)	t(392)= -1.160, *p*=0.123	**1.11 (0.79)**	**t(392)= -3.399, *p*<0.001**	**1.20 (0.82)**	**t(392)= -2.772, *p*=0.003**	**1.06 (0.72)**	**t(391)= -3.124, *p*<0.001**	**1.26 (1.14)**	**t(392)= -2.081, *p*=0.019**
	LGBTQ	3.94 (1.36)		**1.44 (0.79)**		**1.47 (0.83)**		**1.34 (0.79)**		**1.55 (1.07)**	
Relationship status	Single	3.76 (1.30)	t(405)= -1.058, *p*=0.145	**1.15 (0.79)**	**t(405)= -1.866, *p*=0.031**	1.27 (0.85)	t(405)= 0.016, *p*=0.494	1.12 (0.74)	t(404)= -0.099, *p*=0.461	1.34 (1.13)	t(405)= 0.010, *p*=0.496
	In relationship	3.99 (1.51)		**1.38 (0.85)**		1.26 (0.73)		1.13 (0.74)		1.33 (1.10)	
Parental occupation	Higher managerial	3.79 (1.31)	t(405)= -0.120 *p*=0.452	1.15 (0.79)	t(405)= -1.393, *p*=0.082	1.25 (0.84)	t(405)= -0.687, *p*=0.246	1.10 (0.73)	t(404)= -1.231, *p*=0.109	**1.27 (1.10)**	**t(405)= -2.253, *p*=0.012**
	Other	3.80 (1.42)		1.32 (0.82)		1.32 (0.82)		1.21 (0.80)		**1.58 (1.20)**	
Widening Participation	Yes	**4.15 (1.25)**	**t(405)= 2.326 *p*=0.010**	**1.41(0.83)**	**t(405)= 2.553, *p*=0.006**	**1.54 (0.86)**	**t(405)= 2.864, *p*=0.002**	**1.29 (0.80)**	**t(404)= 1.937, *p*=0.027**	**1.76 (1.11)**	**t(405)= 3.249, *p*=0.001**
	No	**3.72 (1.33)**		**1.13 (0.79)**		**1.22 (0.82)**		**1.09 (0.73)**		**1.26 (1.12)**	

		Emotional exhaustion		Depression/anxiety symptoms		Insomnia symptoms		Somatization symptoms		OCD symptoms	
		M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic
University year		**$r_p(406) = 0.099$, $p=0.046$**		$r_p(406) = -0.014$, $p=0.785$		$r_p(406) = -0.028$, $p=0.577$		**$r_p(405) = -0.134$, $p=0.007$**		$r_p(406) = -0.018$, $p=0.721$	
University	UNI 1	4.06 (1.41)	**$F(8,406)= 0.741$, $p=0.655$**	1.39 (0.93)	$p=0.201$	1.52 (0.90)	$F(8,406) = 4.116$, $p<0.001$	1.31 (0.89)	$F(8,405) = 0.897$, $p=0.519$	1.42 (1.29)	$F(8,406) = 1.514$, $p=0.150$
	UNI 2	4.80 (0.20)		1.58 (0.72)		3.14 (0.38)[a]		.46 (.58)		2.89 (0.38)	
	UNI 3	3.72 (1.29)		1.04 (0.76)		1.24 (0.83)[a]		1.09 (0.74)		1.40 (1.09)	
	UNI 4	3.89 (1.25)		1.23 (0.76)		1.32 (0.80)		1.02 (0.67)		1.34 (1.09)	
	UNI 5	3.68 (1.33)		1 (0.68)		0.91 (0.71)[a]		1.03 (0.77)		1.18 (1.12)	
	UNI 6	3.54 (1.40)		1.36 (0.47)		1.66 (0.88)		1.30 (0.80)		1.60 (0.88)	
	UNI 7	3.63 (1.34)		1.15 (0.85)		1.10 (0.76)[a]		1.14 (0.76)		1.17 (1.18)	
	UNI 8	3.90 (0.51)		1.30 (0.88)		1.25 (0.81)		1.25 (0.75)		1.42 (1.22)	
	UNI 9	3.70 (1.47)		1.26 (0.92)		1.10 (0.77)[a]		1.17 (0.68)		.99 (1.09)	

		Paranoia symptoms		Bipolar symptoms		Hazardous drinking (yes)		Anorexic tendencies (yes)	
		M(SD)	**Statistic**	**M(SD)**	**Statistic**	**N(%)**	**Statistic**	**N(%)**	**Statistic**
Gender	Male	1.08 (0.84)	t(402)= -1.426, *p*=0.077	0.23 (0.23)	t(402)= -1.335, *p*=0.091	63 (63.6%)	χ^2 (1, 403) = 1.204, *p*=0.402	**20 (20.2%)**	**χ^2 (1, 403) = 32.391, *p*<0.001**
	Female	1.23 (0.93)		0.27 (0.28)		179 (58.9%)		**161 (63%)**	
Ethnicity	White	1.19 (0.93)	t(400)= 0.127, *p*=0.449	0.28 (0.28)	t(400)= 1.226, *p*=0.111	**183 (69.8%)**	**χ^2 (1, 401) = 22.879, *p*<0.001**	118 (44.9%)	χ^2 (1, 401) = 0.023, *p*=0.881
	Ethnic minority	1.18 (0.91)		0.25 (0.26)		**60 (43.2%)**		63 (45.7%)	
Age		r_s(407) = -0.086, *p* = 0.082		**r_s(407) = -0.251, *p*<0.001**		**U=17302, *p*=0.035**		U=18486.5, *p*=0.104	
Sexual orientation	Heterosexual	**1.11 (0.91)**	**t(392)= -2.874, *p*=0.002**	**0.24 (0.25)**	**t(392)= -3.735, *p*<0.001**	181 (58.4%)	χ^2 (1, 393) = 2.931, *p*=0.089	**130 (41.9%)**	**χ^2 (1, 393) = 5.708, *p*=0.017**
	LGBTQ	**1.44 (0.92)**		**0.37 (0.31)**		57 (68.7%)		**47 (56.6%)**	
Relationship status	Single	1.20 (0.93)	t(405)= .273, *p*=0.393	**0.27 (0.28)**	**t(405)= 1.863, *p*=0.034**	219 (60.7%)	χ^2 (1, 406) = 0.139, *p*=0.709	166 (46.05)	χ^2 (1, 406) = 1.759, *p*=0.185
	In relationship	1.16 (0.88)		**0.21 (0.22)**		26 (57.8%)		16 (35.6%)	
Parental occupation	Higher managerial	1.16 (0.91)	t(405)= -1.773, *p*=0.038	0.27 (0.28)	t(405)= -0.413, *p*=0.340	198 (61.3%)	χ^2 (1, 406) = 0.603, *p*=0.438	139 (43.0%)	χ^2 (1, 406) = 2.055, *p*=0.152
	Other	1.36 (0.94)		0.28 (0.22)		47 (56.6%)		43 (51.8%)	
Widening Participation	Yes	**1.42 (0.97)**	**t(405)= 2.086, *p*=0.019**	0.31 (0.29)	t(405)= 1.393, *p*=0.082	38 (61.3%)	χ^2 (1, 406) = 0.027, *p*= 0.869	29 (46.8%)	χ^2 (1, 406) = 0.112, *p*=0.738
	No	**1.16 (0.91)**		0.26 (0.27)		207 (60.2%)		153 (44.5%)	
University year		**r_p(406) = -0.130, *p*=0.009**		**r_p(406) = -0.240, *p*<0.001**		t(403)= 1.623, *p*=0.053		**t(403)= 1.731, *p*=0.042**	

		Paranoia symptoms		Bipolar symptoms		Hazardous drinking (yes)		Anorexic tendencies (yes)	
		M(SD)	Statistic	M(SD)	Statistic	N(%)	Statistic	N(%)	Statistic
University	UNI 1	1.16 (1.01)	$F(8,406) = 0.742$, $p=0.539$	0.54 (0.29)	$F(8,406) = 2.623$, $p=0.008$	**16 (42.1%)**	**χ^2 (8, 406) = 35.691, $p<0.001$**	19 (50.0%)	χ^2 (8, 406) = 5.436, $p=0.710$
	UNI 2	1.93 (1.31)		0.11 (0.19)		**1 (33.3%)**		3 (100%)	
	UNI 3	1.18 (0.88)		0.27 (0.26)		62 (48.8%)		53 (41.7%)	
	UNI 4	1.20 (0.97)		0.24 (0.27)		74 (81.3%)		40 (43.5%)	
	UNI 5	1.02 (0.92)		0.14 (0.21)		24 (80.0%)		15 (50%)	
	UNI 6	1.27 (0.79)		0.45 (0.33)		9 (56.3%)		8 (50.0%)	
	UNI 7	1.29 (0.84)		0.29 (0.27)		20 (51.3%)		17 (43.6%)	
	UNI 8	1.45 (0.88)		0.37 (0.26)		20 (71.4%)		11 (40.7%)	
	UNI 9	1.02 (0.99)		0.29 (0.27)		19 (55.9%)		16 (47.1%)	

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UK Medical students' mental health and their intention to drop-out: a longitudinal study

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Abstract

Objective: Attrition of medical students is an incredibly important problem feeding into healthcare workforce issues. This study seeks to explore the relationships between various mental health issues and dropout.

Design: This is a longitudinal study where medical students completed an online questionnaire between November 2020 and February 2021 and those who took part were invited (February-May 2021) to complete the questionnaire again three months later.

Settings: Students from nine geographically spread medical schools in the UK took part in this study.

Participants: 792 (71.16%) participants filled in the baseline questionnaire and 407 (51.39%) from these students completed the follow-up survey (385 participants were lost to follow-up).

Outcome measures: Drop-out intentions.

Exposures: Various mental ill-health symptoms using validated scales: emotional exhaustion, insomnia, somatization, hazardous drinking, anxiety/depression, anorexia tendencies, obsessive-compulsive disorder, paranoia, bipolar.

Results: A large number of students met criteria for mental health disorders (e.g., 54.1% insomnia, 37.9% anxiety/depression, 19.4% paranoia) and 19.4% (79) said that they considered dropping out from medical school. Those students who were more emotionally exhausted ($B_{adjusted}$=0.94, p<0.0001), expressed higher anxiety/depression symptoms ($B_{adjusted}$=1.12, p<0.0001), insomnia symptoms ($B_{adjusted}$=0.69, p<0.0001), somatization symptoms ($B_{adjusted}$=0.77, p<0.0001), anorexia tendencies ($B_{adjusted}$=-0.83, p<0.0001), OCD symptoms ($B_{adjusted}$=0.61, p<0.0001), paranoia symptoms ($B_{adjusted}$=0.52, 95% p<0.0001), expressed significantly stronger intentions to leave their medical education. Hazardous drinking and bipolar symptoms did not predict students' intention to drop-out (p>0.05).

Conclusions: A substantial number of UK medical students experienced mental ill-health symptoms, about one in five medical students consider leaving medical school, and mental ill-health symptoms contributed to students' intentions to leave their medical education. Medical schools should improve the learning environment for students and encourage them to seek help to reduce the stigma of mental ill-health symptoms (e.g. through education, signposting). It may be useful for medical schools to help applicants/medical students to understand whether medical school is the right decision for them and provide them with resources should they wish to leave.

Strengths and limitations of this study

- A strength of the study is the elaborate data collection approach, which used inclusive recruitment materials both spoken and written and disseminated across various platforms.
- The geographical and demographic spread represented in the sample is more likely to contribute to the generalisability of results.

- Limitation of this survey study is the inability to calculate a response rate due to the recruitment strategy
- The work relies on self-reported data by students.

Introduction

The ever-increasing doctor shortages are a huge cause for concern, with the current shortfall reported as being over 6.4 million doctors worldwide.[1,2] A recent survey of The National Health Service (NHS) in the UK, which has experienced a chronic shortage of doctors over the past decade, reported that four in ten junior doctors wanted to leave the NHS as soon as possible.[3] Doctor shortages have an undeniable impact on healthcare systems – resulting in increased workload, decreased doctors' wellbeing, and a lower quality of care.[4] These environments of chronic stress and decreased morale that occur due to doctors being unable to provide optimal care for patients, in turn increase pressure on existing staff, resulting in them leaving the NHS and further contributing to staff shortages.[5–7] In other words: the continuous shortfall of doctors and increase in vacancies has created a vicious cycle within the workplace.

A complete resolution of the staffing crisis has been deemed to be unlikely for the near future, due to the health and social care sector facing the most acute recruitment and retention crisis in its history[8]. To combat this workforce crisis, medical students – as our future doctors - play a pivotal role. Medical students' attrition rates are reported to vary from 3.8% to 26% in different countries, such as the UK, Pakistan, Saudi Arabia, and Nigeria.[9] Attrition of medical students is therefore an incredibly important problem feeding into healthcare workforce issues. To be better able to address the worldwide doctor shortages, we must understand the reasons why certain students are more likely to leave their medical training, so that we may retain these valuable individuals and prevent future students from dropping out.

There are many similarities between doctors and medical students, specifically their work environments; both populations are subjected to high levels of competition, insufficient support systems and isolation.[10,11] Evidence-based theoretical occupational health psychology models such as the job demands and resources (JD-R) model demonstrate how such a stressful work environment that is high in demands and scarce in resources can trigger stress reactions and hamper motivation and productivity.[12] Thus, the work environment of an individual has a strong impact on their well-being.[13] How this affects mental health may be challenging to quantify, with the literature reporting 20-78% of medical students worldwide have been reported to be suffering from mental health issues.[14–18] Despite it being evidenced that medical students are highly likely to face mental health issues and burnout, little research has been conducted into the influence this has on students' drop-out rates. In addition, although the Diagnostic and Statistical Manual of Mental Disorders (DSM)[19] emphasises that mental health issues are often accompanied by functional impairment, including academic, and so the assumption that mental health issues impact students' drop-out intentions seems to follow logically from that knowledge, concrete scientific proof of this relationship for our study context is missing. Student attrition might have a significant impact on an overall already

overstretched healthcare workforce and thus a better understanding of what aspects contribute to this problem is needed. We therefore believe it is of great value to researchers and practitioners to explore the relationship between mental health and academic outcomes in medical education and training. It is also particularly uncertain which specific mental health issues have a larger influence on students dropping out of medical school. Therefore, the aim of this study is to explore the relationships between various mental health issues and dropout intentions. This can help us ascertain which medical students need to be prioritised for mental health support with the aim of preventing them from dropping-out of medical school.

Methods

Study setting

This study is a part of a larger research project funded by the British Medical Association (BMA) consisting of a survey, documentary analysis, and interviews.[16,20,21] The current study will focus on the data obtained through the survey. The reporting follows STROBE reporting guidelines.

Data collection

For this study, we selected nine geographically spread medical schools from England, Scotland, Wales and Northern Ireland varying in size and type of curriculum (integrated combining pre-clinical and clinical study years vs non-integrated separating pre-clinical and clinical study years). Students from all study years were invited to fill in a web-based survey (platform: *Online surveys*) between November 2020 and February 2021 and those who took part were invited (February-May 2021) to complete the questionnaire again three months later. The 3-months mark for the follow-up was made based on the medical students' education schedules avoiding any substantial curriculum changes (e.g. moves between university years) and exams periods. This was done to avoid any peaks of stress that would potentially have impacted students' responses. Recruitment material was distributed through various channels by medical school staff (e.g., newsletter or lecture announcement). As recruitment strategies varied per school depending on their policies and preferences, it was not possible to calculate response rates. From the 1113 medical students who consented to take part in the study, 310 did not fill in the questionnaire and another 11 were ineligible (9 duplicates, 1 from unparticipating university, 1 missing more than 50% of answers). 792 (71.16%) participants filled in the baseline questionnaire and 407 (51.39%) from these students completed the follow-up survey (385 participants were lost to follow-up). There were no substantial differences between those who completed the follow-up survey (407) and those who did not (385) (see [16])

Patient and Public Involvement statement

The survey was piloted with five medical student volunteers who filled in the survey and provided us with their feedback. After amendments the survey was discussed with advisory group members which consisted of medical students, doctors, other academics, researchers, and practitioners working at organisations responsible for medical education provision and student support. The survey was then finalised based on their feedback.

Questionnaire

The survey included previously validated questionnaires where possible. The survey consisted of demographic variables that were considered empirically or theoretically relevant to the study, a drop-out measure asking medical students about their intention to drop-out in the recent past (i.e. the past month), and mental ill-health measures (see table 1 for a detailed description of the operationalisation of these measures). Identical questionnaires were collected at both time points.

Table 1. Overview of variables and measures used in the current study.

Variables	Measure/ Author	No of items/ Scoring	Example item	Cronbach α
Drop-out	Created by authors	1 item (*yes/no*)	Have you considered dropping out of medical school in the past month?	-
Emotional exhaustion	Maslach burnout inventory – General survey for students [22]	5 items, 0 (*never*) to 6 (e*very day*)	I feel emotionally drained by my studies	0.894
Insomnia	The Insomnia Severity Index [23]	7 items, 0 *(scores showing no insomnia)* to 4 *(showing severe insomnia)*	How SATISFIED/ dissatisfied are you with your current sleep pattern?	0.866
Somatization	The Somatic Symptom Scale–8 [24]	8 items, 0 (*not at all*) to 4 (*very much*)	During the past 7 days, how much have you been bothered by stomach or bowel problems?	0.770
Hazardous drinking	The Alcohol Use Disorders Identification Test – C [25]	3 items,0 (*never; 1 or 2*) to 4 (*daily or mostly daily; 10 or more*)	How often do you have a drink containing alcohol?	0.780
Anxiety /depression	The Patient Health Questionnaire-4 [26]	4 items, 0 (*not at all*) to 3 (*nearly every day*)	Over the last 2 weeks, how often have you been bothered by little interest or pleasure in doing things?	0.852
Anorexia tendencies	The Eating Disorder Diagnostic Scale [27]	3 items, 0 *(not at all)* and 6 *(extremely)*	Have you had a definite fear that you might gain weight or become fat?	0.922
Obsessive-Compulsive disorder	Obsessive-Compulsive Inventory – Revised [28]	3 items, 0 (*not at all*) to 4 (*extremely*)	I find it difficult to control my own thoughts.	0.916

Variables	Measure/ Author	No of items/ Scoring	Example item	Cronbach α
Paranoia	The persecution and deservedness scale [29]	10 items, 0 (*not at all*) to 4 (*certainly true*)	There are times when I worry that others might be plotting against me.	0.883
Bipolar	Hypomanic Personality Scale [30]	6 items, 0 (*false*) and 1 (*true*)	There have often been times when I had such an excess of energy that I felt little need to sleep at night.	0.713
Demographic characteristics	Self-developed items by the authors of this paper	9 items, Variety of question types (described in Table 2)	Which of the following best describes your gender identity?	n/a

Note. Cronbach α calculated for all baseline participants

Ethics

The project received ethical permission from the UCL Research Ethics Committee (REF: 14983/002).

Analysis

SPSS V26.0 was used for the analysis. Participants were allowed to miss up to 1/3 of data for each scale and mean scores were computed over the remaining items. All scales were approximately normally distributed (skewness and kurtosis between -2 and 2; no extreme outliers). Internal consistency (Cronbach's α) deemed sufficient (>0.7). Exploratory statistics were performed to gain insight in associations between main constructs (see Appendix 1 for results).

Longitudinal data were used to investigate what mental ill-health symptoms were associated with students' drop-out intentions. Unadjusted and adjusted Generalized Estimating Equations (GEE) were performed to investigate what mental ill-health symptoms were associated with students' drop-out intentions. Adjusted models included demographic characteristics. GEE were considered appropriate for handling the longitudinal data as they allowed us to include data from both timepoints and specify dependency between the data from similar subjects. The best fit for the covariance matrix for each analysis was determined by comparing the Fisher scoring of an unstructured covariance matrix to the simpler independent matrix. Missing data were automatically removed from the analysis (<5%). Power calculations for GEE models are less accurate that traditional power calculations. Our sample size with 407 participants exceeds Rules of Thumb for GEE; we have >20 subjects (clusters) in our study. P values <0.05, <0.01, and <0.001 for two-sides tests were calculated and reported, as were the regression coefficient and the 95% confidence interval. We also present results corrected for multiple testing (9 tests, *p* value with Bonferroni correction equals 0.006).

Results

Participants

Please refer to Table 2 for more details on study characteristics.

Table 2. Study characteristics

Variables	407 Participants N (%) or M (SD)
Gender (female)	305 (74.9%)
Missing	3 (0.7%)
Age	21.49 (3.24)
Ethnicity (white)	263 (64.6%)
Missing	5 (1.2%)
Sexuality (heterosexual)	311 (76.4%)
Missing	13 (3.2%)
Relationship status (single/never married)	362 (88.9%)
Widening Participation student (yes)[1]	62 (15.2%)
Parents/Guardians/Carers occupation (higher managerial)	324 (79.6%)
University year	
First	121 (29.7%)
Second	74 (18.2%)
Third	58 (14.3%)
Fourth	75 (18.4%)
Fifth	56 (13.8%)
Sixth	22 (5.4%)
Missing	1 (0.2%)
University (UNI)	
UNI1	38 (9.3%)
UNI2	3 (0.7%)
UNI3	127 (31.2%)
UNI4	92 (22.6%)
UNI5	30 (7.4%)
UNI6	16 (3.9%)
UNI7	39 (9.6%)
UNI8	28 (6.9%)
UNI9	34 (8.4%)

[1]Widening participants is a scheme that aims to support and encourage students from underrepresented backgrounds to study in higher education

19.4% (79) of medical students said that they considered dropping out from medical school. Table 3 presents the prevalence of students meeting screening criteria for mental ill-health in our sample. Over 1 in 2 students were drinking hazardously (60.2%), experienced insomnia symptoms (clinical or subthreshold; 54.1%), somatisation symptoms (medium-very high; 52.1%), had OCD symptoms (51.8%). Nearly half of our participants expressed having anorexia tendencies (44.7%). Approximately 1 in 3 students were emotionally exhausted (36.1%) and had anxiety/depression symptoms (37.9%). 19.4% of students had paranoia symptoms and 2.9% bipolar symptoms.

Table 3. Prevalence of mental ill-health symptoms

		Prevalence	Cut-off points
Emotional exhaustion	High	36.1% (147)	The lower, middle and higher tertiles represent 'low', 'moderate' or 'high' emotional exhaustion
	Moderate	34.6% (141)	
	Low	29.2% (119)	
	Missing	0	
Anxiety/depression symptoms	Severe	12.8% (52)	Severe symptoms: 9–12 Moderate symptoms: 6–8 Mild symptoms: 3–5 No symptoms: 0–2
	Moderate	25.1% (102)	
	Mild	31.2% (127)	
	No symptoms	30.7% (125)	
	Missing	0.3% (1)	
Insomnia symptoms	Clinical insomnia (severe insomnia)	1.5% (6)	Clinical insomnia (severe insomnia): ≥22 Clinical insomnia (moderate severity): 15–21 Subthreshold insomnia: 8–14 No signs of insomnia: 0–7
	Clinical insomnia (moderate severity)	17% (69)	
	Subthreshold insomnia	35.6% (145)	
	No signs of insomnia	44% (179)	
	Missing	2% (8)	
Somatisation symptoms	Very high	14.7% (60)	Very high: 16–32 High: 12–15 Medium: 8–11 Low: 4–7 No to minimal symptoms: 0–3
	High	13.8% (56)	
	Medium	23.8% (97)	
	Low	30.2% (123)	
	No to minimal symptoms	16.5% (67)	
	Missing	1% (4)	
Hazardous drinking	Yes	60.2% (245)	"Yes" was coded if 3-4 or more drinks are consumed containing alcohol on a typical day of drinking or consumptions of 6 or more drinks on one occasion
	No	39.6% (161)	
	Missing	0.3% (1)	
Anorexic tendencies	Yes	44.7% (182)	"Yes" was coded if scoring 4 or more on expressing a definite fear of gaining weight or becoming fat and 4 or more aspects around weight/body shape influencing self-evaluation
	No	55% (224)	
	Missing	0.3% (1)	
OCD symptoms	Yes	51.8% (211)	Yes: ≥4
	No	47.9% (195)	
	Missing	0.3% (1)	
Paranoia symptoms	Yes	19.4% (79)	Yes: >mean+1 SD No: < mean+1 SD
	No	80.6% (328)	
	Missing	0	
Bipolar symptoms	Yes	2.9% (12)	Yes: > 6 No: < 6
	No	96.8% (394)	

	Missing	0.3% (1)	

Predicting students' intentions to drop-out

All mental ill-health symptoms predicted medical students' drop-out intentions except for hazardous drinking and bipolar symptoms (see Table 4a and 4b). Those students who were more emotionally exhausted ($B_{adjusted}$= 0.94, 95% CI: 0.68 to 1.21, p<0.0001), expressed higher anxiety/depression symptoms ($B_{adjusted}$=1.12, 95% CI: 0.84 to 1.39, p<0.0001), insomnia symptoms ($B_{adjusted}$=0.69, 95% CI: 0.43 to 0.94, p<0.0001), somatization symptoms ($B_{adjusted}$=0.77, 95% CI: 0.48 to 1.06, p<0.0001), anorexia tendencies ($B_{adjusted}$=-0.83, 95% CI: -1.29 to -0.38, p<0.0001), OCD symptoms ($B_{adjusted}$=0.61, 95% CI: 0.44 to 0.79, p<0.0001), paranoia symptoms ($B_{adjusted}$=0.52, 95% CI: 0.31 to 0.73, p<0.0001), expressed significantly stronger intentions to leave their medical education. Hazardous drinking and bipolar symptoms did not predict students' intention to drop-out (p>0.05).

Table 4A. Association between intentions to drop out and emotional exhaustion, anxiety/depression, insomnia, somatisation symptoms and hazardous drinking (controlling for socio-demographic characteristics).

Emotional exhaustion	**0.94 (0.68 to 1.21)*****sg**				
Anxiety/depression symptoms		**1.12 (0.84 to 1.39)***** sg**			
Insomnia symptoms			**0.69 (0.43 to 0.94)***** sg**		
Somatisation symptoms				**0.77 (0.48 to 1.06)***** sg**	
Hazardous drinking *(yes)*					-0.3[illegible] (-0.81 to 0.10)
Gender *(Female)*	0.06 (-0.54 to 0.65)	0.011 (-0.46 to 0.68)	-0.08 (-0.60 to 0.45)	0.14 (-0.41 to 0.69)	-0.1[illegible] (-0.71 to 0.34)
Ethnicity (*BME*)	0.50 (-0.02 to 1.02)	0.49 (-0.01 to 0.99)	**0.53 (-0.03 to 1.03)***	0.42 (-0.08 to 0.92)	0.31 (-0.[illegible]7 to 0.80)
Sexual orientation (*LGBTQ*)	0.17 (-0.42 to 0.76)	0.25 (-0.35 to 0.85)	0.25 (-0.36 to 0.86)	0.23 (-0.36 to 0.81)	0.03 (-0.[illegible]4 to 0.61)
Relationship status (*Married/co-habiting/civil partnership*)	-0.53 (-1.11 to 0.05)	-0.44 (-1.15 to 0.26)	-0.72 (-1.33 to -0.11)	**-0.72 (-1.36 to -0.09)***	**-0.7[illegible] (-1.[illegible]34 to -0.15)***
Widening participation (*No*)	0.51 (-0.10 to 1.12)	0.52 (-0.11 to 1.15)	**0.59 (0 to 1.17)***	0.58 (-0.02 to 1.18)	**0.72 (0.[illegible]13 to 1.32)***
Medical school year	**-0.25 (-0.39 to -0.11)*****sg**	**-0.18 (-0.33 to -0.03)***	**-0.17 (-0.30 to -0.04)***	-0.13 (-0.27 to 0)	**-0.1[illegible] (-0.[illegible]29 to -0.03)***

Note: Drop out *ref* group 0=no; *** $p<0.0001$; ** $p<0.001$; *$p<0.05$; Bonferroni correction indicates *sg* (g tests, p value with Bonferroni correction equals 0.006)

Table 4b. Association between intentions to drop out and anorexic tendencies, OCD, paranoia, and bipolar symptoms (controlling for socio-demographic characteristics).

Anorexic tendencies *(yes)*	**-0.83 (-1.29 to -0.38)*** sg**			
OCD symptoms		**0.61 (0.44 to 0.79)*** sg**		
Paranoia symptoms			**0.52 (0.31 to 0.73)*** sg**	
Bipolar symptoms				0.51 (-0.27 to 1.28)
Gender *(Female)*	0.14 (-0.41 to 0.69)	0.10 (-0.43 to 0.64)	-0.08 (-0.61 to 0.45)	0.46 (-0.66 to 0.39)
Ethnicity (*BME*)	0.47 (-0.01 to 0.95)	**0.66 (0.27 to 1.16)****	0.45 (-0.43 to 0.73)	0.46 (-0.03 to 0.94)
Sexual orientation (*LGBTQ*)	0.15 (-0.44 to 0.74)	0.13 (-0.48 to 0.74)	**-0.71 (-1.35 to -0.07)***	0.09 (-0.49 to 0.66)
Relationship status (*Married/co-habiting/civil partnership*)	**-0.72 (-1.34 to -0.10)***	**-0.67 (-1.32 to -0.02)***	0.61 (0.02 to 1.20)	**-0.69 (-1.29 to -0.09)***
Widening participation (*No*)	**0.74 (0.15 to 1.33)***	0.57 (-0.01 to 1.14)	**0.61 (0.02 to 1.20)***	**0.69 (0.10 to 1.28)***
Medical school year	**-0.16 (-0.29 to -0.02)***	**-0.17 (-0.31 to -0.03)***	**-0.14 (-0.28 to -0.01)***	**-0.15 (-0.28 to -0.01)***

Note: Drop out *ref* group 0=no; *** p<0.0001; ** p<0.001; *p<0.05; Bonferroni correction indicates *sg* (9 tests, p value with Bonferroni correction equals 0.006)

Discussion

The pressure on health services is bound to increase in the future: considering the ageing population the NHS Long Term Plan foresees a healthcare shortage of 260,000-360,000 staff by 2036/37.[31] Dropout across the medical training pathway, alongside practising healthcare professionals leaving the NHS early in their careers, is contributing to the staffing concerns and service pressures.[32] To better understand why medical students are dropping out of medical school, this study aimed to explore to what extent mental ill-health symptoms lead to medical student attrition intentions. The study revealed that a substantial number of UK medical students experienced mental ill-health symptoms, about one in five medical students consider leaving medical school, and that mental ill-health symptoms contributed to students' intentions to leave their medical education.

The prevalence for each of the mental health conditions varied in our sample, but results showed that a substantial number of medical students met screening criteria for mental ill-health. Over half of the students were drinking hazardously (60.2%), experienced insomnia (54.1%), somatization (52.3%), or OCD symptoms (51.8%). Over one in three students were experiencing anorexia tendencies, emotional exhaustion, or depressive/anxiety symptoms. These results may partly be attributed to the study demographic; medical students are young adults that face significant life challenges and often prioritise socialising over healthy life-choices.[33,34] Drinking and staying up late are therefore behaviours often seen amongst students. In fact, studies show that undergraduate students in the UK and Ireland consume similar amounts of alcohol as our study population.[35] However, the pressures from medical school and

students' learning environments may exacerbate mental ill-health symptoms.[16] Research shows that high prevalence of mental ill-health also applies to nursing students. Meta-analyses of nursing students globally show that they also have similarly high levels of emotional exhaustion (41.1%)[36] and depression (34%).[37] Nursing and medical students share similarities in studying a healthcare curriculum. For instance, they may encounter stressful interactions with patients and other clinicians and responsibilities in clinical work which they feel unprepared for. A further similarity is that both medical students and student nurses report unwillingness to seek help for their own mental health because of fears of stigma and confidentiality.[38,39] This may act as a considerable barrier to seeking help for both groups and may be partly responsible for the high levels of mental ill-health.

This current study additionally revealed that 19.4% of medical students considered dropping out from medical school. This is a higher number than actual medical student attrition, which has been estimated to be around 5%.[40] However, following the principles of the Theory of Planned Behaviour, we know that intentions are proxy to action [41] and considering the recent challenges of the pandemic and the difficulties after, the percentage of actual attrition might potentially have increased. Furthermore, the fact that students are considering leaving medical school is a sign that students may be unhappy during their education, even when staying in medical school. Students that complete medical school whilst doubting about their career trajectory, may be more inclined to drop-out in postgraduate training. This feeds into an already existing problem of attrition in postgraduate training: the number of doctors that pause their training after completing Foundation training has doubled from 34% in 2011/12 to 70% in 2020/21.[32] From this cohort of students pausing training, it is thought that 12% will not return to practice.[32] This is not only problematic for healthcare systems, but also for the medical students themselves. Dropping out of medical school can have significant personal, financial and psychological consequences for the individual. There is also the financial cost to the taxpayer, and the time and effort wasted by educators.[42]

To combat the loss of trainees and support the workforce in the future, the NHS Long Term Plan ambitiously sets out to double the number of medical school training spots, with the intention of achieving 15,000 places in 2031/32.[31] Furthermore, plans are to shorten the curriculum from the current 5 and 6-years to 4 years and to introduce medical school apprenticeships, with a focus on attracting those from underrepresented backgrounds. These measures may seem promising at first glance, but the workload of medical students is already concerning in the current 5 and 6 year curricula,[20] so adding pressure by shortening training may lead to increased dropout rates.

This reasoning can be further supported by our study results, but also by occupational health psychology theories. Our study linked mental ill-health to increased intentions to drop-out and specifically those students that were emotionally exhausted, had anxiety/depression symptoms, insomnia, somatisation symptoms, anorexia tendencies, obsessive-compulsive or paranoia symptoms were more likely to consider dropping out from medical school. Using occupational health psychology theories such as the JDR model can help to better understand the results of this study. According to the JDR model, the higher the job demands and the lower the resources in a work environment, the more likely is the occurrence of stress and a lack of work engagement and general well-being.[43] In turn, this can impact employees' productivity and potentially their decision to stay in or leave their workplace.[44,45] Although this model is rarely used in the medical undergraduate setting,[46] similarly to workplace students' learning environment brings on demands and resources that can impact students' wellbeing. From a

JDR model perspective, increasing demands such as the proposed curriculum change without offering sufficient resources to handle these demands can be detrimental to medical students.

The approach taken in this study – exploring a variety of specific mental ill-health symptoms – is novel and differs from studies linking more generic mental health indicators to drop-out, such as a recent longitudinal study of Thai medical students.[47] Authors collected medical students' self-reported mental health screening data upon admission and found a significant association between students' mental health and drop-out. Our specific approach allows for differentiation between the various mental health conditions, bringing insight in which student groups might be most benefitted by support. Those mental ill-health issues not related to drop-out, such as hazardous drinking and experiencing bipolar symptoms, might require a different approach or policy when trying to reduce attrition in medical school.

Implications

The findings of this study suggest that medical students' mental health is an important contributor to students dropping out and reinforces the importance of supporting students at medical school. Mental health symptoms can be difficult to pinpoint, like emotional exhaustion, somatization symptoms and insomnia, due to students actively trying to conceal their problems. To combat this, regular well-being checks can be implemented through meetings with personal tutors. The various mental health symptoms that have been found to predict drop out are particularly difficult to recognise in medical students, due to the "toxic" and competitive work culture of medical school normalising the idea of individuals experiencing them. We know the context in which medical students learn impacts their wellbeing.[16,48] Medical schools should improve the learning environment for students and encourage them to seek help to reduce the stigma of mental health symptoms. This can be through educating students on warning signs of mental decline through workshops or courses, and signposting clearly where they can go for help. Medical schools should also actively clarify that seeking help will not jeopardise their careers, rather improve their chances of completing their degree. There should be no discrimination against individuals with these diagnoses, as with appropriate interventions and more supportive learning environments many students can flourish.

While medical schools can take action to improve their environment, it is important to acknowledge that medical school is not for everyone and to provide resources for those medical students who are deciding whether to continue and those who choose to leave. It may be useful for medical schools to have systems in place that can help new applicants (and existing medical students) consider whether medical training is for them by setting realistic expectations of the demands of medical training.

Strengths and limitations

The sample in this study may be skewed as students with mental health issues may be keener to respond. Although the researchers tried their best to work with medical schools to guarantee a representative sample, due to the role of medical schools in the recruitment process the researchers were unable to fully control recruitment strategy. A strength of the study is the elaborate data collection approach, which used inclusive recruitment materials both spoken and written (e.g., newsletter or lecture announcement) and disseminated across various platforms.

Furthermore, the geographical and demographic spread represented in the sample is more likely to contribute to the generalisability of results.

The various mental health conditions represented in this study bring new insights to the existing discourse of similar work in this field. However, some of the conditions, such as experiencing bipolar symptoms, were only prevalent for a small subset of the sample. This means that analysis conducted for these conditions were less reliable. In addition, despite bipolar symptoms potentially affecting students' time at university, they might not deliberate leaving medial school because of their mental state (grandiose ideation) due to this condition. This may explain why we did not find any significant links for those experiencing bipolar symptoms.

We did not measure action of dropping out but measured intentions with one item. However, we believe that the findings are valuable as (i) intentions are a proxy of action; and (ii) findings provide insight into various signs of drop out intensions, including students contemplating leaving as well as students having serious considerations of leaving. This is a strength as it allows to understand what factors contribute to students' intentions to leave medical school and plan for early interventions to help retain these students.

Furthermore, the work relies on self-reported data by students. Considering the sensitive nature of the research, this may mean that students underreported their mental ill-health symptoms. In terms of the drop-out measure, we were only able to ask about students' intentions. We consider this relevant as even having the intention to leave medical school is an important measure in of itself and an indication that students are unhappy. However, for future research, it is key to consider actual drop-out statistics to get a better sense of the true scale of the problem.

We also acknowledge that the relationships between different mental ill-health issues and students' personal/medical school circumstances are complex and might have an impact on their drop out intentions. Psychiatric symptoms also can co-occur. This study did not aim to investigate the path looking at how different diagnoses relate to each other but rather focuses on investigating symptoms and their link to such medical school outcomes such as drop-out. We encourage future researchers to investigate this topic in more depth, using quantitative and qualitative methods.

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Competing interests

None.

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Data sharing

The data generated and analysed during the current study are not available as consent for this has not been granted by participants.

Author contribution

Concept and design: AM, MS, AR.
Acquisition, analysis, or interpretation of data for the work: AM, MS, NL.
Drafting and critical revision of the manuscript: all authors.
Critical revision of the manuscript: all authors.
Final approval: all authors.
Guarantor: AM

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APPENDIX 1.

TABLE 1. Differences in mental health (Time-1: left; Time-2: right) between students with and without intentions to drop out (Time-2)

	Drop out (M/SD or N/%)			Drop out (M/SD or N/%)		
	No	**Yes**	**Statistics**	**No**	**Yes**	**Statistics**
Emotional exhaustion	**3.61 (1.33)**	**4.58 (1.02)**	**t(404)= -6.959, *p*<0.001**	**3.80 (1.28)**	**4.96 (1.23)**	**t(404)= -7.972, *p*<0.001**
Depression/anxiety symptoms	**1.09 (0.76)**	**1.58 (0.86)**	**t(404)= -4.934, *p*<0.001**	**1.03 (0.79)**	**1.86 (0.97)**	**t(403)= -7.956, *p*<0.001**
Insomnia symptoms	**1.19 (0.82)**	**1.59 (0.83)**	**t(404)= -3.782, *p*<0.001**	**1.16 (0.79)**	**1.71 (1.01)**	**t(404)= -4.383, *p*<0.001**
Somatization symptoms	**1.06 (0.71)**	**1.42 (0.81)**	**t(403)= -3.897, *p*<0.001**	**1.01 (0.70)**	**1.52 (0.91)**	**t(404)= -4.793, *p*<0.001**
Hazardous drinking (Yes)	200 (81.6%)	45 (18.4%)	$\chi^2(1,405) = 0.147$, $p=0.701$	193 (82.1%)	42 (17.9%)	$\chi^2(1,402) = 0.001$, $p=0.981$
Anorexia tendencies (Yes)	**137 (75.7%)**	**44 (24.3%)**	**$\chi^2(1,405) = 8.748$, $p=0.003$**	**129 (73.3%)**	**47 (26.7%)**	**$\chi^2(1,404) = 15.708$, $p<0.001$**
Obsessive compulsive symptoms	**1.23 (1.09)**	**1.81 (1.19)**	**t(404)= -4.089, *p*<0.001**	**1.08 (1.20)**	**1.88 (1.28)**	**t(404)= -4.965 *p*<0.001**
Paranoia symptoms	**1.11 (0.88)**	**1.60 (1.01)**	**t(404)= -4.171, *p*<0.001**	**1.05 (0.90)**	**1.74 (1.10)**	**t(404)= -5.728, *p*<0.001**
Bipolar symptoms	**0.25 (0.26)**	**0.34 (0.32)**	**t(404)= -2.142, *p*=0.008**	**0.23 (0.27)**	**0.29 (0.30)**	**t(404)= -1.690, *p*=0.046**

TABLE 2. Link between sociodemographic characteristics and students' intentions to drop out (Time 2).

		N(%) or M/SD		Statistics
		Drop out (no)	Drop out (yes)	
Gender	Male	80 (80.8%)	19 (19.2%)	χ^2 (1,403) = 0.224, p=0.636
	Female	252 (82.9%)	52 (17.1%)	
Ethnicity	White	211 (80.2%)	52 (19.8%)	χ^2 (1,401) = 1.712, p=0.191
	Ethnic minority	118 (85.5%)	20 (14.5%)	
Age		21.51 (3.11)	21.41 (3.82)	U=11550.5, p=0.503
Sexual orientation	Heterosexual	257 (82.9%)	53 (17.1%)	χ^2 (1,393) = 0.932, p=0.334
	LGBTQ	65 (20.2%)	18 (21.7%)	
Relationship status	Single	**303 (83.9%)**	**58 (16.1%)**	**χ^2 (1,406) = 8.089, p=0.004**
	In relationship	**30 (66.7%)**	**15 (33.3%)**	
Parental occupation	Higher managerial	**273 (84.5%)**	**50 (15.5%)**	**χ^2 (1,406) = 6.698, p=0.010**
	Other	**60 (72.3%)**	**23 (27.7%)**	
Widening Participation	Yes	**44 (71%)**	**18 (29.0%)**	**χ^2 (1,406) = 6.061, p=0.014**
	No	**289 (84.0%)**	**55 (16.0%)**	
Year of medical school		**2.92 (1.65)**	**2.46 (1.36)**	**t(403)= 2.533, p=0.006**
University	UNI 1	32 (84.2%)	6 (15.8%)	χ^2 (8,406) = 9.624, p=0.292
	UNI 2	3 (100%)	0 (0.0%)	
	UNI 3	105 (83.3%)	21 (16.7%)	
	UNI 4	72 (78.3%)	20 (21.7%)	
	UNI 5	22 (73.3%)	8 (26.7%)	
	UNI 6	15 (93.8%)	1 (6.3%)	
	UNI 7	30 (76.6%)	9 (23.1%)	
	UNI 8	27 (96.4%)	1 (3.6%)	
	UNI 9	27 (79.4%)	7 (20.6%)	

TABLE 3. Link between sociodemographic characteristics and students' intentions to mental health (Time 1).

		Emotional exhaustion		Depression/anxiety symptoms		Insomnia symptoms		Somatization symptoms		OCD symptoms	
		M(SD)	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**	**M(SD)**	**Statistic**
Gender	Male	**3.50 (1.30)**	**t(402)= -2.442, *p*=0.008**	**0.96 (0.78)**	**t(402)= -2.931, *p*=0.002**	1.20 (0.82)	t(402)= -0.862, *p*=0.195	**0.77 (0.60)**	**t(401)= -6.141, *p*<0.001**	**1.04 (1.05)**	**t(402)= -2.980, *p*=0.002**
	Female	**3.87 (1.32)**		**1.23 (0.79)**		1.28 (0.84)		**1.23 (0.75)**		**1.42 (1.14)**	
Ethnicity	White	3.83 (1.36)	t(400)= -0.843, *p*=0.200	1.20 (0.80)	t(400)= 1.056, *p*=0.146	1.24 (0.82)	t(400)= -1.032, *p*=0.151	1.16 (0.77)	t(399)= 1.431, *p*=0.077	**1.26 (1.12)**	**t(400)= -1.900, *p*=0.029**
	Ethnic minority	3.71 (1.26)		1.12 (0.80)		1.33 (0.87)		1.05 (0.68)		**1.48 (1.15)**	
Age		$r_s(407)$ = 0.062, *p*=0.215		$r_s(407)$ = 0.020, *p*=0.692		$r_s(407)$ = -0.011, *p*=0.825		$r_s(407)$ = 0.081, *p*=0.102		$r_s(407)$ = -0.043, *p*=0.383	
Sexual orientation	Heterosexual	3.75 (1.32)	t(392)= -1.160, *p*=0.123	**1.11 (0.79)**	**t(392)= -3.399, *p*<0.001**	**1.20 (0.82)**	**t(392)= -2.772, *p*=0.003**	**1.06 (0.72)**	**t(391)= -3.124, *p*<0.001**	**1.26 (1.14)**	**t(392)= -2.081, *p*=0.019**
	LGBTQ	3.94 (1.36)		**1.44 (0.79)**		**1.47 (0.83)**		**1.34 (0.79)**		**1.55 (1.07)**	
Relationship status	Single	3.76 (1.30)	t(405)= -1.058, *p*=0.145	**1.15 (0.79)**	**t(405)= -1.866, *p*=0.031**	1.27 (0.85)	t(405)= 0.016, *p*=0.494	1.12 (0.74)	t(404)= -0.099, *p*=0.461	1.34 (1.13)	t(405)= 0.010, *p*=0.496
	In relationship	3.99 (1.51)		**1.38 (0.85)**		1.26 (0.73)		1.13 (0.74)		1.33 (1.10)	
Parental occupation	Higher managerial	3.79 (1.31)	t(405)= -0.120 *p*=0.452	1.15 (0.79)	t(405)= -1.393, *p*=0.082	1.25 (0.84)	t(405)= -0.687, *p*=0.246	1.10 (0.73)	t(404)= -1.231, *p*=0.109	**1.27 (1.10)**	**t(405)= -2.253, *p*=0.012**
	Other	3.80 (1.42)		1.32 (0.82)		1.32 (0.82)		1.21 (0.80)		**1.58 (1.20)**	
Widening Participation	Yes	**4.15 (1.25)**	**t(405)= 2.326 *p*=0.010**	**1.41(0.83)**	**t(405)= 2.553, *p*=0.006**	**1.54 (0.86)**	**t(405)= 2.864, *p*=0.002**	**1.29 (0.80)**	**t(404)= 1.937, *p*=0.027**	**1.76 (1.11)**	**t(405)= 3.249, *p*=0.001**
	No	**3.72 (1.33)**		**1.13 (0.79)**		**1.22 (0.82)**		**1.09 (0.73)**		**1.26 (1.12)**	

		Emotional exhaustion		Depression/anxiety symptoms		Insomnia symptoms		Somatization symptoms		OCD symptoms	
		M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic	M(SD)	Statistic
University year		**$r_p(406) = 0.099$, $p=0.046$**		$r_p(406) = -0.014$, $p=0.785$		$r_p(406) = -0.028$, $p=0.577$		**$r_p(405) = -0.134$, $p=0.007$**		$r_p(406) = -0.018$, $p=0.721$	
University	UNI 1	4.06 (1.41)	**$F(8,406)= 0.741$, $p=0.655$**	1.39 (0.93)	$p=0.201$	1.52 (0.90)	$F(8,406) = 4.116$, $p<0.001$	1.31 (0.89)	$F(8,405) = 0.897$, $p=0.519$	1.42 (1.29)	$F(8,406) = 1.514$, $p=0.150$
	UNI 2	4.80 (0.20)		1.58 (0.72)		3.14 (0.38)[a]		.46 (.58)		2.89 (0.38)	
	UNI 3	3.72 (1.29)		1.04 (0.76)		1.24 (0.83)[a]		1.09 (0.74)		1.40 (1.09)	
	UNI 4	3.89 (1.25)		1.23 (0.76)		1.32 (0.80)		1.02 (0.67)		1.34 (1.09)	
	UNI 5	3.68 (1.33)		1 (0.68)		0.91 (0.71)[a]		1.03 (0.77)		1.18 (1.12)	
	UNI 6	3.54 (1.40)		1.36 (0.47)		1.66 (0.88)		1.30 (0.80)		1.60 (0.88)	
	UNI 7	3.63 (1.34)		1.15 (0.85)		1.10 (0.76)[a]		1.14 (0.76)		1.17 (1.18)	
	UNI 8	3.90 (0.51)		1.30 (0.88)		1.25 (0.81)		1.25 (0.75)		1.42 (1.22)	
	UNI 9	3.70 (1.47)		1.26 (0.92)		1.10 (0.77)[a]		1.17 (0.68)		.99 (1.09)	

		Paranoia symptoms		Bipolar symptoms		Hazardous drinking (yes)		Anorexic tendencies (yes)	
		M(SD)	**Statistic**	**M(SD)**	**Statistic**	**N(%)**	**Statistic**	**N(%)**	**Statistic**
Gender	Male	1.08 (0.84)	t(402)= -1.426, *p*=0.077	0.23 (0.23)	t(402)= -1.335, *p*=0.091	63 (63.6%)	□2 (1, 403) = 0.704, *p*=0.402	**20 (20.2%)**	**□2 (1, 403) = 32.391, *p*<0.001**
	Female	1.23 (0.93)		0.27 (0.28)		179 (58.9%)		**161 (63%)**	
Ethnicity	White	1.19 (0.93)	t(400)= 0.127, *p*=0.449	0.28 (0.28)	t(400)= 1.226, *p*=0.111	**183 (69.8%)**	**□2 (1, 401) = 21.879, *p*<0.001**	118 (44.9%)	□2 (1, 401) = 0.023, *p*=0.881
	Ethnic minority	1.18 (0.91)		0.25 (0.26)		**60 (43.2%)**		63 (45.7%)	
Age		r_s(407) = -0.086, *p* = 0.082		**r_s(407) = -0.251, *p*<0.001**		**U=17302, *p*=0.035**		U=18486.5, *p*=0.104	
Sexual orientation	Heterosexual	**1.11 (0.91)**	**t(392)= -2.874, *p*=0.002**	**0.24 (0.25)**	**t(392)= -3.735, *p*<0.001**	181 (58.4%)	□2 (1, 393) = 2.931, *p*=0.089	**130 (41.9%)**	**□2 (1, 393) = 5.708, *p*=0.017**
	LGBTQ	**1.44 (0.92)**		**0.37 (0.31)**		57 (68.7%)		**47 (56.6%)**	
Relationship status	Single	1.20 (0.93)	t(405)= .273, *p*=0.393	**0.27 (0.28)**	**t(405)= 1.863, *p*=0.034**	219 (60.7%)	□2 (1, 406) = 0.139, *p*=0.709	166 (46.05)	□2 (1, 406) = 1.759, *p*=0.185
	In relationship	1.16 (0.88)		**0.21 (0.22)**		26 (57.8%)		16 (35.6%)	
Parental occupation	Higher managerial	1.16 (0.91)	t(405)= -1.773, *p*=0.038	0.27 (0.28)	t(405)= -0.413, *p*=0.340	198 (61.3%)	□2 (1, 406) = 0.603, *p*=0.438	139 (43.0%)	□2 (1, 406) = 2.055, *p*=0.152
	Other	1.36 (0.94)		0.28 (0.22)		47 (56.6%)		43 (51.8%)	
Widening Participation	Yes	**1.42 (0.97)**	**t(405)= 2.086, *p*=0.019**	0.31 (0.29)	t(405)= 1.393, *p*=0.082	38 (61.3%)	□2 (1, 406) = 0.027, *p*= 0.869	29 (46.8%)	□2 (1, 406) = 0.112, *p*=0.738
	No	**1.16 (0.91)**		0.26 (0.27)		207 (60.2%)		153 (44.5%)	
University year		**r_p(406) = -0.130, *p*=0.009**		**r_p(406) = -0.240, *p*<0.001**		t(403)= 1.623, *p*=0.053		**t(403)= 1.731, *p*=0.042**	

		Paranoia symptoms		Bipolar symptoms		Hazardous drinking (yes)		Anorexic tendencies (yes)	
		M(SD)	Statistic	M(SD)	Statistic	N(%)	Statistic	N(%)	Statistic
University	UNI 1	1.16 (1.01)	$F(8,406) = 0.742$, $p=0.539$	0.54 (0.29)	$F(8,406) = 2.623$, $p=0.008$	**16 (42.1%)**	**χ^2 (8, 406) = 35.691, $p<0.001$**	19 (50.0%)	χ^2 (8, 406) = 5.436, $p=0.710$
	UNI 2	1.93 (1.31)		0.11 (0.19)		**1 (33.3%)**		3 (100%)	
	UNI 3	1.18 (0.88)		0.27 (0.26)		62 (48.8%)		53 (41.7%)	
	UNI 4	1.20 (0.97)		0.24 (0.27)		74 (81.3%)		40 (43.5%)	
	UNI 5	1.02 (0.92)		0.14 (0.21)		24 (80.0%)		15 (50%)	
	UNI 6	1.27 (0.79)		0.45 (0.33)		9 (56.3%)		8 (50.0%)	
	UNI 7	1.29 (0.84)		0.29 (0.27)		20 (51.3%)		17 (43.6%)	
	UNI 8	1.45 (0.88)		0.37 (0.26)		20 (71.4%)		11 (40.7%)	
	UNI 9	1.02 (0.99)		0.29 (0.27)		19 (55.9%)		16 (47.1%)	