CLINICAL & BASIC RESEARCH

Associations of Pass-Fail Outcomes with Psychological Health of First-Year Medical Students in a Malaysian Medical School

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العلاقة بين نتائج النجاح – الفشل والصحة النفسية لطلاب سنة أولى طب في كلية للطب بماليزيا

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الملخص: الهدف: الحاجة والبيئة الحادة للتدريب الطبي قد يخلف ضغوطاً شديدة على طلبة الطب، الأمر الذي قد يؤدي بدوره إلى نتائج غير إيجابية على كلا من الوضع الشخصي أو المهني. قد يشمل هذا ضعف الاداء الأكاديمي واعتلال في القدرة المعرفية. هذه الدراسة أعتمدت على اكتشاف الترابط بين نتائج النجاح – الفشل ومتغيرات الصحه النفسية (التوتر،القلق، واعراض الكآبة). الطريقة: شملت هذه الدراسة المقطعية جماعة من طلاب سنة أولى طب في كلية للطب بماليزيا. مقياس الكآبة القلق التوتر ذو 21 وحدة تقييم (21–DASS) تم إعطاؤه فور انتهاء من آخر ورقة امتحان لطلبة السنة الأولى. تم تتبع نتائج الامتحانات (نجاح—– فشل) للطلبة باستخدام رمز الطالب التعريفي عن طريق المكتب الأكاديمي بجامعة ساينس الماليزية. النتائج: إجمالي194 (98%) من طلاب الطب استجاب ل DASS–21. اختبار t– المستقل أظهر أن الطلاب الذين نجحوا كان لديهم نسبة قليلة معتبرة من التوتر، القلق وأعراض الكآبة مقارنة بأولئك الذين فشلوا في الامتحان النهائي للسنة الأولى (0.05> P). أولئك الذين يعانون من توتر متوسط إلى حاد كانوا بنسبة 2.43 أعلى عرضة للفشل في الامتحانات من أولئك الذين يعانون من توتر عادي إلى بسيط. الخلاصة: طلاب الطب الذين فشلوا في الامتحان النهائي كان لديهم معدل أعلى من القلق النفسي مقارنة بأولئك الذين نجحوا في الامتحان. أولئك الذين يعانون من مستوى أعلى من القلق كانوا أكثر عرضة للفشل من غيرهم. خفض القلق النفسي لطلاب الطب قبل الامتحان قد يساعدهم على تقديم أداء أفضل في الامتحانات.

مفتاح الكلمات: التوتر النفسي؛ القلق؛ الكآبة؛ طلبة الطب؛ تقييم الطلبة؛ ماليزيا.

abstract: ***Objectives:*** The demanding and intense environment of medical training can create excessive pressures on medical students that eventually lead to unfavorable consequences, either at a personal or professional level. These consequences can include poor academic performance and impaired cognitive ability. This study was designed to explore associations between pass-fail outcome and psychological health parameters (i.e. stress, anxiety, and depression symptoms). ***Methods:*** A cross-sectional study was conducted on a cohort of first-year medical students in a Malaysian medical school. The depression anxiety stress scale 21-item assessment (DASS-21) was administered to them right after the final paper of the first-year final examination. Their final examination outcomes (i.e. pass or fail) were traced by using their student identity code (ID) through the Universiti Sains Malaysia academic office. ***Results:*** A total of 194 (98.0%) of medical students responded to the DASS-21. An independent t-test showed that students who passed had significantly lower stress, anxiety, and depression symptoms than those who failed the first-year final examination ($P < 0.05$). Those who experienced moderate to high stress were at 2.43 times higher risk for failing the examination than those who experienced normal to mild stress. ***Conclusion:*** Medical students who failed in the final examination had higher psychological distress than those who passed the examination. Those who experienced high stress levels were more likely to fail than those who did not. Reducing the psychological distress of medical students prior to examination may help them to perform better in the examination.

Keywords: Psychological stress; Anxiety; Depression; Medical students; Student assessment; Malaysia.

Advances in knowledge

- *This study showed that there was an association between pass-fail outcomes and the psychological health status of medical students during a summative assessment.*

- *Efforts to reduce psychological distress of medical students prior to a summative assessment might improve their performance on the assessment.*

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MANY STUDIES HAVE REVEALED THAT the environment of medical training programmes are not optimal to medical students' psychological health as the reported prevalence of psychological disorders among them was higher than that of the general population and of students taking other courses.[1-13] The prevalence of medical student psychological distress, which broadly encompasses anxiety, stress, depression and mental health-related problems, ranged from 21% to 56% in two different studies.[14–15] The prevalence was found to have doubled at the end of first-year medical training and during the final examination period.[8,16] Some aspects of medical training cause unwanted consequences for medical students' psychological health, therefore hampering the noble aims of medical training. The reported sources of stress for medical students seem to be linked with medical training and are related particularly to academic requirements.[2,10,11,17] The demanding and intense environment of medical training creates excessive pressures on medical students that eventually leads to unfavorable consequences either at personal or professional levels, possibly resulting in poor academic performance and/or impaired cognitive ability.[2,3]

Many studies have revealed that the greatest source of stress for medical students is the medical curriculum.[2,10,11,15,16,18] The top three sources of stress found in previous studies were examinations, learning large amounts of content, and lack of time to review what had been learnt.[10,11] These studies showed that medical students were overloaded with the tremendous amount of information to be learnt in a limited time for examinations. The overload of information created feelings of academic disappointment because most medical students never perceived themselves as being able to revise sufficiently in the subjects they had studied in order to attain personal examination performance goals. Therefore, many medical students struggle with questions about their ability to meet the demands of medical curricula.[19]

The mismatch that occurs between demands and perceived ability to meet the demands may worsen stressful feelings in medical students.[20] It is possible that these feelings of academic disappointment may be most prevalent among those students who have poor previous academic performance.[21] Previous studies reported that the prevalence of medical students with unfavourable stress levels was found to double during final examinations.[16]

Many studies have shown that female medical students face more stressors than their male peers.[1,3,22,23] It was also reported that women experience a greater degree of anxiety and depressive symptoms than men do.[3,9,12,19] In contrast, several studies have found no association between gender and psychological distress.[10,11,24] A few studies also have found an association between race and psychological distress among medical students.[23,24] However, other studies have found that there is no significant association between race and psychological distress.[10–12,25,26] Other research studies have shown that minority medical students experience higher stresses than their counterparts.[27–29] Several studies have reported that psychological distress is associated with poor academic achievement.[2,3,30,31] In contrast, a number of studies have reported that there is no association between stress and academic achievement.[11,13,32] A previous study reported that there was also no association between depressive symptoms and academic qualifications upon entry to university.[12] These studies have suggested that race, sex, entry qualifications, and academic achievement might have a significant relationship to stress, anxiety, and depression. However, a review of this literature reveals that the relationship between the psychological health parameters to pass-fail outcomes in summative assessments have been largely unexplored.

This study was therefore designed to explore possible associations between psychological health parameters (i.e. stress, anxiety, and depression) and pass-fail outcomes in a cohort of first-year

medical students at the Universiti Sains Malaysia (USM) School of Medical Sciences (SMS) during a summative assessment. The working hypothesis for this study was that medical students who passed their examinations would experience a lower degree of stress, anxiety, and depression symptoms than those who failed. After controlling for race, entry qualifications, and gender, those who experienced a high degree of psychological distress would be at high risk of failing their examination.

Methods

A cross-sectional study was conducted on a cohort of 196 new first-year medical students in the SMS at USM. Ethical approval was obtained from the Human Ethical Committee of USM prior to the start of the research.

The SMS offers an integrated, problem-based, and community-oriented medical curriculum. This five-year programme is divided into three phases. Phase I (year 1) is the fundamental year focusing on organ-based systems. Phase II (years 2 and 3) continues the system-based approach and introduces the basics of clinical clerkship. Phase III (years 4 and 5) is the clinical phase where the students are rotated through all clinical disciplines. The medical school grades student performance in assessments based on a pass/fail grading. Year 1 medical students have to go through three continuous assessments tests and one final examination before they can progress to the second year of study. The final examination (i.e. summative assessment) is constituted of three main tests—an objective structured practical examination (OSPE), an essay section, and multiple choice questions (MCQs). The examinations are administered over a week and constitute 70% of the total marks. The other 30% of marks are based on the 3 continuous assessments, each of them contributing 10%. The students must obtain a total examination mark of more than 50% to pass and progress to the second year. Otherwise, they have to repeat the whole year.

The Depression Anxiety Stress Scale 21-item (DASS-21) questionnaire was administered to a cohort of 196 new medical students in the 2009–2010 academic session right after the final paper of the first-year final examination in the examination hall.[33] Participants were asked to write down their matrix number on the DASS-21 form as an identity

code (ID) for follow-up purposes. They were also asked to tick boxes regarding basic demographic information pertaining to gender, race (Malay, Chinese, Indian, or other), and entry qualifications (matriculation, high school certificate [HSC], or A-Level). Instructions and information about the study were given to them. They were clearly informed that the results of this study would not have any influence on their examination results. They were informed that they would be referred to and further assessed by the Student Medical Academic Response Team (SMART), (constituting the deputy dean of academics, the chairman of personnel and the professional development programme, a medical educationist, a clinical psychologist, and a psychiatrist), if they were found to be experiencing high to severe psychological distress. Their final examination outcomes (i.e. pass or fail) were traced by using their ID through the USM academic office. The students did not know the results of their summative examination at the time they completed the DASS-21.

The DASS-21 was developed to measure depression, anxiety and stress levels.[33-35] Its validity and reliability among student samples was well-established, among others, by McDowell in 2006. The reliability coefficient of depression, anxiety, and stress subscales range from 0.81 to 0.97, and the three subscales demonstrated a satisfactory discriminative ability to differentiate between psychiatric and non-psychiatric patients.[36] The DASS Manual for Student Samples,[33–35] categorises 1) stress subscale scores as normal (0–14), mild (15–18), moderate (19–25), severe (26–33), and extremely severe (34 and above); 2) anxiety subscale scores as normal (0–7), mild (8–9), moderate (10–14), severe (15–19) and extremely severe (20 and above), and 3) depression subscale scores as normal (0–9), mild (10–13), moderate (14–20), severe (21–27) and extremely severe (28 and above).[33–35] The DASS-21 was chosen for this study because it can be administered rapidly, is a well-validated and reliable instrument, and further is superior and more consistent than the full-scale version.[36] A high score on each subscale indicated poor psychological health.[33]

Data were analysed by Predictive Analysis SoftWare (PASW), version 18 (IBM, Inc., Chicago, IL, USA). Descriptive statistics were used to report on frequency and percentage of variables. An

Table 1: Demographic profiles of respondents

Variable		Frequency n (%)
Sex	Male	066 (34.0)
	Female	128 (66.0)
Entry Qualification	Matriculation	172 (88.7)
	High School Certificate	13 (6.7)
	Others	9 (4.6)
Race	Malay	104 (53.6)
	Chinese	60 (30.9)
	Indian	24 (12.4)
	Others	6 (3.1)
Examination outcome	Passed	161 (83.0)
	Failed	33 (17.0)
Stress status	Normal to mild	147 (75.8)
	Moderate to extremely severe	47 (24.2)
Anxiety status	Normal to mild	63 (32.5)
	Moderate to extremely severe	131 (67.5)
Depression status	Normal to mild	136 (70.1)
	Moderate to extremely severe	58 (29.9)

independent t-test was applied to determine the mean difference of stress, anxiety, and depression scores between the pass and fail groups. Binary logistic regression was applied to determine the factors that contributed to a pass-fail outcome and its odds ratio. For analysis purposes, stress, anxiety, and depression scores were categorised as 'normal to mild' and 'moderate to extremely severe'.

Results

A total of 194 (98%) medical students responded to the DASS-21. The majority of them were female, had matriculated from high school and were Malay [Table 1]. The total number of students who passed

and failed in the final examination were 161 and 33, respectively. A majority of the medical students experienced a high degree of anxiety (67.5%), followed by depression (29.9%) and stress (24.2%) [Table 1].

An independent-t test showed that students who passed had experienced significantly lower stress, anxiety, and depression symptoms than those who failed [Table 2]. These results indicated that students who failed in the examination experienced a high degree of stress, anxiety, and depression symptoms during the final examination.

Binary logistic regression (Forward: LR Method) was applied to determine factors which contributed to the medical students' pass-fail outcomes in the final examination. A logistic regression model indicated that one factor significantly contributed to the pass-fail outcomes—the stress status ($x2$ = 4.58; P value <0.032; -2 log likelihood = 172.37; Nagelkerke $R2$ = 0.039) [Table 3]. This result indicated that those who experienced moderate to extremely severe stress were at a 2.43 times higher risk of failing the final examination than those who experienced normal to mild stress. The pass-fail outcomes among medical students were not affected by gender, race, entry qualification, anxiety status, or depression status.

Discussion

Prior to medical training, approximately 14.4% and 1.1% of entering medical students suffered from mild and moderate anxiety symptoms, respectively. In contrast, during medical training approximately 11.5% of medical students suffered from anxiety disorder.[19,37] These facts suggested that both before

Table 2: Association between pass-fail outcomes of the final examination with stress, anxiety, and depression scores

DASS	Phase 1 Final exam status*	n	Mean	SD	Mean difference (95% CI)	t-test	P value
Stress	Passed	161	12.18	9.44	3.93	2.306	0.029
	Failed	033	16.12	8.75	(0.42, 7.45)		
Anxiety	Passed	161	13.06	9.25	4.34	2.457	0.015
	Failed	033	17.39	9.17	(0.86, 7.35)		
Depression	Passed	161	08.76	9.24	4.03	2.292	0.023
	Failed	033	12.79	9.03	(0.56, 7.50)		

DASS = Depression Anxiety Stress Scale; n = number; SD = standard deviation; CI = confidence interval.

Independent t-test: a P-value <0.05 was considered significant. Parametric assumptions were met as the Levene's test was not significant (P value >0.05) and histogram showed data were normally distributed.

*The pass and fail outcomes were based on the official results from the Examination Board of Phase I, Universiti Sains Malaysia.

Table 3: Factors that contributed to failure of medical students in the final examination

Variables	B-coefficient	Wald-X2 statistics (df)	P value*	Odds Ratio (95% CI)
Stress status				
Normal to mild stress (reference group)				2.43 (1.10, 5.37)
Moderate to extremely severe stress	0.887	4.79 (1)	0.029	
Constant	-1.848	59.04 (1)	<0.001	

CI = confidence interval.
*Binary logistic regression test (Forward: LR method); a P value <0.05 was considered significant at 95% CI. Variables included in the analysis were sex, race, entry qualification, stress status, anxiety status, depression status. Pass was coded as 0 and fail was coded as 1.

and after medical training, medical students experience a substantial degree of anxiety. Our study found a far greater percentage of medical students experienced significant anxiety disorders (67.5%) during the final examination than those figures reported either before or during medical training, but relatively similar to figures reported by a few previous studies which ranged from 60% to 70%.[19,37–39] The huge increase in anxiety disorders among medical students found in this study is, perhaps, due to the impact of the final examination on psychological well-being as reported by a previous study.[16] Even so, the percentage of medical students who experienced significant symptoms of stress (24.2%) and depression (29.9%) were similar to previous studies, ranging from 21% to 56% for stress, and 5% to 37.5% for depression.[3,4,6,12,15,40]

Also of great interest in this study, is the fact that a far greater percentage of medical students scored moderate to severe on the anxiety scale (67.5% of the students) than on either the stress scale (24.2% of the students) or the depression scale (29.9% of the students), but yet, only the stress scale showed a statistically significant correlation with examination performance. Apparently, a majority of the students were expressing anxiety, but the higher performers on the assessment were expressing as much anxiety as the low performers. A logical reason behind this finding could be due to the consequences of the pass-fail outcomes to the students, whereby if they failed they could not progress to Phase II and would have to repeat the first year of medical training. The consequence creates a great worry among the students regardless of their real performance.

Results showed that students who passed had significantly lower symptoms of stress, anxiety, and depression than those who failed during the examination period. These findings were similar to previous studies that reported that medical students who had significant mental health problems achieved low academic results.[1-3,30,40] For example, a nationwide study conducted on medical students across medical schools in Korea revealed that medical students with major depressive disorder had significant lower cumulative grade point average (CGPA) as an expression of academic achievement, than those who were not depressed.[40] However, a previous study conducted on students from various courses, including a medical course, found a weak negative correlation between CGPA and stress levels.[13] Another study that was conducted on pre-diploma science students reported a similar finding where students' CGPAs weakly correlated with stress levels.[32] In a nutshell, based on findings from the literature and our study, it could be said that a substantial association might exist between psychological health and the examination performance of medical students. There are short-term and long-term postulations for a correlation between a psychological well-being factor and examination performance. The short-term postulation is that if the students are anxious, stressed, or depressed at the time that they are taking the examination, their performance may be affected regardless of how well they have learnt the material. The long-term postulation is that if a student is chronically anxious, stressed, or depressed through their first year of medical training, then this may have affected their ability to learn properly and/or retain the material necessary for successful performance on the final examination. Continued research is required to verify these postulations. One important lesson learnt from these findings is that medical schools should be aware that students who performed poorly in examinations might need psychological support, as seen in a study conducted in Oman by a committee that deals with students who were under academic probation.[41]

Introducing peer-group support might serve as effective psychological support to academically weak students.[42,43]

Optimal levels of stress (i.e. favourable stress) will enhance the learning abilities of students; however, excessive stress (i.e. unfavourable stress) may lead to unfavourable consequences.[2,3,44] Our study revealed that medical students who experienced moderate to extremely severe stress were at a 2.43 times higher risk of failing in the final examination than those who experienced normal to mild stress. This finding was relatively similar to those of a previous study which reported that medical students with a major depressive disorder were at a 1.8 times higher risk to get CGPAs below 2.0 as compared to those who were not depressed.[40] Our study failed to demonstrate any significant risks posed by anxiety and depression status after controlling for gender, race, and academic qualifications upon entry to university. These findings suggested that the stress status of medical students was the main risk factor for pass-fail outcomes.

Two important lessons can be learnt from these findings. The first would be to introduce a programme that induces favourable stress and reduces the unfavourable stress experienced by medical students prior to examination. This might improve students' outcomes in examinations. The second would be to provide faculty mentoring to academically weak students which might help to improve students' psychological health. People who feel well-supported are less likely to burn out, giving credence to these postulations.[45] Apart from that, stress management interventions should be introduced to help medical students cope positively with the stressors related to medical training.[46-48] Such an intervention might be a medical student well-being workshop; this was reported to be a well-accepted intervention and showed promise in positively impacting medical students' psychological health.[49-52]

It is worth highlighting the finding that unfavourable stress in medical students was associated with low self-esteem, difficulties in solving interpersonal conflicts, sleeping disorders, cynicism, decreased attention spans, reduced concentration, academic dishonesty, and alcohol and drug abuse.[52,53–58] Likewise, many medical students suffered from symptoms of depression during medical training.[3,4,6,12] Approximately 10 to 14% of them had suicidal thoughts and 6% planned to commit suicide during medical training.[1,3,59] In contrast, prior to medical training the reported prevalence of depression was less than 1% which is comparable with the general population's prevalence of depression ranging from 2.1 to 3.1%.[9,19] These facts indicate that some aspects of medical training, such as academic requirements, can cause unfavourable stress that might lead to an unintentional adverse impact on students' academic performance.

This study has several limitations which would need to be considered in future studies. First, the study design was cross-sectional and so would not reflect the cause-effect relationship between factors and outcomes. Second, the purposive sampling method may have led to a sample bias that might have compromised the accuracy of the results. Third, this study did not control other potential confounding factors such as intelligent quotient (IQ), age as an indicator of maturity level, or previous academic achievement that might have influenced pass-fail outcomes. Fourth, this study did not measure or control the coping strategies of the students as a potential confounding factor that might have influenced the psychological well-being of the students. Fifth, the psychological health measurement was done during the examination period and, therefore, might not truly reflect the state of the students' psychological health prior to the examination. Therefore, future studies should administer this psychological health measurement at entry into medical school and halfway through the first and second semesters as well as at the end of the first year. Finally, the study population was confined to first-year medical students in a medical school so the results may not be generalised to other years of study or other medical schools. Considering all of these limitations, the results of this study should be interpreted and applied cautiously.

Conclusion

Medical students who failed their final examinations had higher psychological distress than those who passed. Those who experienced high stress levels were more likely to fail than those who experienced optimal stress levels. Reducing psychological distress in medical students prior to examinations may help them perform better in examinations.

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