

Physical, Mental, and Emotional Fatigue Experienced by IT Students During Covid-19 Pandemic

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Abstract

The 2019 Coronavirus Disease (COVID-19) pandemic has significantly affected Malaysia's higher education sector. It also creates an incentive for the restoration of the school sector and the establishment of revised programmes and evaluations. Higher learning institutions begin to embrace virtual learning which forces the students to adopt new types of learning in a short period. This research paper presents an empirical investigation of physical, mental and emotional fatigue experienced by undergraduate Information Technology (IT) programme students during the COVID-19 pandemic. A set of questionnaires was developed using the ZEF Scale focusing on physical, mental and emotional fatigue. To validate the questionnaires, the item questions were administered by the three education technology domain experts, from the Computing Department, Faculty of Arts, Computing, and Creative Industry (FSKIK), Universiti Pendidikan Sultan Idris (UPSI). This study involved a total of 230 undergraduate students from the IT program. The responders were administered with the questionnaire using Google Form. The collected data had been analysed using descriptive analysis with frequency and percentage, correlation analysis with frequency and percentage, validity, and reliability of each question. The Pearson correlation (r) demonstrated that the study was significant. The majority of undergraduate IT programme students were experiencing physical fatigue ($r=0.984$), emotional fatigue ($r=0.965$) and mental fatigue ($r=0.937$) while attending classes virtually. Thus, with this study, we support the notion that the undergraduate IT programme students were experiencing physical, mental and emotional fatigue while attending the classes online during the COVID-19 pandemic.

Keywords: physical fatigue; mental fatigue; emotional fatigue.

INTRODUCTION

The 2019-novel COVID-19 was first discovered from the Wuhan market in China on January 7, 2020. Pneumonia, colds, sneezing, and coughing are all symptoms of the disease. Due to pandemic situations, many countries resort to full lockdown; yet, we cannot ignore the influence on education, as the traditional education that is provided to kids has now been completely shut down everywhere because of lockdown (Jadhav et al., 2020). Malaysia has temporarily closed down the schools, universities and colleges, as well as the cancellation of exams. Millions of pupils have been placed in temporary 'home schooling' as a result of these choices. These nationwide closures are impacting over 91% of the world's student population (Xudong & Jing, 2020). The changes were uncomfortable, nevertheless, they also provided fresh opportunities for educational innovation (Zhang et al., 2020).

The quick growth of Zoom, a virtual conferencing app, from about 10 million daily Zoom meeting attendees in December 2019 to 200 million in March 2020 and 300 million in April 2020 is a perfect illustration for the above statement (Evans, 2020). Staying on a video conference all day seems extremely exhausting and the phrase Zoom Fatigue has quickly gained traction (Bailenson, 2021). This study is mainly to identify the physical, mental and emotional fatigue experienced by undergraduate IT programme students while attending the classes virtually. The rating scale development process is adopted from the three phases by Boateng et al. (2018) which includes; (i) item development, (ii) scale development, and (iii) scale evaluation. This research paper uses only six steps to conduct this study. The remaining three items were not appropriate for this study because they were more related to an interview-based survey. Table 1 shows the rating scale development overview of six steps that were referred to in this research.

Table 1: Rating scale development overview: Six steps across the three phases

Phase	No.	Step
1. Item Generation	1	1.1 Domain identification
		1.2 Item generation
2. Scale Development	2	Content validity
	3	Pre-testing questions
	4	Survey administration and sample size
3. Scale Evaluation	5	Tests of reliability
	6	Test of dimensionality & validity

BACKGROUND OF STUDY

The Centers for Disease Control and Prevention is monitoring an outbreak of COVID-19, a respiratory illness caused by a new virus. At the end of March 2020, China had more than 80,000 cases of Coronavirus, and the virus had infected more than 750,000 people around the world (Budholiya et al.,

2020). It spreads from person to person by airborne droplets (WHO, 2020). The World Health Organization (WHO) and the European Centre for Disease Prevention and Control (ECDC) urged people to avoid public places and close contact with infected people and animals (Patil & Naqwi, 2020).

Several announcements have been made in a few weeks after the outbreak of COVID-19 in Malaysia, regarding the prohibition of student attendance at schools and colleges, as well as the cancellation of exams (Zaid & Almarzooq, 2020). Millions of pupils have been placed in temporary homeschooling as a result of these choices, which were made to address the situation. These nationwide closures are impacting over 91% of the world's student population (Xudong & Jing, 2020).

The unexpected transition from classroom teaching to online education is a challenge both for faculties and learners, and a great deal of preparation and effort is needed in a short time (Patil & Naqwi, 2020). This epidemic has caused recent changes and disruptions in the educational sector, which is a catalyst for any nation's progress. To mitigate the impact of the pandemic, the educational sector appears to be leaning toward online learning globally (Adeoye, 2020). As a result, the virtual classes and meetings went from being a novelty to becoming a necessity.

Applications like Zoom have proven to be an invaluable tool for productivity, learning and social contact. (Fauville et al., 2021). However, staying on a video conference all day seems extremely exhausting and the phrase Zoom Fatigue has quickly gained traction (Nadler, 2020). However, there is a lack of academic study on the psychological consequences of virtual learning. Deemah et al. (2020), in his research, stated that there are currently no studies that have assessed stress among students during the quarantine related to the COVID-19 pandemic.

LITERATURE REVIEW

Malaysia has become one of the education hubs in South-East Asia drastically transforming from traditional learning into online learning during the pandemic. In most private colleges and universities, the conventional form of face-to-face engagement which is also known as traditional learning has steadily shifted to online learning (Crawford et.al, 2020). Online learning or also known as virtual learning, is the new trend of schooling mainly to facilitate this expansion. The instructors, students, and parents were given free access to portable paper archives of all textbooks for all classes (Cho & Hong, 2021). Conversely, the most critical thing in this regard was that Internet quotas for students were inadequate to attend live lessons and download lesson materials (Bhakti & Wandy, 2020).

Another significant problem, online courses require a great deal of time and intensive work for many adults to assist their kids. For these learners, a regular schedule planner would be a significant aid. On the other hand, students have to find their motivation to follow the new trends in education. Only a positive attitude can help them to overcome online learning's challenges, and online learning is an essential requirement for self-motivation.

Zoom Fatigue

The term Zoom Fatigue refers to the fatigue experienced during or after video conferencing with any platform, such as Microsoft Teams and Google Meet (Fauville et al., 2021). For synchronous education, Zoom has become the premier academic teaching and learning tool. Viewers were frequently distracted while gazing at their screens by happenings in their environment, notifications from smartphones, social media, and email (Erik, 2021).

This paper used Google Meet as an example for synchronous online teaching. Fatigue is described as the inability to initiate or maintain voluntary activity. It can be in the form of physical or mental (Watanabeab, 2012). Moreover, Jorunn et al. (2007), in their research claims that fatigue is a vaguely characterized symptom related to chronic disorders, that can significantly impair everyday functioning. Self-reported fatigue is characterized by a sense of exhaustion, low energy, and diminished muscle strength. Other than that, fatigue is also linked to muscle fatigue, which is defined as a reduction in muscle performance after repetitive or continuous stimulation. It can be just as incapacitating as pain, is difficult to control, and has a significant influence on one's quality of life (Overman et al., 2016).

Many chronic diseases have fatigue as a symptom. It is defined as a feeling of extreme exhaustion, usually caused by mental or physical exertion or disease (Stebbing & Treharne, 2010). This linguistic definition of exhaustion is significant since it is likely to shape a person's perception of the ailment. Several documented definitions of fatigue were described by Watanabeab, (2012), including the comprehensive definition of fatigue which incorporates total body feelings, ranging from tiredness to extreme exhaustion.

Physical Fatigue

The physical, physiological, emotional and social health of youth can be adversely affected by improper use of technology. Technology makes it possible for humans to communicate without spatial limits, makes operations more productive, and complements the human brain's intelligence and effectiveness. Young adults are more vulnerable to these potentially harmful consequences than young children because their sensory and motor systems are not accustomed to technology's physically sedentary and emotionally chaotic existence (Halupa, 2016).

Mental Fatigue

The restrictions exerted during the pandemic caused tension, anxiety and anticipation in children. Digital technology, capability and expertise vary, impacting their adaptation to distance education. To increase their equipment and capacity, universities should take steps. Practical preparation, laboratory research, and applied research have been disrupted. The pressure on university personnel to provide distance learning has also impacted the standard of education (Samuele et al., 2009).

Emotional Fatigue

Negative and positive effects are the two primary qualities of emotional experience (Overman et al., 2016). Positive affect scores have a normal distribution between individuals, with scores spanning a wide range of moderate values. Negative affect scores, on the other hand, tend to cluster together in a narrow range of low values. This is because negative affect scores do not seem to fluctuate within people, but rather tend to stay at a low level. Mental exhaustion is a psychobiological condition brought on by prolonged durations of mentally taxing activities. The impact of mental tiredness on cognitive and skilled performance is well understood, but its impact on physical performance has yet to be fully examined. This mental exhaustion or fatigue is a state defined by subjective feelings of tiredness and loss of energy generated by prolonged periods of intensive cognitive effort.

Virtual Learning and Fatigue

Suicide is the biggest cause of mortality among young people all over Malaysia. Between March 18 and October 30, the Malaysian Government Movement Control Order (MCO) which is a series of national quarantines, created during the Covid-19 epidemic witnessed 266 suicide cases (Menon, 2021). Moreover, suicide is the most common cause of death for young people under the age.

For example, on the 9th January 2021, The Star reported that a student at Universiti Sains Malaysia (USM) committed suicide and her body was discovered by her parents beside a cupboard in her room at 6 a.m. Forensic evidence of the woman's death has been ruled out by police. It was widely considered that she decided due to academic pressure (Chua, 2021).

On the other hand, recently in Malaysia, on the 11th July 2021, in the wake of the tragic deaths of two students at Universiti Malaya, the students' union has urged for a reduction in student workloads. The union claimed that online learning has harmed university students' mental health. Meanwhile, Universiti Teknologi Mara (UiTM) had two students who died recently. One of them is thought to have died as a result of the stress of having to go through online learning (FMT Reporters, 2021).

RESEARCH METHODOLOGY

PHASE 1: ITEM GENERATION

Step 1.1 - Domain Identification

According to Lexico (2021), the word domain here indicates an area of knowledge or activity. The first step is to define the domain that a study is attempting to quantify. The concept, trait, or unobserved behaviour that is the study's focus is referred to as a domain or construct. This chapter reflects the background of this study which establishes the context of the research.

Step 1.2 - Domain Identification

The item pool can then be recognised once the domain has been defined. This is also known as question development (Raykov & Marcoulides, 2011). There are two ways to identify appropriate questions: inductive and deductive methods. Inductive reasoning moves from specific observations to broad generalizations, and deductive reasoning the other way around. Other than that, inductive reasoning aims at developing a theory while deductive reasoning aims at testing an existing theory.

This study was carried out by using a deductive method, which is also known as logical partitioning. It was based on the description of the relevant domain and the identification of items. This can be done through literature review and assessment of existing scales. The study used the existing scale which is known as ZEF Scale, to prepare the questionnaire (Fauville et al., 2021). A collection of typed or written questions conceived for a survey or mathematical study is considered a questionnaire with a choice of answers. The questionnaire was given to the respondents via Google Form. The questionnaire was sent to check validity and reliability before being given to the targeted respondents to answer.

In the initial part of the research, three Information Technology (IT) experts in the field of education technologists from FSKIK, UPSI were consulted to check on the questionnaire validity. Validity is the degree to which an instrument calculates and does what it is supposed to measure as expected, while accuracy can be regarded as reliable. In this study, the questionnaire was divided into four parts, which is Part A, Part B, Part C and Part D. The demographic information such as the respondents' age, gender, semester, and so on were asked in Part A. The next part, which is Part B was about physical fatigue which consisted of six questions, Part C is for collecting information about mental fatigue, which consisted of six questions, while Part D focused on mental fatigue they had experienced while attending classes virtually with six questions respectively.

Responses with only two to three points are deemed less reliable than those with five to seven points on a Likert-type response scale. For unipolar items, such as those expressing relative degrees of a single item response quality, such as not at all satisfied to very satisfied, response scales with five points are recommended (Edward et al., 2013). All the questions in the questionnaire were in direct form and the respondents were given multiple-choice to pick up one for Part A and Part B. 'Likert' scale answers also provided for the Part C and Part D. Likert scaling is a form of bipolar scaling, calculating a statement's either positive or negative answer (Albaum, 1997). Often a seven-point scale is used where there is no middle choice of "neither agree nor disagree" This is often referred to as a form of "forced choice" because the neutral alternative is excluded. There is also an advantage to the questionnaire. That is once it is produced it can provide a vast amount of information.

Step 2 - Content validity

Content validity was the second step from the first phase. The adequacy with which a measure analyses the domain of interest is referred to as content validity, often known as theoretical analysis (David et al., 2018). If the items were supposed to measure what they were supposed to assess, content adequacy

becomes critical. Content validity also stipulates content relevance and content representations, i.e., that the items capture the relevant experience of the target population under study.

The questionnaire was prepared and administered to three IT experts in the field of education technology from FSKIK UPSI. Expert judges were well-versed in the topic of interest and/or scale development, while target population judges are potential scale users (David et al., 2018). Each item was judged by experts to see if it represents the subject of interest correctly. Expert judging might be done in a systematic way to eliminate bias in item evaluation. Experts should be separated from those who created the item pool, according to the expert judge. Following experts' checks, the questionnaire, the number of questions on each part was reduced due to being quite irrelevant to the study. Table 2 shows the number of questions reduced after the expert validation.

Table 2: Number of questions after expert validation

Part	Question	Number	Number after reduced
A	Demography	5	5
B	Physical Fatigue	7	5
C	Mental Fatigue	7	4
D	Emotional Fatigue	7	5

PHASE 2: SCALE DEVELOPMENT

Step 3 - Pre-testing questions

The pre-testing question was the third step which was from Phase 2. It helps to ensure that items were meaningful to the target population before the survey can be administered. Pre-testing eliminated poorly worded items and facilitates revision of phrasing. It also served to reduce the cognitive burden on research participants. This study conducted a pilot study to Pre-Test the questionnaire before administering it to the targeted respondents.

Pilot study

A pilot study is a short feasibility study that is used to test different components of the methodologies that have been used in a bigger, more rigorous, or confirmatory investigation. This could also be referred to as a scaled-down version of a full-scale study or a trial run conducted before the full study (Gillet, 2017). According to David et al. (2018), there are two types of sample size guidelines: flat and stepped. A single number is recommended for every case as a simple rule of thumb. The number '30,' for example, is extremely popular. Other than that, Isaac and Michael (1995) recommended 10 to 30 participants; Hill (1998) also recommended 10 to 30 participants. So, in this pre-test of the question, 20 undergraduate students took part in an information technology programme from FSKIK.

All of them were from Semester 2. Of the total of 20 participants, 16 of them were female and four of them were male (80% female, 20% male). The number of students who were between the age of 18 to 20 was four which was equal to 20%, while the rest (80%) were between the age of 21 to 23. A total of three of them (15%) were having classes once a day while the rest (n=17, 85%) were having classes multiple times a day. After that, eight of them (40%) agreed that they spent two hours for each class they attended virtually, eight of them, (40%) spent more than three hours and the rest (n=4, 20%) of them spent less than an hour for each class. As this pilot study focussed more on testing the validity and reliability of the questionnaire, Table 3 below shows the reliability while Table 4 shows the validity of each item used in the questionnaire of the *pilot* study.

Table 3: Reliability for each question of Pilot Study

Items	Mean	Std. Deviation	Question
Q1	2.9000	0.91191	I was exhausted after attending a virtual class.
Q2	3.2000	0.76777	My back hurts after attending a virtual class.
Q3	2.6500	1.03999	I often get a headache after attending virtual classes.
Q4	2.6000	1.27321	My neck hurts after attending a virtual class.
Q5	2.4500	0.99868	My body feels tired after attending virtual class.
Q6	3.2000	1.36111	I felt mentally drained during attending virtual classes.
Q7	2.4000	1.31389	My thoughts easily wander while attending virtual classes.
Q8	2.4500	1.39454	I need to give a lot of effort to concentrate on my next tasks in virtual classes.
Q9	3.6000	0.99472	I cannot concentrate well in my virtual classes.
Q10	3.2500	0.96655	I feel emotionally drained.
Q11	2.9000	0.91191	I felt irritable after attending a virtual class.
Q12	3.2000	0.76777	I felt moody after attending a virtual class
Q13	2.6500	1.03999	I felt not excited to learn from the virtual class.
Q14	2.6000	1.27321	I felt unhappy to learn from the virtual class.

Table 4: Validity for each question of Pilot Study

Questions	Cronbach's Alpha if item deleted	Question	Cronbach's Alpha if item deleted
Q1	0.947	Q8	0.946
Q2	0.948	Q9	0.953
Q3	0.950	Q10	0.950
Q4	0.949	Q11	0.947
Q5	0.949	Q12	0.948
Q6	0.946	Q13	0.950
Q7	0.948	Q14	0.949

According to the results given in Table 3 and Table 4, the *Cronbach's Alpha* (CA) for the whole item used in this pilot study was 0.952, and it demonstrates a very good internal consistency. It is also considered as excellent reliability. Then the validity of each question was calculated. The result showed that the CA for each question was above 0.9 which indicate that each of the questions was valid. Then

the reliability of each question was also checked, to measure the accuracy, precision and consistency of each question.

Step 4 - Survey administration and sample size

This was the fourth step which was from Phase 2, the scale development. The goal of this study was to reduce the number of items and verify it by suggesting a structural model using *Confirmatory Factor Analysis* (CFA). The finalised questionnaire was administered to the whole undergraduate IT programme students. Even the targeted respondents were 186, but the study collected a total of 230 respondents.

The raw data were processed using *Statistical Package for the Social Sciences* (SPSS) software to analyse. To answer the research questions, the gathered data would be used. Data analysts can use descriptive statistics to interpret the data. Descriptive statistics are brief descriptive coefficients that summarise a given collection of data that may be either a population as a whole or a sample representative. Descriptive statistics are divided into measures of core trend and measures of heterogeneity (spread). For SPSS software was used to find the mean, median and mode of the respondent answer. Then the software was also used to find the *Confirmatory Factor Analysis* (CFA), *Cronbach's alpha* (CA) and correlation among the questions.

DATA ANALYSIS

Demography

The total number of respondents was 230. There were a total number of 135 (59%) respondents of female students and 95 (41%) were male students. A total of 14 (6%) respondents were between the age of 18 to 20. Only 12 (5%) of the total respondents were from the age of 24 and above. The majority of the students which was 204 respondents (89%) were from the age of 21 to 23. Most of the respondents were from semester six, which was 35.7%, (n= 82), followed by semester two, which was 30.0% (n= 69), semester four, which was 20.4% (n=47), and semester seven, which was 13.0% (n=30). The least of the students were from semester five, which was 0.9% (n=2). A total of 77% (n=178) respondents were having virtual classes multiple times a day, while only 23% of the respondents (n= 52) were having classes once a day. The majority of 72% (n= 166) respondents spent two hours for each class, while the rest of the respondents, which was 28% (n= 64) spent two hours and above for each class.

Physical Fatigue

Based on Table 5, shows that, for Item Q1, the majority of 93 (40%) respondents agreed that they were exhausted and 91 (39%) of the respondents strongly agreed to the statement. Only 46 (20%) respondents felt neutral about this statement. The same goes for Item Q2. The majority of 114 (49.6%) respondents agreed that they had back pain after attending classes virtually, 91 (39.6%) of respondents

strongly agreed to that statement, and only 25 (10.9%) respondents felt neutral. For Item Q3, a total of 93 (40.4%) respondents agreed that they had headaches after attending classes virtually, 91 (39.6%) respondents strongly agreed, and 35 (15%) of the respondents felt neutral. Only 11 (4.8%) respondents disagreed with this statement. For Item Q4, a total of 117 (50.9%) respondents agreed that their neck hurt after attending classes virtually, 91 (39.6%) of the total respondents strongly agreed, and only 22 (9.6%) of them felt neutral to this statement. The majority of 94 (40.9%) respondents agreed to Item Q5, which was their body felt tired after attending classes virtually. A sum of 91 (39.6%) respondents strongly agreed, 34 (14.8%) respondents felt neutral and only 11 (4.8%) of the whole respondents disagreed with that statement. No one respondent strongly disagreed with any of the questions indicating their physical fatigue while attending classes virtually. The frequency and percentage of responses gathered from the respondents for experiencing physical fatigue was shown in Table 5 below.

Table 5: Frequency and percentage of research objective 1 (RO1)

Item	Physical Fatigue	SD	D	N	A	SA
Q1	I was really exhausted after attending virtual class.	0	0	46 (20%)	93 (40%)	91 (39%)
Q2	My back hurts after attending a virtual class.	0	0	25 (10.9%)	114 (49.6%)	91 (39.6%)
Q3	I often get a headache after attending virtual class.	0	11 (4.8%)	35 (15.2%)	93 (40.4%)	91 (39.6%)
Q4	My neck hurts after attending a virtual class.	0	0	22 (9.6%)	117 (50.9%)	91 (39.6%)
Q5	My body feels tired after attending virtual class.	0	11 (4.8%)	34 (14.8%)	94 (40.9%)	91 (39.6%)

Mental Fatigue

Table 6 shows that, for Item Q6, a total of 104 (45.2%) of respondents agreed that they felt mentally drained while attending classes virtually, 91 (39.6%) of them strongly agreed to that statement, and only 35 (15.2%) respondents felt neutral. For Q7, the majority of 105 (45.7%) respondents agreed that their thoughts easily wandered while attending classes virtually. A total of 102 (44.3%) respondents strongly agreed, 12 (5.2%) respondents felt neutral, and only 11 (4.8%) respondents disagreed with that statement. For Item Q8, about 104 (45.2%) respondents agreed, 91 (39.6%) of them strongly agreed, 23 (10%) respondents felt neutral, and 12 (5.2%) respondents disagreed with the statement that they gave a lot of effort to concentrate on next tasks in virtual classes. For the Q9, the majority of 91 (39.6%) respondents strongly agreed that they cannot concentrate well in their virtual classes, 81 (35.2%) respondents agreed to that statement and 58 (25.2%) respondents felt neutral to that statement. No one student strongly disagreed with any of the questions indicating their mental fatigue while attending classes virtually. The frequency and percentage of responses gathered from the respondents for experiencing mental fatigue was shown in Table 6 below.

Table 6: Frequency and percentage of research objective 2 (RO2)

Item	Mental Fatigue	SD	D	N	A	SA
Q6	I felt mentally drained during attending virtually classes.	0	0	35 (15.2%)	104 (45.2%)	91 (39.6%)
Q7	My thoughts easily wander while attending virtually classes.	0	11 (4.8%)	12 (5.2%)	105 (45.7%)	102 (44.3%)
Q8	I need to give a lot of effort to concentrate on my next tasks in virtual classes.	0	12 (5.2%)	23 (10%)	104 (45.2%)	91 (39.6%)
Q9	I cannot concentrate well in my virtual classes.	0	0	58 (25.2%)	81 (35.2%)	91 (39.6%)

Emotional Fatigue

Based on Table 7, shows that the majority of 91 (39.6%) respondents strongly agreed that they felt emotionally drained, 82 (35.7%) respondents agreed, followed by 23 (10%) respondents who felt neutral and 34 (14%) respondents who disagreed with that statement. For Item Q11, the majority of 109 (47.4%) respondents agreed that they felt irritated after attending virtual classes, 92 (40%) respondents agreed, 13 (5.7%) respondents felt neutral and a minority of 16 (7%) respondents disagreed with that statement. For Item Q12, the majority of 92 (40%) respondents agreed that they felt moody after attending virtual class, followed by 91 (39.6%) respondents strongly agreed, and 47 (20.4%) respondents felt neutral. A total of 104 (45.2%) respondents agreed that they were not excited to learn from virtual classes, 102 (44.3%) respondents strongly agreed, 12 (5.2%) respondents felt neutral and 12 (5.2%) respondents disagreed with that statement. No one student strongly disagrees with any of the questions that indicate their emotional fatigue while attending classes virtually. The frequency and percentage of responses gathered from the respondents for experiencing emotional fatigue was shown in Table 7 below.

Table 7: Frequency and percentage of research objective 3 (RO3)

Item	Emotional Fatigue	SD	D	N	A	SA
Q10	I feel emotionally drained.	0	34 (14.8%)	23 (10%)	82 (35.7%)	91 (39.6%)
Q11	I felt irritable after attending a virtual class.	0	16 (7%)	13 (5.7%)	109 (47.4%)	92 (40%)
Q12	I felt moody after attending virtual class	0	0	47 (20.4%)	92 (40%)	91 (39.6%)
Q13	I felt not excited to learn from the virtual class.	0	12 (5.2%)	12 (5.2%)	104 (45.2%)	102 (44.3%)
Q14	I felt unhappy to learn from the virtual class.	0	0	34 (14.8%)	105 (45.7%)	91 (39.6%)

PHASE 3: SCALE EVALUATION

Step 5 - Test of reliability

Test of reliability was the fifth step from the third Phase, which was the scale evaluation. Step five aimed to assess the internal consistency of the revised version of the ZEF scale using independent samples.

Table 8: Cronbach’s Alpha of each research objectives

No	Dimension	Cronbach’s Alpha	No of Items
1	Overall	0.985	14
2	Physical Fatigue	0.968	5
3	Mental Fatigue	0.954	4
4	Emotional Fatigue	0.954	5

The Cronbach’s Alpha (CA) were calculated for each of the three constructs of fatigue. The reliability for each construct was above 0.95 (physical fatigue: $\alpha = 0.968$, mental fatigue: $\alpha = 0.954$, emotional fatigue: $\alpha = 0.954$). The overall Cronbach’s Alpha of all those 14 items showed high reliability of 0.985, which was excellent reliability. While 0.8 to 0.9 is very good reliability, 0.7 to 0.8 is considered as good reliability, 0.6 to 0.7 is moderate reliability, less than 0.6 is usually considered as poor reliability.

Step 6 - Test of dimensionality and validity

Test of dimensionality and validity was the sixth step from the third Phase. It aimed to assess the internal consistency of the revised version of the ZEF scale. Based on Table 9, shows the descriptive statistics, factor loading and Cronbach’s Alpha (CA) of each research question.

Table 9: Descriptive statistics, factor loading, and CA of the research question.

Fatigue	Items	Factor Loading	Alpha	Mean	SD
Physical Fatigue	Q1	0.979	0.983	4.1957	0.74820
	Q2	0.957	0.984	4.2870	0.65104
	Q3	0.882	0.985	4.1478	0.84877
	Q4	0.930	0.984	4.3000	0.63487
	Q5	0.905	0.984	4.1522	0.84542
Mental Fatigue	Q6	0.906	0.984	4.2435	0.70048
	Q7	0.898	0.984	4.2957	0.77599
	Q8	0.928	0.984	4.1913	0.81894
	Q9	0.970	0.983	4.1435	0.79371

Emotional Fatigue	Q10	0.940	0.984	4.0000	1.04485
	Q11	0.896	0.984	4.2043	0.83430
	Q12	0.952	0.983	4.1913	0.75224
	Q13	0.817	0.986	4.2870	0.79039
	Q14	0.965	0.983	4.2478	0.69582

The *Standard Deviation* (SD) of this descriptive statistic range was from 0.7 and 1.0 and all their mean values were above 4.0. Factor analysis was also performed to measure the convergent validity of the research questions on whether undergraduate IT programme students were experiencing physical, mental and emotional fatigue from attending classes virtually during the COVID-19 pandemic. Past researchers suggest that 0.5 is a valid value of factor loading for each item. Table 9 above shows the factor loading on each question asked in the questionnaire and the result shows that all the factors loading were above 0.7 which mean a good convergent validity. Table 10 shows the mean and *Standard Deviation* (SD) of all the research objectives. Other than that, it also shows the bivariate correlation among the three research objectives.

Table 10: Means, SD, Bivariate correlation among the score and 3 constructs of research objectives.

		Score	RO1	RO2	RO3	Mean	SD
Score	Pearson Correlation	1					
	Sig. (1-tailed)					58.8870	10.08459
	N	230					
RO1	Pearson Correlation	0.978**	1				
	Sig.(1-tailed)	.000				21.0826	3.53364
	N	230	230				
RO2	Pearson Correlation	0.988**	0.950**	1			
	Sig.(1-tailed)	.000	.000			16.8739	2.89959
	N	230	230	230			
RO3	Pearson Correlation	0.984**	0.937**	0.965**	1		
	Sig.(1-tailed)	.000	.000	.000		20.934	3.82413
	N	230	230	230	230		

**Correlation is significant at the 0.01 level (1-tailed).

Note. The score is average scoring of 14 items.

The simplified result was shown in Table 11. From the table below, the result of Pearson Correlation between all three objectives showed that the test was significant. The correlation value for the research objective 1 (RO1) which was used to identify the physical fatigue experienced by undergraduate IT programme students by attending classes virtually during COVID-19 Pandemic, showed the value of $r=0.984$. Research objective 2 (RO2) which was to identify the mental fatigue experienced by undergraduate IT programme students by attending classes virtually during COVID-19 Pandemic, showed the value of is $r=0.937$ and research objective 3 (RO3) that was to identify the emotional fatigue experienced by undergraduate IT programme students by attending classes virtually during COVID-19 Pandemic, showed the value of $r=0.965$. The Pearson Correlation of RO1 showed the highest value, indicating students were experiencing Physical Fatigue, followed by Emotional Fatigue and Mental Fatigue. Significant value, $p = 0.00$ or $p \leq 0.05$ which is highly significant. Table 11 shows

that the p -value of all the research objectives was ≤ 0.01 . Therefore, this study answered the research question by giving a significant result on whether the undergraduate IT programme students were experiencing physical, mental and emotional fatigue during the COVID-19 pandemic by confirming that the undergraduate IT programme students were experiencing physical fatigue, followed by emotional fatigue, and lastly mental fatigue.

Table 11: Simplified table of correlation

Variable	p -value	r-value	Mean	SD
RO1	≤ 0.01	0.984	21.0826	3.53364
RO2	≤ 0.01	0.937	16.8739	2.89959
RO3	≤ 0.01	0.965	20.934	38.82413

DISCUSSION OF FINDINGS

This study was conducted to see the physical, mental and emotional fatigue experienced by undergraduate IT programme students during the COVID-19 pandemic. The questionnaire was created using the ZEF scale and went through expert validation and pilot study before administering it to the targeted respondents who were the undergraduate IT programme students from FSKIK, UPSI. The obtained data were analysed using descriptive analysis with frequency and percentage. Besides descriptive statistics, the data analysis also includes factor loading, and CA of each research objective. Moreover, the means, SD, bivariate correlation among the score and three constructs of research objectives was also explained to answer the research question. To answer the research question, this chapter focuses on three primary topics of research objectives:

Research question - Do undergraduate IT programme students are experiencing physical, mental and emotional fatigue while attending virtual classes during the COVID-19 pandemic?

Table 12 shows the mean of every question on research objective 1. The results indicated that most of the students strongly agreed to each of the questions because the mean value of each question was above 4.0 showed that the undergraduate IT programme students were experiencing physical fatigue.

Table 12: Overall mean and status of research objective 1 (RO1)

Q	Mean	Status	Overall Mean Score
Q1	4.1957	Strongly Agree	21.0826
Q2	4.2870	Strongly Agree	
Q3	4.1478	Strongly Agree	
Q4	4.3000	Strongly Agree	
Q5	4.1522	Strongly Agree	

Note. RO1- To identify the Physical Fatigue experienced by undergraduate IT programme students by attending classes virtually during the COVID-19 Pandemic.

Table 13 shows the mean of every question on research objective 2. The results indicated that most of the students strongly agreed to each of the questions because the mean value of each question was above 4.0. It showed that undergraduate IT programme students were experiencing mental fatigue.

Table 13: Overall mean and status of research objective 2 (RO2)

Q	Mean	Status	Overall Mean Score
Q6	4.2435	Strongly Agree	16.8739
Q7	4.2957	Strongly Agree	
Q8	4.1913	Strongly Agree	
Q9	4.1435	Strongly Agree	

Note. RO2- To identify the Mental Fatigue experienced by undergraduate IT programme students by attending classes virtually during the COVID-19 Pandemic.

Table 14 shows the mean of every question on research objective 3. The results indicated that most of the students strongly agreed to each of the questions because the mean value of each question was above 4.0. It showed that undergraduate IT programme students were experiencing emotional fatigue.

Table 14: Overall mean and status of research objective 3 (RO3)

Question	Mean	Status	Overall Mean Score
Q10	4.000	Agree	20.934
Q11	4.2043	Strongly Agree	
Q12	4.1913	Strongly Agree	
Q13	4.2870	Strongly Agree	
Q14	4.2478	Strongly Agree	

Note. RO3- To identify the Emotional Fatigue experienced by undergraduate IT programme students by attending classes virtually during the COVID-19 Pandemic.

Suggestion & future work

This study only targeted IT programme students at UPSI to study the physical, mental and emotional fatigue they faced during this COVID-19 pandemic. The future work can be conducted not by programme, but by faculty, or University. This is because when the size of the population and sample is bigger, the more accurate the study will be.

Other than that, this study also uses just three types of fatigue from the ZEF scale to create the questionnaire. Since there are nine types of fatigue, and 49 items overall, the future study can be conducted with all those scales. Other than that, future work can be conducted using interviews, so that the research questions will answer the respondents' exact feelings more deeply and accurately.

The fact that more individuals are smoothly integrating Zoom and other virtual meeting technology into their work and social lives in the new media era has raised crucial concerns about when, how, and why Zoom fatigue arises, as well as how to successfully minimise the tiredness. This study encourages more future research on this topic to promote this new line of inquiry, as it will have practical

ramifications for interpersonal communications in video conferencing and platform interface design.

Moreover, more studies have to be conducted since the number of suicide cases among students also increasing day-by-day, the reason of stress, hypertension, exhaustion and more. Future studies also can be conducted regarding the steps to overcome stress, among students and also all the Zoom users.

CONCLUSION

To summarise, video conferencing and virtual learning have become the only way to interact in this COVID-19 pandemic, and all users have adapted to it, including students who are continuing their studies virtually. The amount of time people spend on virtual classes is proportional to their physical, mental, and emotional exhaustion. The average of each question on the three research objectives was discussed to provide a clear picture of the undergraduate IT programme students' tiredness. The research questions were finally answered, as the study showed that undergraduate students of the IT programme were experiencing physical, mental and emotional fatigue while attending classes online during this COVID-19 pandemic.

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