Study on the Effect of Video Conference on the Fatigue of Students Using one-way ANOVA and Regression Analysis

Abigail V. Malang
Undergraduate Student
Industrial Engineering
Department of Industrial Engineering and Engineering Management
Mapúa University
Intramuros, Metro Manila
malangabby29@gmail.com

Almarose C. Villapando
Assistant Professor
Industrial Engineering
Department of Industrial Engineering and Engineering Management
Mapúa University
Intramuros, Metro Manila
acvillapando@mapua.edu.ph

Abstract
The COVID-19 pandemic pushed for the sudden implementation of online classes; students were forced to work within a new adjustment to continue their education. The prolonged virtual life eventually led to the popularization of video conference fatigue, commonly known as Zoom fatigue. However, literature on the relationship between video conferences and fatigue is lacking. The researchers conducted a one-way ANOVA and regression analysis on data collected through a survey questionnaire in identifying the factors that has a significant effect over the fatigue of students attending online classes. In the failure, modes, and effect analysis, the results indicated that length of synchronous sessions, posture, and temperature are the factors that have a proven relationship with the types of fatigue, namely mental, physical, and physiological fatigue, are present during video conferences. Risk mitigation for the priority failure modes is limited to what could be controlled by education institutions and the availability of immediate resources to students, such as class schedules and meditated breaks. Future researchers should analyze fatigue quantitatively to understand the relationship between video conferences and fatigue.

Keywords
fatigue, video conference, online class, COVID-19 pandemic, students

1. Introduction
The COVID-19 pandemic brought about an unforeseeable change in society as the government restricted the general mobility of the public. It was done by enforcing public health measures such as quarantine of the infected and social distancing to minimize virus transmission (Anderson et al. 2020; Nussbaumer-Streit et al. 2020). In the Philippine setting, policies are divided into mass and granular types for the local and national government units, following the recommendation of the World Health Organization. These policies range from social distancing, mass testing, closure of public places, and wearing a face mask and face shield (World Health Organization, n.d.; Talabis et al. 2021).

In the adjustment of educational institutions to the enforced policies, traditional classes are replaced with online education as the learning process of a student cannot halt. Online learning is a type of learning that utilizes electronic devices and allows the student to control the pacing of their learning (Singh & Thurman 2019). According to Huang et al. (2020), online education is fully utilized to its total capacity if the elements of uninterrupted time for video conferences, user-friendly online tools, online platforms for interrelationship building, and diverse educational resources are present.

According to Suryaman et al. (2020), these stemmed from the working environment, such as weak technology literacy, high internet costs, and lack of interpersonal connection between classmates and teachers. In the study by Kapasia et al. (2020), similar results are seen in students' perspectives in remote and marginalized areas. It revealed that students continued their studies amidst mental health problems, uncontrollable poor internet connection, and an unfavorable home learning environment.

Video conference, informally known as a video call or video chat, is a type of online technology that allows meetings to happen without any physical exertion of moving to a single location altogether. It is conducted in various manners through built-in cameras in laptops, desktop computers, smartphones, and tables, with the help of software-based platforms that transmit the facility of communication through the internet (Kagan 2021). According to studies, it has been a key to creating a productive environment due to how video conferencing is a structure that provides an on-campus experience (Correia et al. 2020; Reaburn & McDonald 2017). In the increased use of video conferencing tools, video conference fatigue arose, with its effect aggravated by the existing issues of online learning (Bedenlier et al. 2021). Several studies define it as the feeling of being physically and mentally taxed due to the excessive use of virtual conference tools (Fosslien & Duffy 2020; Lee 2020; Strassman 2020).

Existing studies about the relationship between video conferencing and fatigue are few. The need for it to be studied only came to be when video conferences became a need during the COVID-19 pandemic. The researchers focused on the cause and effect of video conference fatigue of students enrolled in online classes due to the COVID-19 pandemic. Video conference characteristic included in the study scope is camera use, as studies have shown its relationship with fatigue. An assumption considered by the researchers is that students are assumed to have a specific space for learning, primarily with a desk wherein they work with a laptop or desktop. The study results benefit students of educational institutions conducting online classes in Metro Manila.

1.1 Objectives

The study is focused on contributing to the lack of academic research about the relationship between fatigue, video conferences, and academics. It shall be done by achieving the following objectives: 1. To identify the significant factors of video conferencing that affect students' fatigue during online classes. 2. To identify the significant effect of these factors on the video conference fatigue level 3. Create a mitigation plan to alleviate the fatigue of students using video conferencing during online classes.

2. Literature Review

2.1. Online Learning

Online learning has two types of modality implementation, namely synchronous and asynchronous. It is done simultaneously or alternative manner per the educational institution's academic calendar. Synchronous online learning is the working environment wherein the student and course teacher work together in real-time to facilitate classes. It is a structured type of online learning. It has scheduled live lectures with tasks outside of class time, done through video conference tools that allow simultaneous use of visual and audio functions between a group of people. The second type is asynchronous online learning, which focuses on self-study and assessments completed at a given time frame. It is done with the consensus of teachers that give feedback when needed, in line with the pacing of the educational institution curriculum (Scheiderer 2021; Correia et al. 2020). The majority favors synchronous online learning. It maintains a productive learning environment, primarily how video conference applications can provide a structure for an on-campus experience that plays an essential part in a student's learning experience (Correia et al. 2020; Reaburn & McDonald 2017).

In the study by Khalil et al. (2020), the efficiency of synchronous online learning was evaluated through a focus group that was given open-ended questions. The results showed that students are dissatisfied with their learning progress in an online education set-up, which contradicts a synchronous environment's positive point of view. It is said that the delivery of content for online learning is lacking in terms of how it cannot adequately address the objectives of hands-on practice, especially in higher education programs, even with the adoption of virtual laboratories. In a parallel study done by Day et al. (2021), observations of six institutions in three countries discovered that the adjustment to COVID-19 directly impacted a student's learning experience. The results revealed that the factors which affect a student's learning progress are the lack of appropriate devices, stress, poor home learning space, and lack of field and laboratory work.

For the study done by Wang et al. (2012), the relationship between internet use and the functional health of students was evaluated through a cross-sectional survey. The results showed that online learning risks a student's well-being, leading to a sedentary lifestyle. A sedentary lifestyle has an energy expenditure of 1.5 metabolic equivalent tasks. (Ainsworth et al. 2011). Developing a sedentary lifestyle has shown to be a public health concern as it is the leading cause of death and a origin of disability worldwide. It increases a person's risk for cardiovascular diseases, diabetes, colon cancer, breast cancer, lipid disorders, high blood pressure, depression, and anxiety (World Health Organization 2002).

2.2. Fatigue

These are fatigue types identified for students, namely physiologic, physical, mental, and eye fatigue (Schiffer Health Center, 2010). According to Brown and Schutte (2006), physiologic fatigue is an improper balance between lifestyle activities such as exercise, sleep, and diet. It is the reason the symptoms of this fatigue type are sleep issues, unchecked weight gain or loss, and lack of exercise (Schiffer Health Center 2010). The second type is physical fatigue, defined as the muscle's ability to perform at optimal condition temporarily halted. Symptoms of this fatigue include soreness, localized muscle pain, muscle cramps, and muscle twitching (Anthony 2018). The third is mental fatigue, defined by Bernstein et al. (2016) as a temporary issue that makes it hard for someone to focus or pay attention. This type of fatigue is complex as it includes a person's emotional, psychological, and social well-being. It is identified through detachment symptoms, lack of motivation, concentration difficulty, and headache (Santos-Longhurst 2021; Bernstein et al. 2016). Fourth is eye fatigue, prominent among students due to the online education modality. Eye Fatigue is defined by the symptoms experienced by individuals that perform visual tasks for an extended period. The symptoms of this fatigue type are headache, blurred or reduced vision, dry eyes, difficulty maintaining visual focus, and eye pain (Kaya 2020).

Countless factors induce fatigue, but commonly it is grouped into physical, mental, and environmental aspects. The physical element is about actions that directly impact the body. The third is the environmental aspect, wherein elements are found in the workspace. These are commonly known to be light intensity, temperature, and humidity. One study examined the relationship between light intensity, light exposure, and fatigue. It was seen that exposure to a lower light intensity for a short period leads to higher fatigue levels. For temperature and humidity, it was seen that maintaining a 49% relative humidity and temperature along 24 degrees Celsius is the optimal temperature, wherein an increase from this could immediately affect the fatigue felt. (Cowley et al. 2014; Lu et al. 2020; Liu et al. 2005; Liu et al. 2021).

The adverse effect of online classes is not limited to the physical elements but is highly influenced by elements related to the online environment. One study assessed the relationship between internet usage, fatigue, and pain levels through a survey and visual analog scale. The study showed that fatigue was dominantly felt visually and physically, focusing on the neck and shoulder regions. It has proved that online tasks have high visual and motor demands on the user, wherein the prolonged duration of internet use aggravates its effect. The pain level was seen prominently in the upper extremities, such as the neck, shoulder, and waist. In terms of the relationship between internet usage, fatigue, and pain, it was concluded that they have a significant relationship due to how fatigue and pain levels varied accordingly to the duration of internet use (Dol 2016). In a related study by Chawla et al. (2021), screen time on student well-being put students at risk for Digital Eye Strain. Electronic devices have shifted to entertainment, social communication, and education service due to the COVID-19 pandemic restrictions, leading to increased screen time for students. American Optometric Association (n.d.) defined digital eye strain as the symptom experienced after excessive use of digital devices. These range from eye problems such as watering, redness, foreign body sensation, and grittiness to related issues like eye ache, headache, and difficulty focusing. Digital Eye Strain also has systemic symptoms due to how one might have an improper posture during electronic device use, leading to body pain, sleep problems, and concentration issues.

2.3. Video Conference Fatigue

Current studies on the phenomenon known as zoom fatigue focus on employees, video conference elements, a general scale for measurement, and psychological theories. The study by Bennett et al. (2021) analyzed the nature of video conference fatigue, timing of video conference fatigue, and video conference characteristics that affect fatigue through a mixed-methods approach. The results revealed that video conference fatigue was a unique construct incomparable to other types. The event itself and video conference characteristics influenced the fatigue felt. It also showed that the time of day when video conference events happened impacted fatigue. The study results showed that fatigue was

highest during the midday period. The last point to be discovered is how sustained attention could affect the fatigue level through a basis on the Attention Restoration Theory. Kaplan (1995) defines the Attention Restoration Theory as exhaustion that could be felt by simultaneously maintaining attention and processing information. For video conference fatigue, the Attention Restoration Theory helps explain how video conference characteristics such as closing or opening the camera and microphone could affect fatigue due to the need for attentional resources.

For the study done by Shockley et al. (2021), the effect of camera use was seen through the engagement and voice of participants during meetings to the level of fatigue felt. The researchers focused on a theoretical standpoint on assessing video conference fatigue through the topic of self-presentation. Self-presentation is how a person wants to be seen and understood positively by others (Goffman 1959; Schneider 1981). It is a form of activity that considerably takes a large amount of cognitive energy, as it requires self-regulation of expressions and behavior (Vohs et al. 2005; Klotz et al. 2018). The self-presentation action has been identified as a precursor to fatigue and its related consequences (Johnson et al. 2018; van der Linden et al. 2003). In the study by Shokely et al. (2021), self-presentation was evaluated through a controlled experiment where the researchers monitored camera use. The study results showed that video conference occurrences with the camera significantly affected the fatigue felt by employees, mainly women and newly hired employees. The results align with the study done by Bailenson (2021), as it was seen that non-verbal cues take up a more significant amount of cognitive energy, leading to greater fatigue felt during video conferences. The study by Fauville et al. (2021) focused on developing a scale to understand video conference, video conference functions, and its effects of the video conference. The scale was created through one on one interviews and basis on existing fatigue scales. The scale went through numerous factor analyses to identify the significant elements. The final version included frequency, duration, attitude towards video conference, and five dimensions of fatigue from the multidimensional fatigue inventory.

3. Methods

The researchers of this study focused on identifying the significant factors that affected the video conference fatigue of students during their synchronous online classes. Figure 1 presents the diagram paradigm for achieving the study's objectives. As research on video conference fatigue is just a few, there is no existing data to be a starting point. A survey questionnaire must be formed based on related literature on students' fatigue and primary demographic data collection for the researchers to have a baseline foundation. The researchers will then process the collected data through descriptive statistics, one-way ANOVA, and Tukey-post hoc analysis. Descriptive statistics enables to see where most respondents are and one-way ANOVA with a Tukey-post hoc analysis to identify statistically significant factors. One-way ANOVA mainly identifies the statistically significant relationship between the dependent and independent variables. Tukey-post hoc analysis justifies which of the dependent variables largely contributes to the relationship (Laerd Statistics n.d.). Regression Analysis is then used to determine the strength of the identified relationship between statistically significant factors classified as statistically significant due to how it can estimate the influence of one variable on another (Alchemer 2021; Gallo 2015). The researchers used demographic, risk factors, and work environment as the independent variables and independent variables as fatigue types, namely physiological, physical, mental, and visual. After identifying the significant factors, a Failure, Modes, and Effects Analysis was done. It is a type of analysis that allows the researchers to have a basis for their risk mitigation plan that will allow institutions to protect the well-being of their students and other constituents. The Failure, Mode, and Effects analysis is a risk mitigation strategy that identifies the possible failures of a system, procedure, or manufacturing. It allows the researchers to have a factual basis for what recommendations could be implemented (Corrosionpedia 2017).

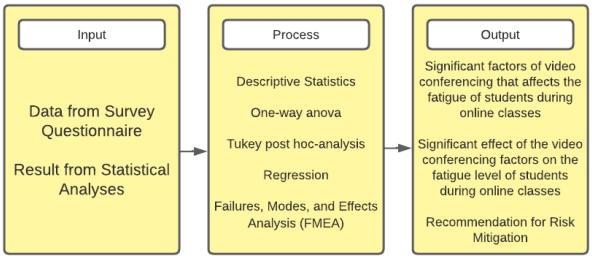


Figure 1. Input-Process-Output Diagram for Study Objectives

4. Data Collection

Research for the data is collected through online software that allows users to create surveys and quizzes wherein data is summarized through their in-house functions called google forms (Demarest 2021). The researchers shared the formulated survey questionnaire through social media applications such as Facebook, as it allows the gathering of data at a rapid pace from a diverse population (Schneider & Harknett 2022). Additional methods included the survey questionnaire posted on social media groups and personal pages, encouraging sharing of the post.

5. Results and Discussion

5.1 Numerical Results

Table 1 represents the summary of statistical results deemed significant in this case. Terms of air quality give an uncomfortable feeling during synchronous online classes due to the negative result of temperature (45.37%) and humidity (42.93%). According to several studies, air quality affects the essential skills of students as laboratory tests have shown that a poorly ventilated room with suboptimal temperature leads to poor cognition and decision-making skills (Seppanen et al. 2006; Fisk 2017; Du et al. 2020). In the study done by Park (2020), the extreme temperature greatly affected students' academic performance and well-being. For Bullough et al. (2006), humidity affects a student's vision due to its drying effect over the ocular eye surface. These related literatures justify the p-value generated from linear regression analysis with the relationship to physiological fatigue (p(temp)=.007; p(hum)=.005), physical fatigue (p(temp)=.005); p(hum)=.002), and mental fatigue (p(temp)=.002; p(hum)=<.001). The second statistically significant element is neutral posture factors, and initial results have shown that students are often in a proper posture during synchronous online classes. These are shown through the position of their feet (37.56%), back (33.17%), thighs (40.00%), arms (38.05%), and head (38.05)% which are connected in a mannerly order. It is presented to have a statistically significant relationship through the linear regression analysis with physiological fatigue (p(feet)=.222, p(head) = .199), physical fatigue (p(feet)=<.001, p(back)=<.001, p(thighs)=<.001, p(arms)=.002), and p(head)=<.001), mental fatigue (p(feet)=<.001, p(back)=.016, p(thighs)=.007, p(arms)=.012, and p(head)=<.001), and visual fatigue (p(back)=.013).

The results coincide with the study by Nair et al. (2015), wherein a relationship between negative mood and low self-esteem has a statistically significant association with bad posture. In a similar study by Wilkes et al. (2017), the relationship between how posture improvement could reduce negative affect and fatigue. The study was done through respondents with mild to moderate depression. They undergo a stressful task of creating a baseline and then repeating the task with an improved posture through physiotherapy tape. The results showed that an upright posture reduced negative affect and overall fatigue. For physical well-being, poor posture is recognized to put patients at risk for complications such as spinal dysfunction and joint degeneration (Better Health Chanel n.d.). In a related study by Lu et al. (2020), the effect of poor posture was analyzed through a physical experiment of strenuous activities. The findings show that poor posture significantly influenced the development of fatigue, wherein physical performance abilities were affected by it. In a comparable study by Jung et al. (2020), the relationship between participants' discomfort, fatigue, and prolonged sitting was evaluated. It was done through a controlled experiment wherein data came from the surface electromyography and borg category ratio scale. The experiment results showed that lower back discomfort was more significantly felt with people sitting in a slumped posture. In a study by Kripa and Kaur (2021), an in-depth understanding of the relationship between posture and lower back pain was done. The results showed that it is difficult to see the association between the two due to body structure differences; however, pain can lead to poor posture. Posture is associated with visual fatigue and neck pain, commonly known as "text neck syndrome."

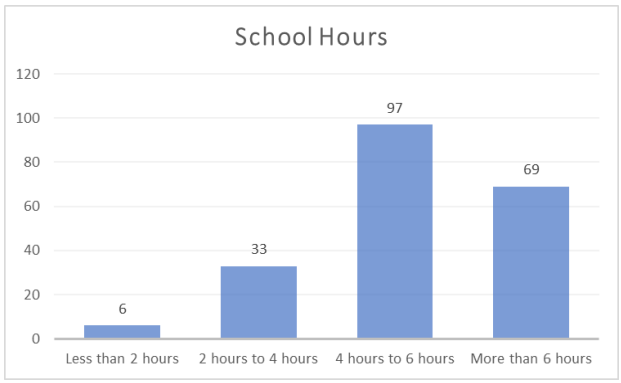
Table 1. Summary of Statistically Significant Results

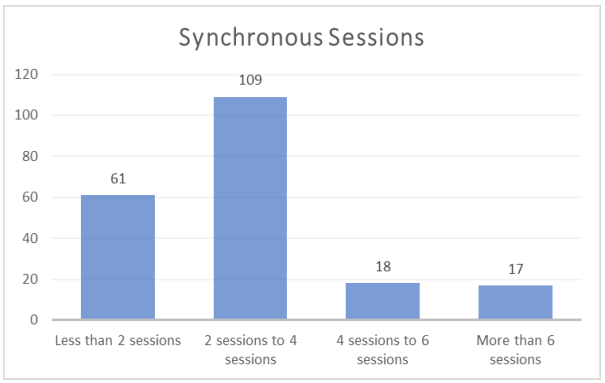
Variable		R	R-squared	Sig	B	
Visual Fatigue						
Neutral Posture	Back	.172	.030	.013	Constant	2.077
					Back	.132
Mental Fatigue						
Temperature		.212	.045	.002	Constant	2.417
					Temperature	.168
Humidity		.239	.057	<.001	Constant	2.352
					Humidity	.193
	Feet	.264	.069	<.001	Constant	2.382

Neutral Posture					Feet	.185
	Back	.169	.028	.016	Constant	2.503
					Back	.122
	Thighs	.189	.036	.007	Constant	2.488
					Thighs	.142
	Arms	.175	.031	.012	Constant	2.468
					Arms	.133
	Head	.275	.076	<.001	Constant	2.280
					Head	.210
Physical Fatigue						
Temperature		.196	.039	.005	Constant	2.370
					Temperature	.160
Humidity		.213	.045	.002	Constant	2.326
					Humidity	.176
Neutral Posture	Feet	.326	.106	<.001	Constant	2.195
					Feet	.234
	Back	.269	.072	<.001	Constant	2.231
					Back	.200
	Thighs	.280	.078	<.001	Constant	2.244
					Thighs	.216
	Arms	.211	.045	.002	Constant	2.314
					Arms	.164
	Head	.349	.122	<.001	Constant	2.050
					Head	.272
Physiological Fatigue						
Temperature		.187	.035	.007	Constant	2.167
					Temperature	.123
Humidity		.197	.039	.005	Constant	2.142
					Humidity	.132
Neutral Posture	Feet	.222	.049	.001	Constant	2.155
					Feet	.129
	Head	.199	.040	.004	Constant	2.139
					Head	.125

5.2 Graphical Results

Figure 2 represents students' screentime in a day that pertains to the baseline evidence on video conference fatigue as a real phenomenon among students taking up their education in an online set-up due to the COVID-19 pandemic. It shows that students' well-being is at risk because 97 respondents spend four to six hours in one day, which coincides with 109 respondents with two to four sessions. These are proven in a study done by Stiglic and Viner (2019), wherein a systematic review of related literature was done on the factors of body composition, energy intake, mental health, cardiovascular risk, fitness, sleep, pain, and asthma. It shows an extensive relationship between screen time and user well-being. The study results have shown a significant association between higher energy intake, unhealthy physical lifestyle, and depression issues with higher levels of screen time. In a related study by Maroof et al. (2019), the relationship between screen hours and digital eye strain was defined through the help of a descriptive cross-sectional survey. The results revealed frequent symptoms experienced were headaches, tired eyes, blurred vision, eye strain,





glare discomfort, and irritated and dry eyes. A statistically significant relationship between digital eye strain and screen hours was also revealed.

Figure 2. Screentime of Students in a Day

5.3 Proposed Improvements

The failure, modes, and effects analysis for the fatigue experienced by students during video conferencing for online classes are seen in Table 2. Elements placed in the control column or the indicator for the root causes are enrolled subjects, cooling devices, and workspace as it could identify the effect of synchronous session length, temperature, and student posture. Possible effect column that indicates the consequences of the failure mode was based on the collected literature about the types of fatigue considered for the study. Prioritization is based on severity, occurrence, and detection scores due to reduced accuracy if a risk priority number is repeated.

Table 2. Summary of Initial Failure, Modes, and Effects Analysis

Priority	Failure Mode	Possible Effect	Root Cause	Current Control	S	O	D	RPN	C
1	Mental Fatigue	Burnout	Temperature	Cooling	8	7	6	336	56
2	Physical Fatigue	Burnout	Feet (without 3rd level)	Workspace	8	6	9	432	48
3	Physiological Fatigue	Risk to physical health	Head (1st and 3rd level)	Workspace	6	6	9	324	36

Table 3 presents the mitigation plan for each prioritized identified risk. The risk mitigation that could be done is limited to the educational institution and the user's ability. In Table 2, the temperature is the root cause of mental fatigue that matches the highest scores. It cannot be a match to have a cool space; scheduling during peak average cool temperatures within Metro Manila suggests proper hydration and personal breaks. Physical and Physiological fatigue's root cause is a workspace, but modifying one's workspace does not apply to all as it largely depends on the resources. It is why the reason breaks and stretching could be scheduled in during classes or could be done by the user on their own.

Table 3. Risk Mitigation Plan for Priority Failure Mode

Identified Risk	Mitigation Plan	Category
Mental Fatigue	Schedule of Class Hours in Peak Cool Temperatures, Hydration	User, Educational Institution
Physical Fatigue	Stretching Exercises	User, Educational Institution
Physiological Fatigue	Movement Break	User, Educational Institution

5.4 Validation

Table 4 results from the post risk mitigation failure, modes, and effects analysis. It could be seen that the severity, occurrence, criticality, and detection scores are decreased, which leads to a lower risk priority number. A risk priority number percentage difference of 57.14% for priority one, 27.08% difference for priority two, and 30.56% difference for priority three. The cause for each failure mode is temperature, head position, and comfortability of feet. The first priority is Mental Fatigue, wherein the risk priority number decreased by 57.14%, with the application of scheduling classes in cool peak temperatures with proper hydration and personal breaks, an aspect that the educational institution and user could control. According to Armstrong (1998), if the fluids released by the body mechanism of sweat production are not replaced immediately, it can lead to a hypohydration state wherein a steady increase in body temperature will happen. As in a sedentary condition, sweat production can be 0.3 liter per hour, reaching dangerous conditions of 6 liters per day with extreme temperatures due to how this is dependent upon environmental temperature and humidity, activity level, and the clothing worn (Sawka et al.1998; Sawka et al. 2005).

Cooling devices are not controllable by the user and educational institution. It largely depends on the available resources, considering a mitigation plan for scheduling classes at cool peak temperatures. According to Means (2019), the day's highest temperatures generally happen from 3 to 4 in the afternoon due to how heat has built up since noon. The coolest temperatures happen between seven in the evening and seven in the morning. It puts into perspective scheduling classes during evenings and early morning to have a cool environment while keeping hydrated. For priorities two and three, a mandatory stretching exercise or movement break can be individually done by the user or scheduled during classes to ease the long-term risk of physical and physiological fatigue, leading to a 27.08% and 30.56% difference in the risk priority number. Recent studies have shown that most people have spent large enough of their time in a sedentary position due to the occupation as working conditions have shifted into taking up greater cognitive demands rather than physically (Ciccarelli et al. 2013; Jans et al. 2007; Katzmarzyk et al. 2009; Toomingas et al. 2007). The study was done by Ding et al. (2020) to measure muscle fatigue during sedentary movement and what time breaks should be scheduled to mitigate the prolonged risk, done with a preliminary survey and an electromyography measurement study. It has led to a result that after forty minutes of sedentary work, one should stand and stretch for five minutes, creating a time before fatiguing symptoms appear by thirty to forty-five minutes. The study done by Wennberg et al. (2015) compares the effects of uninterrupted and interrupted sitting time through a randomized two-condition crossover trial wherein blood pressure, heart rate, glucose, and self-report of fatigue are taken. The study results have concluded that walking breaks after prolonged sitting periods are an effective measure to counter fatiguing effects.

Table 4. Post Risk Mitigation Failure, Modes, and Effects Analysis

Failure Mode	Possible Effect	Root Cause	Current Control	S	O	D	RPN	C
Mental Fatigue	Burnout	Temperature	Cooling	6	4	6	144	24
Physical Fatigue	Burnout	Feet (without 3rd level)	Workspace	7	5	9	315	35
Physiological Fatigue	Risk to physical health	Head (1st and 3rd level)	Workspace	5	5	9	225	25

6. Conclusion

The researchers aimed to identify the significant factors of video conference fatigue and its effect, which put students at risk due to increased screen time, and how education has shifted into virtual mode due to the pandemic. In the initial analysis through one-way ANOVA and Tukey post hoc analysis, the factors of length of synchronous sessions, neutral posture elements, work environment temperature, and work environment humidity have a significant relationship with the types of fatigue considered. With this, the researchers have achieved the first objective of the study. For the study's second objective, the researchers did a linear regression analysis of the significant factors identified for objective one. It led to the result that some neutral posture factors significantly affect the four types of fatigue and the work environment temperature and humidity for physical, mental, and physiological fatigue. The failure, modes, and criticality analysis achieve objective three, showing that mental, physical, and physiological fatigue are the priority failure modes.

It has shown that educational institutions could mitigate the consequences of the risk through proper scheduling according to the weather and mandated breaks during class. The post risk mitigation failure, modes, and effects analysis have shown a significant decrease in risk probability through the risk priority number present in the second failure, modes, and effects analysis. The risk mitigation plan effect could significantly impact fatigue consequences, but educational institutions are limited to the availability of student resources considering the COVID-19 pandemic restrictions. Overall, the study has shown that the phenomenon of video conference fatigue should be seen as a threatening subject to every subject involved within the educational institution. It is recommended that future researchers who would tackle a similar study scope should employ methodological tools that are more complex. These could help in having a better understanding of fatigue levels wherein it could accurately give quantitative data. Future researchers could also expound on the current study by considering a more comprehensive number of factors by surveying a broader population, wherein more accurate elements will be counted for the final tests.

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Biographies

Abigail V. Malang is an undergraduate student undertaking a Bachelor of Science in Industrial Engineering at Mapua University. She undertook an internship under the Moment Group Incorporation that focused on data validation and analysis. Since the start of her college degree, she has actively participated as a member and officer in local and national school organizations such as the Philippine Institute of Industrial Engineers – Mapua Student Chapter and the Philippine Institute of Industrial Engineers – National Student Chapter. Her interests are operations research, project management, and quality improvement in the view of research. It is seen in the scientific publication of research with groupmates that focused on applying operations research in maximizing the use of public bus stops during the COVID-19 pandemic.

Alma Rose Chan-Villapando has over 20 years of relevant working experience in various fields of Industrial Engineering, including Methods and Systems Engineering, Work Measurement and Improvement, Compensation Administration, Operations Management, Productivity & Quality Management, and Value Engineering and Analysis. A Professor in the School of Industrial Engineering - Engineering Management of Mapua University, Alma obtained her Bachelor's degree in Industrial Engineering (Rank 1) and Master's in Engineering Management (Magna Cum Laude) from Mapua Institute of Technology. On the side, Alma is involved in a no. of consultancy works with various companies, including construction, undergarments, logistics with engagement dealing with Process Review and Improvement, Compensation and Benefits, Productivity and Quality Improvement, to name a few. She is a certified Professional Industrial Engineer as conferred by the Philippine Institute of Industrial Engineers (PIIE).