

Original article

Test anxiety as a risk factor for use of psychoactive compounds in medical students

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Summary

Introduction. Test anxiety implies an intense pathological fear in situations of preparing and taking exams which is a significant problem for 15–70% of medical students. The frequent use of psychoactive substances is recognized as a problem for young people. The aim was to determine the frequency and degree of test anxiety and the association with misuse of psychoactive substances in medical students of the Faculty of Medicine in Foča.

Methods. The research was conducted according to the principle of a cross-sectional study at the Faculty of Medicine in Foča. Students were offered a custom-made questionnaire containing general and specific questions for test anxiety and use and dependence of psychoactive compounds and social networks. Test anxiety was evaluated by Westside anxiety scale.

Results. The sample included 145 respondents, 69.7% females and 30.3% males. The results indicate that the degree of test anxiety does not differ in male and female students, but test anxiety is less pronounced in younger students and students with medium academic success. The level of test anxiety was correlated with the rate of psychoactive compound use. Psychoactive substances were used by 50.3% of students, primary for anti-anxiety, than for psychostimulation and for hypnotic effects. The most commonly used classes of psychoactive substances were plant anxiolytics, followed by benzodiazepines, marijuana, alcohol and narcotics/cocaine (18.6%, 12.4%, 12.4%, 8.3%, and 4.8%, respectively).

Conclusion. A significant number of students reach for anxiolytics and other drugs that can create addiction. Elevated levels of test anxiety are positively correlated with increased consumption of psychoactive compounds. However, the frequency of use of psychoactive compounds surpasses the frequency of altogether moderate, high and extreme test anxiety.

Keywords: test anxiety, anxiolytics, psychoactive compounds, plant anxiolytics

Introduction

Medical professionals are frequently subjected to high levels of stress throughout their careers and they must be capable of maintaining their psychological well-being amid demanding work

environments. Anxiety stands out as the most prevalent psychological issue worldwide [1]. While an optimal level of anxiety can enhance an individual's performance, excessive anxiety can lead to negative consequences for both physical and psychological health. The rigorous nature of medical studies can be viewed as part of the preparatory process for future professional endeavors, inevitably involving stress and anxiety [2].

One specific form of anxiety, exam anxiety, is particularly prevalent in academic environments, especially in demanding fields such as medicine. Exam or test anxiety refers to a psychological condition characterized by intense feelings of apprehension, fear, or nervousness experienced before, during, or after an examination or assessment [3, 4]. The rate and intensity of exam anxiety vary significantly across different faculties, influenced by various factors such as education systems, the quality and alignment of pre-academic education, the coherence of teaching methods and examination formats, student demographics including age and study type. Medical education is often regarded as one of the most stressful faculties, typically associated with the highest levels of exam anxiety. While some degree of anxiety is inevitable and can even be beneficial, high levels of anxiety are detrimental to students' academic success, health, and quality of life. Moreover, elevated levels of exam anxiety may be associated with the use of legal and illegal substances with anxiolytic or other psychoactive effects, potentially leading to dependence and causing long-term consequences for personal and public health.

Psychoactive substances act on the central nervous system, altering mood, behavior, and even consciousness [5]. In addition to prescribed drugs such as anxiolytics, sedatives, antidepressants, and opioid analgesics, psychoactive effects have legal compounds like alcohol and nicotine, as well as illegal substances such as marijuana, cocaine, and amphetamines. Additionally, certain foods, beverages,

and dietary supplements are believed to enhance mental functions, such as energy drinks, coffee, herbal teas, vitamins, and minerals, and are sometimes consumed by students for this purpose [6]. All of these substances can induce detrimental effects. Overuse of psychoactive substances can be linked to exam anxiety. It is crucial to determine the levels of exam anxiety and psychoactive substance use among medical students in Bosnia and Herzegovina, as well as the potential association between these two factors. This is necessary as a foundation for future intervention strategies

Methods

The cross-sectional study was conducted at the Faculty of Medicine in Foča, involving students in the second, fourth, and sixth year of study. A questionnaire was distributed to all students present at the Faculty during the survey period (April 1–15, 2023) who had consented to participate in the study. The participants were briefed on the purpose of the study and provided verbal informed consent. Participation was voluntary and anonymous, with no requirement for names or identification data on the questionnaire. To ensure no undue influence, students, rather than teachers, distributed the questionnaire. Out of the 186 medical students enrolled in the second, fourth, and sixth year of the Faculty of Medicine in Foča in 2023, 145 participated in this study (53, 46, and 46 from each year, respectively), representing assessment rates of 62.3%, 90.2%, and 92% of the total population.

The questionnaire was custom-designed for this study and tailored to suit the student population. It was focused on assessing exam anxiety among medical students using the Westside Test Anxiety (WTA) Scale, which consisted of 10 Likert scale questions with five possible responses ranging from 'not at all' or 'never true' to 'extremely' or 'always true.' Anxiety levels were determined by calculat-

ing the Westside score (WTAS), ranging from 1 to 5 for each question and totaling 10 to 50 overall. The level of anxiety was categorized based on the total score divided by 10, with a final WTAS of 1.0–2.5 indicating low anxiety, 2.5–3.5 indicating medium anxiety, and WTAS greater than 3.5 indicating high anxiety. In terms of descriptive variables, students were surveyed about their use of psychoactive compounds, encompassing synthetic compounds such as benzodiazepines and antidepressants, herbal drugs, sleep supplements, coffee, tea, nicotine, marijuana, and alcohol as well as social network use and dependence. The considered covariables included sex (female or male), age (17 to 20 years old or over 20 years old), year of study (second, fourth and sixth), socioeconomic status (low, middle, and high), and academic success, measured by average marks and number of renewed years. The survey questions were divided into four parts: demographic data (3 questions), academic success (3 questions), test anxiety (11 questions), deprivation of night sleeping (2 questions), psychoactive compound use and dependence (12 questions), and social network use and dependence (2 questions). Respondents were presented closed-ended statements, offering a range of answers or a choice between true/false responses.

Data analysis

Descriptive and analytical statistics methods were employed for data description and analysis. To assess statistical differences among categorical variables, Pearson's chi-square

test was utilized, with results yielding p-values lower than 5% ($p\text{-value} < 0.05$) considered statistically significant. All statistical analyses were conducted using IBM SPSS Statistics Software version 20.0 for Windows. (IBM Corp., Armonk, NY, USA).

Results

The study population consisted of 44 male and 101 female medical students. Concerning socioeconomic status, the majority of students reported being in the low category, followed by middle and high statuses (74, 52, and 12, respectively). Anxiety levels were self-reported by students and assessed in two ways. The first method involved the WTAS, while the second method involved scoring responses to the question 'How stressful does taking exams influence you?' The scores obtained from both methods were significantly associated (Table 1), suggesting that approximately one-quarter of students were experiencing high or extreme levels of test anxiety. Learning itself was reported as highly or extremely stressful by 20.6% of students according to their self-reports, but our results suggested that it was not the single factor associated with test anxiety (Table 2). Sex did not appear to have a significant impact on the level of test anxiety, but test anxiety may increase with the progression of years of study. Additionally, we observed marginal significance in the association between socioeconomic level and average marks with test anxiety level (Table 2).

Students with low and high average marks exhibited a higher likelihood of experiencing

Table 1. Frequency of test anxiety according to WTAS score and students self-evaluation

	Without or negligible anxiety		Moderate anxiety		High or extreme anxiety		Chi2 test
	N	%	N	%	N	%	
WTAS	59	40.7%	47	32.4%	39	26.9%	$p < 0.001$
Simple answer	30	20.1%	75	52.5%	38	26.6%	

Table 2. Characteristics of medical students population regarding level of exam anxiety

		Anxiety 0		Anxiety 1		Anxiety 2		Chi2 test
		N	%	N	%	N	%	
Sex	m	16	34.9	13	30.2	15	34.9	NS
	f	43	43.0	34	34.0	24	23.0	
Year	II	33	62.3	14	26.4	6	11.3	p<0.001
	IV	19	41.3	18	39.1	9	19.6	
	VI	7	15.2	15	32.6	24	52.2	
Financial status	low	23	31.1	24	32.4	27	36.5	p=0.012
	middle	29	55.8	15	28.8	8	15.4	
	good	4	26.7	7	53.3	3	20.0	
Average mark	low	9	33.3	7	25.9	11	40.7	p=0.048
	medium	38	48.1	28	35.4	13	16.5	
	high	12	30.8	12	30.8	15	38.5	
Renewed year	No	50	47.2	31	29.2	25	23.6	p=0.097
	1	7	28.0	9	36.0	9	36.0	
	2 or more	2	14.3	7	50	5	35.7	
Social networks	Dependent	15	44.1	6	17.6	13	38	p=0.073
	Non-dependent	44	39.6	41	36.9.6	26	23.4	
Disturbed sleep	Never or rarely	48	47.5	31	30.7	22	21.8	p=0.025
	Often	11	25.0	16	36.4	17	38.6	
Psychoactive compound For anxiety	Never	50	48.5	30	29.1	23	22.3	p=0.015
	Rarely	5	29.4	8	47.1	4	23.5	
	Often	4	16.0	9	36.0	12	48.0	
Psychoactive compound For insomnia	Never	57	48.7	37	31.6	23	19.7	p<0.001
	Rarely	1	7.1	7	50	6	42.9	
	Often	1	7.1	3	21.4	10	26.9	
Psychostimulants (Neuro-enhancers)	Never	14	29.2	17	35.4	17	35.4	NS
	Rarely	45	46.4	30	30.9	22	22.7	
	Often	59	40.7	47	32.4	39	26.9	

high and extreme anxiety compared to students with medium average marks. Increased anxiety levels were also associated with disturbed sleep, dependence on social networks, and the use of psychoactive substances for anti-anxiety and hypnotic purposes (Table 2). Furthermore, the level of test anxiety was correlated with the rate of psychoactive compound use, both for anti-anxiety ($p<0.05$) and hypnotic effects ($p<0.001$).

Among the examined students, 50.3% reported using psychoactive substances for

various reasons. Among them, 35.2% cited anti-anxiety effects as the primary motivation for their usage. Even though 30.3% of students reported frequent problems with sleeping at night, only 6.2% of them exclusively used these substances for their hypnotic effects. Additionally, 33.1% of students reported using psychoactive substances for psychostimulation purposes. When considering the consumption of coffee and tea, the rate of psychostimulant use increased to 62.8%. Specifically, coffee was reported by 60.0% of students, while green tea

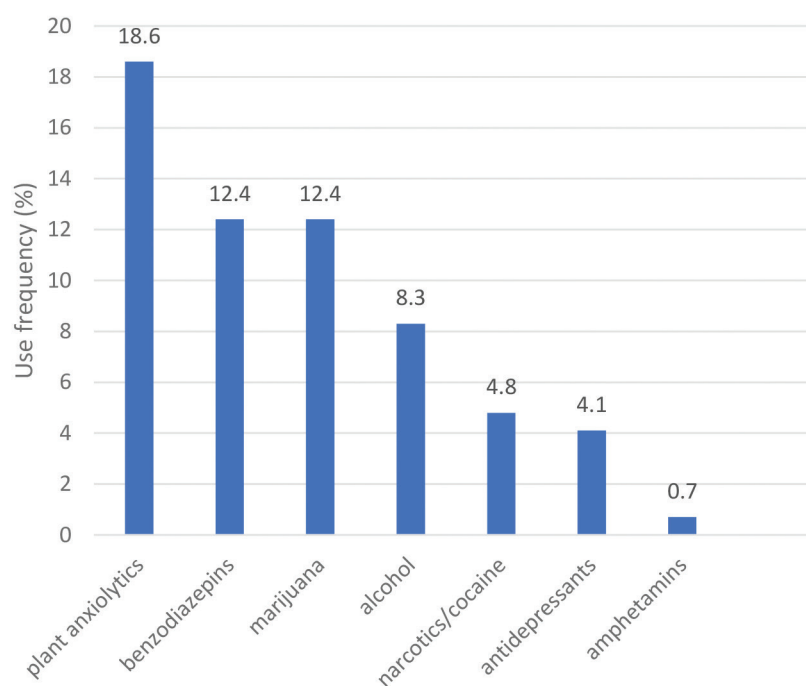


Figure 1. Frequency of psychoactive substance use among medical students

Table 3. The use of psychoactive substances among students

		Psychoactive substance use				Chi2 test
		NO		YES		
		N	%	N	%	
Renewed years	0	45	42.5	61	57.5	p=0.006
	1	17	68.0	8	32.0	
	≥2	11	73	3	72	
Do you have problem with night sleeping?	rarely	45	44.6	56	55.4	p=0.035
	often	28	63.6	16	36.4	
Do you use social networks?	rarely	10	29.4	24	70.6	p=0.005
	often	63	56.8	48	43.2	
Level of test-anxiety	low	21	35.6	38	64.4	p=0.013
	medium	29	61.7	18	38.3	
	high	23	59.0	16	41.0	

was used by 50.3% of students for psychostimulation purposes. In addition to caffeine-containing beverages, other psychoactive substances were also common. Plant anxiolytics were the most frequently used, followed by benzodiazepines and marijuana (Figure 1).

Sex, socioeconomic status, and study year were not found to be correlated with the use

of psychoactive substances. However, a significant association was observed between psychoactive substance use and academic performance, as measured by the number of years renewed (Table 3). Additionally, the use of psychoactive substances was significantly associated with disrupted sleep patterns, social network usage, and the level of test anxiety.

Discussion

The objective of this study was twofold: to assess the degree of test anxiety among medical students enrolled at the Faculty of Medical in Foča, and to explore potential associations with the frequency of psychoactive substance use. According to the results, approximately one-quarter of students reported experiencing high or extreme test anxiety, while nearly twice that number used psychoactive substances to alleviate anxiety, insomnia, or for psychostimulation. Moreover, students experiencing high or extreme test anxiety were more inclined to use psychoactive substances.

The results confirmed the assumption that the level of test anxiety was associated with academic success, consistent with the findings of the majority of studies on this issue. However, the methods used to measure test anxiety and academic success varied among studies. Test anxiety was assessed by cortisol levels [7, 8], visual analog scales [9], or different test anxiety scales [10]. Measures of academic success included average marks, retention rates, personal satisfaction [11], or various other psychological factors. Due to the absence of a standardized scale for measuring academic success in Bosnia and Herzegovina, average marks and the duration taken to complete the program were employed as objective indicators of academic achievement. The discovered negative association between test anxiety level and academic success was anticipated and aligned with findings from other studies [12–14].

In comparison with a previous study in Bosnia and Herzegovina, where high and extreme levels of test anxiety were found in 38.2% of students, the level found in our study was significantly lower. This difference may be partially explained by the examination method employed. In our study, students were assessed by peers during lectures, rather than immediately before exams when test anxiety was typically heightened. Addition-

ally, while moderate anxiety is often deemed beneficial, it is conceivable that some students experiencing moderate levels of anxiety still find it somewhat disruptive during exams.

In this study, no difference was found between male and female students regarding test anxiety levels. This contrasts with some other studies where higher levels of test anxiety were observed in females than in males, including studies conducted in Bosnia and Herzegovina [9, 10, 15, 16], while some authors reported higher levels in males [17]. It is evident that sex differences depend on the country, culture, and organizational structure of the institution. The higher test anxiety observed in female students in the Bosnian and Herzegovinian study was attributed to the emotional vulnerability of women and the more significant social roles of men [10]. The similar levels of exam anxiety observed in our study suggest sex equality within our society, particularly at the Faculty of Medicine in Foča, where significantly more women than men are enrolled. Despite historical disparities in educational opportunities, more women than men are currently pursuing higher education in Bosnia and Herzegovina.

The percentage of students using psychoactive substances exceeds the rate of high and extreme test anxiety by almost twice. Additionally, the percentage of students who reported using psychoactive substances for anxiolytic purposes surpasses the rate of test anxiety, suggesting that anxiety in the student population is not solely connected to exams, learning, and studying. The poor socioeconomic situation reported in this study could be one of the reasons for this phenomenon. Comparing the use of psychostimulants among students in Foča with their peers in Sarajevo, it was found to be at the same level, approximately 30% in both locations. However, students from Sarajevo more commonly reported using nicotine and energy drinks, whereas students from Foča, in contrast, reported using narcotics (opioids) and cocaine.

Specifically, 4.8% of students reported the use of narcotics and/or cocaine, while there were no such reports in Sarajevo. This is a cause for concern and requires urgent action, even though we are aware of significantly higher levels of illicit substance use among students in European countries. In a study conducted in France during the COVID-19 pandemic, opioid use was reported in 14.7% of students and cocaine in 7.5% of students [6].

In addition to the use of narcotics and cocaine, French students reported more frequent use of alcohol, marijuana, and benzodiazepines compared to their counterparts in Bosnia and Herzegovina. The results of this study indicate a strong association between the level of test anxiety and the overall use of psychoactive substances, as well as their separate use for treating anxiety and insomnia. The use of psychoactive compounds frequency among medical students in Foča overpasses overall frequency of moderate and high/extreme test anxiety. The use of psychostimulants for neuroenhancement was not associated with the level of test anxiety. It implies that medical students in Foča used psychostimulants more probably for recreational purposes than for neuroenhancement associated with learning and exams. It is in contrast with findings from the previous study in Bosnia and

Herzegovina [10]. The difference in findings could be attributed to the different faculties involved in these two studies. It is possible that the better medical knowledge of medical students led to less interest in using psychostimulants as cognitive enhancers. Conversely, it is expected that students of economics would have less knowledge and more misconceptions about the effects of psychostimulants on learning abilities.

Conclusion

High to extreme test anxiety was present in approximately one quarter of students. Associations were observed between test anxiety levels and the use of psychoactive substances for treating anxiety and insomnia. Students with high or extreme test anxiety showed a greater inclination towards using psychoactive substances. The obtained results indicate an increase in test anxiety with the progression of study years. The use of legal and illegal psychoactive substances among medical students in Foča is evident, with the most concerning finding being that 4.8% of students reported using narcotics and cocaine. This is a cause for concern and necessitates urgent action.

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Ethical approval. The Ethics Committee of the Faculty of Medicine Foča, University of East Sarajevo, Republic of Srpska, Bosnia and Herzegovina, approved the study

(No: 01-2-27, 15.03.2023) and informed consent was obtained from all individual respondents. The research was conducted according to the Declaration of Helsinki

Conflicts of interest. The authors declare no conflict of interest.

References:

1. Alonso J, Liu Z, Evans-Lacko S, Sadikova E, Sampson N, Chatterji S, et al. Treatment gap for anxiety disorders is global: Results of the World Mental Health Surveys in 21 countries. *Depress Anxiety* 2018;35(3):195–208.
2. Martin RD, Naziruddin Z. Systematic review of student anxiety and performance during objective structured clinical examinations. *Curr Pharm Teach Learn* 2020;12(12):1491–7.
3. Zhang X, Li W, Wang J. Effects of Exercise Intervention on Students' Test Anxiety: A Systematic Review with a Meta-Analysis. *Int J Environ Res Public Health* 2022;19(11):6709.
4. Memon I, Omair A, Barradah OM, Almegren NM, Almuqbil MM, Batarfi OH, et al. Measurement of Exam Anxiety Levels Among Medical Students and Their Association With the Influencing Factors. *Cureus* 2023;15(7):e41417.
5. Ciucă Anghel DM, Nițescu GV, Tiron AT, Guțu CM, Baconi DL. Understanding the Mechanisms of Action and Effects of Drugs of Abuse. *Molecules* 2023;28(13):4969.
6. Carton L, Bastien A, Chérot N, Caron C, Deheul S, Cottencin O, et al. An overview of the use of psychoactive substances among students at the University of Lille during the COVID-19 health crisis: Results of the PETRA study. *Dialogues Clin Neurosci* 2023;25(1):101–11.
7. Loureiro F, Família C, Barroso MH, Baúto RV, Antunes AV. Cortisol dynamics in undergraduate nursing students during clinical practice: protocol for an exploratory cross-sectional study. *BMJ Open* 2023;13(7):e071062.
8. Takatsuji K, Sugimoto Y, Ishizaki S, Ozaki Y, Matsuyama E, Yamaguchi Y. The effects of examination stress on salivary cortisol, immunoglobulin A, and chromogranin A in nursing students. *Biomed Res* 2008;29(4):221–4.
9. Khoshhal KI, Khairy GA, Guraya SY, Guraya SS. Exam anxiety in the undergraduate medical students of Taibah University. *Med Teach* 2017;39(Suppl 1):S22–S26.
10. Kusturica J, Hajdarević A, Nikšić H, Skopljak A, Tafi Z, Kulo A. Neuroenhancing Substances Use, Exam Anxiety and Academic Performance in Bosnian-Herzegovinian First-Year University Students. *Acta Med Acad* 2019;48(3):286–93.
11. York TT, Gibson C, Rankin S. Defining and measuring academic success. *Practical assessment, research, and evaluation* 2019;20(5):1–20.
12. Schaefer A, Matthes H, Pfitzer G, Köhle K. Mental health and performance of medical students with high and low test anxiety. *Psychother Psychosom Med Psychol* 2007;57(7):289–97.
13. Seipp B. Anxiety and academic performance: A meta-analysis of findings. *Anxiety research* 1991;4(1):27–41.
14. Pighi M, Pontoni G, Sinisi A, Ferrari S, Mattei G, Pingani L, et al. Use and propensity to use substances as cognitive enhancers in Italian medical students. *Brain Sci* 2018;8(11):197.
15. Rosal MC, Ockene IS, Ockene JK, Barrett SV, Ma Y, Hebert JR. A longitudinal study of students' depression at one medical school. *Acad Med* 1997;72(6):542–6.
16. Shaikh BT, Kahloon A, Kazmi M, Khalid H, Nawaz K, Khan NA, et al. Students, stress and coping strategies: a case of Pakistani medical school. *Educ Health (Abingdon)* 2004;17(3):346–53.
17. Khan MS, Mahmood S, Badshah A, Ali SU, Jamal Y. Prevalence of depression, anxiety and their associated factors among medical students in Karachi, Pakistan. *J Pak Med Assoc* 2006;56(12):583–6.

Predispitna anksioznost kao faktor rizika za upotrebu psihoaktivnih supstanci kod studenata medicine

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Uvod. Predispitna anksioznost podrazumijeva intenzivan patološki strah u toku pripremanja i polaganja ispita, što predstavlja značajan problem kod 15–70% studenata medicine. Česta upotreba psihoaktivnih supstanci se prepoznaje kao problem mladih ljudi. Cilj je bio utvrditi učestalost i stepen predispitne anksioznosti, kao i njihovu povezanost sa zloupotrebom psihoaktivnih supstanci kod studenata medicine Medicinskog fakulteta Foča.

Metode. Istraživanje je sprovedeno po principu studije presjeka na Medicinskom fakultetu Foča. Studenti su dobili upitnik koji je prilagođen za ovo ispitivanje, sačinjen od opštih i pitanja specifičnih za predispitnu anksioznost, upotrebu i zavisnost od psihoaktivnih supstanci i društvenih mreža. Za procjenu nivoa predispitne anksioznosti korišćena je Westside skala anksioznosti.

Rezultati. Ispitivanjem je obuhvaćeno 145 studenata, od kojih 69,7% ženskog, a 30,3% muškog pola. Rezultati ukazuju da se stepen predispitne anksioznosti ne razlikuje među muškim i ženskim ispitanicima, ali je predispitna anksioznost manje ispoljena kod mlađih studenata i studenata sa prosječnim akademskim uspjehom. Nivo predispitne anksioznosti je bio u korelaciji sa učestalošću upotrebe psihoaktivnih supstanci. Prvenstveno za postizanje anksiolitičkog, zatim psihostimulativnog i hipnotičkog efekta, 50,3% studenata je prijavilo upotrebu psihoaktivnih supstanci. Najčešće upotrebljavane grupe psihoaktivnih supstanci bili su biljni anksiolitici, potom benzodiazepini, marihuana, alkohol i narkotici/kokain (18,6%; 12,4%; 12,4%; 8,3% i 4,8%, redom).

Zaključak. Značajan broj studenata poseže za anksioliticima i drugim supstancama koje mogu stvoriti zavisnost. Povišen nivo predispitne anksioznosti je u pozitivnoj korelaciji sa upotrebom psihoaktivnih supstanci. Međutim, učestalost upotrebe psihoaktivnih supstanci prevazilazi zbirnu učestalost umjerene, visoke i ekstremne predispitne anksioznosti.

Ključne riječi: predispitna anksioznost, anksiolitici, psihoaktivne supstance, biljni anksiolitici