Original Research Article

ACADEMIC STRESS MEASUREMENT AND MANAGEMENT OF RADIOLOGIC TECHNOLOGY STUDENTS

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ABSTRACT

Academic stress among Radiologic Technology students in Iligan City, Philippines, significantly impacts their well-being and academic success. This research aims to measure and address this stress by developing tailored stress management activities. The study utilizes an exploratory sequential mixed-methods design, combining qualitative and quantitative approaches. Qualitative interviews with Radiologic Technology students identify the key stressors, including academic demands, interpersonal conflicts, and societal expectations. Based on the qualitative findings, a stress management program is developed, that incorporates self-awareness, self-care, and goal setting. Stress levels are measured using questionnaires before and after participating in stress management activities. Participants include second, third, and fourth-year Radiologic Technology students who have completed at least one semester in the Radiologic Technology program. Sampling methods include simple random and purposive sampling. Thematic analysis identifies coping mechanisms such as binge eating, exercise, and entertainment. Quantitative analysis shows a significant decrease in stress levels post-intervention, highlighting the effectiveness of stress management activities. Students express positive feedback, acknowledging the benefits of the stress management workshop. This study contributes to understanding academic stress among Radiologic Technology students and highlights the importance of tailored stress management strategies. It emphasizes the significance of self-awareness, self-care, and goal-setting, and emphasizes the need for targeted interventions.

Keywords: Academic stress; Stress measurement; Stress management, Pre-test, Post-test, Constructs, Perception.

1. INTRODUCTION

Stress, a common occurrence throughout human life, has been etched into both individual and collective histories. This unique aspect of life, prominently explored in literature and artistic expression, is defined by psychological sciences as "pressure and tension in the mind" [1]. Among university students, academic stress stands as a major factor in anxiety and depression. It is highly prevalent and can become overwhelming [2]. Moreover, it is defined as "the body's response to academic-related demands that exceed the adaptive capabilities of students," it is an inevitable part of life [3]. Unless managed appropriately, it can take a toll on students' physical health, emotional well-being, and academic success.

College students frequently experience academic stress due to numerous factors, including academic demands and expectations from parents, themselves, and the institution; workload

and deadlines; interpersonal conflicts with classmates, professors, or others; and major projects like theses or dissertations [4].

The pursuit of high grades to impress others further fuels this stress. Failures become additional pressures stemming from various sources – intrapersonal, interpersonal, academic, and environmental. Since not all students can effectively cope with these stressors, academic stress often takes hold [5].

This pervasive stress burdens students throughout their educational journeys, from secondary to high school and university. Studies reveal those adolescents experiencing academic stress exhibit depressive symptoms at a rate 2.4 times higher than their non-stressed counterparts [6]. Additionally, self-imposed and individual-specific concerns amplify this burden, impacting areas like social interaction and personal relationships [7,8]. Moczko et al. [9] research on final-year medical students identified excessive workload, socialization pressures, inadequate guidance, and transition periods as the most stressful factors.

For medical students, the most stressful times occur during sessions and examination periods. The primary stressors are academic in nature, including pressure from teachers and family, competition among peers, the vast amount of information to be learned, increased study load before exams, insufficient time for revision, a higher failure rate leading to missed assignments, poor academic performance, and an inability to complete assignments on time. This high academic stress leads to emotional burnout, severely impacting students' general health, academic performance, and susceptibility to anxiety and depression. Studies report that medical students exhibit a "poor mental health state", with a significant risk of suicide: 45% to 83% harboring suicidal thoughts [10,11]. Research suggests that stress management is linked to reduced symptoms of depression and anxiety. Inthe study of Kong et al. [12] demonstrates the successful implementation of this strategy in reducing stress and anxiety among nursing students. Therefore, early detection and intervention can potentially prevent and mitigate the negative consequences of stress on students. By teaching them to perceive stress as a challenge or an opportunity rather than a negative force, students can be empowered to effectively manage and cope with it.

According to the World Health Organization [13] stress ranks among the leading causes of death. In extreme circumstances, stress is adaptable and controllable. However, persistently high levels of stress can cause serious issues. Academic life is one of the experiences in a person’s life that has various pressures. Academic stress can reduce motivation, hinder academic achievement, and lead to increased college dropout rates [14]. For instance,as many as 87% of college students surveyed across the United States cited education as their primary source of stress [15]. College students are exposed to novel academic stressors, including an extensive academic course load, substantial studying, time management, classroom competition, financial concerns, familial pressures, and adapting to a new environment [16, 17, 18, 19].

According to research from the University of the Philippines Los Banos, respondents' top five sources of overall stress were workload because of the subjects, time management because of the subjects, responsibilities because of being on their own, and time management due to both the subjects and organizations [20]. Affective and cognitive responses to stress were the two that occurred the most frequently. Those in the soft sciences displayed cognitive stress responses, whereas affective stress responses were displayed by those in the hard sciences [21]. Regardless of their academic standing, most students agreed that their biggest sources of stress were academics, subject-related workload, and time management. They all experienced emotional stress reactions in response to stress. Observing these tendencies can preserve adolescent students' psychological and physical health

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There had been a study at the College of Nursing, Mindanao State University – Iligan Institute of Technology, Philippines, about college students' stressors and coping techniques. The substantial level of academic stress among students in the region, particularly in Iligan, Lanao del Norte, is further supported by the results that college students are under tremendous pressure to perform well academically, complete an excessive number of assignments, homework, and tests, and maintain excellent relationships with their professors. Having a lot of homework and feeling the need to rush to meet deadlines can be overwhelming [22]. There is a remarkably high amount of parental pressure on children to excel in their schoolwork and perform well in extracurricular activities. One of the biggest sources of stress, failure, and breakdown is the compelling urge to perform well in school [23]. In the competition among parents to demonstrate how well-rounded their child is, they wind up being victims. In these situations, the fact that some kids live away from their parents adds to the stress. Another burden is having trouble managing their allowance. College students must maintain a balance between their academic and social lives [24].

Because of the higher rates of suicide and depression among college students, stress management is vital [25]. This study would help contribute to the success of managing depression among college students. Primary care settings are crucial, particularly regarding the dynamic mental and physical health relationship that can affect academic performance. Depression will not go on its own; extreme levels of stress can hinder work effectiveness and lead to poor academic performance and attrition [26]. Untreated depression can last for months or even years and have a variety of detrimental repercussions on a person's life, especially for students that are currently experiencing depression. Everyone must determine the course of action that is best for them. Finding a treatment that works might require time and patience [27].

Everyone must determine the course of action that is best for them. Finding a treatment that works might require time and patience. The radiologic technology profession has an increasing role in the hospital, and because of this increasing role, there are also a lot of contents that need to be covered in school [28]. Because of that, students are given a lot of learning activities that eventually lead to students being overloaded, which leads to high levels of stress. Aside from the roles, technology is rapidly changing, and because of that, students are expected to perform better [29]. This study aims to create a tool to measure academic stress and provide management activities to combat this stress among Radiologic Technology Students in a higher education institution in Iligan City, Philippines.

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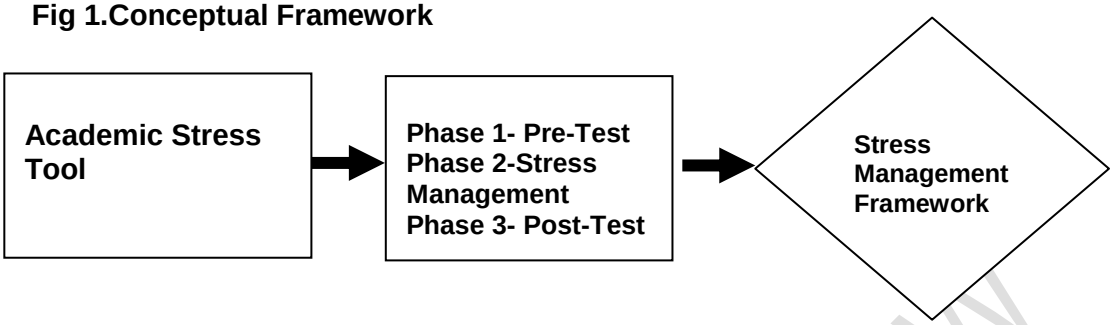
1.1

Fig 1.Conceptual Framework



The diagram outlines a research framework for evaluating and reducing academic stress in Radiologic Technology students. It utilizes an academic stress tool in the input box to measure their stress levels. The process is divided into three distinct phases: a pre-test to identify the causes of stress, implementation of stress management activities in phase 2, and evaluation of the effectiveness of these interventions in phase 3. Finally, the output box synthesizes the findings into a comprehensive framework to guide future initiatives in reducing academic stress among Radiologic Technology students.

2. METHODOLOGY

2.1 Research Design

The study employed an exploratory sequential mixed-methods design, combining qualitative and quantitative research methodologies to achieve its goals. Mixed methods research integrates both qualitative and quantitative aspects to comprehensively address a research question. In this specific design, the quantitative data collection and analysis phase follows the initial qualitative phase [30].The choice of an exploratory-sequential approach stemmed from the researchers' interest in complementing qualitative findings with quantitative analysis. This two-phase structure proved particularly useful for their aim of developing a stress management framework. By leveraging the strengths of both methodologies, the mixed-methods design facilitated a more holistic understanding compared to relying solely on quantitative or qualitative methods alone [31].

2.2Research Participants

The sample for this study comprised Radiologic Technology students at Iligan Medical Center Collegewhich is located in San Miguel Village, Iligan City, Lanao del Norte province. Second, third, and fourth-year students 18 years old and above participated, having completed at least one semester. First-year students were excluded as they have not yet finished a semester.

For the qualitative phase, students were selected using a simple random sampling technique. Random selection used an automated process where individuals were assigned numbers. Using a lottery system with number-generating software or random number tables, the researchers randomly chose participants from the sample. Only second, third, and fourth-year students who are 18 years old and above and officially enrolled in the current semester, were eligible. First-year students were excluded, again, due to incomplete semesters.

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For the quantitative phase, students were selected using purposive sampling. This sampling method involved the researchers using their judgment to select participants. This strategy aimed to include only students with the highest academic stress levels from the Radiologic Technology student population. These students were identified after answering the academic stress questionnaire. Participants were again second, third, and fourth-year students 18 years old and above, having completed at least one semester. First-year students were excluded for the same reason.

2.3Materials and Instrument

The study began with a qualitative phase, where students were interviewed about their views on academic stress. Key statements from these interviews were then used to develop an academic stress questionnaire. This questionnaire was administered to students both before and after a stress management intervention. Additionally, in-depth interviews were conducted before the intervention to explore participants' existing stress management strategies, and afterwards to gauge their perceptions of the intervention's activities. Prior to being used in the study, the questionnaire underwent pilot testing with 20 students. The results yielded an acceptable Cronbach's alpha value of 0.891, indicating good internal consistency. Furthermore, the questionnaire was subjected to expert validation by professionals in guidance and counseling, as well as psychology, to ensure its content validity.

2.4Data Gathering

The researchers first obtained ethical clearance from the school's Institutional Ethics Review Committee and a Letter of Approval from the College of Radiologic Technology's Program Head. They then created interview questions to address the research problems and interviewed five radiologic technology students to develop a tool. Using the interview data, they designed a questionnaire to identify the most common academic stressors experienced by students. After pre-testing the questionnaire through a Google Form survey distributed within the department, they selected eight students from the second and third years with unusually high stress levels to participate in their stress management activity.

Collaborating with an expert from the guidance office, the researchers designed a stress management workshop focusing on self-awareness, self-care, and goal setting. The first activity involved meditation for self-reflection, followed by group sharing. The guidance counselor then introduced Johari's Window, a framework for understanding self-awareness and biases. Divided into groups of eight, participants discussed their self-awareness and awareness of others using this concept. They then received booklets containing self-care questions and shared their thoughts and responses. Finally, another booklet helped them list their life and academic goals.

To assess the program's effectiveness, a post-test questionnaire measured participants' stress levels after the intervention. Additionally, a post-interview gathered feedback and perceptions regarding the implemented stress management activity.

2.5Data Analysis

In the qualitative phase, the researchers employed thematic analysis following the Colaizzi Method to transcribe and process the interview data. This involved three stages: aggregation, coding, and abstraction. Thematic analysis, a qualitative approach, was chosen to examine the respondents' experiences gathered during the qualitative phase of the study [32].

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During the quantitative phase, the researcher used mean and standard deviation (SD) to assess the level of academic stress. Mean is a measure of the central tendency of a dataset, representing its average value [33]. To determine whether there was any significant difference between two sets of observations before and after intervention, a paired t-test or Wilcoxon signed-rank test was conducted [34].

3. RESULTS AND DISCUSSION

3.1 Constructs of Academic Stress

The foundations of academic stress concepts stem from a preliminary interview with the participants. These encompass essential statements expressed by the participants, interpretations derived from those statements, groups of related themes, and an emerging overarching theme. The objective is to gain insight into the factors and experiences contributing to college students' academic stress.

Seven themes were extracted based on the responses of the students. These include onset of academic stress in college, peak stress triggers, impact on interpersonal relationships,physical manifestations of academic stress, financial factors as stressors, persistence of academic stress, and heightened stress during academic struggles.Academic stress is a multifaceted phenomenon with various identified constructs from the participants. To them, the stress begins to take root in college, stemming from the demands and pressures associated with academic requirements. Its intensity reaches its zenith during crucial events such as term examinations, return demonstrations, grade consultations, and the looming uncertainty of securing internships. This heightened stress not only impacts academic performance but also has ripple effects on interpersonal dynamics among classmates, often leading to strained relationships. Moreover, the ramifications extend to physical well-being, with manifestations like hair loss being linked to academic stress. Financial concerns and the absence of adequate financial support further exacerbate the academic stress experienced by students. The prolonged duration of academic stress is noteworthy, persisting over ten years throughout the college experience. This enduring pressure is particularly pronounced during critical junctures such as failing major subjects, challenging laboratory activities, and demanding return demonstrations. In essence, academic stress constitutes a pervasive and enduring challenge that encompasses a spectrum of stressors, affecting various facets of a student's life and well-being.

The first theme revolves around the initiation of academic stress, attributing its origins to the pressures and requirements encountered in the college environment. This is validated by one of the participants:

> *"I experienced academic stress in my 3rd year of college because of the requirements like a research paper, and the pressure I feel in myself for the upcoming internship like what will happen at the hospital at and it will lead to overthinking."*

The second theme highlights specific peak periods during the academic journey, such as term examinations, return demonstrations, grade consultations, and the apprehension of not securing an internship. One student mentioned that:

> *"During term examinations and revalida, the clinical instructors will tell us that on that day, we will come to the hospital (where I am working) and we will do a return demonstration and then the stress starts even though we already know what to do. I feel pressured."*

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The third theme focuses on the social consequences of academic stress, emphasizing its adverse effects on relationships with classmates, often resulting in a deterioration of these interpersonal connections. A participant verbalized:

> *"At this time, I am undergoing an internship and I get stressed about my colleagues like my co-interns. There are situations where I don't know if they did it on purpose or not about the things that are not supposed to happen and it made me rethink if I should trust this person at all and it only happens at the last month of duty where it made you realize all that happened."*

The fourth theme centers on the physical toll of academic stress, with examples like hair loss serving as tangible indicators of the physiological impact it can have on students. One of the participants stated that:

> *"…since K-12 senior high but it got worse here in college. I experienced hair loss because of stress."*

The fifth theme identifies financial concerns and the absence of adequate financial support as significant contributors to academic stress, highlighting the broader economic dimension of this challenge. A student mentioned that:

> *"If I think about the money, I cannot study well and when I heard from my aunt that the money ran out, my motivation to study was lost. I cried and felt the struggle of college life because of finances."*

The sixth theme underscores the enduring nature of academic stress, pointing out that its impact can persist over an extended period, spanning ten years throughout the college experience. One participant expressed:

> *"I have been experiencing stress very long. I have been in college for 10 years now."*

The final theme centers on the exacerbation of academic stress during specific academic challenges, such as failing major subjects, engaging in demanding laboratory activities, and participating in return demonstrations. This is validated by a response from the student:

> *"…failing in major subjects. It hurts me especially if I studied overnight and in the end, I still fail. I am not even sure if I can pass this subject and do the internship next year."*

College students today face significantly more challenging issues than they did even a decade ago [35]. Adjusting to life away from home and navigating evolving family dynamics, coupled with increased academic obligations and exposure to the views and temptations of new individuals, create a complex and often stressful environment. While some thrive in this environment, others struggle with the stark contrast it presents to high school. Even those who adjust well can experience tension while away from home. Importantly, while some stress is necessary for personal growth, excess stress can be debilitating, hindering students' ability to cope effectively.

Students reported and experienced higher anxiety levels during Objective Structured Clinical Examinations (OSCEs) compared to written exams [37]. Notably, both laboratory and self-

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assessment questionnaires did not demonstrate significant differences in academic performance between the two exam types. Furthermore, research by Omigbodun et al. [38] and Polychronopoulou and Divaris [39] identified specific stressors: excessive homework, crowded classes, faculty strikes, and inadequate laboratory supplies. Additionally, studies have linked parental and teacher expectations to exam-related stress and pressure surrounding academic path choices. Hancock [40] and Hembree [41] found that negative exam-related cognitions, such as overestimating one's abilities or underestimating the consequences of failure, are often associated with increased anxiety and decreased performance.

Multiple studies have established a strong link between social support and college students' well-being. However, while social support has declined in recent year [42,43], Curran et al. [44] highlight the need for further investigation into how reduced social support impacts stress management capabilities. In other words, under-supported students may lack essential stress-coping mechanisms. Low social support among college students has been linked to various issues, including parental divorce [43], lack of friends [44], and poor social life [45]. Today's rapidly changing culture means college students often perceive social support as inconsistent and fluctuating, particularly during COVID-19 when they need it most [46]. While some students can maintain good mental health despite this stress due to available support services, those with limited social support are more likely to engage in unhealthy behaviors like sedentary lifestyles, alcohol use, and irregular sleep patterns [47]. Worryingly, lack of social support among college students is even more strongly associated with unhappiness and even suicidal ideation, as research by Claypool et al. [48] indicates.

Research by Claypool et al. [49] has shown a clear link between financial stress and negative mental health outcomes. For instance, financial concerns have been linked to mental health conditions like depression and anxiety. Notably, El-Ghoroury et al. [50] found that students experiencing greater financial stress than their peers are more likely to abandon their studies. Additionally, according to data from the National College Health Assessment, 24% of students reported a negative impact on their academic performance due to their financial situation [51].

3.2 Constructs of Stress Management

Participants in the study reported a variety of stress management strategies, yielding three distinct themes: binge eating, exercise, and entertainment (film viewing).

The participants highlighted binge eating as a prominent theme in stress management. This theme revolves around using food consumption as a coping mechanism to alleviate stress and provide a sense of comfort. Participants shared their experiences and strategies related to managing stress through indulging in various foods, exploring flavors, and finding solace in the act of eating. Binge eating emerged as a coping strategy that individuals employ to momentarily escape stressors and seek emotional relief through the pleasure derived from food consumption. This is validated by one of the responses of the participant:

> *"I find eating comfortable and I am able to express my feelings through eating and with that, I am able to lessen my stress."*

The theme of exercise emerged as a prevalent stress management strategy. Participants discussed various physical activities such as jogging, yoga, and strength training that contribute to stress reduction. The focus on the positive impact of regular exercise on mental

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well-being highlighted the role of physical activity in promoting stress resilience and overall emotional balance. One participant mentioned that:

> *"The best technique I used is moving my body physically that's why I move a lot as I have said I exercise a lot when I'm stressed and it helps me a lot by diverting my stress."*

Entertainment, particularly film viewing, was identified as a key theme in stress management. Participants described the act of watching movies as a means to escape from reality temporarily. Engaging in cinematic experiences, whether through comedy, drama, or other genres, was highlighted as a way to unwind, relax, and divert attention from stressors, providing a mental break and fostering a sense of enjoyment.

> *"I watch videos on YouTube and TikTok because when I think of stress, I will not be able to eat well and school is not the only factor that gives me stress but also my family."*

Binge eating is broadly defined as a loss of control while overeating to the point of discomfort and suffering[52, 53, 54, 55]. Research suggests it often serves as a coping mechanism for managing difficult emotions and reducing stress, particularly during critical developmental stages[56]. Both clinical and subclinical binge eating habits are associated with negative psychosocial consequences, including anxiety, depression symptoms, impaired daily functioning, and concerns about physical appearance [57, 58].

Gupta et al. [59] highlighted Zumba as a fun and effective dance workout that releases endorphins, contributing to stress reduction. Additionally, exercise offers numerous benefits beyond stress reduction, including improved hormonal profiles, reproductive health, weight management, memory, focus, and even the development of new nerve cells and blood vessels [59]. Stults-Kolehmainen et al. [60] further emphasized the effectiveness of physical activity (PA) programs and exercise in reducing real-world perceived stress. Their randomized clinical trials demonstrate exercise as a valuable tool for managing both perceived and actual stress, its symptoms, and ultimately improving quality of life. Exercise helps counteract the negative effects of psychological stressors on stress hormones and serotonin levels, dampening their impact on heart reactivity.

Quiao [61] points out that film viewing is one of the most popular leisure activities. Beyond mere entertainment, movies can also serve educational and therapeutic purposes [62, 63]. Cultivation theory, proposed by Gerbner et al. [64], suggests that media content can subtly influence viewers' perceptions of reality, especially through repeated exposure to specific emotions. While disturbing content may heighten or maintain viewers' tension, positive and lighthearted media can contribute to maintaining a positive emotional state.

3.3 Academic Stress Level Before and After Intervention

A total of eight Radiologic Technology students were assessed based on academic stress measurement using a 20-item questionnaire using a 5-point rating scale where 5 = strongly agree and 1 = strongly disagree prior to activity implementation (pre-test). The same set of respondents took the same survey after the implementation of the activity (post-test).

Based on the mean ratings per statement in Table 1, notable differences were observed between the pre-test and post-test scores. Out of the 20 statements, 18 statements received lower mean ratings in the post-test compared to the pre-test, suggesting a potential decrease in stress levels following the implementation of the activity. For Statement 1: "I am

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reluctant to request a comprehensive clarification from the instructors", the mean rating in the pre-test was 4.5, whereas, in the post-test, it was 1.63. Similarly, for Statement 2: " I can concentrate during study hours", the mean ratings were 3.38 and 1.13 for the pre-test and post-test, respectively. This consistent pattern of lower mean ratings in the post-test across 18 statements indicates a potential reduction in stress levels. However, it is essential to determine the statistical significance of the differences between the pre-test and post-test scores through hypothesis testing.

Shapiro-Wilk was done to test if the data meet the assumption of normality. For statements wherein the normality assumption is met, a paired t-test was used to compare differences in academic stress between the pre-test and post-test scores of the eight respondents. Otherwise, the Wilcoxon Signed Rank Test was used to test the hypothesis.

The results indicated statistically significant differences in the majority of statements when comparing pretest and post-test scores, suggesting substantial changes following the implementation of the activity. A Wilcoxon signed-rank test revealed a significant difference between the pre-test and post-test scores for Statement 1: "I am reluctant to request a comprehensive clarification from the instructors" (Mdn_Pre-test = 4.5, Mdn_Post-test = 2), W = 36, p = 0.012 at a 95% confidence level. Furthermore, the results showed a significant difference between the pre-test and post-test scores for Statement 3: "My instructors require too many tasks on students" (Mdn_Pre-test = 4, Mdn_Post-test = 2), W = 28, p = 0.019. Using a paired t-test, there was an apparent distinction was found in the mean scores for Statement 4: "Subjects have lengthy examination coverage" between the pre-test (Mean = 4.25, SD = 0.886) and post-test (Mean = 2.13, SD = 0.641), t(7) = 5.34, p < 0.001 at a 95% confidence level. Likewise, there was an apparent distinction observed in the mean scores for Statement 5: "My study space or place at home is not conducive" between the pre-test (Mean = 4, SD = 1.069) and post-test (Mean = 1.25, SD = 0.463), t(7) = 6.07, p < 0.001. However, the two statements that did not show a significant difference between the pre-test and post-test were Statement 16: "Working with a classmate on a task makes me uncomfortable and hinders my ability to carry out the task effectively" (Mdn_Pre-test = 2, Mdn_Post-test = 1), W = 10, p = 0.098, and Statement 20: "The department assists me in reducing my stress levels" (Pre-test: Mean = 2.88, SD = 1.246, Post-test: Mean = 3.25, SD = 1.282), t(7) = -0.60, p = 0.57.

The study findings suggest that the implemented activity had a significant positive impact on reducing the academic stress levels of the respondents. The interventions effectively addressed and alleviated specific stressors, leading to an overall reduction in stress. The section emphasizes the importance of targeted strategies and comprehensive support systems in stress management interventions, highlighting the value of identifying and addressing individual stressors to promote well-being.

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Table 1. Descriptive and inferential statistics on academic stress level.

Statements	Test	N	Mean	SD	p-value
I am reluctant to request a comprehensive clarification from the instructors.	Pre-Test Post-Test	8 8	4.5 1.63	0.535 0.518	0.012*
I cannot concentrate	Pre-Test	8	3.38	0.518	0.01*

during study hours.	Post-Test	8	1.13	0.354	
My instructors require too many tasks for students.	Pre-Test Post-Test	8 8	3.88 1.75	0.991 0.463	0.019*
My subjects have lengthy examination coverage.	Pre-Test Post-Test	8 8	4.25 2.13	0.886 0.641	0.00*
My study space or place at home is not conducive.	Pre-Test Post-Test	8 8	4 1.25	1.069 0.463	< .001*
I lack assertiveness or confidence in the class.	Pre-Test Post-Test	8 8	4.25 1.25	0.707 0.463	< .001*
I am having trouble keeping up with the curriculum.	Pre-Test Post-Test	8 8	4 1.88	0.926 0.354	0.013*
There is a lack of effective communication between me and the instructors.	Pre-Test Post-Test	8 8	3.25 1.13	1.488 0.354	0.01*
I tend to worry about the results of the examinations.	Pre-Test Post-Test	8 8	4.88 1.88	0.354 0.354	0.01*
I cannot communicate my academic deficiencies to my parents.	Pre-Test Post-Test	8 8	3.75 1.88	1.165 0.991	0.01*
I have too many things to worry about other than studying.	Pre-Test Post-Test	8 8	4.13 1.75	0.835 0.463	0.013*
I cannot comprehend the discussions in my subjects.	Pre-Test Post-Test	8 8	3.88 1.5	0.835 0.535	< .001*
There is too much competition among students, which puts me under a lot of academic pressure.	Pre-Test Post-Test	8 8	3 1.25	1.414 0.707	0.03*
I feel worried when I fail to meet my own	Pre-Test Post-Test	8 8	4.5 1.75	0.535 0.463	< .001*

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expectations.					
I cannot sleep because I am worried about not meeting the goals I have set for myself.	Pre-Test Post-Test	8 8	4.25 1.25	1.389 0.463	0.018*
Working with a classmate on a task makes me uncomfortable and hinders my ability to carry out the task effectively.	Pre-Test Post-Test	8 8	2.13 1.13	1.246 0.354	0.098
My strategy in dealing stress is ineffective.	Pre-Test Post-Test	8 8	3.25 1.38	0.707 0.518	0.012*
There is a relationship between academic stress and numerous health problems.	Pre-Test Post-Test	8 8	3.88 1.38	0.991 0.518	< .001*
Both school and parents play a role in reducing academic stress among students.	Pre-Test Post-Test	8 8	3.5 4.75	0.926 0.463	0.02*
The department assists me in reducing my stress levels.	Pre-Test Post-Test	8 8	2.88 3.25	1.246 1.282	0.57

*** Significant at 95% confidence level (alpha = 0.05)**

3.4Perceptions on the Stress Management Activities

The perception of Radiologic Technology students regarding the implemented stress management activities was overwhelmingly positive. Most respondents expressed that the workshop was effective in helping them manage their stress and acquire techniques for achieving work-life balance. These findings highlight the success of the stress management activities in meeting the needs and expectations of the students, providing them with valuable tools to cope with stress and improve their overall well-being.

The analysis indicates that students recognize the importance of self-awareness, such as expressing thoughts and feelings better, building self-care activities, developing a goal-setting mindset, and embracing personal growth. Meditation is a valuable practice for enhancing clarity of thought and problem-solving. Goal setting is emphasized as a means to gain confidence and prioritize objectives. Integrating self-awareness, self-care, and goal-setting is a pathway to self-reflection and personal development. Additionally, the significance of self-care and the prioritization of tasks are acknowledged for overall well-

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being and effective time management. These are validated by the responses of the participants:

> *"Self-awareness made me know myself better and helped me express my thoughts and feelings. It was also fun to talk to my fellow classmates and realize that I am not only the one that is feeling this emotion but also them."*
>
> *"I learned that short meditation can make me think clearer and the activity was an excellent way to express myself. I will apply it to my daily life because it has made me separate my personal and school difficulties."*
>
> *"I think self-care has changed my ways of dealing with stress. Sometimes I forget that there are many ways to cope, but knowing one's self is a reminder that in many difficulties I will face, I will overcome them all."*

Students have been seen to engage in value-driven activities, self-awareness exercises, empathy exercises, and forceful and altruistic workplace conduct [65]. Various academic activities, such as group projects, team exercises, role plays, and so on, assist them in developing these skills and their academic accomplishment.

Sarza et al. [66] mentioned that mindfulness meditation is a development in mental health practice and can involve reform and intervention strategies. One of the psychological techniques that can be utilized to effectively treat depression, anxiety, and other physical dysfunctions brought on by stress is meditation. Maintaining mindfulness meditation leads to higher productivity and reduced stress. College students who are under academic stress or may not be in the academic area may benefit from research on mindfulness meditation for stress management.

Locke and Latham's [67] work emphasizes the importance of setting clear, measurable goals that are challenging yet attainable. They discuss the role of goals in enhancing self-regulation, focus, and persistence and provide insights into the underlying psychological mechanisms that drive goal-directed behavior. The literature review also examines factors influencing the effectiveness of goal setting, such as feedback, commitment, and goal difficulty.

Self-care practices may be outlined as actions that uphold and advance one's physical and emotional well-being [68]. These practices may include getting enough sleep, exercising, utilizing social support, using emotion control techniques, and engaging in mindfulness training. Previous studies have demonstrated that wellness, or the daily activities of being conscious of and addressing one's emotional and psychological requirements can serve as an alleviating aspect that can greatly lower stress. They discovered that pupils who consistently practiced self-care went through less psychological anguish than those who failed to [69].

Self-reflection and insight have been demonstrated to be helpful during self-monitoring of a student's professional conduct throughout his or her medical education program [70]. According to Grant et al. [71], self-reflection is the deliberate awareness of one's thoughts, feelings, and conduct. It also results in the capacity for self-monitoring. People skilled at examining and keeping track of their thoughts, feelings, and behaviors should have good

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self-reflection and insight. Insight is awareness of one's internal condition and is linked to the capacity to identify and express feelings.

3.5Stress Management Framework

Radiologic Technology students often face intense academic pressure, leading to stress that can impact their personal lives, physical health, and academic performance. Recognizing this, this framework proposes a comprehensive approach to address academic stress, drawing upon insights from student experiences and the effectiveness of implemented workshops.

The framework begins with identifying the unique landscape of academic stress for each student. When does it typically surface? What triggers intensify it? How does it affect their relationships and physical well-being? Are financial burdens major contributors? Exploring these questions helps tailor support strategies effectively. Additionally, understanding how long-term stress manifests and its potential impact on academic success and mental health provides a crucial foundation for intervention.

Self-awareness lies at the heart of effective stress management. By incorporating mindfulness techniques into the curriculum, students can identify their personal stress triggers and responses, equipping them to proactively manage their well-being. Encouraging healthy habits like balanced meals, regular exercise, and adequate sleep further bolsters their resilience. Moreover, equipping students with effective time management skills and guiding them in setting realistic and achievable academic goals empowers them to navigate challenges with confidence.

While the workshop identified binge eating as a coping mechanism for some students, exploring alternative strategies for emotional regulation is crucial. Promoting other forms of mindful and relaxing entertainment, such as music, meditation, or nature walks, offers healthier options. Additionally, reminding students about professional support resources like counselors andtherapists ensures they have access to personalized guidance and support when needed.

Implementing this framework effectively requires tailoring it to the specific needs and resources available within the Radiologic Technology program and student community. Cultural sensitivity is paramount, ensuring the approach respects and integrates the diverse values and beliefs that influence stress perception and coping mechanisms. Interactive workshops based on identified stress constructs and preferred management strategies can provide a starting point. Fostering peer support networks through group discussions allows students to share experiences and learn from each other, creating a sense of community and shared responsibility for well-being.

The true success of this framework lies in its integration into daily routines. Emphasizing the importance of practicing stress management techniques consistently, even during periods of low stress, empowers students to proactively build resilience and navigate challenges throughout their academic journey. By continuously gathering student feedback and adapting the framework to their evolving needs, Radiologic Technology programs can create a supportive environment that fosters the well-being and academic success of their students.

4. CONCLUSION

The study identified key stressors among Radiologic Technology students, encompassing challenging coursework, exams, clinical training pressure, time management challenges,

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and future career concerns. These factors collectively contribute to heightened academic stress in this field, as evidenced by significant differences in pre-test and post-test mean scores related to these stressors. Recognizing these challenges is imperative for the development of targeted interventions. Implementing supportive measures focusing on these stressors can foster an environment conducive to student well-being and academic success. Furthermore, the findings emphasize the importance of future research and interventions to explore effective strategies for mitigating academic stress and promoting resilience in Radiologic Technology students, ultimately enhancing their overall learning experience and professional development.

The study also revealed diverse stress management methods employed by Radiologic Technology students, ranging from entertainment to occasional binge eating. Some participants found music, videos, and drinking helpful, while others deemed these methods ineffective. Time management challenges, financial concerns, and stress within the academic institution itself were highlighted. This underscores the need for comprehensive stress management approaches addressing these specific stressors, creating a supportive academic environment.

Upon analyzing stress levels among Radiologic Technology students, post-implementation of stress management activities successfully targeted and reduced stress-inducing factors. This highlights the efficacy of such activities in alleviating stress among students, emphasizing the importance of targeted stress management strategies for their well-being.

In light of these findings, recommendations for stakeholders in managing academic stress among Radiologic Technology students include the following:

To combat academic stress among radiologic technology students, school administrations should establish support services such as counseling centers, workshops, and wellness programs. Creating a pleasant learning environment allows students to express their issues and offer feedback, promoting collaboration, transparent communication, and healthy connections among students, instructors, and staff. Work with instructors and guidance counselors to establish ways that will assist students in managing their time efficiently, prioritizing responsibilities, and feeling less overwhelmed. Make sure the curriculum is difficult but not overly demanding, allowing students to improve their abilities while keeping a manageable burden.

Teachers should recognize students' various needs and abilities and customize classes and assignments accordingly, providing additional aid or resources to pupils who may require it. They should clearly state course objectives, grading standards, and assignment deadlines, giving pupils regular feedback to help them assess their progress and make necessary modifications. Additionally, teachers should foster a supportive classroom environment, encouraging peer cooperation, providing chances for students to seek assistance, and establishing a safe space for open discourse about academic stress.

Guidance personnel should meet with students regularly to assess their academic progress and well-being, providing students with information, methods, and assistance to help them handle stress successfully. To assist students in coping with academic stress, guidance personnel should organize workshops or activities that teach stress reduction techniques, time management skills, and resilience-building tactics. They should also maintain open communication with teachers and parents to identify students who may be under excessive stress, coordinating activities to deliver appropriate assistance and interventions.

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Students should prioritize physical and mental well-being by engaging in regular exercise, mindfulness, sufficient sleep, and maintaining a healthy work-life balance. They should develop strategies for effective studying, time management, and organization, seeking help when needed and not hesitating to ask questions or clarify doubts. Additionally, students should be aware of campus resources, such as counseling services and academic support centers, and seek help when feeling overwhelmed or stressed.

Parents should regularly communicate with their child to understand their academic challenges and stress levels, offering a supportive and non-judgmental environment for them to express their concerns. They should reassure their child that they are there to support them and emphasize the importance of their well-being over excessive academic achievement. Furthermore, parents should collaborate with the school by establishing a line of communication with teachers, guidance personnel, and school administrators to stay informed about their child's academic progress and any potential concerns.

To address academic stress among radiologic technology students, the general public can promote understanding and awareness through public campaigns, media platforms, and community events. Highlighting the potential impact of stress on student well-being and academic performance is crucial. Encouraging support-seeking behavior and emphasizing the importance of seeking help and support when experiencing academic stress is essential. Providing information about available resources and encouraging individuals to contact appropriate services is also valuable. Additionally, advocating for change by raising awareness among policymakers and educational institutions about the need for comprehensive support systems to address academic stress is important.

Future researchers can assess the effectiveness of policy interventions by evaluating the impact of institutional policies and interventions to reduce academic stress. They should examine policies related to workload, assessment methods, academic scheduling, and support services, and assess their effectiveness in promoting student well-being and stress reduction. Conducting comparative studies that compare academic stress levels and coping mechanisms among radiologic technology students across different institutions, countries, or educational systems is essential. Identifying cultural, institutional, or contextual factors that contribute to variations in stress levels and exploring best practices from different contexts is valuable. Additionally, conducting longitudinal studies to investigate the long-term effects of academic stress on radiologic technology students by spanning multiple academic years will provide insights into the persistence and impact of academic stress over time.

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CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that the protocols of this study have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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