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# The mediating role of students' academic resilience in the relationship between self-efficacy and test anxiety

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## Abstract:

**BACKGROUND:** There is growing acknowledgment that medical education can be a stressful experience for students and may have a devastating effect on their psychological well-being. The present article, therefore, aimed at investigating students' academic resilience as a mediating variable in self-efficacy-test anxiety relation.

**MATERIALS AND METHODS:** In this cross-sectional correlational study, a convenience sample of 243 medical students was selected and participated, three prevalidated questionnaires were applied, that is, general self-efficacy questionnaire, academic resilience questionnaire, and test anxiety questionnaire. To analyze the data, Pearson's correlation coefficient as well as structural equation modeling (SEM) were used.

**RESULTS:** According to Pearson's coefficients, self-efficacy was found to be positively correlated with academic resilience ( $r = 0.437, P \leq 0.01$ ) and negatively with test anxiety ( $r = -0.475, P \leq 0.01$ ). SEM results also indicated that self-efficacy positively impacts on academic resilience ( $\beta = 0.43, P < 0.001$ ) and negatively on test anxiety ( $\beta = -0.37, P < 0.001$ ). In addition, results demonstrated the mediating role of academic resilience in self-efficacy-test anxiety relationship ( $\beta = -0.108, P < 0.001$ ).

**CONCLUSION:** This study showed that academic resilience could play a mediating role in students' self-efficacy-test anxiety relationship.

## Keywords:

Iran, medical education, partial least squares-structural equation modeling, resilience, self-efficacy, test anxiety

## Introduction

Medical education can be a stressful experience for students<sup>[1-3]</sup> and may have a devastating effect on their psychological well-being.<sup>[1,4]</sup> Hence, it is believed that medical students are more likely than other people to be exposed to mental disorders,<sup>[5]</sup> so one of the concerns in the public health domain across the globe is the mental and psychological welfare of medical students, which is associated with the quality of health care provided by them.<sup>[6]</sup> However, this group is particularly at risk of psychological distress.<sup>[2]</sup> In addition to depression, several different research

studies have demonstrated a growing spread of anxiety signs and symptoms among medical students.<sup>[7-10]</sup> Approximately one-third of medical students have been proven to suffer from anxiety globally, a high rate that is greater than anxiety rate among the public.<sup>[11]</sup> According to a meta-analysis study, anxiety stretches across 33% of medical students.<sup>[11]</sup> About 30% of European students studying medicine suffer from anxiety or depression.<sup>[12]</sup> It has also been reported that about 47% of Chinese medical students suffer from anxiety; this figure for Iran, Saudi Arabia, India, and Malaysia is 43%, 53%, 32%, and 32%, respectively.<sup>[13]</sup> Spread of anxiety across Middle Eastern and Asian medical students is noticeably greater than elsewhere.<sup>[11]</sup>

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Besides, in time of pandemics, according to various studies, there is an increase in the number of mental diseases, particularly anxiety, among health care workers.<sup>[14]</sup> Some studies indicate Covid-19 pandemic has increased anxiety among students<sup>[15]</sup> and particularly medical students in different contexts.<sup>[14,16]</sup> For instance, a study by Nakhostin *et al.* reported that about 38% of Iranian medical students went through anxiety in the event of the COVID-19 pandemic. This study also revealed that a high level of anxiety was present in students, and 18% of students suffered a lot of anxiety.<sup>[17]</sup>

Persistent anxiety signs and symptoms may result in anxiety-related problems.<sup>[14]</sup> Anxiety and related health conditions interfere with learning as well as clinical outcomes leading to low academic achievement, dropout from school, Internet addiction, academic procrastination, and suicide contemplation among student population.<sup>[15-18]</sup> Families, society as a whole, and health care systems, in particular, are burdened with anxiety as a ubiquitous psychiatric condition.<sup>[19,20]</sup> The spread of anxiety disorders has been on the rise in the last decades, ranking 7<sup>th</sup> among diseases and conditions globally.<sup>[21]</sup> While most of the research has examined anxiety among medical students, many explored the prevalence as well as consequences of anxiety.<sup>[4,5,9,21,22]</sup> It is necessary, thus, to identify factors contributing to reducing anxiety. It is, hence, worthwhile to help students cope with their test anxiety. Studies indicate self-efficacy can impact test anxiety.<sup>[23,24]</sup> Self-efficacy beliefs are critical in regulating human motivation and behavior and controlling anxiety.<sup>[25]</sup> According to Perkon's control-value theory,<sup>[26,27]</sup> cognitive control and value appraisal interaction with regard to a given achievement situation (e.g., forthcoming exam) may lead to test anxiety. Although value appraisals reflect the perceived value assigned to achievements (for instance, learning to pass an exam) and their consequences (for instance, pass mark) by students, control appraisals are defined as student's personal judgment about the extent to which he/she has control of achievement activities and their resulting consequences. Particularly, the likelihood of test anxiety to occur gets high when learners concentrate on a situation on which they put a great value (for instance, final examination), and at the same time, they feel perceived moderate control over their achievement activities. Such anxiety inducing control evaluations may be a product of low self-efficacy beliefs. Since learners who lack self-efficacy do not have faith in performing successfully on a given learning assignment,<sup>[28,29]</sup> their control expectation with regard to an achievement situation will be negatively impacted. Students with high self-efficacy would rather ascribe their lack of accomplishment to low attempt than low ability.<sup>[30]</sup> Consequently, they may undergo anxiety.<sup>[13]</sup> In other terms, learners who are deficient in

self-efficacy are more prone to fear, avoid, postpone, or abandon their assignments.<sup>[31]</sup> On the contrary, learners who demonstrate high self-efficacy are more to figure problems out, to exhibit patience throughout the process, to try hard, and to make serious attempts to tackle challenges by themselves.<sup>[25,31]</sup> This hypothetical notion was substantiated by research studies indicating students suffering from low self-efficacy beliefs undergo high test anxiety.<sup>[13,32,33]</sup>

Although there is a limited body of knowledge regarding self-efficacy test anxiety relation among medical students, the mechanism explaining this relationship still remains unknown. To figure out the mechanism through which self-efficacy stokes risk, help develop interventions in order to deal with anxiety. With the increasingly growing use of positive psychology to prevent and treat mental health problems, resilience, as a component of psychological capital, can be a critical factor in self-efficacy-anxiety relation. Although resilience is hard to define,<sup>[34]</sup> it, based on an extensive review of literature, reflects capacity and dynamic process to cope with stressors and difficulties while maintaining physical and psychological functioning.<sup>[35]</sup> As a capacity to bear difficulties and quickly recover from a stress-inducing experience, resilience helps one to make beneficial adaptation to difficulties and can function as a protective shield against adversities, therefore facilitating welfare.<sup>[36]</sup> Resilience is referred to as one's capability to maintain and improve their well-being when faced with challenges of life.<sup>[37]</sup> In this regard, Wang and Gordon define academic resilience as increasing possible (academic) achievement against all of the environmental challenges and adversities.<sup>[38]</sup> According to Abiola and Udofia (2011), having finished a major professional examination, less resilient medical students will go through stress, anxiety, and depression.<sup>[39]</sup> Waxman *et al.* argue that resiliency factors ought to be taken into account in research on resilience in order to determine processes that can promote preventive mechanisms.<sup>[40]</sup> In this regard, Martin and Marsh showed that self-efficacy could be predictive of academic resilience. According to them, resilient students displayed high self-efficacy and low anxiety.<sup>[41]</sup> Hamill also reported self-efficacy as a defining attribute capable of discriminating between resilient students and nonresilient students in the 16–19 age group.<sup>[42]</sup>

In addition, self-efficacy is proven by various studies to be able to significantly predict academic resilience among university students.<sup>[23,41,42]</sup> In the meantime, resilience is found to be negatively correlated to anxiety among medical students<sup>[34,39]</sup> as well as other communities.<sup>[43,44]</sup> It, therefore, seems that resilience can affect students' test anxiety, and highly resilient students may suffer less from anxiety and vice versa.

However, the mediating role resilience may play in self-efficacy-test anxiety relation has yet remained unexplored. The aim of the present article is, hence, two-fold: (1) to explore self-efficacy-test anxiety correlation, and (2) to examine the part resilience, as a mediator, may play in self-efficacy test anxiety relation among medical students.

## Materials and Methods

### Study design and setting

A cross-sectional correlational design was used in the present research. This study took place at Shiraz University of Medical Sciences (SUMS). SUMS is one of the oldest and most well-known medical centers in southern Iran.

### Study participants and sampling

The target population consisted of all medical students at SUMS. To determine the sample size, the recommendations by Hair *et al.*,<sup>[45]</sup> were followed. These recommendations were developed based on the significance level, statistical power, and the number of independent variables. Considering the number of independent variables, a minimum sample size of 176 was needed to obtain a statistical power of 80% for detecting  $R^2$  values of at least 0.10 in any of the endogenous variables for a significant level of 5%. Later, in the research process, however, questionnaires were administered to a convenience sample of 296 individuals, of which 243 usable surveys were returned, accounting for a 90% response rate. The inclusion criteria used to select participants were medical students studying at SUMS and their willingness to participate. The exclusion criteria were unusable returned questionnaires as well as participants' reluctance to participate in the process.

### Data collection tool and technique

To collect data, 3 prevalidated instruments were used as follows:

#### General self-efficacy

To quantify self-efficacy, the New General Self-Efficacy Scale (GSE) comprised of 8 items was used. GSE is constructed and validated by Chen *et al.*,<sup>[46]</sup> and proven to be valid and reliable in Iran<sup>[47]</sup> and abroad.<sup>[46]</sup> Confirmatory factor analysis (CFA) was used to check the psychometric properties of GSE, and the results are presented in Table 1.

#### Academic resilience

The scale is developed to measure students' academic resilience to the obstacles, challenges, and conditions of academic stress.<sup>[41]</sup> This single dimension measure comprises 6 items and proven to be valid and reliable in the Iranian population. CFA was, however, used to check the psychometric properties, and the results are presented in Table 1.

**Table 1: Confirmatory factor analysis: Factor loadings, composite reliability, Cronbach's alpha, and average variance extracted**

Variables	Items	Factor loading	Cronbach's alpha	CR	AVE
Self-efficacy	S1	0.665	0.886	0.909	0.558
	S2	0.795			
	S3	0.754			
	S4	0.757			
	S5	0.759			
	S6	0.809			
	S7	0.709			
	S8	0.723			
Academic resilience	R1	0.819	0.876	0.906	0.619
	R2	0.849			
	R3	0.867			
	R4	0.806			
	R5	0.720			
	R6	0.635			
Test anxiety	E1	0.572	0.852	0.896	0.638
	E2	0.795			
	E3	0.849			
	E4	0.873			
	E5	0.864			

CR=Composite reliability, AVE=Average variance extracted

#### Test anxiety

A 5-item survey questionnaire constructed by Pintrich *et al.* was used to measure test anxiety.<sup>[48]</sup> The reliability and validity of this questionnaire were confirmed in previous studies. CFA was, however, run to check whether the measure is valid and reliable [Table 1].

To rate responses on all the measures, a 5 point scale was used.

#### Data analysis technique

To analyze data, Pearson's correlation coefficient was utilized using SPSS software version 21 developed by the IBM, New York, U.S.A. Furthermore, structural equation modeling (SEM) was used by means of Smart-partial least squares (PLS) to test the measurement models as well as the structural model. Smart-PLS software was first developed and introduced in Germany.

#### Ethical considerations

The study was approved by the university ethics committee under the ethics code IR.SUMS.REC.1398.307. To ensure confidentiality, the respondents were assured that the surveys would remain anonymous and data would only be used for research purposes.

## Results

The Pearson's correlation results demonstrated a significantly positive association between self-efficacy and academic resilience ( $r = 0.437, P \leq 0.01$ ). Results also showed that self-efficacy is significantly and negatively

associated with test anxiety ( $r = -0.475, P \leq 0.01$ ). Furthermore, a significantly negative association was found to exist between academic resilience and test anxiety ( $r = -0.391, P \leq 0.01$ ) [Table 2].

### The measurement model

Using SEM, the data were analyzed by PLS software. PLS-SEM involves a two-stage process.<sup>[45]</sup> The first stage involves evaluating the measurement models. The measurement model exhibits the relation between the indicators/observable variables and their relevant constructs. In the second stage, after checking the measurement models, the researchers move on to assess the structural model to examine whether the hypotheses are confirmed.

According to Hair *et al.*, Cronbach's Alpha and composite reliability values  $>0.7$ , and the average variance extracted (AVE) value  $>0.5$  would be deemed acceptable.<sup>[45]</sup> As shown in Table 1, all the values associated with the indices are higher than cut-off points. Subsequently, discriminant validity for all variables was tested. Findings also demonstrated satisfactory discriminant validity for all  $\sqrt{AVE}$ s were found to be higher compared to the inter-correlation values between the variables in the model [Table 2]. Therefore, all the research constructs are validated in terms of reliability and validity.

### The structural model

Figure 1 displays the path coefficient values. To assess the hypotheses proposed in the model, a bootstrapping procedure was deployed. The results (path coefficients and the *t*-test scores), as shown in Figure 1, indicate a direct, negative, and significant impact self-efficacy has on test anxiety ( $\beta = -0.37, P < 0.001$ ). Furthermore, self-efficacy was demonstrated to have a significantly positive and direct impact on academic resilience ( $\beta = 0.43, P < 0.001$ ). Finally, the results showed that academic resilience negatively and significantly affects test anxiety ( $\beta = -0.22, P < 0.001$ ) [Figure 1]. Moreover, the Sobel and mediation test demonstrated that self-efficacy negatively and indirectly affects test anxiety through academic resilience ( $\beta = -0.108, P < 0.001$ ) [Figure 1 and Table 3].

In the proposed model, self-efficacy accounted for 19% of academic resilience variance. In addition, results also

showed that 26% of test anxiety variance was explained by academic resilience and self-efficacy [Table 3].

In addition to basic metrics, as Hair *et al.* suggested, predictive relevance ( $Q^2$ ) should be reported. If the cross-redundancy value is greater than zero, the model is deemed to have predictive relevance. According to the results, cross-validated redundancy values are 0.116 and 0.169, exceeding the cut-off point. Hence, the predictive quality of the model is secured.

## Discussion

This study hypothesized that (1) self-efficacy directly affects both students' test anxiety ( $H_1$ ) and academic resiliency ( $H_2$ ), (2) academic resiliency directly affects students test anxiety ( $H_3$ ), and (3) academic resiliency mediates self-efficacy-test anxiety relation ( $H_4$ ). According to the SEM results, all hypotheses were substantiated, which is consistent with theoretical expectations.

As for the first hypothesis, results indicated self-efficacy has a significantly negative effect on test anxiety. This result is in accord with both previous kinds of research demonstrating the potentiality of self-efficacy to alleviate test anxiety<sup>[13,24,32,33,48-50]</sup> and control-value theory,<sup>[26]</sup> which discusses that test anxiety results from cognitive assessments including (low) self-efficacy beliefs. This theory posits that academic self-efficacy (which would be deemed to be a cognitive appraisal) can be an antecedent of test anxiety and other negative emotions.

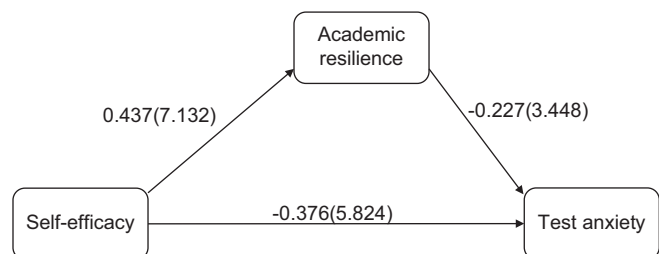
Students who enjoy high self-efficacy expect better results, opt for higher goals, experience less test anxiety, and receive better exam marks. According to the results, students with high motivation for accomplishment seem not easy to give up when facing difficulties. Similarly, students with high self-efficacy perform well in dealing with problems.<sup>[51]</sup>

Using Bandura's theory,<sup>[28]</sup> a various number of studies have shown an association between self-efficacy, anxiety, and performance. Medical students who enjoy self-efficacy set challenging goals, await better results, go through low levels of anxiety, and receive better

**Table 2: Correlation and discriminant validity**

Variable	Mean	SD	Self-efficacy	Academic resilience	Test anxiety
Self-efficacy	3.072	0.989	0.748		
Academic resilience	3.017	1.015	0.437**	0.787	
Test anxiety	3.012	1.011	-0.475**	-0.391**	0.776

SD=Standard deviation. \*\*  $P < 0.001$



**Figure 1: Partial least squares-path analysis**



**Table 3: Path coefficients for hypothesis testing**

Hypothesis	Path	F <sup>2</sup>	f <sup>2</sup>	Q <sup>2</sup>	β	t	Result
H1	Self-efficacy → academic resilience	0.191	0.191	0.116	0.437	7.132	Supported
H2	Self-efficacy → test anxiety		0.157		-0.376	5.824	Supported
H3	Academic resilience → test anxiety	0.268	0.056	0.169	-0.227	3.448	Supported
H4	Self-efficacy → academic resilience → test anxiety				-0.108	3.104	Supported

marks in their examinations. Indeed, students with high self-efficacy perform well on exams.

Second, our findings demonstrated that self-efficacy significantly and positively impacts academic resilience. This result has been proven in previous studies,<sup>[41,52,53]</sup> corroborating that self-efficacy beliefs are related to individual psychological resilience. Therefore, positive self-efficacy beliefs can be expected to increase resilience in students.

The way people perceive their knowledge, skills, capability, and experiences profoundly influences their resilience. In this line, some scholars have argued resilience may be a possible result of self-efficacy because of the fact the senses of optimism, control, and security while dealing with stressors help develop an individual's self-confidence.<sup>[54]</sup>

Self-efficacy significantly predicts academic resilience, and its development may entail restructuring and reorganizing learning settings in order to maximize opportunities for success, for example, through developing individualized tasks if possible, promoting positive beliefs of students about themselves and their academic capacities,<sup>[25]</sup> and developing effective goal setting skills that can lead to success and lay the foundation for raising one's academic resilience.

Herrman *et al.* argue that self-efficacy is a characteristic of resilient individuals.<sup>[55]</sup> One of the most important theoretical notions within the social-cognitive approach is self-efficacy that contributes to many different behavioral outcomes.<sup>[56]</sup> Not only does a strong feeling of self-efficacy contribute to good performance but it also makes people stronger against failure and weaknesses, increasing an individual's endurance. Owing to their abilities to successfully deal with past hardships and adversities, individuals with high self-efficacy are able to overcome problems and therefore try to figure out problems. In addition, facing a difficult situation, these individuals organize their efforts to seek out an appropriate solution to the problem. In this regard, Schwarzer and Warner emphasize that resilience is a likely product of self-efficacy since senses of control, security, and optimism when dealing with stressors help develop an individual's self-confidence.<sup>[54]</sup> Hence, it is assumed a positive perception of the capability to do a specific

job (self-efficacy) allows for dealing with challenges and difficulties with better understanding.

Third, another finding demonstrated academic resilience has a significantly negative effect on test anxiety. Students with a high level of resilience may undergo less test anxiety empowering them to retain their performance under evaluation related pressure. Hence, test anxiety can act as a consequence of academic resilience. Highly resilient students would be expected to undergo less test anxiety and give a superior performance than their less resilient counterparts who undergo more test anxiety.<sup>[43]</sup> As we assumed, academic resilience negatively predicted test anxiety. This is in accord with the earlier researches.<sup>[34,41,43]</sup> Similarly, Putwain *et al.* indicated that highly resilient students were less likely to have test anxiety and consequently had better test marks.<sup>[43]</sup>

Possessing what is called hardiness, high resilient individuals view unpleasant events as learning opportunities. They feel more in control of life events, therefore being more able to keep their composure in time of stress and crises, eventually making better adaptation and having high academic performance, and experiencing less test anxiety as a result.<sup>[57]</sup> In general, academic resilience allows people to cope with factors contributing to poor academic performance, successfully adapt to inevitable challenges and threats, as well as retain their mental health and well-being and make successful reactions.<sup>[58]</sup>

Self-efficacy was directly as well as indirectly associated with test anxiety through academic resilience. Academic resilience was shown to mediate self-efficacy-test anxiety relation. Medical students enjoying high self-efficacy exhibit higher levels of resilience and lower levels of test anxiety.

The finding suggests that intervention plans should include emphasis not only on self-efficacy but also on resilience development. The increasing knowledge of resilience in different disciplines sheds light on how to prevent and treat anxiety.<sup>[59]</sup> Therefore, university officials can choose research-based actions to promote medical students' resilience so as to deal with their test anxiety.

In previous research, academic resilience has acted as a mediating variable between self-efficacy and other

variables such as academic burnout<sup>[53]</sup> and academic performance.<sup>[49]</sup> Yet, it has not been examined to mediate self-efficacy-test anxiety relation. Self-efficacy beliefs seem to impact learners' behavior, thoughts, and motivation. Those who are not confident in performing a task, and those who do not believe that practice and effort will result in success, are often anxious and feel unworthy. Conversely, confident learners can focus on problem-solving strategies, will be more resilient, and eventually undergo less test anxiety.<sup>[60]</sup>

### Limitations and suggestions

The findings put emphasis on improving self-efficacy in academic settings, particularly in learners who enjoy a high level of test anxiety. One way to boost self-efficacy is to set up a learning environment that allows students to repeat tasks accomplishments.

In order for students to succeed in doing certain academic tasks, academicians should also furnish students with process-related and detailed feedback on the ways they tackle problems and guide them to promote learning strategies. If medical students cannot capitalize on past experiences when encounter with new challenges in academic setting, teachers should motivate them to do the job on their own as well as to watch those students with similar features (in terms of learning levels, ability, and/or experience) when doing the same job. Similarly, teachers are encouraged to assist those students who have high level of test anxiety in noticing their own physio-affective and cognitive symptoms in event of performance evaluation.<sup>[49]</sup>

In addition, conducting research on how to increase students' academic resilience and academic self-efficacy will contribute to the literature. The study was carried out among medical students of a single university, which is indicative of study limitation. Future studies should adopt larger sample sizes. Besides, all data were gathered by means of questionnaires, which are prone to response bias. A multi-method approach is, hence, expected to be employed in future studies.

### Conclusion

This study has theoretical and practical implications. From a theoretical perspective, this empirical study showed self-efficacy was positively correlated with academic resilience and negatively with test anxiety. Results also showed that academic resilience served as a mediator in self-efficacy-test anxiety relation. From a practical perspective, identifying at-risk medical students and undertaking proper interventions with focus on both resilience and self-efficacy could be more beneficial in reducing and preventing anxiety among students.

### Ethics approval and consent to participate

Permission to conduct the research was obtained from the Ethics Committee of SUMS (IR.SUMS.REC.1398.307). Also, written informed consent was obtained from all the students, and they were informed that their information would remain confidential.

### Availability of data and materials

The datasets used during this study are available from the corresponding author on reasonable request.

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### Conflicts of interest

There are no conflicts of interest.

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