Academic Performance, Fatigue, and Stress in Online Learning Among College Students: A Multivariate Analysis

John Jeric R. Almonte, Emil R. Badillo, Kevin Brian S. Candelaria,
Ian Kent D. Tadle, John Timothy P. Villacorte, Romalyn Galingan
Department of Industrial Engineering, College of Engineering and Architecture
Technological Institute of the Philippines –
Cubao, Quezon City, Philippines
qjjralmonte@tip.edu.ph, qerbadillo@tip.edu.ph, qkbscandelaria@tip.edu.ph,
qikdtadle@tip.edu.ph, qjtpvillacorte@tip.edu.ph, rgalingan.ie@tip.edu.ph

Abstract

Academic performance is one of the indicators of educational accomplishment. Stress prompts low confidence of students, trouble in dealing with various circumstances, seeing disorders, and decreased attention to academic accomplishment and self-improvement of students. Fatigue or tiredness and lack of energy are some of the most generally reported consequences of the new normal: online learning. More than 90% of students have come up against negative mental health signs because of the pandemic. The study aims to examine whether stress and fatigue have a significant impact on the academic performance of Industrial Engineering Students in the Technological Institute of the Philippines - Quezon City. The researchers make use of Pearson Correlation Coefficient, Multiple Regression, Perceived Stress Scale (PSS), and Fatigue Severity Scale (FSS). The dependent variable is academic performance, while the independent variables were: stress and fatigue. The level of perceived stress of college students was measured resulting in low stress (f=2, 4.35%), moderate stress (f=40, 86.96%), and high perceived stress (f=4, 8.69%) with a total frequency of 46 and a percentage of 100%. The level of fatigue of college students was measured resulting in a total score of (f=35, 76.09%) experiencing fatigue and (f=11, 23.91%) not experiencing fatigue. Based on the statistical tests applied by the researchers, the model produced by correlation did not fit data well, having a p-value of 0.313 for stress and 0.532 for fatigue. The multiple regression analysis has indicated that both stress and fatigue do not affect the academic performance of college students. This means that stress and fatigue do not have a significant impact on the final model, although it is an important variable and is significant while correlating with academic performance.

Keywords
Academic Performance, Fatigue, Stress, Correlation, Multiple Regression

1. Introduction

1.1. Introduction

Academic performance is one of the many factors that go along with academic success. Academic success is influenced by a variety of factors, including social background, student attitude, motivation, group and family support (Masud, S., Muffarih, S., et al. (2019), Lamas, H. (2016), Kassarnig, V., Mones, E., Nielsen, A., et al. (2018)). However, online learning has taken place in our society and takes it as our new normal due to the COVID-19 pandemic. The COVID-19 pandemic has created a severe shift in the way people communicate. Technology advancements were critical in aiding this change (Mheidy, N., Fares, M., Fares, J. (2020)). The term "virtual classrooms" refers to education that occurs through the internet. So, it is referred to as e-learning or a variation of other terms. However, digital learning is only one form of distance learning, which refers to any form of education outside of a regular classroom and occurs over a long distance (Stem, J. (2020), Bates, T. (2016)) . Taking an online class was not easy as it looks, there is a lot of stress on it compared to face-to-face classes. Since we all know what it is like to be overwhelmed or unable to cope with the pressures we encounter, it is surprising how difficult it is to define exactly what "stress and tiredness" are in terms of study. At its most basic level, stress is our body's reaction to stresses imposed by a stressor, which can be a circumstance/problem that changes one's life. What constitutes a "stressor" varies greatly among individuals, depending on our social and economic situations, our living environment, our genetic composition, and our physiology (Samele, C., Manning, H., et.al. Mental Health Foundation (May 2018)).

Many physical problems, including psychological illnesses like depression and anxiety, can be caused or influenced by stress (Davis, C. (2017)). Excess stress can harm your health, while the right amount of stress can help you learn. This lowers kids' self-esteem and has an impact on their academic performance. Students' cognitive performance and learning may be harmed by excessive levels of stress (Sohail, N. (2016)). Once the person's individual resources to cope with their circumstances are exhausted due to a mix of internal and external pressures, stress results. University and school are the most important moments of life for many young adults. Depression, anxiety, and stress may all impact negatively on these formative years. Students who struggle to manage stress have a significant impact on their academics and conduct (Maajida, M., Vinshnu, V., Gayathri, R. (2018), Samaha, M., Hawi, N. (2016), Chandra, Y. (2020)). Fatigue is a subjective condition, and its negative consequences can manifest themselves in a variety of ways, including decreased task performance, intellectual weakening, and emotional difficulties. Fatigue can prompt a decrease in school performance, negative well-being results, and refusal to go to class (Maggiano D. (2017), Chen, T.-Y., Chou, Y.-C., Tzeng, N.-S., Chang, H.-A., Kuo, S.-C., Pan, P.-Y., Yeh, Y.-W., Yeh, C.-B., & Mao, W.-C. (2015, March 19)). Most of the students experience some sort of disorder, which can influence their academic performance. Expanding the exposure of students to natural and academic stresses might result in disorders and fatigue, which can subsequently impact their academic efficacy (Sajadi, S. A., Farsi, Z., Rajaei, N., Mazhari, M. S., & Habibi, H. (2018, February)).

1.2. Background of the Study

It is observed that stress can play a vital role in decreasing a person's performance, learning capacity, and other academic and physical abilities. Normally, these mood changes are mainly caused by a person's way of perceiving things that are affecting an individual's daily life routine (Arsalan. (2020, January 30)). Stress is just one of the many problems that college students experience. Stress, if not addressed, can have bad side effects. More than half of student seekers report that stress affects their schoolwork and unchecked stress can lead to physical side effects which include exhaustion. The bad effects are that stress brings more headaches and overthinking in college students. Although most of this stress often comes from other factors such as family, friends, school, work, and stress can lead to undesirable academic outcomes (Broderick T. (May 05, 2020)). The impact of stress has been generally studied in operational and school settings and working populations. Less is known about the impacts of stress on the academic performance of college students and the current study aimed to provide information and data on this topic. Previous study results showed that higher stress was associated with the lower academic output of college students (Cardiff University | Prifysgol Caerdydd (2018)). Stress is another important factor to identify in-school activity and it can also affect student learning. The student's stress was reportedly for 83.5% of students experiencing stress and it can be triggered by previously perceived stress which may lead to impairment of academic performance and around 50% of the students were stressed due to study-related issues whereas 28.4% faced stress due to personal reasons (The Journal of chiropractic education (2021), M, M. A., V, V. P., & R, G. (2018)). Due to digital fatigue, college students can't focus on the lessons. The idea is that since college students are online the entire day, the retention of information begins decreasing. This perpetually makes learning ineffective (Tutorbin Blog. (2020, August 18)). Fatigue among college students may not just add to bring lower grades and an absence of inspiration yet may likewise expand the odds of serious levels of emotional and behavioral disturbances (Westchester. (2017, November 7)). Fatigue was the significant focus of the study because of its high prevalence in college students. Past studies have announced that 6.5% to 30.6% of college students experience severe fatigue, with the differences being acceptable from the study design plan and enrolled subjects (] Chen, T.-Y., Chou, Y.-C., Tzeng, N.-S., Chang, H.-A., Kuo, S.-C., Pan, P.-Y., Yeh, Y.-W., Yeh, C.-B., & Mao, W.-C. (2015, March 19)).

1.3. Problem Statement

Stress and fatigue can be found anywhere: at home, with friends, at work, and in school. It's impossible to stop because it's a part of being human. In reality, many people are stressed daily. The causes and severity of stress differ from person to person. Frustrations, losses, changes, and disputes will confront at some stage, especially in this time of the pandemic. It affects individuals from all walks of life in any case of age, gender, and profession. It affects decision-makers such as the manager, the employee, the housewife, and the student (Generoso, N., Mazo. (2016)). Fatigue or a psychological or actual condition of tiredness and lack of energy is one of the most generally reported consequences of the lockdown (Labrague, L., & Ballad, C. (2020, October)). Students have additionally thought that it is hard to partake in internet-based classes and complete schoolwork. More than 90% of students have encountered negative mental health symptoms because of the pandemic (Dennon, A. (2021, April 11)). According to the latest Social Weather Stations (SWS) survey, 37% of Filipinos say they are often stressed, 34% say they are occasionally stressed, 2% say they have never felt stressed, and 32% say they are frequently stressed. Stress, by age group, was frequent among 35 to 44 years old at 36%. In the meantime, the study showed 25% of 45 to 54 years of age Filipinos survive

pressure every now and then, 24% of each among 18 to 24 years of age, 25 to 34 years of age, and those 55 years old and above (Hallare, K. (2020, March 31)). Stress has been linked to a variety of psychological and physical issues. According to Vogel, S. & Schwabe, L. (2016) stress and the hormones and neurotransmitters released during and after a stressful event have been identified as major modulators of human learning and memory processes in studies conducted over the last two decades, with important implications for educational settings. While it is thought that stress during the learning process enhances memory formation, resulting in strong memories, stress significantly impairs memory retrieval, putting students at risk of failing exams. Stress may also impede the updating of memories in light of new information, causing a shift from a flexible, "cognitive" form of learning to a more rigid, "habit"-like behavior, according to recent evidence (Vogel, S., & Schwabe, L. (2016)). The lack of cognitive reasoning, reduced ability to concentrate, deprived responses, and impaired or unreasonable decision-making skills are all common indicators of stress. Fatigue on the other hand is also essential to be taken into consideration, it contrarily impacts work execution, day-to-day life, and social connections. The differential finding of weakness incorporates lifestyle issues, physical conditions, mental disorders, and treatment side effects. Fatigue can be named auxiliary to other ailments, physiologic, or ongoing (Rosenthal, T. C., Majeroni, B. A., Pretorius, R., & Malik, K. (2008, November 15)). Fatigue is tiredness that might be either independent of or related to exertion. Complaints of weakness and fatigue are among the most widely recognized and challenging issues experienced by clinicians (Holbrook, J. H. (2021, September 24)). University students experience moderate levels of weariness during the compulsory lockdown or home control period. Resilient students and the people who see higher social help experience lower levels of exhaustion during the lockdown time frame contrasted with understudies with low flexibility and social help (Labrague, L., & Ballad, C. (2020, October)). For the most part, University students revealed moderate levels of lockdown exhaustion, with a mean score of 31.54 (out of 50). Physical tiredness or sleepiness, migraines, body torment, decreased motivation, and expanded concern were the most indications of fatigue (Labrague, L., & Ballad, C. (2020, October), (Rosenthal, T. C., Majeroni, B. A., Pretorius, R., & Malik, K. (2008, November 15)). The study makes the argument that college students, the majority of whom are adolescents, face learning disabilities at this age. It goes on to state that all age groups of college students are much too vulnerable to mental and social issues (Arsalan. (2020, January 30)). The study aims to investigate the relationship between fatigue, stress, and academic performance in online learning.

1.4. Objectives of the Study

This study aims to examine the relationship between fatigue, stress, and academic performance and its impact on Industrial Engineering students in the Technological Institute of the Philippines - Quezon City. College students belong to the age group that requires them to meet the demands of being a student and the life outside the academe, thus they are most likely to experience stress and fatigue from attending these roles. Furthermore, to cope with the health threat posed by COVID-19, the education sector shifted to online or distance learning. This transition is often associated with stress and fatigue as it highlights the challenges in the educational system (Mheidy, N., Fares, M., Fares, J. (2020), Labrague, L., & Ballad, C. (2020, October), Kizhakkeveettil, A., Vosko, A. M., Brash, M., Ph, D., & Philips, M. A. (2017, March)). Previous studies reported that stress and fatigue contribute to substandard individual's learning, mental or physical abilities (Arsalan. (2020, January 30), Labrague, L., & Ballad, C. (2020, October)). Likewise, fatigue and stress-inducing situations result in cognitive decline over time which affects the academic performance of the said subject of interest.

1.5. Scope and Limitations

The scope of the study is to provide an established relationship between fatigue, stress, and academic performance wherein the study is limited only to the Industrial Engineering students from the section IE41S1 students in Technological Institute of the Philippines - Quezon City since it will be pertinent to the given period in addition to the compliance in avoiding face-to-face interaction as a safety measure amid the time of the pandemic. The focus of this study is to test the hypothesis of the relationship between fatigue, stress, and academic performance of the students that are used and of importance every day at school, even at work, and in life. The relationship will be determined through Multiple regression and Pearson correlation coefficient with the use of Minitab 18 and Microsoft Excel 2016. Overall, the results of this study should ideally benefit all Industrial Engineering students in meeting the demands of being a student and their life outside the academe in the absence or with minimized stress.

Literature Review

Stress is the body's reaction to a trial of interest. In short bursts, stress can be positive, for example, when it assists with staying away from risk or fulfilling a deadline. However, when stress goes on for quite a while, it might harm mental health (Bethesda, A. (2021)). This is when cortisol and stress can lead to problems/difficulties. According to several studies, chronic stress hinders cerebrum work in multiple ways. It can disturb synapse regulation, related to the loss of amiability and the avoidance of interactions with others (Bernstein, R. (2016), Camh, A. (2021), Bhandari, S. (2020)). At this stage, the school execution of an understudy assumes a basic part in picking the following phase of their schooling, which thusly structure their vocation. An excess of scholastic or school pressure during this stage can acquire unfavorable effects that are expansive and delayed. Too many levels of academic stress can result in an enlarged pervasiveness of psychological problems and physical problems like depression, nervousness, trauma, and stressor-related disorders, which in turn can affect their academic outcome (Thakkar, A. (2018), Reddy K. J, Menon K. R, Thattil A. (2018)).

According to several researchers, college students experience stress during their school years. This stress can be identified with issues including financial issues, health issues, social issues, or academic difficulties. Evidence shows that first-year college students' stress is more related to academic-related rather than social factors and students who start with relatively low academic grades are more likely to experience greater stress (OMICS International (April 2017)). Stress seems to affect thinking ability, regardless of the controversy found by research. From a subjective standpoint, stress induces increased feelings of tiredness, lack of energy, and alertness. From a behavioral perspective, stress has been shown to negatively affect human performance (Generoso, N., Mazo. (2016), Cardiff University, Prifysgol Caerdydd (2018)). It is common to identify stress factors that create negative effects on students' academic performance, which can affect one's perception of stress. Therefore, it is important to identify the stress to better understand the effects on health, attitudes, and student performance (Bedewy, D. and Gabriel, A. (2016)). Academic stress rises out of experiencing stress due to scholarship requirements, family-related pressures, competition in the class, and course-related stress and monetary burdens, and is experienced by students (Chandra, Y. (2020)). The study showed that the majority of the students (64.4%) reported that they encountered between moderate to high levels of stress while just over a third (35.6%) reported low-stress levels (Josiah B., Oboth, O., et al. (2018)). The perception of academic pressure is making an adverse consequence on their well-being and the decision to choose career options, sleeping difficulties, psychosomatic complaints, worrying over the future, comorbid conditions like anxiety and depression, inability to manage course workload, etc. (Bedewy, D. and Gabriel, A. (2016)).

Significant levels of stress and exhaustion are linked to depression and anxiety, a decrease in scholarly achievement, a decrease in mental and physical prosperity, and a decrease in personal satisfaction. While it is common to recognize both pressure and exhaustion as factors that contribute to negative outcomes, they are distinct mental substances (Kizhakkeveettil, A. (2016, August)). E-learning fatigue is one of the major contributors nowadays. The expansion of the pandemic, as well as the limitations of social distancing, are forcing major institutions and schools to rethink how they approach education and learning. If you read the news over the last several weeks, you'll notice a slew of articles about different colleges adopting an e-learning strategy until the situation improves (*Fighting e-learning fatigue in 5 ways in the new normal*. Tutorbin Blog. (2020, August 18)). A total of 60 school-aged undergraduates completed a battery of neurocognitive functioning and picking in the current study, which included proportions of fatigue, stress, executive, working memory, and academic capacity. The findings revealed that fatigue and stress had significant negative effects on members' learning and intellectual execution and that these two components (i.e., fatigue and stress) are still undervalued aspects of learning (Palmer, L.K. (2017, July)). Digital fatigue is also linked to a lack of or inability to concentrate, lowering academic performance and data retention. Apart from self-detachment and weak social abilities, this condition, when combined with tension and stress, can lead to self-isolation and poor social skills (Dianne, Z. (2021, March 26)).

2. Methodologies

2.1. Conceptual Framework

Figure 1. Conceptual Framework

A. First Variable
The first variable is the factor that is related to basic information associated with the stress level among the Industrial Engineering students of the Technological Institute of the Philippines - Quezon City. This research aims to assess the experience and difficulties of every student during their online conference and doing their task.

B. Second Variable
The second variable is the factor that is related to basic information associated with the fatigue level among the Industrial Engineering students of the Technological Institute of the Philippines - Quezon City. This research aims to assess the experience and difficulties of every student during their online conference and doing their task.

D. Third Variable
The third variable is the factor identified with the Industrial Engineering students of the Technological Institute of the Philippines - Quezon City. This part of the research evaluates the academic performance of the students in a new way of the learning process.

C. Hypothesis
The purpose of this study is to find out if there is a relationship between stress, fatigue, and academic performance, also if those two factors have a significant impact on the academic performance of college students of Technological Institute of the Philippines - Quezon City.
For stress, the hypothesis of this study is
Ho: There is no correlation between Stress Level and Academic Performance.
H1: There is a correlation between Stress Level and Academic Performance.
For fatigue, the hypothesis of this study is
Ho: There is no correlation between Fatigue Level and Academic Performance.
H2: There is a correlation between Fatigue Level and Academic Performance.

2.3. Sampling and Participants

The subjects of this study are selected using purposive sampling, a non-random sampling technique. Purposive sampling is used when the sample size is small and the researchers can choose a group of participants that will provide unique and rich information about the study. Also, purposive sampling is a conventional technique due to the reason that it will allow the researchers to save time and money to gather the data, as well as ensure the safety of everyone due to the strict restriction brought by the pandemic. In this case, the researchers will be concentrating on fellow Industrial Engineering students in the Technological Institute of the Philippines - Quezon City that are currently enrolled and using the online platform to study. The following subject is selected due to the reason that it helps the researchers to get accurate information since the respondents are perfectly fitted for the study.

2.4. Questionnaires and Ergonomic Tools for Data Gathering

The researchers used an online structured survey questionnaire to understand the relationship between stress level, fatigue level, and the academic performance of the participants. The questionnaire is composed of three sections. Section one consists of two questions relating to individual data. Section two consists of ten questions regarding the stress level of participants and will be measured using the Perceived Stress Scale (PSS). The PSS is a classic stress assessment instrument. This tool created in 1983, stays a well-known decision for assisting you with seeing what various circumstances mean for our feelings and our perceived stress. Section three consists of nine questions regarding the fatigue level of participants and will be measured using the Fatigue Severity Scale. The Fatigue Severity Scale (FSS) is a method of evaluating the impact of fatigue on you. The FSS is a short questionnaire that requires you to rate your level of fatigue. For each situation, you will be approached to demonstrate how regularly you felt or thought a specific way. Although some portions of the inquiries are similar, there are contrasts among them and you should regard everyone as a different question.

2.5. Statistical Treatment Used

The study aims to understand the relationship between factors, and how it affects each other through utilizing the Minitab 18 as well as the statistical tool of (1) Pearson Correlation Coefficient and (2) Multiple Regression. The Pearson Correlation Coefficient is a statistical formula that will be used to measure the relationship strength between variables. In this study, this statistical tool will be utilized to determine the relationship of each variable to one another. In connection to this, to understand the association between variables, the verbal interpretation will be adapted from De Vaus (2002) to interpret the correlation coefficient values for the value of r.

Table 1. Interpretation of correlation coefficient values

Correlation Value	Verbal Interpretation
± 0.01 - 0.09	Trivial
± 0.10 - 0.29	Low to moderate
± 0.30 - 0.49	Moderate to substantial
± 0.50 - 0.69	Substantial to very strong
± 0.70 - 0.89	Very Strong
± 0.90 - 0.99	Near Perfect

Source: De Vaus (2002, p.272)

3. Results and Discussion

This study uses purposive sampling to gather the subject size, which is 49 students.

Table 2. Level of perceived stress of college students

Perceived Stress	Frequency	Percentage
Low Stress	2	4.35%
Moderate Stress	40	86.96%
High perceived Stress	4	8.69%
TOTAL	**46**	**100.00%**

Table 2 shows the percentage of stress perceived by college students. The perceived stress "Moderate stress" got the highest percentage of 86.96, while the "Low stress" got the lowest percentage of 4.35. This result indicates that most of the students have moderate stress ranging from 14 to 26 score intervals.

Table 3. Level of fatigue of college students

Fatigue	Frequency	Percentage
Experiencing Fatigue	35	76.09%
Not Experiencing Fatigue	11	23.91%
TOTAL	**46**	**100.00%**

Table 3 shows the percentage of college students that are experiencing and not experiencing fatigue. The total percentage of students that are experiencing fatigue is 76.09%, while the percentage of students that do not experience fatigue is 23.91%. This result indicates that most of the students are experiencing fatigue ranging from 37 and up score intervals.

Table 4. Level of academic performance of college students

General Weighted Average	Frequency	Percentage
1.00 - 1.25	19	41.30%
1.26 - 1.50	14	30.43%
1.51 - 1.75	4	8.70%
1.76 - 2.25	2	4.35%
2.26 - 3.00	7	15.22%
4.00	0	0
5.00	0	0
TOTAL	**46**	**100.00%**

The GWA ranging from 1.00 to 1.25 got the highest frequency of 19 with a percentage of 41.30%. While the GWA ranging from 4 and 5 have no frequency. The result shows that most of the college students have a superior rating and no incomplete or failed rating for their academic performance.

Table 5. Relationship between stress level and academic performance of college

Variables	Mean	Standard Deviation	r	Interpretation	P-value	Decision
Stress	20.26	4.01	-0.12	Low to moderate	0.313	Accept Ho
General Weighted Average	1.46	0.38				

The stress level of the respondents is recorded to have a mean of 20.26 with a standard deviation of 4.01. On the other hand, the academic performance that represents the respondents has an average of 1.46 with a standard deviation of 0.38. The result of Pearson correlation coefficient analysis was performed through the use of Minitab 18 statistical software. The resulting relationship between academic performance and stress is computed to be -0.12 with a verbal interpretation of low to moderate. Furthermore, the p-value is 0.313 which is higher than 0.05, thus resulting in the researchers accepting the hypothesis of the study that there is no significant relationship between the two variables.

Table 6. Relationship between fatigue level and academic performance of college students

Variables	Mean	Standard Deviation	r	Interpretation	P-value	Decision
Fatigue	41.80	10.80	0.03	Trivial	0.532	Accept Ho
General Weighted Average	1.46	0.38				

The fatigue level of the respondents is recorded to have a mean of 41.80 with a standard deviation of 10.80. On the other hand, the academic performance that represents the respondents has an average of 1.46 with a standard deviation of 0.38. The result of Pearson correlation coefficient analysis was performed through the use of Minitab 18 statistical software. The resulting relationship between academic performance and fatigue is computed to be 0.03 with a verbal interpretation of trivial. Furthermore, the p-value is 0.532 which is higher than 0.05, thus resulting in the researchers accepting the hypothesis of the study that there is no significant relationship between the two variables.

4. Conclusion

Students' academic performance has been linked to stress and fatigue in several studies. However, the findings showed that, despite the various changes in pandemic-related stress and fatigue, a person's stress and fatigue level had no effect on academic performance. Despite the fact that respondents gave varying scores based on their recent academic performance as a result of the pandemic, the overall test determined that their perception of the new setting is either the same as it was before the pandemic or only slightly different. The result suggests that there is no correlation between one's academic performance and stress level, as indicated by the p=0.313 result. The level of perceived stress of college students was measured resulting in low stress (f=2, 4.35%), moderate stress (f=40, 86.96%), and high perceived stress (f=4, 8.69%) with a total frequency of 46 and a percentage of 100%. The correlation results show that the General Weighted Average (GWA) of college students is not statistically significant when it comes to stress. In addition, the results also suggest that there is no correlation between one's academic performance and their fatigue level, as indicated by the p=0.532 result. The fatigue severity scale was measured resulting in a total score of (f=11, 23.91%) not experiencing fatigue, and (f=35, 76.09%) experiencing fatigue, with a total frequency of 46 and a percentage of 100%. The correlation results show that the General Weighted Average (GWA) of college students is not statistically significant when it comes to fatigue. This study led the researchers to accept the null hypothesis that there is no correlation between stress, fatigue, and academic performance which means that stress and fatigue don't affect the academic performance of the college students of Technological Institute of the Philippines – Quezon City. Therefore, despite being in a new online environment, their attitudes towards challenges and stressful and exhausting situations in life are not related to them. The research is similar to the findings of Espanola (2016), where the correlation of Adversity Quotient - a score that measures the ability of a person to deal with adversities in his or her life, and Academic performance was found to have an insignificant weak correlation. The results may help other Local Universities in the Philippines who are struggling to adjust to the new learning setup; they could benchmark the strategies and methodologies of the Technological Institute of the Philippines.

5. Recommendations

The following topics for further research are suggested as a result of this study: (1) An increase in sample size. Due to the pandemic, the researchers were only able to test a small number of sample sizes; however, the results of a larger population can provide valuable feedback and outcomes (2) A similar study with a comparison of respondents' stress levels based on their gender. Females are motivated to achieve, according to Stein and Bailey (1975), but their areas of actual achievement differ from males'. A comparison of respondents' stress levels based on their gender may yield a different result. (3) A comparison of stress and fatigue levels among college students from public and private institutions, as well as in pre-and pandemic settings. (4) A similar study with a comparison of respondents' stress and fatigue levels based on their Age. According to the study of Xu & Jaggars (2014), they have found that older students adapted more readily to online courses than did younger students. Since we examine undergraduate students who are considered adolescents. Most likely it is easier for them to adapt and adjust to the new online learning setup. A comparison of respondents' stress and fatigue levels based on their age may also yield a different result. Finally, another academic performance measure could be used. As Espanola suggested, academic performance could be a complex construct that cannot be simply described by a single score.

References

Arsalan. (2020, January 30) "The Relationship Between Stress, Fatigue, and Cognitive Functioning" Retrieved from https://academic-master.com/the-relationship-between-stress-fatigue-and-cognitive-functioning/

Bates, T. (2016). "Online learning for beginners: 1. What is online learning?". https://www.tonybates.ca/2016/07/15/online-learning-for-beginners-1-what-is-online-learning/

Bedewy, D. and Gabriel, A. (2016), "Examining perceptions of academic stress and its sources among university students: the perception of academic stress scale. Retrieved from https://journals.sagepub.com/doi/full/10.1177/2055102915596714

Bernstein, R. (2016). "The Mind and Mental Health: How Stress Affects the Brain". https://www.tuw.edu/health/how-stress-affects-the-brain/#:~:text=It%20can%20disrupt%20synapse%20regulation,responsible%20for%20memory%20and%20learning.

Bethesda, A. (2021). "Stress and your health". https://medlineplus.gov/ency/article/003211.htm#:~:text=Stress%20is%20a%20feeling%20of,danger%20or%20meet%20a%20deadline.

Bhandari, S. (2020). "What Does Stress Do to the Body?" Retrieved from: https://www.webmd.com/balance/stress-management/stress-and-the-body

Broderick T. (May 05, 2020) "A Student's Guide to Managing Stress: BestColleges" Retrieved from https://www.bestcolleges.com/resources/balancing-stress/

Camh, A. (2021). "Stress". https://www.camh.ca/en/health-info/mental-illness-and-addiction-index/stress

Cardiff University | Prifysgol Caerdydd (2018) "Fatigue and the well-being and academic attainment of university students" retrieved from http://orca.cf.ac.uk/109027/

Chandra, Y. (2020). "Online education during COVID-19: perception of academic stress and emotional intelligence coping strategies among college students". https://www.emerald.com/insight/content/doi/10.1108/AEDS-05-2020-0097/full/html

Chen, T.-Y., Chou, Y.-C., Tzeng, N.-S., Chang, H.-A., Kuo, S.-C., Pan, P.-Y., Yeh, Y.-W., Yeh, C.-B., & Mao, W.-C. (2015, March 19). Effects of a SELECTIVE educational system On fatigue, sleep problems, daytime sleepiness, and depression among senior high School adolescents in Taiwan. Neuropsychiatric disease and treatment. Retrieved September 24, 2021, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4372029/.

Davis, C. (2017). "Medical Definition of Stress". https://www.medicinenet.com/stress/definition.htm

De Vaus, D. (2002). Analyzing Social Science Data: 50 Key Problems in Data Analysis. London: SAGE Publications

Dennon, A. (2021, April 11). 95% of college students' mental health impacted by COVID-19: BestColleges. BestColleges.com. Retrieved from https://www.bestcolleges.com/research/college-mental-health-impacts-from-covid-19/?fbclid=IwAR0Ciy-tne9CPChw2B9c_oUaUgX4pnu6hXEuyKq9HHDS-StR3Qo81zOMbSw.

Dianne, Z. (2021, March 26). The impact of digital fatigue in the educational system. NEO BLOG. Retrieved October 9, 2021, from https://blog.neolms.com/the-impact-of-digital-fatigue-in-the-educational-system/.

Espaňola, R.P. (2016) Adversity Quotient (AQ) and Academic Performance of Selected Students in MSU Marawi City. Proceedings Journal of Education, Psychology and Social Science Research.Vol03:Iss01:Pg057. https://www.researchgate.net/publication/335221231 Adversity Quotient AQ and Academic Performance of Selected Students in MSU_Marawi_City?fbclid=IwAR0-DpxuPPvbVdLlHWkIHzVBBfuZ96xdW7fyLlfNlpdHWLxlkJt55H3Ec0s

Fighting e-learning fatigue in 5 ways in the new normal. Tutorbin Blog. (2020, August 18). Retrieved from https://tutorbin.com/blog/fighting-e-learning-fatigue/?fbclid=IwAR0Ax1umAPsD52NVqw4wgAF277Nz5-qITxl7cOS9J458hH6K75VeK2wxmRw.

Generoso, N., Mazo. (2016). Causes, Effects of Stress, and the Coping Mechanism of the Bachelor of Science in Information Technology Students in A Philippine University. Journal of Education and Learning, 9(1), 71–78. Retrieved from https://media.neliti.com/media/publications/71952-EN-causes-effects-of-stress-and-the-coping.pdf

Hallare, K. (2020, March 31). 27% of Filipinos frequently experience stress – SWS. Retrieved from INQUIRER.net website: https://newsinfo.inquirer.net/1251893/27-of-filipinos-frequently-experience-stress

Harvard Health (2021) "Protect your brain from stress" Retrieved from https://www.health.harvard.edu/mind-and-mood/protect-your-brain-from-stress

Holbrook, J. H. (2021, September 24). Weakness and fatigue. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK326/.

Josiah B., Oboth, O., et al. (2018). "The Relationship Between Levels of Stress and Academic Performance Among

University of Nairobi Students" Retrieved from http://www.macrothink.org/journal/index.php/ijld/article/view/13840#:~:text=Results%20showed%20that%20most%20of,%25)%20reported%20low%20stress%20levels.&text=Regression%20analysis%20showed%20that%20the,poorer%20is%20the%20academic%20performance.

Journal of clinical medicine (2018) "The Effect of Stress on Cognitive and Aerobic Performance in Adolescent Active Endurance Athletes: Insights from a Randomized Counterbalanced, Cross-Over Trial" Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6306934/

Kassarnig, V., Mones, E., Nielsen, A., et al. (2018). "Academic performance and behavioral patterns". https://epjdatascience.springeropen.com/articles/10.1140/epjds/s13688-018-0138-8

Kizhakkeveettil, A. (2016, August). Perceived stress and fatigue among students in a doctor of chiropractic The training program, Retrieved from https://www.researchgate.net/publication/306434866-Perceived_stress_and_fatigue_among_students_in_a_doctor_of_chiropractic_training_program

Kizhakkeveettil, A., Vosko, A. M., Brash, M., Ph, D., & Philips, M. A. (2017, March). Perceived stress and fatigue among students in a doctor of the chiropractic training program. The Journal of chiropractic education. Retrieved September 24, 2021, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5345784/

Labrague, L., & Ballad, C. (2020, October). Lockdown fatigue among college students during the COVID-19 pandemic: predictive role of personal resilience, coping behaviors, and health. Research Gate. Retrieved from https://www.researchgate.net/publication/344777452_Lockdown_fatigue_among_college_students_during_the_COVID-19_pandemic_predictive_role_of_personal_resilience_coping_behaviours_and_health?fbclid=IwAR2k9BxtUCJ-9TEDAoC4-HKyY21Zv-vgibv0_dEDHUXSQra50RiABb4B-Oo.

Lamas, H. (2016). "School Performance". https://files.eric.ed.gov/fulltext/EJ1135350.pdf

M, M. A., V, V. P., & R, G. (2018). Effect of stress on academic performance of students in different streams. Drug Invention Today. Retrieved from https://jprsolutions.info/files/final-file-5b669833222de7.71860910.pdf.

Maajida, M., Vinshnu, V., Gayathri, R. (2018). "Effect of stress on academic performance of students in different streams.". https://web.b.ebscohost.com/abstractdirect=true&profile=ehost&scope=site&authtype=crawler&jrnl=09757619&AN=131123674&h=YK%2fk7frA0PDsSSw64lpFCcM7bi7YmgpCQamoS7F%2bX5ioPtUCC7fvOZqDKGVIlaTN1WSvVk8j4pBZ43iXQE4lqA%3d%3d&crl=c&resultNs=AdminWebAuth&resultLocal=ErrCrlNotAuth&crlhashurl=login.aspx%3fdirect%3dtrue%26profile%3dehost%26scope%3dsite%26authtype%3dcrawler%26jrnl%3d09757619%26AN%3d131123674

Maggiano D. (2017). What Are Some of the Effects of Fatigue in the Workplace? Retrieved from https://www.maggianolaw.com/blog/what-are-some-of-the-effects-of-fatigue-in-the-workplace/

Masud, S., Muffarih, S., et al. (2019). "Academic Performance in Adolescent Students: The Role of Parenting Styles and Socio-Demographic Factors – A Cross-Sectional Study From Peshawar, Pakistan". https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02497/full

Mheidy, N., Fares, M., Fares, J. (2020). "Coping With Stress and Burnout Associated With Telecommunication and Online Learning". https://www.frontiersin.org/articles/10.3389/fpubh.2020.574969/full#:~:text=The%20COVID%2D19%20pandemic%20has,%2C%20firms%2C%20and%20even%20countries.

OMICS International (April 2017) "Effect of Stress on Academic Performance of Undergraduate Students" Retrieved from https://www.omicsonline.org/open-access/effect-of-stress-on-academic-performance-of-undergraduate-medical-students-2161-0711-1000566-95704.html

Palmer, L.K.(2017, July).The Relationship between Stress, Fatigue, and Cognitive Functioning. ERIC. https://eric.ed.gov/?id=EJ1022296

Reddy K. J, Menon K. R, Thattil A. (2018). "Academic Stress and its Sources Among University Students". https://biomedpharmajournal.org/vol11no1/academic-stress-and-its-sources-among-university-students/

Rosenthal, T. C., Majeroni, B. A., Pretorius, R., & Malik, K. (2008, November 15). Fatigue: An overview. American family physician. Retrieved from https://pubmed.ncbi.nlm.nih.gov/19035066/.

Sajadi, S. A., Farsi, Z., Rajaei, N., Mazhari, M. S., & Habibi, H. (2018, February). Sleep quality and the factors affecting the fatigue severity and academic performance of students at AJA University of medical sciences. Retrieved from http://jamed.ir/article-1-32-fa.pdf.

Samaha, M., Hawi, N. (2016). "Relationships among smartphone addiction, stress, academic performance, and satisfaction with life". https://www.sciencedirect.com/science/article/abs/pii/S0747563215303162
Samele, C., Manning, H., et.al. Mental Health Foundation (May 2018). Stress: Are we coping? London: Mental Health Foundation. Retrieved from: https://www.mentalhealth.org.uk/sites/default/files/stress-are-we-coping.pdf
Sohail, N. (2016). "Stress and Academic Performance Among Medical Students". https://jcpsp.pk/archive/2013/Jan2013/15.pdf
Stem, J. (2020). "Introduction to Online Teaching and Learning". http://www.wlac.edu/online/documents/otl.pdf
Thakkar, A. (2018). "Academic Stress in Students". https://medium.com/one-future/academic-stress-in-students-498c34f064d7
The Journal of chiropractic education (2021) "Perceived stress and fatigue among students in a doctor of chiropractic training program" Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5345784/
Vogel, S., & Schwabe, L. (2016). Learning and memory under stress: implications for the classroom. Npj Science of Learning, 1(1). https://doi.org/10.1038/npjscilearn.2016.11
Westchester. (2017, November 7). GPA & emotional effects of sleep deprivation on high school students. American Academy of Sleep Medicine – Association for Sleep Clinicians and Researchers. Retrieved from https://aasm.org/poor-sleep-can-negatively-affect-a-students-grades-increase-the-odds-of-emotional-and-behavioral-disturbance/?fbclid=IwAR1hOg7V7XmW3QkneMnjke8gjPxdkElr7GQum7UFAr5qhGjUoPxgngJlTTk.
Xu, D., & Jaggars, S. S. (2014). Performance Gaps Between Online and Face-to-Face Courses: Differences Across Types of Students and Academic Subject Areas. The Journal of Higher Education, 85(5), 633–659.https://doi.org/10.1353/jhe.2014.00288

Biographies

John Jeric R. Almonte is currently a fourth-year Industrial Engineering student at the Technological Institute of the Philippines – Quezon City. He is also an active member of the Organization of the Industrial Engineering Students (ORIENTS) of their school from 2018 up to the present.

Emil R. Badillo is currently a fourth-year Industrial Engineering student at Technological Institute of the Philippines – Quezon City. He is also an active member of the Organization of the Industrial Engineering Students (ORIENTS) of their school from 2018 up to the present.

Kevin Brian S. Candelaria is currently a fourth-year Industrial Engineering student at the Technological Institute of the Philippines – Quezon City. He has a sideline job to fulfill financial needs. He is also an active member of the Organization of the Industrial Engineering Students (ORIENTS) of their school from 2018 up to the present.

Ian Kent D. Tadle is currently a fourth-year Industrial Engineering student at Technological Institute of the Philippines – Quezon City. He is also an active member of the Organization of the Industrial Engineering Students (ORIENTS) of their school from 2018 up to the present.

John Timothy P. Villacorte is currently a fourth-year Industrial Engineering student at the Technological Institute of the Philippines – Quezon City. He is also an active member of the Organization of the Industrial Engineering Students (ORIENTS) of their school from 2018 up to the present.

Romalyn L. Galingan is an Assistant Professor at the Industrial Engineering Department of Technological Institute of the Philippines Quezon City. She earned her Bachelor of Science in Industrial Engineering from Technological Institute of the Philippines and a Master's Degree holder in Industrial Engineering and Management from Polytechnic University of the Philippines, Manila. Presently, she is taking up her Ph.D. in Educational Leadership and Management. She is currently an Education Supervisor II of the Commission on Higher Education (CHED).