Effects of Academic Workload to the Mental Fatigue of Students during Online Class

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Abstract

The present study quantitatively examines the relationship between the effects of academic workload to the perceived mental fatigue of undergraduate college students from Mapúa University in the Philippines. The current global pandemic and the abrupt shift from face-to-face classes to remote learning affected the students' mental health. The researchers used data from a sample of 104 respondents obtained from a digital survey containing the Fatigue Assessment Scale and NASA-Task Load Index, which was then analyzed using descriptive and inferential statistics. Results presented a strong relationship between the academic workload factors during online classes and students' overall mental fatigue level. Thus, results show that these factors significantly contribute to the intensity of the mental fatigue of college students. Based on the conclusion, the results show that the FAS is greatly affected by each dimension – mentally or physically. In addition, the academic workload assigned to each respondent shows that all cognitive factors such as mental demand, physical demand, temporal demand, effort, and frustration are significantly affected due to the assigned workload to the students during an online class. Thus, resulting to students must exert more mental effort to accomplish required outputs.

Keywords
NASA-Task Load Index, FAS, mental fatigue, online class

1. Introduction

Mental fatigue is commonly known as exposure to prolonged mental stress, a state of mind where a person experiences cognitive stress and overwhelming mental pressure due to cognitive activities (Maarten et al., 2008). In addition, it is theorized to be exhibited in various forms either physiologically or through a sudden change of behavior since Smith et al. (2019) stated that mental fatigue is a product of a challenging cognitive activity. This mental state is often correlated to tiredness and lack of energy which is essential to a healthy adult's day-to-day optimal functions. Mental fatigue may have similarities of symptoms with physical fatigue; however, biological functions of both fatigues are separate, which means both may co-exist simultaneously (Fatigue Science, 2019). Although physical fatigue stems from the excessively physical exertion of energy, an individual's mental state remains unharmed, and revival should only be present when the physical state must be resolved. However, it still poses different implications for the different individuals experiencing mental fatigue (Garikiparithi, 2017).

On March 11, 2020, the World Health Organization (WHO) proclaimed the rampant Coronavirus (COVID-19) outbreak as a widespread pandemic, which drastically intensified mental exhaustion as quarantine protocols and digital education were drastically instituted. Labrague & Ballad (2021) published a study where the levels of lockdown-induced fatigue in line with the pandemic including its correlation with personal resilience, coping skills, and overall health among college students in the Philippines which is essential since cognitive factors are being considered upon the analysis of the perceived fatigue levels. It is noted that college students experience moderate fatigue levels amid quarantine restrictions in the Philippines. However, personal and cognitive traits were used as identifiers instead of academic workload related to online classes. Furthermore, Skyline College in San Bruno, California released the results from a survey that tackles transitioning into a new normal amidst the COVID-19 pandemic where statistics show that 60% of the students enrolled find the transition challenging to a degree – in addition, these challenges

include concern regarding falling behind academics, mental health, and physical health which may be related to fatigue overall. With that, it is significant to determine the perceived mental fatigue of college students in the new normal with academic workload as variables since Kocalevent et al. (2011) claimed that fatigue may be rooted in the perceived stress an individual experiences that affect the person's optimal daily function and performance, academically wise.

1.1 Objectives

The researchers aim to measure the perceived academic workload and mental fatigue levels of undergraduate college students from Mapúa University during online classes utilizing the Fatigue Assessment Scale (FAS) and the Academic Workload Questionnaire (NASA TLX). To be more specific, the researchers also intend to determine the significant difference in students' academic workload based on year level, the average duration of classes per week, and the average duration of sleep per day. In addition, it is within the objectives to determine the relationship and effects of academic workload to the mental fatigue of students during online class.

2. Literature Review

2.1. Average Sleep Duration

The American Academy of Sleep Medicine (AASM) and Sleep Research Society (SRS) conducted a joint consensus statement in 2015 wherein they underwent three (3) rounds of voting that utilized a modified RAND Appropriateness Method (RAM) to determine the recommended amount of sleep for a healthy adult. Both organizations considered health factors such as general health, cardiovascular health, metabolic health, mental health, immunologic health, human performance, cancer, pain, and mortality. Voting results from all rounds leans towards those healthy adults are recommended to have 7-9 hours of sleep, for 6 hours or less is deemed to be unsuitable for daily optimal adult functions and the appropriateness of more than 9 hours of sleep is uncertain due to potential harms it may pose and may be an indication of poor health (Watson et al., 2015). Thus, providing a basis that a healthy individual who functions daily, such as college students, should have sleeping hours in between 7 to 9 hours, where 8 hours is the average.

Several studies have established the recommended hours of sleep for a healthy adult. Specifically, the American Academy of Sleep Medicine (AASM), in collaboration with the Sleep Research Society (SRS), concluded this. They followed a standard consensus methodology in 2015 comprising of three (3) voting rounds with the aid of the modified RAND Appropriateness Method (RAM). The mentioned organizations had taken into consideration major health factors, namely, (1) general health, (2) cardiovascular health, (3) metabolic health, (4) mental health, (5) immunologic health, (6) human performance, (7) cancer, (8) pain, and (9) mortality. After accomplishing the voting rounds, it was found that healthy adults should have an optimal sleep of 7 to 9 hours per day as it was found that sleep for less than 6 hours is not suitable for the daily adult lifestyle (Watson et al., 2015). This then provides a threshold of the recommended amount of sleep of adults were 8 hours if the average of the recommended range – which applies to the respondents of this study.

Having an insufficient sleep for a prolonged period of time may aid in the elevated levels of daily fatigue and mental instability that includes anxiety, suicidal thoughts, and self-harming behaviors as Deursen (2017) reiterated the assessment of health effects with sleep deprivation as the root cause of the mentioned issues. Aside from adverse health problems, Kim (2019) evaluated the lack of sleep on the academic performance from North Texas using a hybrid approach of qualitative and quantitative methodology. The Grade Point Average (GPA) from significant courses, educational institution, sleepiness during the day, sleep quality, amount of sleep time, and extracurricular activities were considered. It was found that there is an inverse relationship between sleep deprivation and academic performance. This means that it is possible that when there is an increase in the duration of sleep of students, daytime sleepiness decreases, which results in being more focused during classes and better academic performance. In addition, students who are getting the recommended hours of sleep daily are more likely to excel academically and experience less tiredness. Given that, this serves as a basis that sleep is essential upon considering the perceived mental fatigue of students since lack of concentration is rooted in inadequate sleep, which may compromise an individual's cognitive capacity.

2.2 Academic Workload

In general, heavy workload combined with long working hours has already been proven to significantly contribute to a person's fatigue, as cited in Bakshi et al. (2019). Certain studies have also shown students' perception when it comes to workload; The study conducted by Lam et al. (2012) has proven that students usually have a negative perception towards workload. This means that increasing the students' workload tends to decrease their motivation to learn and

thus could increase their level of stress and frustration. However, workload has a negative effect on the students – According to Smith (2019), but students are also capable to experience both positive and negative effects of their workload. Smith has further explained that, because of the high workload they are dealing with, it has given the opportunity for students to develop a better work efficiency, thus improving their overall GPA scores and contributing to their positive well-being. Yet, the negative impact of workload on students is that higher workload could increase their stress levels, which is considered to be the main factor in developing a negative impact on their well-being. Yet, Smith (2019) have further explained that although there are established positive and negative effects of workload to the students, these effects could occur at contrasting times.

Apart from these, it is significant to know the relationship between stress and workload. The study conducted by Rahim et al. (2016) has stated that students tend to be "stressed individuals, " which is greatly contributed by the amount of workload they could manage. Apart from the amount of workload, the study has also established that an increase in the student's credit hours directly affects their perceived stress. And to support this, the study by Ribeiro et al. (2018), in which they have examined medical students and found that they have higher stress levels due to the academic and clinical workload that comes with their program as well as the very nature of their field of work. Thus, these studies have proven that stress and workload could have a possible significant direct relationship. Apart from this, stress related to academics has already been established to have a negative relationship to the students' mental well-being (2017). Thus, Kiani et al. (2017) have suggested that dealing with factors that commonly influence the stress level of students should be dealt with accordingly to further prevent any damages to the students' emotional, mental, and overall well-being.

Mental fatigue has been an established topic in determining and analyzing its effects on physical performance and its effects on other illnesses. As such, studies pertaining to mental fatigue have also been explored in sports performance and the medical academe. Yet, there are still limited studies that show the direct effect of mental fatigue on students. In line with these, studies involving the investigation of effects, perceptions, and workload factors have already provided significant results. There is still little knowledge of its direct relationship with the mental fatigue of a person. In this case, no studies have yet to explore the relationship between academic workload and the mental fatigue of students during the distance learning setup due to the ongoing pandemic.

2.3. Fatigue Assessment Scale (FAS)

A proper measurement tool is essential to determine the mental fatigue of a person. Fatigue Assessment Scale is considered one of the well-known fatigue assessment tests that allow researchers to measure the overall fatigue level of a person. The FAS was developed by Michielsen, de Vries, and van Heck in 2003 to which is targeted to evaluate the symptoms of chronic fatigue (Shahid et al., 2011; Michielsen et al., 2003). According to Shahid et al. (2011) the difference of FAS to other fatigue measurement scale is that FAS have treated fatigue as a "unidimensional construct" which means that fatigue is considered to have a single underlying dimension, which is the main reason why the developers chose not to separate the measurement into different factors and that items in the assessment represent both physical and mental fatigue to further ensure that the measurement scale would evaluate all aspects of fatigue. In addition, the FAS is also found to have a 0.90 of internal consistency. Results obtained using the scale have been highly correlated with other fatigue-related scales or measurements.

FAS has been considered to be used in the study due to our main objective is finding the several factors that would affect the overall mental fatigue of the students in Mapua University that would later be analyzed on whether factors found in FAS would have a significant relationship with the factors affecting the academic workload of the students. As stated, FAS could treat fatigue as unidimensional; thus, it can explore all aspects of fatigue, including physical and mental fatigues.

2.4 NASA Task Load Index (NASA-TLX)

To determine the overall workload of the students, the NASA Task Load Index or the NASA-TLX was a measurement scale that was developed in the 1960s by the NASA Ames Research Center's Sarah Heart, which is a multi-dimensional scale that is designed order to determine the overall workload scores that will be based upon six (6) subscales namely: Physical Demand, Mental Demand, Individual's Performance, Effort, Temporal Demand, and Frustration (NASA TASK LOAD INDEX (NASA-TLX) V 1.0, n.d.). According to Hart (2006), the reason behind of having these six (6) subscales to be the main factor that will be contributing to the overall workload score of a person is that it is assumed that some combinations of these factors are most likely to represent the workload experience of a person when performing tasks. In addition, the factors were also selected after an extensive analysis on several primary factors that

have been found to have a significant contribution on the experience of workload for people performing various tasks that ranges from laboratory task to a more complicated task such as flying an aircraft. Aside from this, the author has further reiterated that the selected factors have been found to coincide with different theories that equate these dimensions to the workload with the significance of the demand that was inflicted upon an individual's and its response on those demands physically, mentally, and emotionally or the ability of the individuals to meet those certain demands.

The significance of using the NASA-TLX is its weighing scheme method to determine the dimensions' weight in the overall computation of the overall workload scores. In line with the researcher's objectives, the NASA-TLX can examine the students' academic workload and its effects since it could cater simply to complicated tasks that students have experienced during the previous and current online terms.

3. Methods

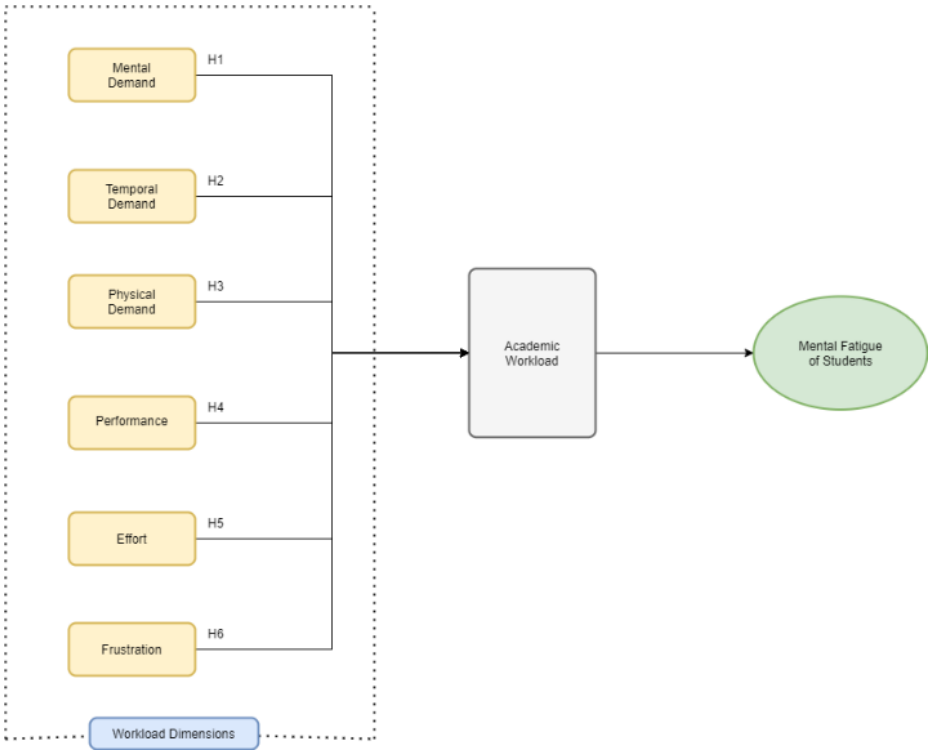

Figure 1. Conceptual Framework

Figure 1 shows the various aspects that the study will focus on—namely, the mental demand, physical demand, temporal demand, performance, effort, and frustration. The mental demand, physical demand, and temporal demand are possibly associated with the student's overall body functionality. In comparison, the duration of study can be related to the working hours of the student. Since both workload and working hours are already proven to have a significant contribution to the mental fatigue of a person. The researchers also considered the duration of sleep as it was also proven to have a direct effect when it comes to academic performances (Kim, 2019).

The researchers formulated a digital questionnaire that is composed of three (3) parts that include: (1) demographic profiling – where the age, sex, year level, average duration of online class per week, and average duration of sleep per day, (2)– wherein it includes a set of questions that aid in the calculation of the fatigue level of the respondents based on how they are feeling, and (3) Academic Workload Questionnaire from the NASA Task Load Index. The digital questionnaire was answered by 104 undergraduate college students of Mapúa University currently enrolled for the 4th Quarter AY 2020-2021.

3.1. Survey Tools

There are two (2) survey tools used in this study. First is the Fatigue Assessment Scale, a 10-item assessment scale to evaluate symptoms of chronic fatigue (Michielsen et al., 2003). Then, the NASA Task Load Index is utilized since it is a multi-dimensional scale to measure the mental workload of operators, which can also be applied to the general public since it covers factors such as mental demand, physical demand, temporal demand, performance, effort, and frustration level.

3.2 Statistical Treatment of Data

Given that ergonomic tools are used in this study, further statistical analysis is used for thorough analysis. In such a way that (1) One-Way ANOVA Welsch's Test is used to determine if there are significant differences between the components, (2) Correlation Analysis, specifically Pearson Correlation to determine significant relationship between academic workload to the mental fatigue of the students, and (3) Regression Analysis to see the effect of academic workload to the overall mental fatigue.

5. Results and Discussion

5.1 Respondents' Profile

Based on the responses from 104 undergraduate college students from Mapúa University enrolled for the 4th Quarter AY 2020-2021, 49% are male, and 51% are female. 11.5% of the respondents are aged 18 to 19, 60.6% are aged 19 to 20, and 27.1% are aged 21 years old and above. In addition, 14.4% are in their first year, 54.8% are in their second year, 24% are in their third year, and 6.7% are in their fourth year enrolled for their respective undergraduate programs. Considering the average duration of online classes per week, results show that 2.9% have less than 4.5 hours, 38.5% have 4.5 to 12 hours weekly, 26% have 12 to 20 hours, and 32.7% have online classes for more than than one 20 hours per week. In line with that, the average duration of sleep was also considered, and the responses show that 79.8% of respondents sleep for less than the recommended 8 hours per day, 12.5% sleep for 8 hours per day, and the remaining 7.7% sleep for more than 8 hours per day.

5.2 Fatigue Assessment Scale Results

The Fatigue Assessment Scale (FAS) is derived from Michielsen et al. (2003) since it contains a 10-item scale that evaluates an individual's feelings about chronic fatigue. To get the overall FAS score, items 4 and 10 are recorded in reverse due to the nature of the question.

Table 1. Summary Results of Fatigue Assessment Scale (FAS)

Items	Mean	Std. Dev.	Range	Remarks
I am bothered by fatigue	4.30	0.74	2-5	significant
I get tired very quickly	3.96	1.03	1-5	significant
I don't do much during the day	2.94	1.17	1-5	significant
I have enough energy for everyday life	3.57	1.03	1-5	significant
Physically, I feel exhausted	3.72	0.99	1-5	significant
I have problems starting things	3.72	1.13	1-5	significant
I have problems thinking clearly	3.80	1.11	1-5	significant
I feel no desire to do anything	3.62	1.23	1-5	significant
Mentally, I feel exhausted	4.46	0.68	2-5	significant
When I am doing something, I can concentrate quite well	2.16	1.05	1-5	not significant

With that, the mean, standard deviation, and range were calculated as shown in table 1 to determine the significance of each factor with a 2.5 threshold for significance in the range. Since the mean of items 1 to 9 is greater than the 2.5 thresholds, this means that those are significant and state that the majority of the respondents feel bothered by fatigue, get tired very quickly, don't do much during the day, do not have sufficient energy for daily life, feel physically exhausted, have issues starting things, have problems thinking, feel no desire to do anything, and feel mentally exhausted. However, since the mean of the last item did not reach the 2.5 acceptable level of significance, most of the respondents do not have concentration problems.

5.3. Academic Workload Questionnaire

The NASA Task Load Index is considered to be the Academic Workload Questionnaire, which is the last part of the digital survey where mental demand, physical demand, temporal demand, performance, effort, and frustration were considered.

Table 2. Summary Results of Academic Workload (NASA TLX)

Items	Mean	Std. Dev.	Range	Remarks
Mental Demand	6.41	0.73	4-7	significant
Physical Demand	5.14	1.66	1-7	significant
Temporal Demand	5.90	1.11	3-7	significant
Performance	3.96	1.82	1-7	significant
Effort	5.92	1.02	3-7	significant
Frustration	5.68	1.19	3-7	significant

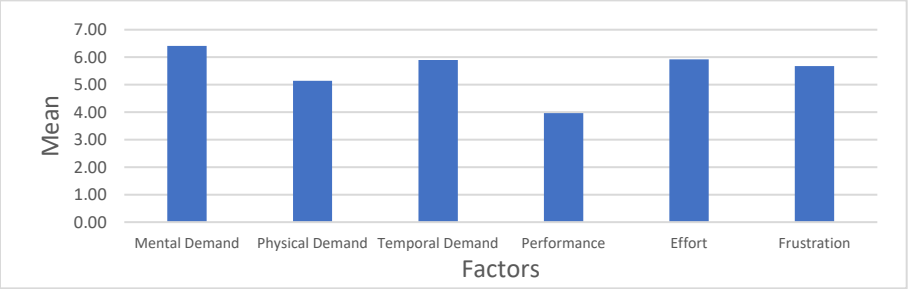

Figure 2. Academic Workload Factors

Table 2 shows the summary of the results from the Academic Workload Questionnaire obtained from the NASA TLX. Similar to the FAS score, the mean, standard deviation, and range were calculated concerning the corresponding weights from the NASA TLX. Since the scale contains choices between 1 to 7, the accepted threshold for significance is 3.5. It can be seen that all factors have a mean greater than 3.5; this means that mental demand, physical demand, temporal demand, effort, and frustration are significant when it comes to the academic workload of the students. However, results vary upon analyzing the range where the highest minimum value is 4 from the mental demand, which may indicate that the respondents find online classes mentally demanding. In contrast, the lowest minimum value is 1 from the physical demand, which can be interpreted as online classes are not physically demanding for the respondents due to the workload being shifted to digital tasks instead.

It is shown in Figure 2 the graphical comparison of the mean of each item considered in the Academic Workload section. This indicates that the students' workload greatly affects mental demand, followed by effort, temporal demand, frustration, physical demand, and lastly, performance.

5.4 One-Way ANOVA Results

Table 3. Summary of One-Way ANOVA Results

Respondent's Profile	Category	Mean	Std. Dev.	F-value	P-Value	Remarks
Year Level	1	4.955	0.797	3.49	0.033	Significant
	2	5.678	0.7077			
	3	5.654	0.657			
	4	5.393	0.705			
Duration of class	4.5 hrs. to 12 hrs.	5.473	0.791	19.65	0.000	Significant
	12 hrs. to 20 hrs.	5.094	0.715			

	more than 20 hrs.	5.998	0.4146			
	less than 8 hrs.	5.6855	0.7131			
Duration of sleep	8 hrs.	5.227	0.569	13.43	0.000	Significant
	more than 8 hrs.	4.653	0.543			

Ho: There is no significant difference in students' academic workload based on year level/average duration of online class per week/average duration of sleep per day.
Ha: There is a significant difference in students' academic workload based on year level/average duration of online class per week/average duration of sleep per day.

Table 3 shows the summary of the One-Way ANOVA test conducted to determine whether there is a significant difference in the students' academic workload based on year level, the average duration of online class per week, and average duration of sleep per day. The values used for the academic workload are computed from the NASA TLX or Academic Workload questionnaire, wherein the weights were multiplied to each score, and the average was calculated.

Furthermore, the computed p-value for all factors (year level, duration of class, and duration of sleep) is less than 0.05, which means that there is a significant difference and that the null hypothesis should be rejected. To analyze more, a posthoc test is necessary. The Game-Howell Post-Hoc test with an assumption of unequal variance was performed, and results show that while those who are enrolled in their second and third undergraduate year are not significantly different from each other, the mentioned year levels are shown to be significantly different to those who are enrolled in their first undergraduate year. The Post-Hoc analysis for the average duration of class per week yielded values that support the interpretation that those who have 4.5 to 12 hours of classes per week do not significantly differ from those who have 12 to 20 hours of classes weekly; however, the mentioned ranges are substantially different from those who have more than 20 hours of classes per week. Lastly, for the average sleep duration per day, those who sleep for at least 8 hours per day and more do not have significant differences. However, they significantly differ from those who sleep for less than the recommended 8 hours of sleep per day.

5.5. Pearson Correlation Analysis Results

To determine the strength and direction of the relationship between the independent and dependent variables, Correlation Analysis was conducted. In this study, the dependent variable is the Fatigue Assessment Scale (FAS) score. In contrast, the independent variables are factors such as mental demand, physical demand, temporal demand, performance, effort, and frustration. With that, the null hypothesis states that the Pearson Correlation Coefficient is equal to 0, while the alternate hypothesis states otherwise.

Table 4. Result of Correlation Analysis

Factor	Pearson Correlation	P-Value	Remarks
FAS-Mental demand	0.227	0.021	Not significant
FAS-Physical demand	0.498	0.000	**Significant
FAS-Temporal demand	0.315	0.001	**Significant
FAS-Performance	0.572	0.000	***Significant
FAS-Effort	0.332	0.001	**Significant
FAS-Frustration	0.508	0.000	***Significant

Table 4 shows the result of the Correlation Analysis and the interpretation of the coefficient value by Hopkins (Hopkins, 2000). The calculated p-value for the mental demand and FAS score is greater than 0.05, indicating that there is no significant relationship. With that, all pairwise comparisons generated a significant relationship with the FAS score. This is an indication that as the mentioned factors increase, the fatigue level of the students also increases. In addition, it is noticeable that FAS-Performance and FAS-Frustration both yielded high correlation values. Thus, it is shown in Figure 3 the scatterplot of the relationships of the mentioned pairwise comparisons, respectively.

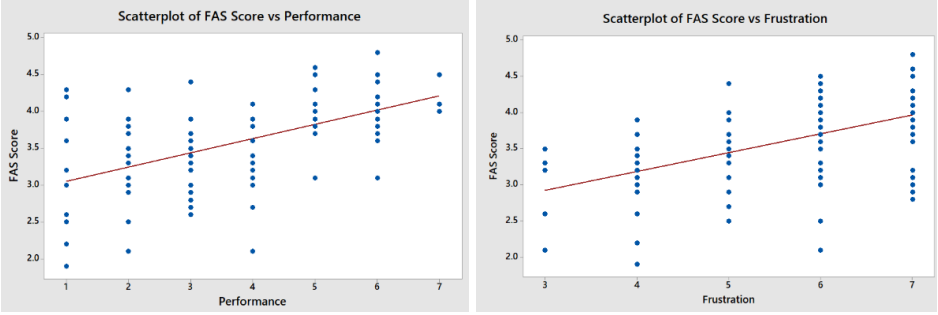

Figure 3. Scatterplot (With Regression) of FAS vs. Performance and FAS vs. Frustration

5.6. Regression Analysis Results

Table 5. Result of Regression Analysis

Model Summary				
S	R-sq	R-sq(adj)	R-sq(pred)	
0.404420	59.32%	56.80%	52.67%	
Coefficients				
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	1.346	0.380	3.54	0.001	
Mental Demand	-0.0720	0.0682	-1.06	0.294	1.57
Physical Demand	0.1438	0.0280	5.13	0.000	1.36
Temporal Demand	-0.0224	0.0420	-0.53	0.595	1.37
Performance	0.1213	0.0245	4.95	0.000	1.25
Effort	0.1245	0.0461	2.70	0.008	1.40
Frustration	0.1611	0.0410	3.93	0.000	1.51

Table 5 shows the regression analysis, which shows the coefficient of factors that determine how much they individually affect students' overall perceived mental fatigue level. To be more specific, coefficients identify how much the dependent variable increases as one of the independent variables increases in any form. Furthermore, the regression analysis then yielded an R-Squared value of 59.32%, which means that most students' perceived mental fatigue during online classes is caused by significant differences based on the statistical tests conducted. These workload factors that significantly contribute to the perceived mental fatigue of students, which are (1) mental demand, (2) physical demand, (3) temporal demand, (4) performance, (5) effort, and (6) frustration – where frustration is the major contributor to the elevated level of mental fatigue. Where the remaining 40.68% may be caused by other factors not tackled in this study, such as non-academic workload factors.

Since the Variance Inflation Factor (VIF) lies between the acceptable range of 1 and 3.5, it is safe to say that the regression equation generated in table 7 can then be used as a predictive model to calculate the perceived mental fatigue level of students considering the workload factors mentioned.

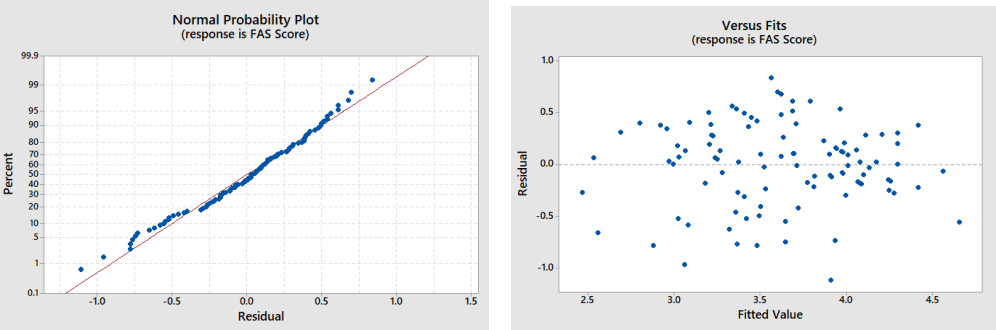

Figure 4. Normality Test and Residual Plots

The normal probability plot and residual plot are used to validate the regression model and confirm if the data is normally distributed, as seen in Figure 4. With that, it can be seen that the data lie within the mean, which indicates that the data used in this study is normally distributed, and there is no bias.

6. Conclusion

This study was conducted to investigate further the role of academic workload in students' perceived mental fatigue levels using ergonomic tools such as the Fatigue Assessment Scale (FAS) and the Academic Workload Questionnaire derived from the NASA Task Load Index (NASA TLX). The researchers accumulated responses from 104 undergraduate college students from Mapúa University who are enrolled in the 4th Quarter AY 2020-2021. The data was then used to determine and measure the academic workload and fatigue level experienced by the students concerning the year level, the average duration of classes per week, and the average duration of sleep per day.

Upon calculating the FAS scores, the analysis yielded results that state the significance of each dimension of fatigue – either physical or mental. With that, it can be concluded that the majority of the respondents are bothered by fatigue, get tired promptly, do not do much during the day, have insufficient energy for daily life, feel physically exhausted, have issues starting things, have problems thinking, feel no desire to do anything, and feel mentally exhausted. Despite that, it was found that a significant fraction of the respondents did not have concentration problems that generated significant effects.

The Academic Workload was then evaluated. Results show that all cognitive factors associated with workloads such as mental demand, physical demand, temporal demand, effort, and frustration are significantly affected due to the assigned tasks to the students during online class. In addition, it was seen that the highest result is generated by the mental demand – which means that the activities being given to students require extra mental effort to accomplish. This is followed by the effort, which indicates that students find it difficult to fulfill their academic responsibilities concerning their desired level of performance. Next is the temporal demand, wherein results show that most of the respondents feel that their pace of work is being rushed. Following that, students also are affected by frustration wherein it is found that they think of a vast set of negative emotions such as insecurity, discouragement, or irritation during an online class. In addition, students find online course physically demanding although it sits on the bottom fraction of the list when arranged according to significance. Lastly, students do not feel successful in how they achieve their respective work during online classes.

The overall FAS score was utilized and analyzed concerning year level, duration of online classes, and sleep duration. It can be concluded that all factors mentioned have significant effects on the fatigue level of students. Specifically, the fatigue level of students enrolled in their second and third undergraduate years significantly differs from those in their first year. This is due to the distribution of significant courses for those in the latter part of their undergraduate program. When it comes to the average duration of online classes in hours per week, it can be deduced that the fatigue level of students who have online courses for more than 20 hours per week are significantly different from those with 4.5 to 12 hours and 12 to 20 hours of online classes weekly. The elevated mental fatigue level is due to long hours of fulfilling academic tasks, which further stains the students. In addition, the fatigue level of students who sleep for less than the recommended 8 hours per day are significantly different to those with at least 8 hours of sleep per day – this is due to the lack of rest the students get during online classes that generally affects their overall being, given that fatigue manifests physically, mentally, and emotionally.

Furthermore, the strength and direction of the relationship between the FAS score and cognitive workload factors were determined. Despite the finding that mental demand dramatically affects the overall Academic Workload score, it did not present any significant relationship with FAS score. However, all remaining factors showed a significant relationship with the fatigue level where performance and frustration correlated among all factors. This means that as physical demand, temporal demand, performance, effort, and frustration increase, the overall fatigue level of students increases as well – this may serve as a predictive model in estimating the mental fatigue level of students based on their perception of academic workload factors since it was proven that 59.32% of the perceived mental fatigue of students during online classes is caused by mental demand, physical demand, temporal demand, performance, effort, and frustration.

7. Recommendation

Based on the results of the statistical analysis conducted, the researchers recommend the following. For the institution, it is recommended to alter the existing allocation of the workload of the students. Based on the analysis, the students indeed sense the fatigue, either mental, physical, or both. In addition, based on the result, it can be seen that the academic workload of a student is significantly affected by the average duration of class hours and sleep hours, which will then lead to an increase in the fatigue scale based on the academic workload factors. It is also recommended to provide ample time for the students to rest mentally and physically. Thus, changes based on the recommendation provided will show significant changes in the fatigue scale of the students.

For the students, since it is shown in the results that academic workload significantly affects one's mental and physical state, it is highly recommended to manage time properly and conveniently. Scheduling co-curricular or leisure activities around the given academic schedule/workload are highly recommended since this is one of the actions that could help prevent or decrease mental fatigue. Another, it is recommended to assign at least a day to give ample time for the physical and psychological state of the body to rest. If such recommendations are taken into consideration, it will help students adjust to the workload assigned.

Due to the current situation, the researchers were limited to the capacity of respondents gathered for future researchers. It is recommended to look into other departments (e.g., Senior High School, Master's Degree, Post-Graduate) students, since each department assigns different amounts of workload. In addition, since the world is still affected by the COVID-19 and all of the classes are given online, it is also recommended to look into other factors excluded in this study, such as study area location and technology used for and software used in delivering online classes.

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