Advances in Social Sciences Research Journal – Vol. 12, No. 07
Publication Date: July 28, 2025
DOI:10.14738/assrj.1207.19076.
Ding, Y., Zhang, A., Hu, X., & Wang, Q. (2025). STEM Students' Adjustment, Coping, and Stress during the COVID-19 Pandemic. *Advances in Social Sciences Research Journal*, 12(07). 320-338.

STEM Students' Adjustment, Coping, and Stress during the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic profoundly affected higher education, disrupting both the academic and personal lives of students. This study investigates differences in academic adjustment, perceived stress, and coping mechanisms between STEM (Science, Technology, Engineering, Mathematics) and non-STEM students during the pandemic. Secondary analyses were conducted on survey responses from 216 participants (n = 108 STEM students, n = 108 non-STEM students) drawn from a larger study focused on university adaptation, perceived stress, coping strategies, and COVID-19-specific factors. The results revealed that non-STEM students adjusted better academically compared to their STEM counterparts, with a greater tendency to use escape-avoidance coping strategies. However, there were no significant differences between the two groups in social or personal-emotional adjustment, nor in overall stress levels despite the varying academic pressures. Regression analysis identified academic adjustment, emotional adjustment, and avoidance behaviors as key predictors of perceived stress and COVID-19-related challenges. These findings highlight the need for tailored support systems to address the distinct challenges faced by students in different academic disciplines,

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particularly during crises. The study concludes with a discussion of the implications, limitations, and future research directions.

Keywords: Higher Education, College Students; STEM, Adjustment, Coping, College Adaptation.

INTRODUCTION

The COVID-19 pandemic deeply impacted all areas of life, including higher education. College students, who are generally at an age of transition, experienced unique set of challenges as they acclimated to a new normal of remote learning, physical distancing, and uncertainty for the future [1]. Research indicates that students experienced increased stress, anxiety and depression during this time [2,3] and needed to create new strategies to navigate the multimodal stressors they faced [4].

However, the effect of the pandemic might not be symmetrical for all students, especially when these findings are compared between students in the STEM (science, technology, engineering, and mathematics) and non-STEM (non-science, technology, engineering, and mathematics) fields. ST STEM students were frequently put in challenging situations where they were forced to adjust to hands-on learning experiences that were abruptly transitioned to an online format [5], resulting in widespread disruption for lab-based courses and experiential learning [6]. Non-STEM students, on the other hand, faced will also face challenges but may have had an easier time transitioning by having curricula that are more theoretical, book based and easier to teach online. In this regard, the pandemic exacerbated existing disparities in STEM versus non-STEM student academic experiences, with the former experiencing added stress to finish practical work and to concentrate in an online environment [7].

University Adjustment Among STEM and Non-STEM Students

Baker and Siryk's theory of college adjustment [8] views students' adjustment to college as a multifaceted construct, encompassing academic adjustment, social adjustment, personal-emotional adjustment, and attachment to the institution. Academic adjustment refers to students' ability to cope with educational demands, including motivation, academic performance, and satisfaction with the academic environment [9]. Social adjustment focuses on navigating interpersonal-societal demands, such as involvement in social activities and relationships [9]. Personal-emotional adjustment relates to psychological and physical well-being [9]. Attachment refers to satisfaction and the quality of the bond with the institution [9].

STEM students typically face a structured and demanding curriculum, characterized by rigorous coursework, laboratory sessions, and research projects. The transition to remote learning during the pandemic posed significant challenges for these students [10]. Laboratory-based courses and research activities, which are integral to STEM education, were disrupted by the shift to online platforms. Selco and Habbak [11] examined how the lack of access to laboratory spaces and equipment severely limited STEM students' ability to complete essential experiments and develop practical skills. They found that virtual simulations often fell short of providing the same level of experiential learning. Wester et al. [12] explored the broader social implications of the pandemic on STEM students' well-being, with a particular focus on their social adjustment and teamwork dynamics. Their research found that collaborative activities, such as group projects and laboratory-based teamwork, were severely disrupted. Many

students reported that online platforms made it difficult to establish rapport and effective communication with peers. Similarly, Aarntzen et al. [13] examined how the loss of in-person interaction affected STEM students' emotional engagement and many experienced a significant decline in their connection to their coursework.

Students in a non-STEM curriculum, on the other hand, encountered the difficulties of remote education, but their transition might have been different. A number of non-STEM subjects, for example the humanities, social sciences and the arts, focus more on reading, writing and discussion based learning, and are more amenable to online formats [14]. Non-STEM subjects, on the other hand, depend on online lectures, discussions, and individual investigation, which has facilitated the switch to online teaching [14].

Stress Among STEM and Non-STEM Students

Perceived stress refers to how an individual feels about the general stressfulness of their life and their ability to manage such stress during a specific period [15]. Stress is an inevitable part of university life, but the COVID-19 pandemic amplified stress levels among students, disrupting their academic routines, social interactions, and overall well-being [1]. Stress can stem from various sources, including academic pressure, uncertainty about the future, financial concerns, and social isolation [4].

Students enrolled in STEM programs experience high academic stress as a result of the challenging curriculum, the need to protect high grades, and the STEM-Specific Culture of IT IS supposed to be hard [16]. It was hypothesized that engineering students would experience greater stress compared to non-engineering students [17,18]. The situation made it even worse as the pandemic brought about new factors of stressor, such as shifting to distance learning model online courses, disruption of lab experiences, and the inability to engage in adequate research due to unavailability of campus facilities [11]. In terms of access to labs, specialized equipment, and collaborative workspaces, STEM students did not have that access, which could have led to frustration and anxiety about the effects of these disruptions on their academic pathway and future academic careers [18]. In addition, the uncertainty related to internships, research opportunities, and job placement most likely increased perceived stress, as students were concerned about the repercussions of the pandemic on their opportunities for hands-on experience and securing a job in their field [19]. These obstacles might have resulted in heightened anxiety, decreased motivation, and feelings of loneliness in STEM majors [2, 20]. Other non-STEM subjects tend to lean on reading, writing, and discussion-based learning, and thus may be able to pivot to online more easily than can STEM counterparts [14]. But it also didn't necessarily relieve anxiety, and in some instances, it may have added a new level of complications. For instance, disruption of in-person learning feeds into the more self-paced and unstructured learning space produced by the shift to online learning, which can be an added source of stress for non-STEM students who faced challenges with time management, self-regulation and staying motivated, and maintaining focus and concentration in the absence of in-person support systems [12]. For students studying fields like art, in which making and doing is not just important but necessary, the restrictions of remote learning could be particularly stressful. Lack of access to studio space, live performance and opportunities to work collaboratively on creative projects most likely led to the feeling of frustration and anxiety [22].

Coping Strategies Among STEM and Non-STEM Students

Coping strategies are the methods individuals use to manage stress and adjust to challenging circumstances [23, 15]. During the COVID-19 pandemic, university students had to quickly adopt new coping mechanisms to navigate the disruptions to their academic, social, and personal lives. Students in STEM fields, particularly given the structured, goal-focused nature of their degree programs, might have been drawn to problem-focused strategies. These coping mechanisms deal with stress on a problem-solving basis, goal setting and seeking help [25]. There are likely many STEM students who would have turned to professors, teaching assistants or peers for help understanding difficult material or making that transition to online learning. On the other hand, students were likely to be engaged academic supports (e.g., attending virtual office hours, virtual study groups, or an online discussion board for a particular course) [13]. Without access to labs and equipment, STEM students may have used virtual simulations, coding platforms or other online-based tools to keep learning. These technologies enabled them to preserve skills firsthand, even under pandemic restrictions [11]. Students in STEM programs might have developed strong time management skills for handling a heavier course load and remote challenges. [to emphasize c, if desired it is possible to help student in] making out a specific learning schedule, establish some realistic objectives, or divide tasks into small steps [21].

Non-STEM students, who faced different academic and social challenges, might have leaned more heavily on emotion-focused coping strategies, which are designed to manage emotional responses to stress rather than directly address the root cause [15]. Many non-STEM disciplines allow for greater flexibility in assignments and assessments. This may have enabled students to adopt a more adaptable approach to their studies, such as exploring new interests, focusing on self-paced learning, or taking advantage of flexible deadlines [21].

Purpose of Study

Although studies have investigated the adjustment, perceived stress and coping strategies of college students, few have considered this in the context of STEM and non-STEM students, particularly during a public health crisis. Insight into how students in various fields of study adapted, coped, and experiences with stress during the pandemic is essential for institutions of higher learning so that they can prepare for future disruptions and support student well-being. Current study aims to examine the differences in adjustment, perceived stress, coping strategies, and COVID-19 adjustment between STEM and non-STEM students during the early COVID-19 pandemic in the United States. By examining these factors, the research hopes to provide insights that could inform more tailored support systems for students in different disciplines, ultimately enhancing their academic and personal well-being during times of crisis.

METHODOLOGY

Participants

A representative subsample of the original larger-scale study's participants was randomly selected for quantitative analysis for the current study (n = 108 STEM major students, n = 208 non-STEM). Participants' ages ranged from 18-57 years (M = 22.71) and about 72% were undergraduate students; the sample comprised predominantly female students (78%), with 70 males and 246 females; about 60.4% attended universities outside of the metropolitan NYC area; Moreover, about 38% of participants were originally living off-campus during the Spring 2020 semester and about 32.4% of students in STEM majors were international students (Table

URL: http://dx.doi.org/10.14738/assrj.1207.19076

1, Table 2) (Appendix A). This study was approved by the Institutional Review Board at Fordham University (approval number: 1517).

Table 1: Quantitative Participant Demographics: Gender, Age, and Household Income

	STEM		Non-STEM		Total	
	n	%	n	%	n	%
Gender						
Male	33	17.48%	37	29.81%	70	22.15%
Female	75	82.52%	171	70.19%	246	77.85%
Age (Years)						
18	4	3.7%	7	3.4%	11	3.5%
19	17	15.7%	23	11.1%	40	12.7%
20	15	13.9%	15	7.2%	30	9.5%
21	14	13.0%	18	8.7%	32	10.1%
22	12	11.1%	18	8.7%	30	9.5%
23	11	10.2%	28	13.5%	39	12.3%
24	11	10.2%	26	12.5%	37	11.7%
25	5	4.6%	18	8.7%	23	7.3%
26	4	3.7%	14	6.7%	18	5.7%
27	4	3.7%	10	4.8%	14	4.4%
28	2	1.9%	5	2.4%	7	2.2%
29	4	3.7%	4	1.9%	8	2.5%
30	2	1.9%	4	1.9%	6	1.6%
31	3	2.8%	3	1.4%	6	1.9%
33	0	0%	3	1.4%	3	0.3%
35	0	0%	1	0.5%	1	1.6%
36	0	0%	5	2.4%	5	0.3%
37	0	0%	1	0.5%	1	0.3%
40	0	0%	1	0.5%	1	0.3%
43	0	0%	1	0.5%	1	0.3%
50	0	0%	1	0.5%	1	0.3%
57	0	0%	2	1%	2	0.6%
Household Income						
Less than $20,000	12	11.1%	21	10.1%	33	10.4%
$20,000 to $34,999	17	15.7%	16	7.7%	33	10.4%
$35,000 to $49,999	11	10.2%	28	13.5%	39	12.3%
$50,000 to $74,999	15	13.9%	31	14.9%	46	14.6%
$75,000 to $99,999	16	14.8%	27	13.0%	43	13.6%
More than $100,000	37	34.3%	85	40.9%	122	38.6%

Table 2: Quantitative Participant Demographics: University Information

	STEM		Non-STEM		Total	
	n	%	n	%	n	%
Race						
White	4	6.1%	133	53.2%	137	43.4%
Black or African American	0	0%	8	3.2%	8	2.5%
Hispanic or Latino	1	1.5%	19	7.6%	20	6.3%
American Indian or Alaska Native	0	0	1	0.4%	1	0.3%
Asian	57	86.4%	72	28.8%	129	40.8%

Native Hawaiian or Other Pacific Islander	1	1.5%	1	0.4%	2	0.6%
Other(Biracial)	3	4.5%	16	6.4%	19	6.0%
Year in School						
1st	22	33.3%	52	20.8%	74	23.4%
2nd	18	27.3%	81	32.4%	65	31.3%
3rd	5	7.6%	47	18.8%	41	16.5%
4th	16	24.2%	52	20.8%	49	21.5%
5th	2	3%	15	6.0%	7	5.4%
6th or higher	3	4.5%	3	1.2%	4	1.9%
School Major						
STEM	35	53.0%	73	29.2%	52	34.2%
Humanities	2	3.0%	9	3.6%	7	3.5%
Social science	14	21.2%	81	32.4%	94	30.1%
Medical or related field	0	0%	47	18.8%	25	14.9%
Law	0	0%	5	2.0%	2	1.6%
Business	9	13.6%	18	7.2%	15	8.5%
Other	6	9.1%	17	6.8%	12	7.3%
University Location						
Outside of Met NYC	72	66.7%	119	54.59%	191	60.4%
Metropolitan NYC	36	33.3%	89	45.41%	125	39.6%
Living Situation						
University dorm	18	27.3%	61	24.4%	64	30.92%
Off-campus	47	71.2%	111	44.4%	79	38.16%
Home with family	1	1.5%	77	30.8%	62	29.95%
Other	0	0.0%	1	0.4%	2	0.97%

Measure

Student Adjustment to College Questionnaire (SACQ):

The Student Adjustment to College Questionnaire (SACQ) is a widely utilized self-report instrument designed to assess college students' academic and social adjustment. Various adaptations of the SACQ have been developed to enhance its usability and convenience, while maintaining its robust psychometric properties. Originally devised as a comprehensive tool for examining college adjustment, the SACQ explores the interplay of personality and environmental factors, with the goal of identifying students who may face adjustment challenges and benefit from targeted interventions (Baker & Siryk, 1984). The full SACQ scale consists of 67 items, rated on a 9-point Likert scale ranging from "doesn't apply to me at all" to "applies very closely to me." These items are divided into four subscales, and the total T-scores reflect overall adjustment levels, with scores of 30 indicating very low adjustment, 40 low, 50 average, 60 high, and 70 very high. However, certain items (R6, R10, R17, R19, R21, R25, R29, R32, R39, R41, R52, R58, R22, R48, R51, R56, R57, R2, R7, R11, R12, R20, R28, R31, R35, R38, R40, R45, R49, R64, R34, R42, R56, R57, R59, R60, R61) are reverse-scored, meaning higher scores on these items indicate lower levels of adjustment.

Perceived Stress Scale:

The questions are broad in nature, making the PSS applicable across various subpopulations. It was designed to examine how unpredictable, uncontrollable, and overwhelming respondents found their lives, focusing on their experiences over the past 30 days. The Perceived Stress Scale (PSS; Cohen, 1994) was used to measure participants' perception of stress. Participants' scores

URL: http://dx.doi.org/10.14738/assrj.1207.19076

were summed to calculate a perceived-stress score with higher scores indicating higher level of perceived stress (Cohen et al., 1983). The PSS is a 10-item questionnaire rated on a 5-point Likert scale, ranging from "never" to "very often," with a Cronbach's alpha reliability of 0.84-0.86 (Cohen et al., 1983; original larger-scale study α = 0.87).

Ways of Coping Questionnaire (WAYS):

The Ways of Coping Questionnaire (WAYS) (Folkman & Lazarus, 1988) was employed to assess participants' coping strategies during the early stages of the COVID-19 pandemic. The WAYS is designed to measure how individuals respond to a specific stressful situation, focusing on what they actually do in that context rather than what they typically do or believe they should do. This 66-item questionnaire uses a 4-point Likert scale (ranging from "does not apply or not used" to "used a great deal") and has a Cronbach's alpha reliability of 0.78 (Folkman & Lazarus, 1988), demonstrating robust internal consistency across eight subscales.

Participants' responses were summed to generate a score for each subscale, with higher scores indicating more frequent use of that coping strategy in response to the pandemic. The WAYS categorizes coping mechanisms into three primary domains: emotion-focused, problem-focused, and avoidance-focused coping. For the purposes of this study, one subscale from each coping category was selected for analysis, based on the definitions provided in the WAYS and relevant coping literature (Folkman & Lazarus, 1988; Lazarus, 1993). The Positive Reappraisal subscale (emotion-focused; 7 items, α = 0.79; original study α = 0.74) assessed participants' efforts to derive positive meaning from the situation by focusing on personal growth. The Planful Problem Solving subscale (problem-focused; 6 items, α = 0.68; original study α = 0.71) measured deliberate, problem-focused efforts aimed at altering the situation. The Escape-Avoidance subscale (avoidance-focused; 8 items, α = 0.72; original study α = 0.67) evaluated participants' wishful thinking and behavioral attempts to escape or avoid the stressor (Folkman & Lazarus, 1988; Folkman et al., 1986).

COVID-19 Related Questionnaire:

The Covid-19 scale was created for the original larger-scale study to measure the effect of COVID-19 on participants in six subdomains. In total there are 31 items on a 5-point Likert-scale. This measure was an adaptation of an unpublished instrument created to measure the mental health index and experiences of university students during the initial outbreak in China (Liu, 2020). Applicable questions from that instrument were adapted and included for analyses in the original larger-scale study. Participants' COVID-19-related responses were scored according to the standard procedures for the SACQ, which included handling omitted questions and calculating the total scores. With regard to COVID-19-related stimuli and experiences, participants' ability to manage their emotions was assessed using the 5-item emotionality subscale (α =.71). Using the 7-item adaptive adjustment subscale (α =.69), individuals' capacity to manage stress, anxieties, and consequences associated with their COVID-19 condition was assessed. The subscale measuring social support (4 items, α =.69) assessed the participants' satisfaction with the assistance they got during the COVID-19 epidemic.

The participants' readiness and motivation to complete coursework, as well as their ability to adjust to studying remotely due to the COVID-19 pandemic were evaluated using the 7-item, α =.85 academic adjustment subscale. A 3-item discriminatory impact adjustment subscale (α =.78) measured respondents' acknowledgement of racism's impact on COVID-19. Ultimately,

the regulation reaction subscale (5-items, α =.61) was used to gauge the participants' agreement with restrictions and rules. Overall, for scales with less than 10 components, Cronbach's alpha levels above .50 are sufficient [31]. Higher agreement with imposed regulations, fewer negative thoughts, behaviors, and worries, better adjustment to academic changes and pressures, less impact of discrimination, and higher scores on COVID-related subdomains all indicated more positive adjustment during the COVID-19 pandemic.

FINDINGS

For research question 1, the independent samples t-tests revealed a significant difference in academic adjustment between STEM and non-STEM students (t (316) = -2.719, p = 0.006), with non-STEM students showing better adjustment (M = 5.98, SD = 1.04) compared to STEM students (M = 5.65, SD = 1.00). No significant differences were found in social adjustment, personal emotional adjustment, or attachment. Additionally, a significant difference was found in escape-avoidance coping (t = -2.885, p = 0.004), with non-STEM students more likely to use avoidance strategies (M = 11.08, SD = 4.00) compared to STEM students (M = 9.62, SD = 4.70), This indicates that non-STEM students were more likely to use avoidance strategies to cope with stress during the pandemic. No significant differences were found in planful problem solving (t= -0.8, p = 0.24) or positive reappraisal (t = -0.658, p = 0.511) (Table 3, Table 4).

Table 3: Independent Samples t Test on SACQ Factors

	Academic Adjustment		Social Adjustment		Personal Emotional Adjustment		Attachment	
	M	SD	M	SD	M	SD	M	SD
STEM	5.65	1.00	4.77	1.05	5.15	1.39	6.50	1.20
Non-STEM	5.98	1.04	4.78	1.05	4.91	1.49	6.50	1.19
Levene's Test F	0.263		0.011		1.649		0.052	
Sig.	0.609		00.916		0.20		0.819	
t	-2.719		-0.046		1.394		-0.301	
p(2 tails)	0.006		0.963		0.155		0.764	
Cohen's d	1.03		1.05		1.46		1.20	

Note. * p ≤ .05, ** p ≤ .01

Table 4: Independent Samples t Test on WAYS Factors

	Escape-Avoidance		Planful Problem		Positive Reappraisal	
	M	SD	M	SD	M	SD
STEM	9.62	4.70	6.93	3.55	7.10	3.87
Non-STEM	11.08	4.00	7.25	3.26	7.42	4.23
Levene's Test F	2.36		0.60		3.40	
Sig.	0.126		0.44		0.066	
t	-2.885		-0.8		-0.658	
p(2 tails)	0.004		0.24		0.511	
Cohen's d	4.26		3.36		4.11	

Note. * p ≤ .05, ** p ≤ .01

An independent sample t-test was conducted to address the second research question. The findings did not support the hypothesis of a significant difference in stress levels; the mean stress scores for STEM students (M = 19.96, SD = 6.28) and Non-STEM students (M = 20.6, SD = 6.44) were not significantly different (t=-0.842, p=0.4) (Table 5).

URL: http://dx.doi.org/10.14738/assrj.1207.19076

Table 5: Independent Samples t Test on Perceived Stress

	Stress		
	M	**SD**	**t**
STEM	19.96	6.28	-0.842
Non-STEM	20.6	6.44	
Levene's Test F	1.23		
Sig.	0.268		
p	0.4		
Cohen's d	6.386		

A multiple linear regression analysis was conducted to explore the third research question. A multiple regression analysis was conducted to investigate the impact of major, SACQ factors, and WAYS factors on perceived stress (PSS). The overall model was significant (F = 49, $p < .01$, with an R^2 of 0.749). The analysis revealed that major was not a significant predictor of perceived stress ($B = 0.003$, $SE = 0.013$, $\beta = 0.008$, $t = 0.218$, $p = 0.828$). Among SACQ factors, academic adjustment (B = -0.094, SE = 0.032, $\beta = -0.015$, $t = -2.90$, $p = 0.004$) and personal emotional adjustment (B = -0.234, SE = 0.021, $\beta = -0.535$, $t = -11.11$, $p < 0.01$) were significantly negatively associated with perceived stress. Notably, planful problem solving (B = -0.138, SE = 0.053, $\beta = -0.121$, t = -2.593, p = 0.01) was significantly negatively associated with perceived stress, and escape avoidance (B = 0.288, SE = 0.050, $\beta = 0.243$, $t = 5.764$, $p < 0.01$) was significantly positively associated with perceived stress (Table 6).

Table 6: Multiple Regression of Major, SACQ, and WAYS on Perceived Stress

	B	**SE**	**β**	**t**	**Sig.**	**F**	**R^2**	**ΔR^2**
Model					<0.01	49	0.749	0.561
Majors	0.003	0.013	0.008	0.218	0.828			
SACQ								
Academic Adjustment	-0.094	0.032	-0.015	-2.90	0.004			
Social Adjustment	0.013	0.027	0.026	0.488	0.626			
Personal Emotional Adjustment	-0.234	0.021	-0.535	-11.11	<0.01			
Attachment	0.049	0.038	0.074	1.293	0.197			
WAYS								
Positive Reappraisal	-0.75	0.065	-0.053	-1.142	0.254			
Planful Problem Solving	-0.138	0.53	-0.121	-2.593	0.01			
Escape Avoidance	0.288	0.5	0.243	5.764	<0.01			

* p ≤ .05, ** p ≤ .01, *** p ≤ .001

For question 4, a multivariate regression analysis was utilized. Pillai's Trace revealed significant effects for several SACQ factors. Academic Adjustment showed a significant effect ($F(6, 306) = 20.03$, $p < .01$); Personal Emotional Adjustment showed a significant ($F(6, 306) = 6.71$, $p < .01$); and Attachment was also showed a significant effect ($F(6, 306) = 2.70$, $p = .015$). For the WAYS factors, Escape Avoidance was significant ($F(6, 306) = 2.16$, $p = .047$). The effect of major was not significant (Table 7). Levene's Test indicated that only some of the COVID-19 related factor scores demonstrated equal variances. Emotionality was significant ($F(1, 306) = 5.722$, $p = .017$), while Social Support, Academic Adjustment, Discriminatory Impact Adjustment, Adaptive Adjustment, and Regulation Reaction did not show significant differences in variances (Table 8).

Table 7: Pillai's Trace of SACQ, WAYS, and Major on COVID-19 Factors

	Value	F	df	Sig.	Partial Eta Squared
SACQ					
Academic Adjustment	0.285	20.03b	6.00	<0.01	0.29
Social Adjustment	0.019	0.99b	6.00	0.429	0.019
Personal Emotional Adjustment	0.118	6.71b	6.00	<0.01	0.118
Attachment	0.051	2.70b	6.00	0.015	0.051
PSS	0.132	7.648b	1	<0.01	0.132
WAYS					
Positive Reappraisal	0.01	0.50b	6.00	0.809	0.01
Planful Problem Solving	0.021	1.09b	6.00	0.367	0.021
Escape Avoidance	0.041	2.16b	6.00	0.047	0.041
Major	0.14	1.49b	6.00	0.183	0.029

Note. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Table 8: Multivariate Regression Levene's Test

	F	df1	df2	Sig.
COVID-19				
Emotionality	5.722	1	306	0.017
Social Support	2.646	1	306	0.105
Academic Adjustment	0.024	1	306	0.876
Discriminatory Impact Adjustment	0.979	1	306	0.323
Adaptive Adjustment	0.181	1	306	0.671
Regulation Reaction	0.91	1	306	0.341

Note. * $p \leq .05$, ** $p \leq .01$

The multivariate regression analysis partially supported the hypothesis that SACQ, PSS, WAYS, and major predict COVID-19 related factors (Table 9). Results showed significant positive relationships with COVID-19 Emotionality ($F(6, 306) = 20.03$, $p < .01$), and COVID-19 Academic Adjustment ($F(1, 306) = 61.112$, $p < .001$). SACQ Personal Emotional Adjustment had significant relationships with COVID-19 Emotionality ($F(6, 306) = 6.71$, $p < .01$) and COVID-19 Adaptive Adjustment ($F(1, 306) = 13.655$, $p < .01$). SACQ Attachment was significantly related to COVID-19 Social Support ($F(1, 306) = 9.674$, $p = .002$). No significant relationship was found between SACQ Social Adjustment and COVID-19 related factors.

Table 9: Multivariate Regression of SACQ, PSS, WAYS, and Major on COVID-19 Factors

Source	Dependent Variable	df	Mean Square	F	Sig.	Partial Eta Squared
SACQ						
Academic Adjustment	Emotionality	1	06.64	24	<0.001	0.074
	Adaptive Adjustment	1	2.819	0.125	0.724	0.000
	Social Support	1	84.452	13.263	<0.01	0.042
	Academic Adjustment	1	1357.053	61.112	<0.001	0.166
	Discriminatory Impact Adjustment	1	0.801	0.15	0.17	0.000
	Regulation Reaction	1	32.403	3.434	0.07	0.011

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Social Adjustment	Emotionality	1	1.457	0.172	0.001	0.172
	Adaptive Adjustment	1	5.385	0.625	0.001	0.239
	Social Support	1	17.671	0.097	0.009	2.775
	Academic Adjustment	1	20.073	0.342	0.003	0.904
	Discriminatory Impact Adjustment	1	1.214	0.634	0.001	0.227
	Regulation Reaction	1	13.265	0.237	0.005	1.406
Personal Emotional	Emotionality	1	202.168	23.893	<0.01	0.071
Adjustment	Adaptive Adjustment	1	307.675	13.655	<0.01	0.43
	Social Support	1	0.337	0.053	0.818	0.00
	Academic Adjustment	1	57.635	2.593	0.108	0.008
	Discriminatory Impact Adjustment	1	6.269	1.171	0.28	0.004
	Regulation Reaction	1	1.488	0.158	0.692	0.001
Attachment	Emotionality	1	4.232	0.50	0.48	0.002
	Adaptive Adjustment	1	10.834	0.481	0.489	0.002
	Social Support	1	61.597	9.674	0.002	0.031
	Academic Adjustment	1	155.443	7.00	0.009	0.022
	Discriminatory Impact Adjustment	1	3.291	0.615	0.434	0.002
	Regulation Reaction	1	17.272	1.831	0.177	0.006
WAYS						
Positive Reappraisal	Emotionality	1	5.32	0.063	0.802	0.00
	Adaptive Adjustment	1	0.068	0.003	0.956	0.00
	Social Support	1	1.26	0.198	0.657	0.001
	Academic Adjustment	1	0.859	0.039	0.844	0.00
	Discriminatory Impact Adjustment	1	13.11	2.449	0.119	0.008
	Regulation Reaction	1	1.957	0.207	0.649	0.001
Planful Problem Solving	Emotionality	1	0.076	0.009	0.925	0.00
	Adaptive Adjustment	1	41.723	1.852	0.175	0.06
	Social Support	1	9.258	1.454	0.229	0.05
	Academic Adjustment	1	0.012	0.001	0.981	0.01
	Discriminatory Impact Adjustment	1	20.952	3.913	0.049	0.013
	Regulation Reaction	1	8.541	0.905	0.342	0.03
Escape Avoidance	Emotionality	1	18.499	2.186	0.14	0.007
	Adaptive Adjustment	1	111.708	4.958	0.027	0.016
	Social Support	1	0.028	0.004	0.947	0.00
	Academic Adjustment	1	114.224	5.144	0.024	0.017
	Discriminatory Impact Adjustment	1	2.344	0.438	0.509	0.001
	Regulation Reaction	1	10.792	1.144	0.286	0.004
PSS	Emotionality		367.938	43.484	<0.001	0.124
	Adaptive Adjustment		3.616	0.16	0.689	0.001
	Social Support		2.082	0.327	0.568	0.001
	Academic Adjustment		89.111	4.013	0.046	0.013

	Discriminatory Impact Adjustment		24.386	4.554	0.034	0.015
	Regulation Reaction		39.026	4.136	0.043	0.013
Major	Emotionality	1	48.415	5.722	0.017	0.018
	Adaptive Adjustment	1	59.626	2.646	0.105	0.009
	Social Support	1	0.155	0.024	0.876	0.00
	Academic Adjustment	1	21.746	0.979	0.323	0.003
	Discriminatory Impact Adjustment	1	0.967	0.181	0.671	0.001
	Regulation Reaction	1	8.585	0.91	0.341	0.003

Note. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

For WAYS factors, significant relationships were found between Escape Avoidance and COVID-19 Adaptive Adjustment ($F(1, 306) = 4.958$, $p = .027$), and COVID-19 Academic Adjustment ($F(1, 306) = 5.144$, $p = .024$). Planful Problem Solving had a significant effect on COVID-19 Discriminatory Impact Adjustment ($F(1, 306) = 3.913$, $p = .049$). Positive Reappraisal did not show significant effects on any COVID-19 factors.

Lastly, PSS showed significant positive relationships with COVID-19 Emotionality ($F(1, 306) = 43.484$, $p < .001$), COVID-19 Academic Adjustment ($F(1, 306) = 4.013$, $p = .046$), COVID-19 Discriminatory Impact Adjustment ($F(1, 306) = 4.554$, $p = .034$), and COVID-19 Regulation Reaction ($F(1, 306) = 4.136$, $p = .043$). The analysis of majors showed a significant relationship with COVID-19 Emotionality ($F(1, 306) = 5.722$, $p = .017$), but not with other COVID-19 factors. Pairwise Comparison results indicated that STEM students had higher means for COVID-19 Emotionality, Adaptive Adjustment, and Academic Adjustment compared to non-STEM students (Table 10). Non-STEM students had higher means for COVID-19 Social Support and Regulation Reaction. These findings suggest significant influences of academic and personal emotional adjustment, perceived stress, and avoidance behaviors on students' coping mechanisms during COVID-19.

Table 10: Pairwise Comparisons of Major on COVID-19 Factors

	Stem	**Mean**	**Std. Error**	**95% Confidence Interval**	
COVID_Emotionality	STEM	11.403[a]	.288	10.836	11.971
	NonSTEM	10.541[a]	.205	10.137	10.944
COVID_AdaptiveAdjustment	STEM	15.833[a]	.471	14.907	16.759
	NonSTEM	14.875[a]	.334	14.217	15.533
COVID_SocialSupport	STEM	15.655[a]	.250	15.162	16.147
	NonSTEM	15.703[a]	.178	15.354	16.053
COVID_AcademicAdjustment	STEM	16.377[a]	.467	15.458	17.297
	NonSTEM	15.799[a]	.332	15.146	16.452
COVID_Discriminatory ImpactAdjustment	STEM	5.404[a]	.229	4.953	5.855
	NonSTEM	5.526[a]	.163	5.205	5.847
COVID_RegulationReaction	STEM	20.631[a]	.305	20.032	21.230
	NonSTEM	20.994[a]	.216	20.569	21.420

a. Covariates appearing in the model are evaluated at the following values: Academic = 5.8734, Social = 4.7792, Emo = 4.9936, atta = 6.4873, EA = 1.332, PP = 1.1891, PR = .1724, PSS = 2.038.

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The results showed that non-STEM students adjusted better academically compared to their STEM counterparts. This finding aligns with previous research suggesting that STEM programs, often characterized by more demanding coursework and rigorous expectations, may impose greater academic pressures, making adjustment more challenging for STEM students [32]. Non-STEM students, by contrast, may benefit from more flexible curricula, allowing for easier adaptation, particularly during disruptive periods like the COVID-19 pandemic [33].

Interestingly, as much as non-STEM students experienced better academic adjustment this was linked with higher use of avoidance coping, which left some worry. Avoidance strategies (e.g., escapism, wishful thinking, emotional suppression and self-isolation) lead to a reduction in anxiety in the short-term, however they are less useful strategies for sustained management of distress [34]. Problem-solving approaches, in contrast, were strong predictors of lower stress because they entail active attempts at recognizing and resolving stressors, which can result in a feeling of increased sense of control and mastery over one's environment [35]. This implies that even though non-STEM students were the ones who acclimatized the easiest in term of academics, they had developed the unhealthiest kind of coping, which could potentially affect their emotional health later in life [36].

In addition, the difference in overall perceived stress was not significant between STEM and non-STEM students, whose coping strategies varied. This implies that the universal nature of the challenges associated with the pandemic which include uncertainty, isolation and contention with disruptions of typical routines may have kept the playing field fairly even in terms of stress across academic disciplines. Both STEM and non-STEM students utilized problem-solving and positive reappraisal, however non-STEM students were more prone to apply avoidance methods [37]. This suggests that, while non-STEM students adapted to the new setting better both in terms of academic performance and use of avoidance strategies, the stress exposure of non-STEMs remained similar to that of STEMs over the pandemic.

Several factors of the SACQ and WAYS were significant predictors of perceived stress in higher education students. Academic adjustment and personal-emotional adjustment from the SACQ were negatively related to perceived stress, suggesting students who fit well academically and emotionally in college had reduced perception of stress [32]. Finally, planful problem solving, as assessed by the WAYS, was a significant negative predictor of perceived stress, such that individuals who employ strategic problem-solving approaches report less stress. In contrast, escape-avoidance coping responses from the WAYS were positively related to stress perceptions possibly meaning that students who avoid dealing with problems or stressors may experience higher levels of stress [35].

Implications

Based on these findings, colleges as well as educators will be recommended to focus on tailored intervention programs, specifically for STEM students who face unique academic adjustment issues. One of the key findings of research is that early, formal advising and mentoring are critical factors in the development of studying habits and clear academic expectations that are especially important to students in STEM fields, who have distinct academic pressures [38]. STEM programs offer rigorous academics and heavy course loads, leaving few opportunities

for extracurricular involvement, and often interfere with quality of life, highlighting the importance for interventions that aim to improve retention and increase resiliency [39]

Workshops that target elemental skills (e.g., time management, productive ways of studying, and how to manage online/hybrid learning) will be beneficial [33]. There is also a very real need to increase access to counseling and mental health services, because that line of support helps students navigate personal life and emotional transitions. An important theme in contemporary research which our findings support is the importance of emotional resiliency in coping with stress; those students of ours who were able to control their emotional reactions and remain psychologically healthy reported far lower levels of stress. For this reason, colleges need to provide support for bolstering emotional resilience, especially for moments of crisis. Mental health services and mindfulness counseling for stress management need to be part of the student services so that students have the capabilities to manage academic and stress from outside [32, 40]. Other college mental health programming, including CBT and MBSR have proven to be effective [41-43]. Both CBT and MBSR are shown to alleviate anxiety, depression, and stress, problems that are common among students in high-intensity fields such as STEM. Research highlights those psychosocial interventions combined with training in stress management, relaxation and problem-solving skills, and increased resilience are very effective, and lead to a better academic performance [44-46].

Indeed, as students progress from high school to postsecondary education, the burdens of STEM programs may exacerbate stress and anxiety, emphasizing the need to proactively support students so as to ensure that stress and anxiety are not detrimental to student success [16]. Thus, frequent monitoring of stress and copings report on the part of students is recommended to identify those who are at risk for academic- or emotion-related burnout. Data analytics can lend additional weight to these initiatives by allowing ongoing student well-being measurement and real-time feedback on which to base individualized, timely interventions. This evidence-informed approach gives colleges and educators the tools they need to help students get through crises, with positive implications for their well-being and academic achievement especially in the context of far-reaching disruptions, as is the case now with the pandemic.

At the same time, creating and growing peer support networks, and launching initiatives to raise awareness about mental health, can also play a role in diminishing the stigma of reaching out for help, by creating a climate it's safe to talk openly about mental health struggles. Interventions such as the Penn Resilience Program have yielded promising findings in the reduction of academic stress through the promotion of resilience-building and social connections, especially in high-demand areas such as STEM [47, 48]. Peer support schemes in HE also enables sharing of coping strategies and experiences and add an enabling layer to traditional mental health services [49]. But for STEM students, they also promote a community environment to counteract the competitive and rigorous culture of their programs. Peer support systems also promote enhanced mental health assertiveness, allowing students to be better prepared to handle their wellness in the face of rigorous academic environments [47, 50].

Lastly, the association of problem-solving coping strategies and addressing discriminatory effects of COVID-19 suggests coping that is beneficial and constructive. Black and Brown

URL: http://dx.doi.org/10.14738/assrj.1207.19076

students who experienced racial, ethnic, and other forms of discrimination experienced stress s related to the pandemic and societal upheaval [37]. Respondents who used a problem-solving approach, like using support networks or self-advocacy, found it easier to deal with this complex aspect of experience. This proactive response suggests that students who proactively faced discrimination would have been better equipped to deal with the emotional and practical ramifications of such incidents [48]. By implementing such approaches can include skill-building workshops, expanded mental health services, peer support programs and evidence-based interventions going forward, colleges and educators can do more to give students the necessary tools to navigate the pressures and demands of academic life, especially during disasters such as the COVID-19 pandemic. Such comprehensive support has been shown to support resilience, long-term student achievement, and student well-being [3, 40].

Limitations and Future Study

We need to discuss the limitations of this study. First, the participants in this study were collected from only one college, and the results may not be generalizable. Future research should include universities from a diverse range of locales (e.g., geographic, cultural, socio-economic) to improve the generalizability of the findings. A broader sampling framework would also contribute to the cross-context application of the results.

Another limitation is that self-reported data is vulnerable to bias. Respondents may consciously or unconsciously lie or provide inaccurate answers because they have impression management which is social desirability, recall difficulties and subjective interpretation of the questions. Consequently, the precision of the data may be questionable, which could in turn influence the generalizability of the findings. In the future, objective or triangulated measurement, as far as it is feasible, should be included in studies to limit problems of bias with self-reported information. Moreover, cultural differences between STEM and non-STEM students were not considered, and this could greatly influence the interpretation of findings. For example, Mohamed et al. [51] have shown that students from collectivist cultures were more likely to use emotion- and problem-focused coping strategies, and dysfunctional coping strategies, than students from individualist cultures. These pupils were also less stressed by the pandemic. Last, it is crucial underlining that the present study was carried out during the COVID-19 pandemic, an exceptional period which might have heavily influenced psychological and emotional reactions in the participants. Although this framework provides important considerations for how to cope during truly catastrophic events, it constrains the generalizability of such findings to non-pandemic times. By doing this, our suggestions are that researchers could longitudinally adopt a more hygienic and larger sampling and investigate how coping strategies and stress levels can interact or change over time; and provide a full picture of both normal and crisis time coping. It would also have allowed researchers to examine how the pandemic will affect students' mental health and coping strategies in the long term, and to develop a more nuanced understanding of how their mental health changes over time in response to prolonged stressors among students from different backgrounds and academic disciplines.

Acknowledgement

Thanks to Qian Wang for help with data collecting. Thanks to the anonymous reviewers for their helpful and constructive comments.

Declaration

We have no conflict of interest to declare.

Institutional Review Board Approval

This study was approved by Institutional Review Board at Fordham University (proposal #1517).

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