

The Impact of Cognitive Flexibility and Optimism on Burnout and Stress Levels in Medical Students: A Psychological Perspective

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DOI: <https://doi.org/10.51583/IJLTEMAS.2025.140600068>

Received: 25 June 2025; Accepted: 30 June 2025; Published: 14 July 2025

Abstract: This study explored the predictive role of cognitive flexibility and optimism on academic burnout and perceived stress among Bangladeshi medical students. A total of 250 participants (49.6% female, 50.4% male; $M_{age} = 22.55$, $SD = 1.63$) were recruited from various medical institutions using a purposive-incidental sampling method. Participants completed five standardized self-report instruments translated into Bangla: the Cognitive Flexibility Inventory (CFI), Maslach Burnout Inventory-Student Survey (MBI-SS), Life Orientation Test-Revised (LOT-R), Perceived Stress Scale-10 (PSS-10), and a demographic questionnaire. Data were analyzed using SPSS (v27). Pearson's correlation showed that cognitive flexibility and optimism were significantly positively correlated ($r = .294$, $p < .01$), and both were significantly negatively correlated with burnout ($r = -.442$, $r = -.369$, respectively) and perceived stress ($r = -.465$, $r = -.280$, respectively). Hierarchical regression analysis revealed that cognitive flexibility and optimism significantly predicted both burnout ($R^2 = .258$) and perceived stress ($R^2 = .239$), with cognitive flexibility emerging as the stronger predictor in both models. Independent samples t-tests showed significant gender differences in cognitive flexibility and perceived stress, with males scoring higher in flexibility and females reporting more stress. No significant gender differences were found in optimism or burnout. These findings suggest that cognitive flexibility and optimism may act as protective psychological resources, buffering against stress and burnout among medical students. Interventions aimed at enhancing these traits could promote mental well-being and resilience in high-pressure academic environments. The study adds culturally relevant insights into the psychological mechanisms underlying student well-being in a South Asian medical education context.

Keywords: cognitive flexibility, optimism, burnout, perceived stress, medical students

I. Introduction

Medical education, characterized by its rigorous curriculum, demanding clinical rotations, and constant exposure to human suffering, presents a unique set of challenges that can significantly impact the psychological well-being of students (Bullock et al., 2017). The journey through medical school is often fraught with chronic stress, emotional exhaustion, and a heightened risk of burnout, potentially leading to adverse consequences for both the individual and the quality of patient care (Jenkins et al., 2018). The convergence of academic pressures, long working hours, and the weight of responsibility for patients' lives can create a breeding ground for psychological distress, making it imperative to identify factors that might mitigate these risks. Among the potential protective factors, cognitive flexibility and optimism have emerged as promising candidates, warranting closer examination within the context of medical education (Siddiqui et al., 2021). Cognitive flexibility, the ability to adapt one's thinking and behavior in response to changing circumstances, is crucial for navigating the multifaceted demands of medical training (Waqas et al., 2014). Optimism, conversely, embodies a cognitive disposition characterized by a generalized expectancy that positive outcomes will occur, even amidst challenging circumstances (Thomas & Segal, 2006). The interplay between these cognitive attributes and the experience of stress and burnout in medical students represents a critical area of investigation, potentially informing interventions aimed at fostering resilience and promoting mental well-being (Abbott, 2019). The elevated incidence of burnout among medical students is a pressing concern, with empirical evidence suggesting a substantial proportion grapple with significant emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment (Dyrbye et al., 2010). Burnout is characterized by a state of emotional, physical, and mental exhaustion caused by prolonged or excessive stress (Kottler & Balkin, 2020). This multifaceted syndrome not only erodes academic performance and impairs the development of essential clinical competencies, but it also significantly heightens the vulnerability to a spectrum of mental health disorders, encompassing depression, anxiety, and substance abuse. Moreover, the repercussions of burnout extend far beyond the individual student, with the potential to compromise the quality and safety of patient care, diminish professionalism, and perpetuate a cycle of disengagement within the healthcare system (Kottler & Balkin, 2020).

Stress, inherent to the demanding landscape of medical education, manifests from a confluence of factors, including the relentless academic workload, performance anxieties, financial burdens, sleep deprivation, and the emotionally taxing exposure to patient suffering and mortality (Malakçioğlu, 2024). Sustained exposure to these stressors can initiate a cascade of physiological and psychological sequelae, ultimately compromising well-being and predisposing individuals to burnout (Kumar, 2016). The concept of burnout has been further defined as a work-related syndrome characterized by emotional exhaustion and pessimism, often manifesting in individuals engaged in social services, typically encompassing emotional lassitude and a contracted sense of personal achievement and contribution to a shared mission (Bhardwaj, 2022). The intricate association between stress and burnout underscores the importance of exploring variables that might buffer the detrimental impacts of stress and promote adaptive coping strategies among medical students. This investigation seeks to elucidate the potential protective roles of cognitive

flexibility and optimism in the context of medical student well-being, providing insights into mechanisms that may foster resilience and mitigate the risks associated with stress and burnout (Rotenstein et al., 2018). Burn-out is a stress-related disorder that may result from prolonged exposure to chronic stress without recovery (Lin & Yang, 2021). Medical students are particularly susceptible to burnout syndrome because of the prolonged years of study coupled with the high demands of the curriculum (Andargeery et al., 2025). Burnout manifests as mental and emotional fatigue, discouragement, cynicism, self-doubt, and feelings of ineffectiveness (Reith, 2018). A sophisticated comprehension of the complex interplay between stress and burnout within the medical student population assumes paramount importance for several compelling reasons, spanning not only the immediate welfare of students but also the enduring ramifications for the healthcare ecosystem. Firstly, a finely-grained understanding of these dynamics facilitates the precise identification of vulnerable individuals who stand to gain from meticulously tailored interventions, thereby enabling the proactive establishment of robust support architectures specifically engineered to alleviate the detrimental sequelae of stress and forestall the emergence of burnout (Neumann et al., 1990) (Jung et al., 2015). Secondly, by unraveling the intricate web of interactions connecting stress, burnout, cognitive flexibility, and optimism, we can discern invaluable insights into the fundamental mechanisms that underpin resilience among medical students, leading to the construction of preemptive strategies that fortify students against the erosive effects of chronic stress and nurture their capacity to thrive amidst adversity (Godoy et al., 2025). Lastly, proactive engagement with the interconnected issues of stress and burnout has the potential to cultivate an academic setting that not only fosters learning but also prioritizes students' holistic well-being, creating an environment where they can flourish both personally and professionally (Madhyastha et al., 2014).

The rationale for exploring cognitive flexibility and optimism as protective factors against stress and burnout in medical students stems from theoretical and empirical foundations. Cognitive flexibility, characterized by the capacity to shift cognitive sets, adapt to novel situations, and overcome ingrained patterns of thought, is posited to play a crucial role in mitigating the impact of stress (Kottler & Balkin, 2020). Individuals with higher levels of cognitive flexibility may be better equipped to reappraise stressful situations, generate alternative solutions to problems, and flexibly adjust their coping strategies to match the demands of the situation (Chaabane et al., 2021). This adaptability may enable them to navigate the inherent challenges of medical education with greater ease and resilience, reducing the likelihood of experiencing overwhelming stress and burnout. Conversely, individuals characterized by inflexibility, perfectionism, competitiveness, shyness and introversion, may be more susceptible to burnout (Kottler & Balkin, 2020). In conjunction with cognitive flexibility, the dispositional attribute of optimism, conceptualized as a generalized expectancy for favorable future outcomes, emerges as a salient construct in the context of stress and burnout (Thomas & Segal, 2006).

Although the impact of cognitive flexibility and optimism on stress and burnout has been widely examined, there is a lack of research focusing on medical students in Bangladesh—a population exposed to intense academic and emotional pressure. Cultural expectations, limited mental health resources, and high academic demands may uniquely influence stress experiences among Bangladeshi students. Moreover, the protective roles of cognitive flexibility and optimism remain underexplored in this context. Therefore, investigating these psychological factors among Bangladeshi medical students can provide culturally relevant insights to inform tailored interventions aimed at promoting resilience and preventing academic burnout.

Research Objectives

1. To examine whether there are significant gender differences between male and female students in cognitive flexibility, optimism, academic burnout, and perceived stress.
2. To investigate the relationships among cognitive flexibility, optimism, academic burnout, and perceived stress.
3. To determine whether cognitive flexibility and optimism significantly predict academic burnout and perceived stress among medical students.

II. Methodology

Participants

The present study consisted of 250 medical students selected from various medical institutions in Bangladesh using a purposive-incidental non-probability sampling technique. Among them, 124 (49.6%) were female and 126 (50.4%) were male, with ages ranging from 19 to 27 years ($M = 22.55$, $SD = 1.63$). All participants reported having passed their academic examinations. Subject choice was self-determined for 62.4%, influenced by parents for 22.4%, and adapted to despite initial disinterest for 15.2%. Subject liking was reported as very much (28.4%), moderately (60.4%), very little (6.4%), and none (4.8%). Most students were in their 4th (46.8%) or 5th year (22%). Regarding study location, 63.6% preferred hall rooms, while only 0.8% used hall reading rooms. Study environments were rated as quiet (51.2%), noisy (6.8%), or neutral (42%). Daily study was reported by 50.4%. Most were unmarried (86.8%) and first-born (49.2%). The majority of mothers were housewives (73.6%), and fathers were salaried employees (54.4%). Most students came from nuclear families (86.8%), middle socioeconomic status (90.4%), and identified as Muslim (88.8%).

Measures

Five self-report questionnaires were administered in Bangla:

1. **Personal Information Form (PIF):** Collected demographic and personal background data.

2. **Cognitive Flexibility Inventory (CFI):** The 20-item scale (Bangla version by Nahar et al., 2024; original by Dennis & Vander Wal, 2010) measures two subscales—Alternative Thinking and Control—using a 7-point Likert scale. Higher scores reflect greater flexibility. Cronbach's alpha: .84 to .91.
3. **Maslach Burnout Inventory-Student Survey (MBI-SS):** 15-item scale (Bangla version by Nahar & Yesmin, 2024; original by Maslach & Jackson, 1981) measures burnout across three subscales: Exhaustion (5 items), Cynicism (4 items), and Efficacy (6 items; reverse scored). Uses a 7-point Likert scale. Cut-off scores by Wickramasinghe et al. (2018). Reliability: $\alpha = .85, .78, .73$.
4. **Life Orientation Test-Revised (LOT-R):** 10-item Bangla version (Uddin et al., 2024) measures optimism using a 5-point Likert scale. Six items are scored. Reliability in this study: $\alpha = .53$.
5. **Perceived Stress Scale-10 (PSS-10):** 10-item Bangla version (Islam, 2020; original by Cohen et al., 1983) assesses perceived stress through two factors: Perceived Helplessness and Perceived Coping, using a 5-point Likert scale.

Procedure

Participants were briefed verbally on the study's purpose and assured of confidentiality. Informed verbal consent was obtained. Instructions were provided before completing the survey, and assistance was available for item clarification. The survey included the five scales and demographic items and took approximately 30 minutes to complete. Data collection occurred over six weeks.

Data Processing and Analysis

Responses were scored per each scale's guidelines and analyzed using SPSS v27. Reliability (Cronbach's α) was computed. An independent samples t-test was used to examine gender differences. Pearson's correlation tested relationships among cognitive flexibility, optimism, burnout, and stress. Linear regression examined predictive effects of cognitive flexibility and optimism on burnout and stress. Mediation analyses tested whether cognitive flexibility and optimism mediated the relationship between perceived stress and academic resilience.

III. Results

Table 1 Correlation Matrix of Cognitive Flexibility, Optimism, Burnout, and Perceived Stress

Variables	1	2	3	4
1. Cognitive flexibility	–			
2. Optimism	.294**	–		
3. Burnout	–.442**	–.369**	–	
4. Perceived stress	–.465**	–.280**	.389**	–

Note. $p < .01$

Table 1 presents the correlation matrix among cognitive flexibility, optimism, burnout, and perceived stress. The results reveal a significant positive correlation between cognitive flexibility and optimism ($r = .294, p < .01$), suggesting that individuals with higher cognitive flexibility tend to report higher optimism. Cognitive flexibility is also significantly negatively correlated with burnout ($r = -.442, p < .01$) and perceived stress ($r = -.465, p < .01$), indicating that greater cognitive flexibility is associated with lower levels of burnout and stress. Similarly, optimism is significantly negatively correlated with burnout ($r = -.369, p < .01$) and perceived stress ($r = -.280, p < .01$), implying that more optimistic individuals experience less burnout and stress. Burnout and perceived stress are significantly positively correlated ($r = .389, p < .01$), meaning that higher burnout is associated with higher perceived stress.

Table 2 Independent Samples t-Test Results by Gender for Cognitive Flexibility, Optimism, Burnout, and Perceived Stress

Variable	Gender	M	SD	t(248)	p	Cohen's d
Cognitive flexibility	Female	94.76	15.71	–2.87	.004	0.36
	Male	100.38	15.24			
Optimism	Female	14.28	3.17	0.84	.400	0.11
	Male	13.93	3.46			
Burnout	Female	36.48	17.49	0.52	.604	0.07
	Male	35.40	15.29			

Perceived stress	Female	20.96	6.69	2.68	.008	0.34
	Male	18.67	6.78			

Table 2 presents the results of independent samples *t*-tests comparing female and male participants on cognitive flexibility, optimism, burnout, and perceived stress. A significant gender difference was found in cognitive flexibility, $t(248) = -2.87, p < .05$, with males ($M = 100.38, SD = 15.24$) scoring higher than females ($M = 94.76, SD = 15.71$). The effect size was small to moderate (Cohen's $d = 0.36$). Perceived stress also showed a significant difference, $t(248) = 2.68, p < .05$, with females ($M = 20.96, SD = 6.69$) reporting higher stress than males ($M = 18.67, SD = 6.78$), and a small effect size (Cohen's $d = 0.34$).

No significant gender differences were observed for optimism, $t(248) = 0.84, p > .05$, or burnout, $t(248) = 0.52, p > .05$, with negligible effect sizes (Cohen's $d = 0.11$ and 0.07 , respectively).

Table 3 Hierarchical Regression Analysis Predicting Burnout

Variable	B	95% CI	SE	β	R^2	ΔR^2
Model 1		[LL, UL]			.195	.195***
Constant	80.94***	[69.36, 92.52]	5.88	–		
Cognitive flexibility	–0.46***	[–0.58, –0.34]	0.06	–.44		
Model 2					.258	.062***
Constant	91.35***	[79.33, 103.36]	6.10	–		
Cognitive flexibility	–0.38***	[–0.50, –0.26]	0.06	–.37		
Optimism	–1.29***	[–1.85, –0.73]	0.28	–.26		

Note. *B* = unstandardized coefficient; β = standardized coefficient; *SE* = standard error; *LL* = lower limit; *UL* = upper limit; *CI* = confidence interval.

$p < .001$.

Table 3 presents the results of a hierarchical regression analysis examining the predictive effects of cognitive flexibility and optimism on burnout. In **Model 1**, cognitive flexibility significantly predicted burnout, $\beta = -.44, p < .001$, accounting for 19.5% of the variance, $R^2 = .195, F(1, 248) = 60.11, p < .001$.

In **Model 2**, the inclusion of optimism significantly improved the model, $\Delta R^2 = .062, \Delta F(1, 247) = 20.78, p < .001$, raising the total explained variance to 25.8%, $R^2 = .258$. Both cognitive flexibility ($\beta = -.37, p < .001$) and optimism ($\beta = -.26, p < .001$) remained significant predictors, indicating that greater cognitive flexibility and optimism are associated with lower levels of burnout.

Table 4 Hierarchical Regression Analysis Predicting Perceived Stress

Variable	B	95% CI	SE	β	R^2	ΔR^2
Model 1		[LL, UL]			.217	.217***
Constant	39.53***	[34.78, 44.28]	2.41	–		
Cognitive flexibility	–0.20***	[–0.25, –0.15]	0.02	–.47		
Model 2					.239	.022**
Constant	42.13***	[37.07, 47.19]	2.57	–		
Cognitive flexibility	–0.18***	[–0.23, –0.13]	0.03	–.42		
Optimism	–0.32**	[–0.56, –0.09]	0.12	–.16		

Note. *B* = unstandardized coefficient; β = standardized coefficient; *SE* = standard error; *CI* = confidence interval; $p < .01, p < .01, *p < .001$.

Table 4 presents the results of a hierarchical regression analysis predicting perceived stress from cognitive flexibility and optimism. In **Model 1**, cognitive flexibility significantly predicted perceived stress, $\beta = -.47, p < .001$, accounting for 21.7% of the variance, $R^2 = .217, F(1, 248) = 68.60, p < .001$. Adding optimism in **Model 2** significantly improved the model, $\Delta R^2 = .022, \Delta F(1, 247) = 7.28, p = .007$, increasing the total explained variance to 23.9%, $R^2 = .239, F(2, 247) = 38.81, p < .001$. Both

cognitive flexibility ($\beta = -.42, p < .001$) and optimism ($\beta = -.16, p = .007$) were significant predictors, indicating that greater cognitive flexibility and optimism are associated with lower perceived stress.

IV. Discussion

The study set out to identify the predicting effect of cognitive flexibility and optimism on burnout and stress in medical students. The first objective was to examine whether there are significant gender differences between male and female students in cognitive flexibility, optimism, academic burnout, and perceived stress. The findings reveal significant relationships among cognitive flexibility, optimism, academic burnout, and perceived stress. A positive correlation between cognitive flexibility and optimism suggests that individuals with higher flexibility tend to maintain a more optimistic outlook, likely due to their ability to reframe challenges and adapt to changing circumstances (Santos et al., 2022; Chen et al., 2019). Cognitive flexibility was also negatively correlated with burnout and perceived stress, highlighting its protective role in managing psychological strain (Ein-Gal et al., 2014). This supports the idea that flexible individuals cope better with adversity and maintain emotional balance (Kashdan & Rottenberg, 2010). Similarly, optimism showed negative associations with burnout and stress, reinforcing its value as a buffer against distress (Abbott, 2019; Asal et al., 2024). The positive correlation between burnout and perceived stress reflects the shared pathways of chronic emotional and cognitive exhaustion (Ko et al., 2013). Overall, the findings underscore the importance of cognitive flexibility and optimism in fostering resilience and reducing vulnerability to stress and burnout.

The second objective was to investigate the relationships among cognitive flexibility, optimism, academic burnout, and perceived stress. The observed gender disparity in cognitive flexibility, with males exhibiting higher scores than females, could be attributed to a multitude of factors, including but not limited to differences in cognitive strategies, problem-solving approaches, and neurological underpinnings (Thomas & Segal, 2006). It is plausible that males and females may employ distinct cognitive pathways when confronted with novel or challenging situations, leading to variations in cognitive flexibility performance (Khasawneh, 2021). Additionally, societal expectations and gender roles may influence the development and expression of cognitive skills, potentially contributing to the observed differences (Thomas & Segal, 2006). The observed difference in cognitive flexibility warrants further investigation into potential neurobiological underpinnings, such as variations in prefrontal cortex activation, differences in white matter connectivity, or disparities in neurotransmitter systems like dopamine and norepinephrine, which are critically involved in executive functions (Jaja & Dapper, 2018).

The finding that females reported higher levels of perceived stress compared to males aligns with a substantial body of research indicating gender differences in stress responses and coping mechanisms (Varghese et al., 2015). It is theorized that hormonal fluctuations, particularly those associated with the menstrual cycle, pregnancy, and menopause, may render females more susceptible to the physiological and psychological effects of stress (Thomas & Segal, 2006). Furthermore, societal expectations and gender roles often place greater pressure on females to balance multiple responsibilities, such as career, family, and caregiving, which can contribute to heightened stress levels (Thomas & Segal, 2006). Psychological factors such as rumination and a greater propensity to internalize emotions may also contribute to higher perceived stress among females (Thomas & Segal, 2006). The higher rate of traumatic stress experienced by women may elucidate gender differences in post-traumatic stress disorder, and while it may not completely account for the female excess in depression, it points to differential exposure and reactivity to stress based on gender (Thomas & Segal, 2006).

The third objective was to determine whether cognitive flexibility and optimism significantly predict academic burnout and perceived stress among medical students. The findings pertaining to burnout reveal a significant predictive role for cognitive flexibility, wherein individuals exhibiting greater cognitive flexibility demonstrate a propensity for lower levels of burnout (Leiter, 1992). This finding aligns with the broader framework of psychological flexibility, which posits that the capacity to adapt one's thoughts and behaviors in response to situational demands is crucial for mitigating psychological distress ("The Wiley Handbook of Obsessive Compulsive Disorders," 2017). The introduction of optimism into the regression model further augmented its explanatory power, underscoring the protective influence of a positive outlook on burnout (Kapusuz & Çavuş, 2019). Specifically, the data suggest that individuals who maintain an optimistic disposition are less susceptible to experiencing burnout, potentially due to their tendency to engage in proactive coping strategies and appraise stressors as less threatening (Chang & Chan, 2013). The observed inverse relationship between cognitive flexibility, optimism, and burnout resonates with the tenets of positive psychology, emphasizing the salutogenic effects of psychological resources in promoting well-being and mitigating the adverse consequences of chronic stress (Ko et al., 2013). Concerning perceived stress, the hierarchical regression analysis demonstrates that cognitive flexibility exerts a significant negative predictive effect, implying that individuals with enhanced cognitive flexibility tend to experience lower levels of perceived stress (Thomas & Segal, 2006). This observation corroborates existing literature highlighting the stress-buffering properties of cognitive flexibility, which enables individuals to effectively navigate stressful situations by employing adaptive coping strategies and maintaining a sense of control ("The Wiley Handbook of Obsessive Compulsive Disorders," 2017). The inclusion of optimism as a predictor significantly enhanced the model's ability to explain variance in perceived stress, demonstrating that a positive outlook contributes to a reduced perception of stress. This may be because optimism is associated with increased self-efficacy, the belief in one's ability to succeed in specific situations or accomplish a task, which in turn influences how individuals cope with stressors (Cadiz & Balongoy, 2023).

This study offers valuable insights into the psychological resources that buffer academic burnout and perceived stress among Bangladeshi medical students. However, several limitations should be acknowledged. First, the cross-sectional design prevents

any causal inferences regarding the relationships among cognitive flexibility, optimism, burnout, and stress. Second, the use of self-report measures may introduce social desirability bias or response inaccuracies. Third, the sample was limited to students from selected medical institutions, which may restrict the generalizability of the findings to all Bangladeshi medical students or students from other disciplines or regions. Despite these limitations, the study has important implications. It highlights the protective roles of cognitive flexibility and optimism in mitigating academic burnout and stress, suggesting that mental health interventions in academic settings should incorporate training to enhance these traits. Such efforts may promote resilience, reduce psychological distress, and improve overall academic performance among medical students. Future research should consider employing longitudinal or experimental designs to establish causal links between cognitive flexibility, optimism, and student well-being. Moreover, qualitative approaches could provide deeper insights into the lived experiences of stress and resilience among medical students. Expanding the sample to include diverse academic institutions and socioeconomic backgrounds will further enhance the generalizability of future findings.

V. Conclusion

This study underscores the critical role of cognitive flexibility and optimism in reducing academic burnout and perceived stress among Bangladeshi medical students. Findings suggest these psychological traits serve as protective factors in demanding academic environments. Enhancing cognitive flexibility and optimism through targeted interventions could foster resilience and mental well-being. These insights offer culturally relevant guidance for supporting student mental health in South Asian medical education contexts.

Acknowledgement

The authors express gratitude towards all those who actively engaged in the study and contributed to the efficient completion of the research.

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