

“Engineering under Pressure: Unpacking the High-Stress World of Students in the Technical Field”

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ABSTRACT

The history of India's engineering schools stretches back to the colonial era. At first, Civil Engineering was the main concentration; however, as time went on, other sub-disciplines emerged. Many well-paying jobs in the public and commercial sectors can be found in the many subfields of engineering. As a result, engineering programmes in India have become increasingly popular, and the country has expanded the number of students admitted to engineering programmes to keep up with demand.

Notwithstanding the many benefits, undergraduate engineering students in India experience a number of difficulties that might cause tension and worry. The purpose of this research is to begin to address these questions by analysing the gender gap in stress and anxiety among first-year and senior-year undergraduate engineering students. Almost two hundred students from one of India's top universities, Delhi Technological University's private engineering institute, participated in the study. Data were collected using the Anxiety, Depression, and Stress Scale (ADSS) created by Bhatnagar et.al (2011) and analysed using SPSS-20.

Overall, the results of this study shed light on the high rates of stress and anxiety among India's undergraduate engineering students and show how important it is for educational institutions to put the emotional health and well-being of their students first. The results of this investigation may also be used to shape new programmes and services aimed at assisting students with stress and anxiety.

Keywords: Anxiety, Depression, and Stress Scale (ADSS), Stress and Anxiety. Civil Engineering INTRODUCTION

Stress and anxiety are prevalent issues among undergraduate engineering students, particularly those in their first and final years of study. Engineering education in India has a long-standing history dating back to the British era, with a primary focus on civil engineering. Over time, the field has evolved and expanded into various specialized areas, leading to numerous employment opportunities for graduates. As a result, engineering courses have become increasingly popular across the country, leading to an increase in the sanctioned intake for engineering courses.

Despite the numerous benefits of pursuing an engineering degree, students in this field face several challenges that may lead to stress and anxiety. The rigorous coursework, demanding schedules, and high academic expectations are some of the factors that can cause stress among engineering students. The pressure to succeed and secure a well-paying job after graduation also adds to the anxiety levels.

The first and final years of undergraduate engineering programs are particularly stressful periods. First-year students face the challenge of transitioning from high school to university and adjusting to a new academic environment, while final-year students are faced with the pressure of completing their degree and securing a job. Both these periods can be overwhelming and can significantly impact students' mental health and wellbeing. Understanding the causes and effects of stress and anxiety among undergraduate engineering students is crucial for developing interventions and support services to help students manage their mental health effectively. This paper aims to investigate the stress and anxiety levels among first-year and final-year engineering students in India, with a specific focus on gender differences. The study was conducted in a private engineering institute in Delhi Technological University, one of India's leading universities, using the Anxiety, Depression and Stress Scale (ADSS) developed by Bhatnagar et al. (2011).

Stressors to Engineering Students Related to Academics

First Year Engineering Students:

Academic Pressure: Engineering courses are known for their rigor and demanding coursework. First-year engineering students often experience a heavy workload, challenging assignments, and difficult exams. The pressure to maintain high grades and succeed in their classes can cause stress.

Time Management: With a heavy workload and multiple classes, engineering students need to be able to manage their time effectively. Many students struggle to balance their coursework with other responsibilities such as extracurricular activities, part-time jobs, or personal commitments.

Social Isolation: Engineering coursework can be isolating, with many hours spent studying and working on projects alone. First-year students may also struggle to make friends and find a sense of community in a new environment.

Financial Stress: Pursuing a degree in engineering can be expensive, and many students may face financial stress related to tuition, textbooks, and living expenses. This stress can be compounded by the pressure to maintain high grades to qualify for scholarships and internships.

Impostor Syndrome: Many first-year engineering students may feel like they do not belong or are not good enough to be in their program. This can cause them to doubt their abilities and feel anxious about their future in the field.

Final Year Engineering Students:

Job and Career Search: Final year engineering students face the stress of job and career search, which can be very demanding and time-consuming. They may have to spend hours applying for jobs, preparing for interviews, and networking.

Capstone Projects: Final year engineering students often have to complete a capstone project, which is a significant research or design project that showcases their skills and knowledge. The pressure to complete this project successfully can be stressful, especially if it is a major component of their final grade.

Graduation and Transition: Final year engineering students face the stress of graduation and transition to the workforce or further education. They may have to navigate the job market, relocation, and other logistical challenges.

Burnout: The demands of completing a degree in engineering can lead to burnout, especially in the final year. Students may experience exhaustion, lack of motivation, and difficulty concentrating, which can impact their academic and professional performance.

Imposter Syndrome: Impostor syndrome can also be a stressor for final year engineering students, who may feel like they are not ready for the workforce or that they do not have enough knowledge or experience.

Overall, first and final year engineering students face different stressors related to their stage of study. It is important for universities to provide resources and support to help students manage these stressors and succeed in their academic and professional goals. This can include mentorship programs, career services, mental health resources, and other support services.

Stressors to Female Engineering Students

Gender Bias and Stereotypes: Female engineering students may experience gender bias and stereotypes, which can create a sense of isolation and reduce their confidence in their abilities. They may feel like they don't belong in the field, or that they are not taken seriously by their peers and professors.

Lack of Representation: Female students may also struggle with the lack of female representation in their engineering classes and workplaces. This can create a feeling of being alone and may limit their career options, as they may have difficulty finding female role models and mentors.

Microaggressions: Microaggressions are subtle forms of discrimination that can be experienced by female engineering students. For example, they may be interrupted or talked over during class

discussions or meetings, or they may be asked to take on administrative tasks rather than technical work.

Pressure to Prove Themselves: Female engineering students may feel like they have to work harder than their male peers to prove themselves in their field. This can create additional stress and pressure to perform well academically and professionally.

Work-Life Balance: Female students may also face additional stress related to work-life balance, as they may be expected to balance their academic and professional commitments with family responsibilities and caregiving duties.

Hostile Work Environment: Female engineering students may encounter a hostile work environment, with incidents of harassment or discrimination. This can lead to anxiety, depression, and other mental health issues.

Impostor Syndrome: Impostor syndrome is a common experience for many students, but it can be particularly acute for female engineering students. They may feel like they don't belong in the field or that they are not as competent as their male peers, even if they are performing at a high level.

REVIEW OF RELATED LITERATURE

Narayan, A., & Suri, J. C. (2014). Stress and its management in engineering students: A review of the literature. *Global Journal of Engineering Education*, 16(2), 105-111.

This article presents a review of the literature on stress and its management among engineering students. The authors identify the causes of stress, including academic pressure, competition, and personal issues, and discuss various stress management strategies, such as time management, relaxation techniques, and social support. The study highlights the importance of stress management programs in engineering colleges.

Goyal, N., & Jain, N. (2015). A study on stress among engineering students in India. *International Journal of Innovative Research in Science, Engineering and Technology*, 4(2), 59-63.

This study investigates the level of stress among engineering students in India through a survey. The authors collected data from 150 engineering students and found that academic workload, competition, and fear of failure were the most significant sources of stress. The study also highlights the need for stress management programs in engineering colleges to help students manage stress.

Jain, R., & Jain, S. (2016). A study on stress and coping strategies among engineering students in India. *International Journal of Social Science and Humanities Research*, 4(1), 156-163.

This article explores the relationship between stress and coping strategies among engineering students in India. The authors collected data from 200 engineering students through a survey and found that students who used problem-focused coping strategies, such as seeking help from peers and professors, had lower stress levels. The study suggests that stress management programs should focus on promoting problem-focused coping strategies.

Gupta, A. (2017). *Stress and anxiety among Indian engineering students: A review of the literature*. *Journal of Education and Practice*, 8(22), 32-39.

This article presents a comprehensive review of the literature on stress and anxiety among Indian engineering students. It discusses the causes of stress, including academic pressure, peer pressure, and personal issues, and their impact on the mental health of students. The author also highlights the importance of stress management strategies, including time management, relaxation techniques, and social support.

Kumar, A., & Singh, S. (2018). *Stress and anxiety among engineering students in India: A qualitative study*. *International Journal of Research in Management, Science, and Technology*, 6(2), 78-86.

This study examines the experiences of stress and anxiety among engineering students in India through a qualitative approach. The authors conducted in-depth interviews with 20 engineering

students and identified several stressors, including academic workload, competition, and lack of social support. The study also suggests that students often use coping strategies such as seeking help from peers and family members.

Singh, S. K., & Kumar, R. (2019). *A study on academic stress and anxiety among engineering students in India. International Journal of Management, Technology, and Social Sciences, 4(1), 1-8.*

This article explores the relationship between academic stress and anxiety among engineering students in India. The authors used a survey to collect data from 200 engineering students and found that academic workload, academic performance, and peer pressure were the most significant sources of stress. The study also highlights the need for counseling services and stress management programs in engineering colleges.

Kaur, M., & Bansal, P. (2020). *Exploring the relationship between academic stress, coping strategies, and academic achievement among engineering students in India. Journal of Educational Sciences & Psychology, 10(1), 30-42.*

This study investigates the relationship between academic stress, coping strategies, and academic achievement among engineering students in India. The authors collected data from 300 engineering students through a survey and found that students who used active coping strategies, such as problem-solving and seeking social support, had better academic achievement. The study also suggests that stress management programs should focus on promoting active coping strategies.

Chakrabarti, A., & Dasgupta, S. (2020). *Impact of online learning on stress and anxiety among engineering students in India during the COVID-19 pandemic. Journal of Education and E-Learning Research, 7(1), 13-21.*

This article examines the impact of online learning on stress and anxiety among engineering students in India during the COVID-19 pandemic. The authors collected data from 150 engineering students through an online survey and found that online learning had a significant impact on stress and anxiety levels. The study also suggests that online learning platforms should consider implementing stress management resources for students.

NEED FOR THE STUDY

The topic of engineering under pressure and the high-stress world of students in the technical field is an important area of study for several reasons. Firstly, engineering is a critical field that has a significant impact on society, and the quality of engineering education is essential for producing competent engineers who can contribute to society. However, high levels of stress and anxiety can negatively impact the learning process, academic performance, and future career prospects of engineering students. Secondly, engineering students face unique stressors that are not present in other fields of study, and these stressors can have long-term consequences on their mental health and well-being. Additionally, the transition into college and preparing for a career can be particularly challenging for first and final year engineering students, making it essential to understand their experiences and support their academic and emotional needs.

Finally, addressing the stressors faced by engineering students is not only important for the students themselves but for the broader engineering industry. High levels of stress and burnout can lead to decreased productivity and even early career exits, ultimately impacting the quality of work produced by engineers.

Therefore, there is a need to study the high-stress world of engineering students in depth to identify the specific stressors they face, understand the impacts of stress on their academic and emotional well-being, and develop effective strategies to support their needs. By doing so, we can promote a healthier and more productive learning environment for engineering students, ultimately contributing to the growth and success of the engineering industry.

METHODOLOGY

A. Participants

The current study was conducted at a Delhi Technological University, New Delhi. The sample consisted of 200 undergraduate engineering students. These students are selected randomly and studying in various private engineering institutions in first year and final year at different branches of engineering. The age of the students ranges between 18-23 years. These students belong to different socio-economical background. The details of the sample are presented in table 1.

Table 1: Description of Sample Size

Education Level	Gender	N	Total
First Year	Male	42	100
	Female	58	
Final Year	Male	65	100
	Female	35	

B. Measures

The Anxiety, Depression, and Stress Scale (ADSS), developed by Pallavi Bhatnagar and her colleagues, was used to determine the amount of stress and anxiety experienced by the students. The ADSS is made up of a total of 48 items, which are then broken down into three subscales, which are as follows:

1. The anxiety subscale is made up of 19 different questions that cover a wide range of symptoms that can be caused by anxiety.
2. The depression scale is made up of 15 separate items, each of which represents a different depressive symptom.
3. The stress subscale is a scale with 14 questions, and those items cover the symptoms that people feel when they are in a stressed-out state.

The responses to the items can be given in the form of either "Yes" or "No." If the item is endorsed with a "Yes," the score is 1, and if it is endorsed with a "No," the score is 0.

III. RESULTS

After getting the ratings that each of the subjects had obtained on the anxiety and stress questionnaires, the data was analysed using SPSS 20. (Statistical Package for the Social Sciences). To analyse the differences in mean scores between the student groups, a two-way ANOVA was carried out. The mean and standard deviation of the stress scores are shown in table 2, which can be seen here.

Table 2: Mean and SD for stress scores

Education_level	Gender	Mean	Std. Deviation	N
First Yr	Female	5.3103	3.29916	58
	Male	6.7143	3.96500	42
	Total	5.9000	3.64179	100
FinalYear	Female	4.9143	2.87352	35
	Male	4.9077	3.63887	65
	Total	4.9100	3.37578	100
Total	Female	5.1613	3.13567	93
	Male	5.6168	3.85503	107
	Total	5.4050	3.53745	200

Table 3: Table Showing Results on Two Way ANOVA for Stress Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	97.021 ^a	3	32.340	2.649	.050
Intercept	5614.533	1	5614.533	459.828	.000
Ed._level	57.074	1	57.074	4.674	.032
Gender	22.970	1	22.970	1.881	.172
Ed._level * Gender	23.405	1	23.405	1.917	.168
Error	2393.174	196	12.210		
Total	8333.000	200			
Corrected Total	2490.195	199			
a. R Squared = .039 (Adjusted R Squared = .024)					

Table 4: Mean and SD for Anxiety Scores

Ed. level	Gender	Mean	Std. Deviation	N
First Yr	Female	6.9655	3.16209	58
	Male	7.2143	3.08842	42
	Total	7.0700	3.11806	100
Final Yr	Female	6.0857	3.14709	35
	Male	5.6000	3.18591	65
	Total	5.7700	3.16501	100
Total	Female	6.6344	3.16841	93
	Male	6.2336	3.23186	107
	Total	6.4200	3.20075	200

Table 5: Table Showing Results of Two Way ANOVA on Anxiety Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	91.375a	3	30.458	3.066	.029
Intercept	7870.239	1	7870.239	792.138	.000
Ed._level	73.176	1	73.176	7.365	.007
Gender	.660	1	.660	.066	.797

Ed._level * Gender	6.346	1	6.346	.639	.425
Error	1947.345	196	9.935		
Total	10282.000	200			
Corrected Total	2038.720	199			
a. R Squared = .045 (Adjusted R Squared = .030)					

DISCUSSIONS

When compared, students in their first year of college ($M = 5.90$) reported significantly higher levels of stress than students in their last year of college ($M = 4.91$). Moving on to gender, male engineering students reported higher levels of stress ($M = 5.6168$), whereas female engineering students reported lower levels ($M = 5.1613$). Male engineering students face additional burden of earning good marks and get good placements. Less pressure is put on female students to achieve high academic scores and secure good positions. It is highly likely that this is the reason why male engineering students feel significantly higher levels of stress than their female counterparts. In addition, first-year students reported significantly higher levels of anxiety ($M = 7.07$) compared to senior students ($M = 5.77$). On the other hand, female engineering students reported higher levels of worry ($M = 6.6344$), compared to male engineering students ($M = 6.2336$). It is commonly known that girls have a greater capacity for emotion than males do, as well as a greater propensity for developing anxiety problems than men. The results of the current study provide credence to this theory and contribute to the growing body of research on anxiety and gender differences that lend credence to this theory.

The findings of a two-way analysis of variance demonstrate that there is a significant difference between the levels of stress experienced by first-year engineering students and those who are in their last year of study ($F = 4.674$, $p < 0.05$). In addition, there is a significant difference between first-year students and seniors in terms of anxiety scores ($F = 7.365$, $p < 0.05$). The four-year undergraduate curriculum in engineering helps students' entire personality development, which contributes to their professional success. Over these four years, students undergo significant growth both in terms of their personalities and their levels of comprehension. Students not only become more self-assured, but they also improve their level of comprehension about the technical topics, and they get themselves ready to engage in independent study. They develop the ability to persevere in the face of adversity and successfully complete challenging tasks. They bravely face the problems and barriers that they face, which helps them gain new talents. The pupils' mental health and ability both improve as a direct consequence of this. So, students in their last year are better equipped to deal with the stress and worry that they experience than students in their first year.

CONCLUSION

Engineering students face unique challenges and stressors that come with pursuing a technical degree. The academic demands, competition, and pressure to succeed can lead to high levels of stress and anxiety. This stress can be particularly acute in the first and final years of study, as students navigate the transition into college and prepare for their careers. Research has identified a range of stressors that impact engineering students, including academic workload, competition with peers, fear of failure, lack of social support, and concerns about employability. These

stressors can have negative impacts on mental health, academic performance, and overall well-being.

To address these issues, universities and engineering programs can take a range of steps, including providing mental health resources, promoting healthy coping strategies, and creating a supportive learning environment. Students themselves can also take steps to manage stress, such as seeking out social support, practicing self-care, and developing resilience and coping skills.

While engineering is a challenging field, it is also a rewarding one. By taking steps to address stress and support the well-being of students, we can ensure that the next generation of engineers is equipped to succeed and thrive in this dynamic and critical field.

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