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Test anxiety, emotional regulation and academic performance among medical students: a qualitative study

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ABSTRACT

Medical school can be a difficult and emotionally turbulent experience for students. Test anxiety is very common among medical students and may impact their academic performance. However, there is a lack of qualitative studies on test anxiety and emotion regulation in relation to the academic performance of medical students. This study aims to examine the relationship between test anxiety and academic performance among medical students, exploring the role of emotion regulation and coping strategies in managing test anxiety during examinations. The study involved 22 medical students from one Saudi medical school who participated in semi-structured interviews. The interviews were recorded and transcribed verbatim. A thematic analysis was conducted on the transcribed data, resulting in the identification of four key themes. The emerging themes are test anxiety, academic performance, emotion regulation, and other coping strategies. Students' anxiety can vary from a source of motivation to a severe obstacle. It impacts their theoretical understanding, practical abilities, and the evaluation criteria used to assess academic achievement. However, some students use both adaptive and maladaptive emotion regulation strategies. Promoting emotion regulation and various coping mechanisms to address test anxiety in medical students is essential to enhance their academic performance and prepare them for future healthcare professions.

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Introduction

Medical students often face intense emotional challenges due to their education's high stakes and competitive nature. The pressure to excel academically, retain vast amounts of information, and perform well in exams can lead to significant levels of test anxiety. Test anxiety is a specific form of anxiety that occurs in evaluative situations, particularly during exams. It involves physiological symptoms such as increased heart rate and sweating, cognitive symptoms like negative thoughts and fear of failure, and behavioural symptoms such as avoidance [1,2]. Evidence shows that test anxiety affects more than 50% of medical students [3,4]. Test anxiety can lead to depression, poor management of workload, insufficient study preparation, mood instability and lower student self-esteem in their academic ability [5–7]. Moreover, several research found that test anxiety has a negative relationship with academic performance [8–10].

Academic performance refers to the measurable outcomes of a student's learning process, including grades, exam scores, and overall academic standing. It is a crucial indicator of a student's success and proficiency in their studies [11].

Emotion regulation involves how individuals influence their emotions, how they experience and express these emotions, and how they manage them in various situations. Effective emotion regulation strategies can mitigate the adverse effects of negative emotions and enhance coping mechanisms [12].

Coping mechanisms are the strategies and behaviours that individuals use to manage stress and emotional challenges. These can include problem-focused coping, which involves tackling the problem directly, and emotion-focused coping, which involves managing the emotional response to the problem [13].

Despite extensive research on test anxiety and its effects on academic performance, there is a scarcity of qualitative studies investigating how medical students experience and manage these emotions during exam periods and their influence on academic outcomes. Much of the existing research originates from Western, individualistic contexts, where practical solutions often focus on external techniques, such as relaxation exercises or animal therapy [14]. These approaches may not align with the cultural norms and expectations in Saudi Arabia. This gap is particularly pronounced in collectivist cultures, such as in Saudi Arabia, where familial and community expectations significantly shape students'

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experiences of anxiety. In these contexts, cultural pressures to uphold family honour and meet societal standards exacerbate stress, especially in demanding fields like medicine [15]. Collectivist values may also discourage seeking external psychological help due to stigma and potential repercussions for family reputation, leading students to adopt internal coping mechanisms and culturally specific strategies [15]. This study aims to delve into the experiences of medical students with test anxiety in a collectivist setting, examining their emotional management techniques during exams and the implications for their academic performance and coping strategies.

Materials and methods

Research design

This study adopts a phenomenological research approach, which aims to explore and understand the lived experiences of individuals [16]. Phenomenology is well-suited for investigating how medical students experience test anxiety, manage their emotions during examinations, and navigate coping mechanisms [16]. This approach aligns with the study's qualitative nature, emphasising capturing the essence of participants' experiences. By focusing on students' narratives, this study seeks to uncover the meaning they ascribe to their experiences, providing deeper insights into the interplay between test anxiety, emotion regulation, and academic performance.

Participants and context

Twenty-two medical students from a Saudi medical school were invited to participate in the study. The medical school 6-year program starts with the foundation year, the second and third years are preclinical, and the fourth are clinical years. Participants were included in the study if they met all the following criteria: they were current medical students of any academic year and gender, and they were willing to participate in a semi-structured interview. Participants were selected through purposive sampling to ensure a diverse representation of gender, academic year, and academic performance. All students who were invited to participate were given the opportunity to consent, and only those who agreed to take part were included in the study. Data saturation determined the study's sample size because interviewing more people would not reveal new themes or codes during data analysis. Table 1 illustrates the demographic characteristics of interviewed medical students.

The first researcher, Nora Alshareef, is a PhD candidate at Lancaster University, holding a Bachelor's degree in Medicine and a Master's in Medical Education. This research was part of her PhD study, In addition to her doctoral work, she worked as a lecturer at the medical school where the study participants were enrolled. However, she did not personally know the participants before the study.

The first researcher conducted all the semi-structured interviews, data analysis, and manuscript

Table 1. The demographic characteristics of interviewed medical students.

Participants	Age	Academic year	Entering GPA	Current GPA	Last exam	Next exam	Difficult exam
F1	22	5th year	4.90	4.0	Psychiatry last week	Paediatric in 3 weeks	Embryology in 2nd year
F2	22	5th year	5.0	3.84	Psychiatry 2 weeks ago	Paediatric in 4 days	Anatomy in 2nd year
F3	22	5th year	5.0	4.0	Formative OSCE yesterday	Paediatric in 4 days	Anatomy in 2nd year
M1	22	4th year	4.8	4.0	Nutrition exam today	Paediatric in 3 weeks	Foundation module in 2nd year
F4	29	5th year	4.5	3.5	Paediatric exam today	Obstetric/gyn in 3 weeks	2nd & 3rd years
M2	20	3rd year	4.9	3.8	Reproductive module today	GIT in 3 weeks	Anatomy in 2nd year
M3	27	6th year	5.0	3.5	SMLE exam last week	No exams	Biochemistry 2nd year
M4	23	6th year	4.91	4.82	Mid-term medicine exam today	Final medicine	OSCE in clinical years
F5	22	5th year	5.0	4.0	Psychiatry 2 weeks ago	Paediatric in 4 days	Anatomy in 2nd year
F6	25	6th year	5.0	3.4	Mid-term Medicine last two weeks	Medicine in 2 weeks	Medicine in 4th year
M5	25	6th year	4.90	4.80	Mid-term Medicine last two weeks	Medicine in 2 weeks	Anatomy in 2nd year
M6	23	5th year	5.0	4.90	Mid-term medicine exam today	Final medicine in 5 weeks	OSCE in clinical years
M7	22	5th year	5.0	4.82	Mid-term medicine exam today	Final medicine in 4 weeks	Immune-blood in 3rd year
M8	22	5th year	5.0	4.4	Last week's mid-term medicine exam	Final medicine in 2 weeks	Nervous system in 3rd year
F7	22	6th year	5.0	4.0	Midterm surgery exam today	Final surgery in 4 weeks	Anatomy in 2nd year
F8	21	4th year	5.0	4.9	Medicine last week	Radiology in 1 week.	OSCE in 4th year
F9	27	4th year	4.38	4.18	Medicine exam today	Radiology in 1 week.	OSCE in 4th year
F10	25	4th year	5.0	3.4	Medicine exam two days ago	Radiology in 1 week.	Biochemistry in 2nd year
M9	21	3rd year	4.85	4.25	Reproductive exam today	GIT in 3 weeks	Anatomy in 2nd year
F11	19	2nd year	4.91	4.85	Pathology exam yesterday	Pharmacology in two weeks.	Not yet
F12	19	2nd year	5.0	4.8	Pathology exam yesterday	Pharmacology in two weeks.	All exams
M10	19	2nd year	5.0	4.85	Pharmacology last week.	Skeletal system in one week	All exams

F=Female, M=Male.

writing. The other researchers were her supervisors, who were involved in obtaining ethical approval, contributing to data analysis, and reviewing the results and discussion sections.

Data collection instruments

Data were collected in the second semester of the 2023/2024 academic year using semi-structured interviews guided by an interview protocol developed by the researchers based on a review of relevant literature on test anxiety, emotion regulation, and coping mechanisms. The protocol included open-ended questions designed to elicit detailed responses about the student's medical school experiences with test anxiety, the effect of test anxiety on their academic performance, and the use of emotion regulation strategies and coping mechanisms. The sequence of questions was flexible, adjusting in response to the participants' answers (the interview questions are shown in appendix 1). This adaptability ensured that the conversations unfolded naturally, facilitating a deeper investigation into the aspects of test anxiety deemed most critical by the students.

Procedure

Participants were contacted via email and invited to participate in the study. Interviews were scheduled at convenient times for the participants and conducted in a quiet, private setting within the university campus. The interviews lasted between 41 and 90 minutes and were audio-recorded with the participant's consent. All participants provided written informed consent before the interview.

Data analysis

Interviews were transcribed verbatim and analysed using hybrid thematic analysis [17] (inductive and deductive approach). The deductive approach predetermines the themes based on the research question and the literature, while the inductive approach allows new themes to emerge. Consistent with the recommendations by Braun and Clarke (2006), we adhered to a structured six-step process, providing a systematic approach to coding and theme development and ensuring that the analysis remains rigorous and transparent. Each step is clearly defined, allowing for a thorough and unbiased examination of the data. First, the researchers became familiar with the data by thoroughly reading it to generate initial thoughts and ideas. Next, initial codes were generated by categorising the data to align with the research objectives. The third step involved searching for themes by grouping similar codes. These themes were then reviewed to ensure they were distinct and non-redundant. Each theme was subsequently defined and given a reflective name. Table 2 illustrates the identfied themes, subthemes and codes. Finally, the analysis culminated in producing a report that detailed the results and linked them to the research objectives. It is important to note that these steps were applied in a flexible, non-linear manner, allowing the researchers to move back and forth between stages as required by the analytical needs of the study. The researchers independently coded the transcripts and then met to discuss and refine the themes. Four major themes were identified: test anxiety, the impact of anxiety on academic performance, emotion regulation strategies, and other coping mechanisms.

Finding rigour

We used the Guba and Lincoln criteria [18] to ensure the study methodology's rigour. First, member-checking involved summing participants' interview ideas and returning their transcripts, which could improve the credibility of the data analysis transcriptions. The transcripts were returned to the participants for feedback, but they did not respond. Second, the study's environment and participants were described to improve the transferability of our findings to readers' circumstances. Finally, we detailed our data collection and analysis openly and accurately to enable future replication and review of research conclusions.

Ethical considerations

The Saudi Medical School's Institutional Review Board (reference no. 641–21) approved the study. All participants provided written and verbal informed consent and were assured of the confidentiality of their responses. To protect participants' identities, pseudonyms were used in the transcripts.

The results

Test anxiety

Most medical students suffer greatly from test anxiety, which can cause a range of mental and physical symptoms that affect not just their academic performance but also their general well-being. Test anxiety affects students before, during, and after exams.

Anxiety before exams

Before exams, medical students often experience heightened levels of anxiety, which manifest in both emotional and physical symptoms. This period of anxiety can begin weeks in advance, significantly affecting their ability to prepare and perform. This

Table 2. The identified themes, subthemes, and codes.

Theme	Subtheme	Codes	Frequency	Example
Test Anxiety	Anxiety Before Exams	Emotional reaction	19	*If I have an exam on Thursday, I will feel worried and anxious starting Sunday*
		Physical Symptoms	11	*I start feeling the stress weeks before the exams. My shoulders and chest get so tight that it is hard to focus on studying.*
		Sleep Disturbance	8	*Before exam day, when I cannot sleep, I start to feel stressed.*
	Anxiety During Exams	Physical and Psychological Symptoms	5	*During the exam, I feel nausea and pain.*
	Post-Exam Anxiety	Mental Exhaustion	7	*I feel mentally burned out after exams; even simple tasks seem overwhelming*
		Post-Exam Rumination	7	*I replay the questions in my head, dwelling on what I could have answered incorrectly.*
Academic Performance	Impact of Anxiety	Effect of Anxiety on Performance	6	*Anxiety is the reason I failed the exam.*
		Anxiety with Practical Skills	5	*I remember feeling worried when I drew blood from a patient for the first time; I was afraid to hurt the patient.*
	Educational Outcome concerns	Concerning exam outcome	11	*I was so nervous going into the anatomy exam that I forgot everything. It was my second year, and I could not solve it. In the end, my test score was below 60, and I had to retake the subject in the summer.*
		Concerning GPA	10	*All I think about is increasing my GPA; it makes me anxious.*
	Clinical Competence	Patient Interaction	6	*I feel nervous when I take a clinical history from the patients.*
Emotion Regulation	Emotion regulation Strategies	Cognitive Reappraisal	3	*Whenever I start thinking negatively, I remind myself about my dream to be a good doctor.*
		Emotion Suppression	7	*I choose not to share my burdens with my mom; she is already carrying enough of her own.*
Coping Mechanisms	Study Habits	Study Routines	4	*I also attempted to study in six different ways until I figured out the most effective way to study, and that relieved my test anxiety.*
		Management of time	4	*Every Saturday, I spend an hour planning my week. It keeps me on track with my studies and exams and manages my stress.*
	Support	Social Support	3	*I go to my mum. She sits with me and tries to calm me. She is always saying to me, 'Everything will be OK'.*
		Professional Help	3	*After discussing my fears with my professor, she pointed me towards additional resources and study groups that helped with my exam worries.*
	Physical Well-being	Physical Exercise	4	*Going to the gym regularly helps me manage my test anxiety. Physical exercise keeps me fit and clears my mind; it helps me to focus and stay calm during exams.*

sub-theme will present the emotional reactions, physical symptoms, sleep disturbances and the urge to use medication that students may encounter.

Emotional reaction

Emotional reactions to upcoming exams are common among medical students. These emotions often include intense feelings of anxiety, fear and dread. The following quotes from students illustrate these emotional responses: Some students experience test anxiety just a few days before the exam, while others start to feel anxious weeks in advance. Many students fear that they will forget everything they have studied once they face the exam.

> Every time an exam comes up, I get really scared. I am afraid that no matter how hard I study, I will not remember anything when the test comes around. (M8)
>
> I started feeling worried and anxious the week before the exam. (F9)
>
> Weeks before the exam, anxiety begins to mount. It is persistent and disruptive, making it difficult to unwind or concentrate. (M6)

M5, a sixth-year medical student, vividly remembers his experience of test anxiety before an anatomy exam in his second year of medicine:

> I remember sitting and studying anatomy at the beginning of the second year of medicine. I was studying in a dark room. I remember my vision starting to fade to black, and I started seeing darkness; I could not see my screen. At that time, I was thinking whether to leave medicine or not. (M4)

M4 has experienced test anxiety since his second year of medical school, highlighting the significant impact of exam-related anxiety on students' mental health, which can persist for years. This high level of test anxiety has disturbed his study preparation and prompted him to consider dropping out of medical school. Moreover, several students have complained about the difficulty of the third year, citing the busy and dense curriculum. Some students experience such intense emotional reactions to test anxiety during this period that it may result in the diagnosis of mental health conditions, such as depression. One student in her third year of medical school was diagnosed with both depression and anxiety; she attributes her condition to the quantity of non-stop exams:

> Honestly, the third year was just like a marathon. The third year is busy…I was diagnosed with depression. I took SSRI medication. (F4)

A senior male student expressed concerns about his experience during the preclinical years of his studies. He has also been diagnosed with depression.

> From the second year, there is never enough time for studying, leading to constant studying. In my third medical year, I was diagnosed with depression and anxiety. (M3)

The results emphasise the significant influence of test anxiety on medical students, particularly impacting their mental well-being during the second and third years. The presence of emotional reactions creates a challenging situation for students. Therefore, there is a need to implement appropriate techniques to handle test anxiety and promote students' overall well-being.

Physical symptoms

Several students reported experiencing physical changes in the days leading up to the exam, such as abdominal pain, loss of appetite, nausea and frequent visits to the bathroom.

> Before exams, I feel sick, I feel pain in my stomach, and I cannot eat anything. (F3)

> As the exams approach, I notice my headaches becoming more frequent, and there's this constant knot in my stomach that just doesn't go away, making it tough to keep my focus on studying. (F10)

These quotes illustrate the debilitating nature of test anxiety and its effect on physical health. Before examinations, some medical students experience various physical symptoms. These symptoms frequently begin weeks beforehand, dramatically affecting their capacity to study for exams adequately. Students often experience anxiety about forgetting the information they have learnt, which is accompanied by physical symptoms of stress, such as muscle tension in the shoulders and chest. Additional physical symptoms may include gastrointestinal manifestations, such as abdominal discomfort, nausea and loss of appetite. These physical symptoms exacerbate discomfort and hinder students' ability to concentrate and excel in their tests.

Sleep disturbance

Many students reported changes in their sleep patterns. Medical students frequently experience exam anxiety, which has a substantial impact on their sleep habits and can negatively affect both their performance and general well-being. The students' descriptions of their inability to sleep, particularly during exam times, show how anxiety can interfere with regular physiological processes. F3 highlights a high degree of anxiety that prevents them from sleeping, mentioning that they stayed up until eight in preparation for the exam. Similarly, F5 finds it impossible to sleep on exam day due to the overwhelming stress. F2 also confirms that sleep disturbances are often the first and most noticeable symptoms of anxiety, indicating that even attempts to rest can be ineffective under significant academic pressure.

> I cannot even sleep… until eight the next morning. I go to the exam after staying up all night. (F3)

Another student stated that her sleeplessness led to further anxiety, which created a negative cycle.

> Before exam day, when I cannot sleep, I start to feel stressed. (F5)

> The initial sign of stress for me was my inability to sleep. No matter how hard I try, I just can't seem to fall asleep. (F2)

These incidents highlight the effect of test anxiety on the sleeping patterns of medical students.

Anxiety during exams

Medical students' body symptoms, frequently occurring during exams, negatively impact exam performance. Both physical and psychological symptoms may be present.

Physical and psychological symptoms

In the previous section, 'Anxiety Before Exams', students mentioned several physical symptoms that can occur before exams – days, weeks or immediately. This section focuses on the exam-related physical symptoms that many medical students commonly experience during the examination period. These symptoms include headaches, nausea, vomiting and abdominal pain, all of which are commonly linked to exam-related anxiety. For instance, F1 has expressed experiencing physical symptoms, such as frequent visits to the toilet, which are typical signs of anxiety:

> During the exam, I feel nausea and pain. (F3)

One student reported experiencing panic attacks during tests. The student provided detailed accounts of their experiences, and the following quotes highlight the difficulties they faced:

> I try to catch my breath by taking deep breaths, but it feels like no air is coming in. Then, I get this hyperventilation; I breathe too much, and my entire body goes into a mode where I get tingles all over my chest, hands, and legs. At the beginning of every exam, it happens. I am just three minutes in, and I am struggling to breathe. I was on the verge of passing out, but thankfully, I did not. They had to take me to the clinic. I could not move my hands; they were locked up. I focused on breathing, calmed down, and everything was fine. But yeah, that panic hit me. (M6)

Another student described the effect of test anxiety on her physical state during an exam:

> I feel so anxious during tests that my hands start shaking. It is embarrassing and makes answering the exam questions harder than they should be. (F11)

The physical manifestations of anxiety that occur during exams can significantly affect students' academic performance.

Post-exam anxiety

After exams, many students struggle with anxiety, especially in terms of mental exhaustion and worrying about exam outcomes.

Mental exhaustion

Mental exhaustion is a common side effect of exam preparation and management, and it may continue long after the test has concluded. F3 and M7, fifth-year medical students, reported feeling exhausted due to their exam experiences, and F4 suffered from constant exhaustion of thinking about their future exam performance:

> After my finals, I find it hard to concentrate on anything. My brain needs to reboot after being on overdrive for weeks. (F3)
>
> I feel mentally burned out after exams; even simple tasks seem overwhelming. (M7)
>
> I'm constantly exhausted, even when I'm not studying. The anxiety about how I'll perform never goes away, and it just drains me. (F4)

A fifth-year student reflects on the exam anxiety she experienced during her second year:

> I still feel and remember the overwhelming anxiety I felt during my second-year exams as if it had happened yesterday. (F1)

The quotation emphasises the impact of persistent test anxiety on students after exams. The cognitive toll of test preparation and performance significantly affects students' productivity and mental well-being after the test. These quotations highlight the prolonged nature of exam anxiety experienced by medical students. Therefore, it is crucial to evaluate the long-lasting anxiety that extends well beyond the completion of the examinations. Several medical students have reported experiencing exhaustion and anxiety regarding their performance and outcomes during such an intense period. The persistent symptoms that follow an exam highlight the significant and lasting impact of anxiety associated with exams. This suggests that the effects are not limited to the examination period but can continue to negatively affect students' well-being long after the exams.

Post-exam rumination

Students frequently experience anxiety after exams as they await their results, knowing that their future academic and professional decisions are at stake. Several students have expressed concerns about their exam results following the tests:

> The waiting period following the exam is the worst part – not the exam itself. My mind goes through every scenario that could happen. (F6)
>
> I replay the questions in my head, dwelling on what I could have answered incorrectly. (M2)
>
> The uncertainty of not knowing how I did on the exam just adds to my anxiety. Even after the exam, I can't relax – I keep stressing and over thinking. (M4)

These reflections show the psychological burden of uncertainty regarding exam outcomes, which can intensify feelings of anxiety and stress, often extending well into the post-exam period. This perspective on their challenges underscores the need for targeted interventions to effectively manage test anxiety. Some students undergo a prolonged period of anxiety after their exams, with the most intense worry occurring as they anticipate their results. These periods are filled with ambiguity regarding the potential outcomes of their academic and career endeavours. According to student experiences, the waiting period serves as the main source of stress rather than the examination itself. This demonstrates the significant psychological toll that uncertainty about exam results can impose on students, both during the waiting period and in terms of heightened anxiety, as well as the long-term effects on well-being and academic achievement. There is a pressing need for solutions that may involve implementing emotion regulation strategies or self-compassion training to reduce anxiety.

Academic performance

This theme will explore how anxiety affects performance across several dimensions. The students reflected on the effect of exam anxiety on their examinations, practical skills, test scores, GPA, patient interactions and learning experiences in clinical settings. They highlighted that clinical practice often induces anxiety due to the significant responsibilities and steep learning curves involved.

Impact of anxiety on performance

Effect of anxiety

Several students reported that during exams, despite being well-prepared, anxiety could lead them to forget even the most basic knowledge.

> During oral exams… I would even forget my name, and I forget how to use some of the equipment I have used so frequently – my mind turns blank. (F4)
>
> I did not even know what 'zygote' mean, which is basic knowledge. (F1)

F1 offers an in-depth account of how anxiety negatively impacted her performance during an embryology exam in her second year. Despite her extensive preparation, anxiety hindered her ability to recall essential concepts and resulted in physical symptoms, ultimately contributing to her failure on the exam.

> I took an exam in embryology in year two and was ready for it. I felt like I was not a medical student when I read the exam paper; I forgot my English and did not know what was written, as if I had never studied embryology. I was also dizzy and lightheaded when I started the exam. Zygotes are basic knowledge that I was not even aware of. What I studied in this module has slipped my mind. Like I am in elementary school… Anxiety is the reason I failed the exam. (F1)

These statements highlight the significant influence of anxiety on cognitive function and exam performance. Physiological symptoms of nervousness, such as vertigo and faintness, exacerbate the issue, hindering the ability to effectively apply knowledge and skills. The experience of F1 underscores the importance of implementing efficient techniques to manage anxiety, implying that if these concerns are not addressed, students may persistently perform below their potential, even when adequately prepared.

Anxiety with practical skills

Many students shared their apprehension about applying their practical knowledge. A typical example of the anxiety experienced by new medical students is the process of taking blood samples from patients or performing standard medical procedures. This anxiety emphasises the emotional aspect of the medical profession, as it involves not merely technical execution but also the safety and well-being of patients.

> My hands trembled the first time I had to suture a wound. Applying what you have studied in a real-world setting might be intimidating when you realise the patient's health is in your hands. (M6)
>
> I recall the anxiety I felt during my first time administering an injection to a patient; I was so concerned about causing them pain. (F5)
>
> The pressure of doing my first IV insertion was intense; I knew the technique well in my mind, but applying it was a completely different experience. (M8)

These medical students described how anxiety and fear impact their performance in clinical settings. Their fear stems from their concern for patients' health and safety.

Educational outcome concerns

Concerning exam outcome

Many students expressed concern about their test scores and pass/fail outcomes, often fixating on their exam performance. Several medical students shared their experiences with anatomy written exams during their second and third years of medical school. Moreover, they noted that half of their cohort failed the exam in the third year.

> I was so nervous going into the anatomy exam that I forgot everything. It was my second year, and I could not solve it. In the end, my test score was below 60, and I had to retake the subject in the summer. (F2)
>
> Anatomy, of course. I hate Anatomy … 30 students out of 60 failed Anatomy. (F4)
>
> As exams approach, my anxiety goes up, and it is harder for me to focus. Even though I studied a lot, I still scored lower because of the stress. (M4)

F6 further explained why many students fail the anatomy exam, stating,

> I honestly struggled with the vast amount of memorising required for anatomy lectures. I could not keep up; there was not enough time. I felt pressured, especially before exams. The neuro lectures on Anatomy were very dense. The information was understandable and memorable, but it required more time than I had, so I failed it. (F6)

Further inquiry is necessary to determine the underlying causes of the 50% failure rate among the third-year medical student cohort in the anatomy exam. Identifying the root causes of this high failure rate is crucial for developing effective interventions and enhancing student outcomes. The following section examines the intricate relationship between test anxiety and academic achievement among medical students.

Generally, test anxiety is believed to negatively impact performance. However, several students reported that it functioned more as a stimulant, compelling them to adopt more rigorous study habits and achieve greater exam grades. One student shared their experience of feeling anxious before the exam but ultimately performing well. They described experiencing nervousness, palpitations and chest pain prior to entering the exam room. Despite these symptoms, they managed to calm themselves and ultimately achieved a score of 80 in the subject.

> Before entering the exam venue, I felt very nervous, with palpitations and chest pain with each heartbeat. I tried to calm myself … but thank God, it went well; I scored 80 in the subject. (M3)
>
> My pre-exam nervousness motivates me to study harder. It serves as a kind of wake-up call for me to get better organised and improve my exam score. (M8)

Some students do not think there is a link between anxiety and test scores. For example, F12, a second-year medical student, believes that her performance is unaffected by test anxiety.

> Once I sit for the exam, I do not think that exam anxiety has an impact on how well I perform. (F12)

Other students believe that there is no direct relationship between anxiety levels and test scores. F12, a second-year medical student, evidenced this

perspective. She states that she detaches from the usual physiological and psychological responses associated with test anxiety once she is actively engaged in the examination process. Her statement suggests that F12 May possess unconscious coping mechanisms that enable her to compartmentalise or at least temporarily set aside her anxiety during an examination.

In summary, there is a notable difference in how students perceive anxiety. For some, anxiety can be crippling. Specifically, a student may perform well under conditions that closely resemble those in which they prepared. For instance, some students perform better only if the amount of anxiety they experience while studying aligns closely with the anxiety they experienced during the test. This alignment allows them to optimise their recall and overall performance.

Concerning GPA

Most students discuss the importance of scores and GPA in medical school. Any changes in GPA attributed to test anxiety can affect their perception of academic performance, their results over the semesters and their long-term academic implications. Several students attribute a drop in their GPA to episodes of anxiety. F4, who entered medical school with a GPA of 5.0, is currently a fifth-year student with a 3.5 GPA. She stated:

> All I think about is increasing my GPA; it makes me anxious. (F4)

M2 is a third-year student whose GPA has dropped from 5.0 to 3.8. This decline has led him to worry about his upcoming exams and to question his study skills.

> After seeing my GPA drop last semester, I started to doubt my abilities. It is hard not to feel like a failure when you know you could do better. (M2)
>
> Some students fear that their GPAs will affect their eligibility for future residency programmes, such as F7.
>
> I am worried that my GPA will not be competitive enough for the residency programmes I aim for. (F7)

It is expected that GPA will be a major source of stress for medical students because of its significant influence on future career opportunities, residency placements and speciality choices. The high academic standards required to achieve a competitive GPA create continuous pressure, which subsequently leads to worry, self-doubt and chronic anxiety, ultimately affecting both mental health and academic performance. The emphasis on GPA tends to sideline important aspects of medical training, such as practical skills and patient interaction. Hence, medical-educational institutions should provide proper support systems, including counselling services and anxiety management workshops, to foster students' personal and professional growth as well as their overall health.

Clinical competency

Patient interaction

Students highlight that complex procedures eventually become routine through repeated exposure to clinical evaluations with patients. This evolution is crucial for professional development, transforming students into skilled practitioners. One medical student, in her fourth year and first year of clinical practice, expressed feeling anxious when dealing with patients.

> I feel nervous when I take a clinical history from the patients. (F8)

However, senior students acknowledged that providing patient care requires ongoing learning, which comes with practice.

> As I get more experience, things that once seemed unattainable seem normal. It is evidence of how medical education imparts knowledge. (F12)
>
> With each patient interaction, I am more adept at managing the clinical tasks and the human health involved, which are just as critical. (M8)

Other students expressed that interacting with patients is the most rewarding aspect of studying medicine:

> Dealing with patients is the most enjoyable part of my medicine … building relationships with patients and seeing their journey from illness to health continually reinforces my passion for medicine. (M4)

These quotations illuminate medical students' typical worries when applying their knowledge in practical situations and the steady confidence that develops through consistent practice. Each quotation highlights medical education's dynamic and demanding character while emphasising the value of perseverance in overcoming initial anxieties and acquiring complex abilities.

Emotion Regulation

This theme presents the emotion regulation medical students use, including cognitive reappraisal and emotion suppression.

Emotion regulation strategies

Cognitive reappraisal

This strategy involves identifying and challenging negative thought patterns to alter unwanted behaviour patterns and relieve anxiety. Students may use these

strategies to tackle irrational fears related to exams and to reframe their thoughts towards more positive outcomes. Cognitive reappraisal refers to the process of re-evaluating and reframing one's thoughts and perceptions to effectively regulate and manage emotions. In this emotion control method, individuals alter their emotional reactions by modifying their cognitive interpretation of a potentially emotion-inducing scenario, resulting in more advantageous emotional outcomes.

> Whenever I predict the worst outcomes for my performance, I change those thoughts and shift my focus towards better scenarios. (F9)
>
> Instead of dwelling on the negatives, I remind myself of the positives; it makes a big difference. (F12)
>
> Whenever I start thinking negatively, I remind myself about my dream to be a good doctor. (M4)

Conversely, a sixth-year male medical student attempted cognitive therapy, which is based on the concept of cognitive reappraisal, to address his anxiety but did not notice any benefits.

> I tried cognitive therapy with a professional, but I did not see changes in my anxiety. (M3)

The quotes above show how students actively engage in reframing their negative thoughts. By shifting their focus from potentially adverse outcomes (like failing an exam) to more positive or realistic expectations, they can reduce anxiety and foster a more constructive mindset.

Emotion suppression

Emotion suppression refers to the act of restraining or controlling the outward display of emotions. Unlike reappraisal, which involves changing the way one thinks about a situation, suppression is a response-focused method that solely affects the outward display of emotions without altering the emotional experience itself. This can entail concealing overt manifestations of negative emotions in the social environment to uphold cultural conventions or individual preferences. While suppression may serve a purpose in the short term, it ultimately has detrimental effects on individuals. It can lead to physiological distress and a decline in the quality of relationships, as there is often a disconnect between internal feelings and outward emotions.

Three medical students (M3, M5 and M9) highlight a common reason for using emotion suppression: the belief that sharing their stress will either overburden their loved ones or be misinterpreted.

> I choose not to share my burdens with my mom; she is already carrying enough of her own. (M3).
>
> I often keep my struggles to myself because explaining the pressures of medical school to my family feels like speaking a different language – they just do not get it. (M9).
>
> I do not like to talk about my stress; I do not want to radiate negative energy. (F6)

On the other hand, several students indicated that discussing their emotional struggles and test anxiety with others helps them cope with exams.

> Sharing my fears about exams with my study group made me realise we all had similar anxieties. We started to support each other more actively. (F12)
>
> Whenever I feel overwhelmed, I call my sister to express my feelings about studying medicine. She went through medical school and understood exactly what I was dealing with. (M1)
>
> I found it beneficial to talk about my test anxiety with my friends and get reassurance. (F7)

These quotes demonstrate the use of emotion suppression and the reasons for using it and highlight the importance of expressing negative emotions and their positive effects on managing anxiety and stress related to exams. Sharing experiences with peers provides mutual support, while family members offer comfort and understanding.

Other coping mechanisms

This theme presents other coping strategies medical students use to reduce exam stress besides emotional regulation. It emerged inductively from the thematic analysis.

Study habits

Study routines

Medical students exhibit an array of study strategies to successfully navigate the rigours of medical school and enhance their academic performance. These techniques not only facilitate information retention but are also vital for preserving mental health amidst the complex demands of medical education. Each student adopts a personalised approach that best suits their unique learning style and emotional needs, as demonstrated by the diversity of their strategies.

> By dividing my study time into 30-minute segments separated by a 5-minute break, I can enhance stress management. (M1)

Similarly, M3 describes their strategy of experimenting with six distinct study methods to determine the most effective approach.

> I also attempted to study in six different ways until I figured out the most effective way to study, and that relieved my test anxiety. (M3)

I also attempted to study in six different ways until I figured out the most effective way to study, and that relieved my test anxiety. (M3)

In contrast, F3 prioritises studying early in the semester to prevent anxiety as the examination period approaches.

> I make an effort to begin studying in advance to avoid feeling regretful and anxious and to reassure myself that I am doing my best. (F3)
>
> My grades and feelings significantly improved in the second term compared to the first because I had developed an efficient study method for unfamiliar and difficult subjects. (M3)

These methods illustrate the significance of structured study regimens for coping with the intense pressures of medical school and improving test scores. Each student's approach offers significant perspectives on distinct strategies for managing their emotions and the pressures of academic requirements.

Time management

Effective time management is crucial for medical students, who often need to balance coursework, clinical rotations and personal commitments. By developing strong organisational skills, students can reduce anxiety and gain a greater sense of control over their workload and deadlines.

> I started allocating specific times for studying and breaks… it helps me to relieve anxiety. (F2)

Other students assert that organising their study schedules in advance facilitated effective time management and reduced their anxiety.

> Every Saturday, I spend an hour planning my week. It keeps me on track with my studies and exams and manages my stress. (F3)

Others improve their academic performance and manage test anxiety by establishing academic objectives.

> I establish daily objectives that are practical and attainable. This helps me manage my emotions better by preventing the feeling of being overwhelmed and keeping me motivated. (M1)

The students' quotations above underscore several efficacious time management tactics that prove especially advantageous in the demanding medical school environment. Each quotation offers insight into strategies for alleviating test anxiety and increasing motivation for learning.

Social and professional support

Social support

Some students depend on the emotional assistance of their peers, family and friends. Engaging in study groups, where students share knowledge and resources or seek solace in discussing their concerns and anxieties with a friend, can effectively mitigate feelings of isolation. Participating in dialogues with senior peers or classmates to obtain reassurance and a more balanced viewpoint on examinations serves as an effective coping strategy.

> Discussing homework with my peers not only helps with studying but also eases the feeling of being overwhelmed. (F2)
>
> My peers have been my friends since school, and they are my biggest source of support. Having such a group helps me manage my emotions better, as I can share my stress and challenges with them, which eases anxiety and keeps me grounded. (M2)

The significance of family, as emphasised by F1, is similarly critical. The emotional solace offered by family members, particularly a mother's reassurance, is significantly calming.

> I go to my mum. She sits with me and tries to calm me. She is always saying to me, 'Everything will be OK'. (F1)

As highlighted by F1, the role of family is equally vital. The emotional comfort provided by family members, such as a mother's reassurance, can have a profoundly calming effect. These support systems foster a nurturing environment that alleviates the psychological burdens associated with rigorous academic demands.

Seeking professional help

Some students may find the university's psychological and counselling services helpful. Instructors frequently offer academic support, point students towards resources that improve their educational experiences and help alleviate exam-related anxiety.

> Sometimes I go to my subject professor and talk to her about the exam. She gives me useful advice, and that helps me to deal with difficult subjects and relieve my anxiety. (F11)
>
> After discussing my fears with my professor, she pointed me towards additional resources and study groups that helped with my exam worries. (M5)

The counselling services were beneficial to many students. Counsellors are skilled at working with students to create individualised time and anxiety management plans, which can make academic difficulties feel more manageable.

> My schedule was getting to me, so I went to see our campus counsellor. She assisted me in creating a strategy that helped me keep things under control and manage my exam anxiety. (M4)

According to these students, subject professors and academic counsellors are crucial in relieving students' anxiety and concerns.

Physical well-being

Physical exercise

Physical activity is also commonly advised as a de-stressor. Many medical students have reported using various forms of exercise to alleviate stress, improve their mood by boosting endorphin levels and maintain their physical fitness.

> I walk a lot, and I put on headphones... It helped me to think about the subject and to calm me before exams. (F11)
>
> I play football now, and I participate in tournaments, padel, and tennis, but yes, I really like these things, and as soon as I find a slot to do it, I do it to relieve my stress. (M4)
>
> Going to the gym regularly helps me manage my test anxiety. Physical exercise keeps me fit and clears my mind; it helps me to focus and stay calm during exams. (F4)

Other students mentioned that they use breathing exercises to relieve their anxiety during examinations.

> When I enter the OSCE stations, if I feel myself getting tense, I will lose everything. To calm myself, I take a deep breath and enter the station. (M1)

One student stated that although she finds comfort in powerlifting and exercise, she frequently experiences feelings of regret and encounters allegations from her peers regarding her inadequate allocation of time to her academic pursuits.

> Even though I enjoy weightlifting and working out, I feel guilty because other students say I do not study enough. (F8)

The statements made by medical students exemplify the substantial impact of physical activity on managing the tension and anxiety associated with their academic pursuits. Engaging in physical activities, such as walking and participating in team sports, offers individuals a valuable means to alleviate stress and enhance cognitive function. It is crucial for students to prioritise their health despite the arduous requirements of medical school. However, balancing academic obligations with self-care via exercise can lead to feelings of guilt, especially when peers perceive such endeavours as diversions from studying.

Discussion

This study aims to explore how medical students experience test anxiety and manage their emotions during exams and investigate these implications for their academic performance. To our knowledge, this is the first qualitative study to explore the role of test anxiety on the academic performance of medical students and their emotion regulation strategies. Test anxiety is a common problem among medical students; students experience test anxiety before, during and after the exam period. They result in a range of mental and physical symptoms and sleep disturbance that negatively impact their academic performance and general health. The level of anxiety that students experience can vary from being a source of motivation to being a severe obstacle. Consistent with previous research [18], the dual nature of anxiety can serve as both a motivator and a severe impediment, depending on its management and intensity. The findings underscore the profound impact of test anxiety on medical students, affecting both their mental and physical health. The combination of emotional and physical symptoms creates a challenging environment for students, emphasising the need for effective strategies to manage test anxiety and support students' well-being.

Test anxiety complexly influences medical students' academic performance, impacting their knowledge and practical abilities. Anxiety levels considerably impact the evaluation criteria for assessing academic achievement, such as test scores and GPA. The GPA of medical students is important throughout their academic career. Dread of failing and evaluations may increase anxiety and feelings of inadequacy [19]. Several students mentioned that their GPA significantly dropped throughout the academic years, demonstrating a link between anxiety and overall performance. Martin and Naziruddin (2020) also find that worry is linked to lower grades in medical school, where residency applications are competitive and GPA matters [20]. Concern that one's GPA may not meet residency programme standards may increase this anxiety. In addition, anxiety impedes the acquisition of clinical competence, which is crucial for providing appropriate patient care. The literature supports these findings by indicating that high levels of anxiety may interfere with the processing and recall of knowledge, thereby lowering academic performance [21].

In clinical settings, the findings show that anxiety not only hinders knowledge application but also impedes the acquisition of practical skills. Medical students frequently suffer from increased anxiety, which limits their ability to conduct standard medical procedures effectively [22]. For example, one student recounted their experience of performing their first suture with trembling hands. Bacon and Taylor [4] asserted that students' performance is substantially impacted by anxiety, specifically when engaging in demanding cognitive tasks, such as physical examinations.

Emotion regulation is essential for medical students, as it substantially influences their academic success and mental well-being. Students in this study frequently employ cognitive reappraisal to reframe a stressful circumstance in a more optimistic perspective to decrease anxiety and sustain concentration, which is a very effective emotion regulation strategy [23]. Those students

perceive anxiety as a catalyst rather than an obstacle, which can assist students in directing their apprehensive energy towards effective study sessions. On the other hand, several medical students prefer to suppress their emotions so they do not harm loved ones through their suffering. This is a maladaptive emotion regulation strategy and, in the long term, can lead to psychological distress [24]. Learning how to regulate emotions may assist students in making correct decisions and handling difficult situations, which consequently helps them to succeed. Therefore, it is potentially beneficial for students to use emotional regulation to minimise their test anxiety.

The findings also explored how medical students cope with their struggles in medical education by adopting several effective strategies. One strategy is managing their study routine effectively by using segmented study time with 30-minute breaks, which is efficient. According to Cirillo 2006, Focus and productivity are improved by this technique [25]. Students also try different study methods, which supports Karpicke's [26] findings that active retrieval activities like self-testing boost long-term retention and understanding. Time management specialists recommend early and consistent study to prevent last-minute stress [26]. These methods highlight the significance of planned and personalised study schedules for medical school's stringent standards. Medical students need time management to reduce anxiety and boost performance. Participants mentioned that weekly planning is based on research showing that planning and goal-setting improve academic achievement and reduce procrastination [27]. Therefore, time management is crucial to reduce test anxiety.

Peer and family support is well acknowledged in academic stress literature. Two participants said discussing assignments with peers helps them study and feel supported. According to the literature, peer relationships improve academic performance and emotional well-being [28]. They also mentioned the importance of the mother's comfort in relieving anxiety, consistent with Cutrona et al. (1994) findings that family support reduces stress and improves mental health [29]. These findings underline the importance of social support systems in decreasing medical education's psychological obstacles. Research participants also recommend counselling and academic support for academic stress management. Academic mentorship and advising improve students' performance [30]. They addressed the benefits of talking to their professors and campus counsellors. The participants recommended contacting teachers and counsellors for practical advice on handling tough courses, exam anxiety, and additional resources. The literature confirmed that campus counselling services effectively address academic stress and anxiety [31]. Some students stated that having professional mental health care helped them manage their anxiety. However, the mixed comments on these services show the need for tailored help.

Exercise is an effective coping tool for many medical students. The literature highly recommends physical activity for stress relief. Several students said frequent exercise helps their mental health. Research found that endorphins from regular exercise reduce stress and improve mood [32]. Students' use of deep breathing exercises to reduce exam anxiety is consistent with relaxation techniques' effectiveness in reducing anxiety and improving focus [33]. Physical health is crucial to coping with test stress and maintaining mental wellness [34]. One student felt guilty about exercising a few hours a week, and her peers exacerbated this. They considered it a waste of time that could be better spent studying. Therefore, physical exercise must be promoted to reduce stress and promote a healthy mind and body. This study is particularly significant in the Saudi Arabian context due to its focus on the experiences of medical students within a collectivist culture. The findings of this study underscore the importance of culturally sensitive approaches to addressing test anxiety. For instance, the reliance on peer and family support, as observed in the participants' experiences, aligns with the broader collectivist values of the region. This highlights the need for practical solutions that integrate these cultural dynamics, such as structured peer mentorship programs or family-inclusive support initiatives, to reduce test anxiety and enhance academic performance. By addressing these local cultural and academic pressures, the study provides valuable insights for educators, policymakers, and mental health practitioners to design effective and culturally appropriate solutions for Saudi medical students.

Conclusion

Medical students experience test anxiety before, during, and after exams leads to various mental and physical symptoms, as well as sleep disturbances, which negatively affect both academic performance and overall health. This study's findings emphasise the need for comprehensive strategies to manage test anxiety effectively and support medical students' mental well-being. By implementing targeted interventions and fostering a supportive educational environment, medical schools can enhance academic and clinical outcomes, ultimately preparing students for successful careers in healthcare.

Given the complexity of test anxiety and its impacts revealed in this study, future research should focus on longitudinal studies to track the effectiveness of specific interventions over time. Comparative studies across different educational environments could also provide insights into cultural and institutional factors that influence anxiety levels and coping strategies among

medical students. Recognising the potential impact of targeted anxiety-reduction strategies on academic performance, we suggest this as a critical area for future research, with further investigation into the most efficacious strategies potentially providing valuable guidance for educational programs aimed at supporting student well-being and academic success.

Limitations of the study

These study results may have limitations. The study included opinions from only one medical school. While the authors provided the maximum sample size and detailed participant characteristics, results from other institutions or student populations may differ. Therefore, these findings cannot be generalised. Another limitation is the lack of available literature on the role of test anxiety, emotion regulation, and academic performance among medical students, making it difficult to compare these results with those of other studies. Another limitation is the difference between participants' current GPA and their original GPA, which was not in the inclusion criteria in this study. It is possible that a lower GPA could have indirectly influenced participation, while those with a higher GPA may have been less likely to take part. This potential selection bias limits the generalisability of the findings.

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Appendix 1

Interview Questions

Age:
Background:
Academic Year:
Last GPA:
Next exam (When and What)

(1) **Introduction:**
- Can you share a bit about your experiences with exams and assessments in your medical studies?
- How do you generally feel leading up to and during exams?

(3) **Test Anxiety Experience:**
- Can you describe your past experience of taking exams in the last academic year?
- Can you describe a specific instance where you felt particularly anxious during a test or exam?
- What thoughts or emotions come to mind when you think about test anxiety?

(4) **Triggers and Contexts:**
- What types of exams or assessment formats have you found to trigger anxiety for you, if any?
- Can you identify any particular conditions or situations that make you more prone to experiencing test anxiety?

(3) **Academic Manifestations:**
- In what ways do you think test anxiety impacts your academic performance or study habits?
- How has test anxiety influenced or changed your approach to learning and studying, if at all?

(3) **Coping Mechanisms:**
- What strategies or coping mechanisms do you typically use to deal with test anxiety?
- Which coping strategies have you found more effective than others in managing your situation, and why?
- How do you typically treat yourself around exam times?
- How do you deal with your negative emotions around exam times?

(5) **Interpersonal Dynamics:**
- How do you feel about seeking support or discussing your feelings of test anxiety with others?
- What coping strategies you will advise your friend when they struggle in medical school?

(3) **Support Systems:**
- What kind of support, if any, do you feel you receive from your academic institution in managing test anxiety?
- How important are relationships with friends, family, or mentors in helping you cope with test-related stress?

(1) What are the most difficult exam in the medical school? why? how did you feel about it?
(2) Is there anything else you'd like to share about your experiences with test anxiety that we haven't covered?