

Effect of Zoom fatigue on health and learning loss in students during the COVID-19 pandemic

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ABSTRACT

Covid-19 pandemic causes all face-to-face activities converted to distance or virtual meetings, including educational learning system. These days, the majority educational institutions in Indonesia still implement distance learning via video conference platforms. This primary research aims to discover how Zoom Fatigue affects health and causes learning loss in university students across Java. The methodologies used in this research are qualitative and quantitative. To specify this research, the population is set to students who study at several universities in Java, with 50 samples being Multimedia Nusantara University students and the other 50 sample are being students from other universities in Java. The techniques used to collect data are observation and questionnaire via Google Forms. After analyzing responses, the result shows that most students experience health issues such as eyesight issues, exhaustion, and saturation. Moreover, most students also go through some issues when it comes to the learning process, they experience a decrease of learning motivation and have trouble concentrating. Nevertheless, their academic records are stable and some even stated that their grades are increasing when compared to face-to-face learning systems, this fact shows that in-class learning is not the only source of information used by students to support their academic performance, but there are other sources of information such as internet where students can look up information from online article and scientific journals.



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INTRODUCTION

Pandemic Covid-19 situations force school or university to arrange learning online. Online learning is an education program that is done without having to meet directly but using an education application platform or an available social network that can distribute the learning materials online. One from many video conference platforms that is often used for online learning is Zoom (Salim et al., 2022). Based on 2020 data, Zoom has been downloaded about 477 million times from all around the world (Curry, 2021; Hidayatullah et al., 2020; Rezki et al., 2020). By using Zoom, it will make

online learning and communication between lecturers and students become easier (Hidayatullah et al., 2020). On the other hand, students feel uncomfortable in study with online learning (Alexandra & Choirisa, 2021). According to UNESCO in March 2021, more than 888 million students around the world have experienced education disturbance because of school closure (Shoshan & Wehrt, 2022; UNICEF, 2021). Disturbances experienced can affect students' physical and mental health (Fauville et al., 2021a). One of the phenomena that happen a lot due to the use of video conference platforms as a replacement for direct learning is Zoom Fatigue, i.e., excessive fatigue because of continuous video conferencing via laptop or smartphone (Duffy, 2020; Nadler, 2020).

The Zoom Fatigue phenomenon can have a destructive impact on students' mental and physical health. To previous research, about 83,7% of students experience light stress, and 59,7% of students experience fatigue during online learning (Hidayati & Irwansyah, 2021; Pustikasai & Fitriyanti, 2021; Rump & Brandt, 2020). Some of the health problems that happen a lot because of Zoom fatigue are hard to focus, feeling dizzy, back problems, and insomnia. Besides influencing students' health, Zoom Fatigue has a possibility of emergence learning loss (de Oliveira Kubrusly Sobral et al., 2022). It will be hard for students to understand the material that is delivered by lectures when they are physically and mentally not in good condition (Peper et al., 2021; Peper & Yang, 2021).

In some of the previous studies, Zoom Fatigue solution has been discussed. Fatigue can be overcome by changing the interface following user comfort, i.e., if the user feels more comfortable without seeing their video, then the user can activate the hide self-window feature (Bailenson, 2021; Cranford, 2020). There are also some solutions from similar studies, such as avoiding multitasking, enough rest, and using the speaker view feature to keep the focus on the person that is talking (Peper et al., 2021). Even though some solutions have already been discovered for the problems before, previous studies tend to discuss only the cause and effect of Zoom Fatigue on students' health (Fauville et al., 2021b). Therefore, this study discusses the aspect that hasn't been discussed in the previous study, which is about the impact of Zoom Fatigue on health, such as physical and mental health, including exhaustion, saturation, inconvenience and anxiety moreover, eyesight issues, spine problems, also headache and learning loss with the decrease of productivity, motivation, understanding, concentration, also academic value as an indicator in student.

This study uses quantitative and qualitative methods. Google Forms will be used in collecting data as questionnaires, with the target respondents being students from Multimedia Nusantara University and other universities. The Target of respondents is set to 100 students to optimize the survey result for the highest accuracy.

With this study, hopefully, can discover how Zoom Fatigue phenomenon impacts health and student achievement, especially in the academic field. After collecting the data, there will be a comparison between the impact of Zoom Fatigue on health and academic achievement, then conclude whether the impact on health and academic achievement is directly proportional or vice versa. The result of this study is expected can be a measurements form of the effectiveness of online learning, specifically in universities.

In life, many things are caused by causality or causal relationships. Causal is a condition where an event happens because of an event before that becomes the impact factor. An impact is power from things, people, or inside symptoms that make a difference in any life aspect. Based on information on the official website of PBB, an impact can be positive or negative and can also happen in the long or short term. Moreover, the effect can be intentional and unintentional, as well as direct and indirect. Generally, the level of impact accuration can be measured by numeric and quantitative data.

Learning is a process of knowledge transfer that involves student as the recipient of knowledge and instructor as source of knowledge (Chatib & Said, 2012; Tjokrodinata et al., 2022). Basically, the learning process has been known since the beginning of human civilization, but the concept of a new formal school was created in the early 500 AD in Ancient Greece, Ancient Rome, and Ancient Egypt. As time passed, the education system and school also evolved, until first university in the world was formed, Bologna University in 1088.

So far, there have been more than 20.000 universities spread around the world and according to Mark In Style UK data, around 250.000.000 students are studying at universities. From the data, it can be concluded that the level of education awareness is very high. Besides awareness of education, other motivational factors of someone studying at university is competition in a competitive professional environment.

In early 2020, most countries in the world was forced to close formal school and college to prevent the spread of Covid-19 virus. School closures have impact in the change of learning system from initially face-to-face become online learning. Online learning is media set in many formats such as text, picture, and video, that can be accessed by internet (Romli, 2018). From the definition, online learning can be interpreted as a learning system that arrange a meeting between student and instructor via media that is connected to the internet.

The most used media in online learning is Zoom Cloud Meeting. Zoom Cloud Meeting is a platform for video conference cloud base. Zoom Cloud Meeting provides a virtual room that enable participant to interact both ways supported with visual feature, video, and sound. These features, used by most of the education institutes, are the one that help education institutes to arrange learning during the pandemic.

Even though features that provided by Zoom Cloud Meeting can meet most of the needs in learning during pandemic, there are still some shortcomings from online learning system via Zoom Meeting. One of the phenomena that arise from the use of Zoom Cloud Meeting is Zoom Fatigue. Zoom Fatigue is excessive tiredness because of doing virtual meeting via video conferencing media continuously.

Researcher from Stanford University has study about causative factor of Zoom Fatigue that consists of 4 main points. First cause is intense eye contact with strangers, for some people this can make them feel uncomfortable or even anxious. Furthermore, one of the research has proven when someone is talking and the other person is looking at them intensely, that can affect their psychology (Fauville et al., 2021). Second cause is cognitive load, this happens because of communication via video conferencing platform nonverbal so that user needs more effort in understanding and sending communication message. Third cause is user stare at their mirrored self, this can provoke tendency in evaluating them self. Fourth cause is low mobility. Communication via Zoom will limit user range of motion especially when they activate their camera, with this habit user will try to stay in camera view area unconsciously which means they will stay at the same position in a long time and that will make them exhausted faster and less comfortable because of limited movement.

Zoom Fatigue phenomenon is very likely experienced by students that do online learning via video conferencing platform in their daily life. This has a negative impact to student's psychological and physical health. In previous study, it was said that students in Eritrea Institute of Technology tend to experience moderate stress (71%) (Yikealo et al., 2018). In the same study, it was found that physical problem that happen during online learning are exhausted (24,4%).

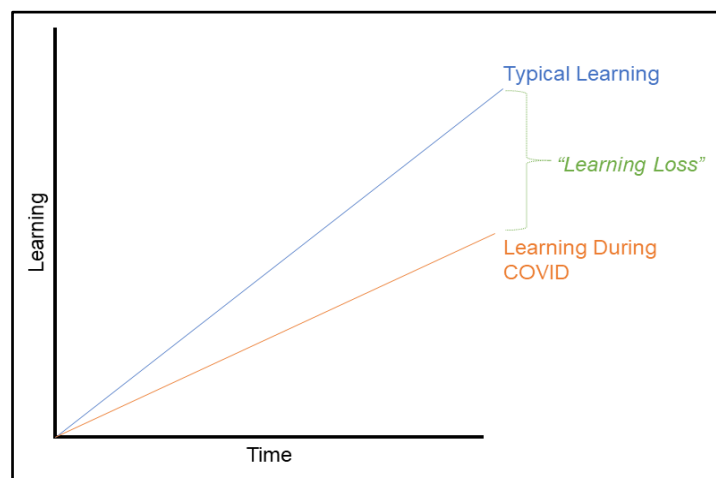


Figure 1. Graph of Comparison of Understanding Levels of Online and Face-to-Face Learning (Pier et al., 2021)

Beside psychologist and physical problems, Zoom Fatigue can also affect in decrease of understanding material in students or called as learning loss. According to The Education and Development Forum in 2020, learning loss can be described as a condition where a student experience in level of understanding and skills also affect in academic performance of the student. Learning loss can be caused by gap or failure in education system.

In relation to Covid-19 pandemic, learning loss caused by online learning can be visualized as a student concern that cannot understand and master learning materials as well as direct learning. Visualization of different levels of understanding online learning and direct learning can be seen in [Figure 1](#).

Emergence of learning loss certainly will create long and short term impact especially in education quality and human resources in the future, even several experts state the impact of this phenomenon will mostly be seen in the next 10 years. Short term impact for students are decrease of study motivation, lose confidence, moreover in some cases can cause depression. For long term impact of learning loss is still predicted by the expert, the quality of human resources that born from online learning won't be able to compete with human resources that born from direct learning. That is caused by lack of practical activity during online learning, thus resulting in students only understand theoretical material.

Indonesia is certainly not spared from the learning loss phenomenon. Based on the observation, not a few students have complained about the online learning situation, this matter is often expressed by students via social media, particularly in Twitter, Instagram, and TikTok. Some of them also worrying about career prospects in the future due to believe they are not having enough skills to compete in working life. It can be concluded that online learning system can affect students' psychology, but in this study will also discuss how online learning affects students' academic value. This is an interesting thing to be studied because in fact online learning gives students more freedom in exploring resources while doing homework or exam.

There are questions in the questionnaire, in the first segment containing questions about zoom fatigue impact to mental and physical health. The second segment containing questions about zoom fatigue impact to academic achievement. To optimize the survey results in reaching the best accuracy, this study targets 100 respondents.

METHOD

Research method is obtaining data with specific object and usage in a scientific way ([Sugiyono, 2017](#)). There are four keywords that have to be noticed, namely the scientific method, data, objectives, and usability. This study using primary data resource with quantitative and qualitative methods. Qualitative method is types of research that aim for understanding the objectives of the study deeply, describes the reality related to basic theory and elaborate understanding of one or more way towards experienced phenomenon ([Moleong, 2007](#)). Quantitative method is research that involves theory, design, hypothesis, and determine the subject. Both of the methods supported with collecting data, data processing, and data analysis before conclusion was made.

Population is the whole object of research ([Arikunto, 2010](#)). Research can only be done with limited population and subjects. Population in this research are students in Java island. Java island is chosen as the location of the population because the researcher is domiciled in Java and has connection with students from universities around Java island.

Sample is part of the total and characteristics of the population ([Sugiyono, 2008](#)). In this research, we spread the questionnaire to 100 respondents, which consists of Multimedia Nusantara University students and other universities around Java. The sampling technique used is random sampling, where the sample is taken somewhat from each individual or group of the population. Total the population in the research is 50 students from Multimedia Nusantara University and 50 students from various universities in Java.

The research focuses on several parts or domains that are defined as the primary situation in a study ([Sugiyono, 2016](#)). The details will be used to limit the topic to discuss and process in collecting data. Some research focus that has been appointed are (1) Respondent intensity in the

usage of video conference platform; (2) Zoom Fatigue impact on mental and physical health; (3) Zoom Fatigue impact on learning loss.

Information or data collecting techniques are done by observation and questionnaire. Observing students' behavior when attending online learning and outside of online learning we do the observation. Questionnaires are data-collecting technique which is conducted by giving questions for respondents to answer. Questionnaires will be spread to 100 respondents that are active students from several universities around November 2021.

A research instrument is a written guideline about an interview, observation, or even questions that will be used for obtaining information. Research instruments are also called observation guidelines, interview guidelines, questionnaire guidelines, or documenters depending on the method used (Ismayani, 2020). Questions and statements from the questionnaire be the focus of the research based on the previous research entitled “*Nonverbal Mechanisms Predict Zoom Fatigue and Explain Why Women Experience Higher Levels than Men*” where in the study, there is a theory that states Zoom and *Exhaustion Fatigue (ZEF)* scale influenced by gender, the intensity factor of video conference usage, nonverbal mechanism like anxiety, stare at the monitor in a long time, and limited physical movement. Moreover, several questions and statements are also based on observations and personal experiences of researchers that happen during online learning.

Table 1. Questionnaire Structure

No	Segment	Answer Type	Total Question
1	Respondent identity	Short answer, multiple choice	7
2	Usage intensity of video conferencing platform	Multiple-choice, checkboxes	6
3	Impact of Zoom Fatigue on health	Linear scale (1 = strongly disagree, 5 = strongly agree)	7
4	Impact of Zoom Fatigue towards Learning Loss	Linear scale (1 = strongly disagree, 5 = strongly agree), multiple choice	5

In this research, data collecting will be done by using Google Forms to create the questionnaire that will be spread to the respondents according to the criteria. Table 1 shows a questionnaire structure.

RESULTS AND DISCUSSION

Results

In Figure 1, we look for students from generations 2018-2021 as respondents because students in that year experience online learning via video conference platform due to the Covid-19 virus. So that every student does learning and graduation via video conference. Therefore in the diagram, there are 72% of students from generation 2019, 14% of students from generation 2020, 13% of students from generation 2021, and 1% of students from generation 2018.

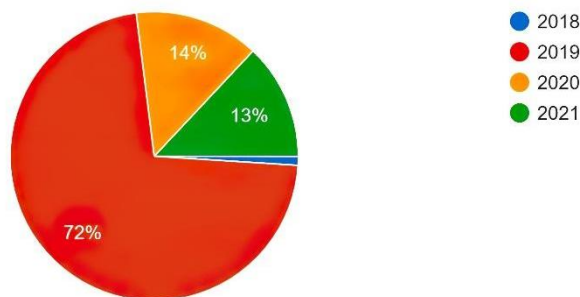


Figure 1. Respondent Batch Year

Zoom Fatigue is excessive fatigue because of video conferencing. From [Figure 2](#) above can be seen that 56% of respondents know about *the Zoom Fatigue* phenomenon, and 44% don't know about *Zoom Fatigue*.

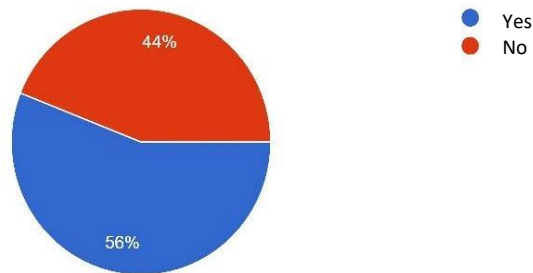


Figure 2. The knowledge of Respondent about Zoom Fatigue

Several platforms provide video conferencing, such as Zoom Meeting, Google Meet, Microsoft Team, etc. In [Figure 3](#), the result based on the questionnaire is that 78% of respondents choose Zoom Meeting as the most used video conference platform. Therefore 14% for Google Meet and 8% for Microsoft Teams.

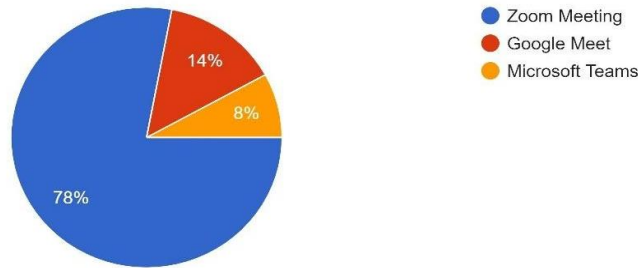


Figure 3. The Most Used Video Conferencing Platform

[Figure 4](#) discusses activities that require to use of a video conference platform, and 99% of respondents state that they use it for the lecture because the questionnaire is spread only to students. Not only that, there are other activities such as organization/committee and communication with friends during online learning that need video conferencing.

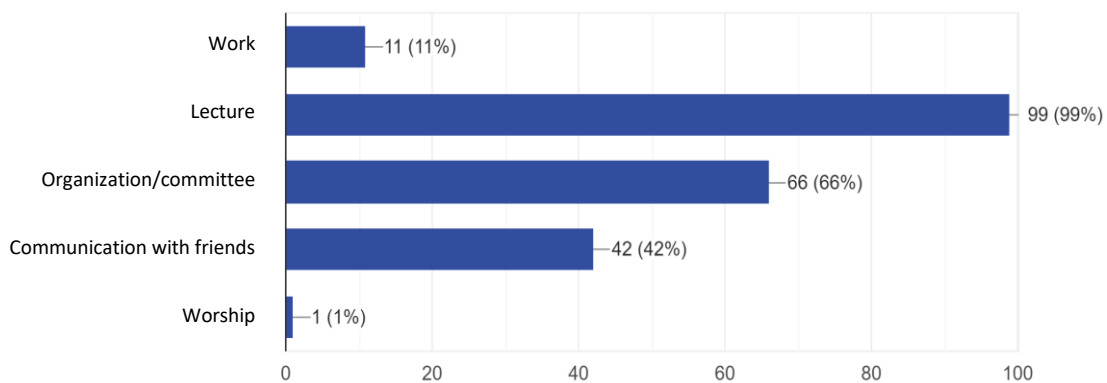


Figure 4. The Needs of Using Video Conferencing Platforms

Most respondents do video conferences for about five days or more a week. The activity which respondents conduct during video conferences are lectures, organization, communication with friends, working, and even worship. 60% of respondents do video conferencing for about 4 hours or more daily to do lectures, organizational meetings, communicate with friends, and even worship.

89% of respondents use a PC / laptop for video conferences. This might be due to the multitasking that they can do while using a PC / laptop. The screen on a PC or laptop tends to be bigger than the screen on a smartphone or tablet, so everything that happens during video conferencing can be seen easily.

Table 2. Video Conference Fatigue Assessment Indicators

No	Aspects	Percentage (%)				
		1	2	3	4	5
1	The fatigue levels during video conferencing	0	0	6.5	43	50.5
2	The saturation levels during video conferencing	0	0	4.3	23.7	72
3	The anxiety levels during video conferencing	2.2	9.7	37.6	28	22.6
4	The effect of turning off the camera on anxiety	2.2	5.4	12.9	25.8	53.8
5	The eye health problems due to video conferencing	0	2.2	7.5	33.3	57
6	The spinal health problems due to video conferencing	1.1	0	8.6	29	61.3
7	The frequency of headaches due to video conferencing	2,2	12.9	28	31.2	25.8
8	The decrease in productivity of respondents after doing video conferencing	5	10	27	27	31
9	The decrease in learning motivation of respondents while using video conferencing platforms	1	13	28	29	29
10	The decrease in understanding of the learning material of respondents while using the video conferencing platform	2	8	28	32	30
11	The difficulty concentrating level of respondents while using the video conferencing platform	1	6	26	31	36

Table 2 shows video conference fatigue assessment indicators. 93% of respondents feel their physical and mental health can be disturbed because of doing video conferencing too often. Most of the respondents (93.5%) feel exhausted after video conferencing, but 6.5% of respondents feel indifferent or neutral even though they are doing video conferencing.

The majority of respondents feel saturated when they are doing a long time of video conferencing. This can be seen by 72% of respondents choosing 5 points, which means they strongly agree, and 23.7% choosing 4 points, which means they agree. Besides, 4.3% of other respondents choose 3 points which means neutral.

The anxiety levels during video conferencing show that 22.6% of respondents chose 5 points, and 28% of respondents chose 4 points which means the majority of respondents feel uncomfortable or uneasy when doing video conferencing. While 37.6% of respondents chose 3 points, they think neutral when doing video conferencing. There 9.7% of respondents chose 2 points, and 2.2% of respondents chose 1 point, which means they feel comfortable when doing video conferencing.

The effect of turning off the camera on anxiety shows 53.8% of respondents chose 5 points, and 35.8% of respondents chose 4 points which means the majority of respondents feel that turning off the camera while doing video conferencing, can decrease their uneasy feeling. 12.9% of respondents chose 3 points which means neutral. While 5.4% of respondents chose 2 points and 2.2% of respondents chose 1 point, that means the respondents consider by turn off the camera when doing video conferencing cannot decrease their uneasy feeling. It can be concluded that activating or non activate the camera during video conferencing can have an impact on the majority of people.

Eye health problems due to video conferencing can be concluded that most respondents agree that eyesight health can be disturbed by video conferencing with high intensity. This conclusion can be seen by 57% of the respondents choosing 5 points and 33.3% choosing 4 points. While 2.2% of respondents choose to disagree that high intensity of video conferencing can disturb eyesight health, and the rest choose neutral.

The spinal health problems due to video conferencing show 61.3% of respondents chose 5 points (strongly agree), and 29% chose 4 points (agree), so it can be concluded that the majority of respondents agree when doing video conferencing with high-intensity can disturb backbone health.

But some respondents choose neutral and disagree that backbone health can be disturbed by doing video conferencing at high intensity.

The frequency of headaches due to video conferencing can be seen in the majority of respondents feeling dizzy or headache while doing video conferencing because 25.8% of respondents chose 5 points (strongly agree) and 31.2% chose 4 points (agree). But not a few respondents choose 3 points (neutral, by 28%), and the rest choose 1 and 2 points, meaning they are not feeling dizzy or headache during video conferencing.

Decreased productivity of respondents after video conferencing can be concluded that most respondents need to be more productive after doing video conferencing. This is shown by 31% of respondents choosing 5 points (strongly agree) and 27% choosing 4 points (agree). But on the other hand, some respondents rarely or even never go through a decrease in productivity after video conferencing.

The decrease in respondents' productivity after video conferencing shows that 28% chose neutral, 29% decided to agree, and 29% chose strongly agree, so two possibilities can be concluded. First is video conference platform user not impacting students' motivation to study. Second, video conference platform users are ineffective for students because they decrease their motivation to learn. Moreover, some students disagree with the statement.

The decrease in understanding of the learning material respondents while using the video conferencing platform can be concluded that students tend to experience a reduced understanding of learning material implemented via video conference platforms. It results in 32% of students agreeing to agree and 30% strongly agreeing. Not a few students chose neutral, indicating that the learning material's level of understanding was not affected by the usage of the video conference platform as a learning platform.

The difficulty concentrating level of respondents while using video conferencing platforms can be seen 67% of respondents agree with the statement that the use of video conference platforms makes students hard to concentrate while studying. This happens because of lots of distractions while learning via video conference platforms. The distraction can be the urge to do other activities or drowsiness because the learning environment tends to be monotonous via video conference platforms and lack of physical communication with friends in class.

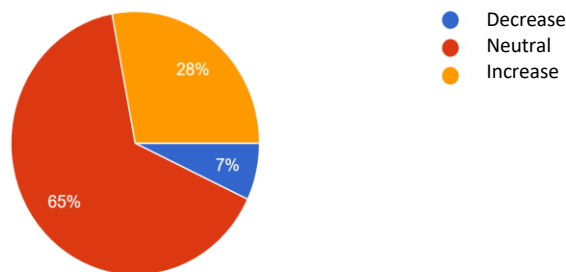


Figure 5. The Academic Score Condition of Respondents While Using Video Conferencing Platform

From Figure 5 can be seen that the academic score of students while online learning tends to be neutral and increasing. It shows that 65% of respondents state their academic scores are neutral, and 28% of respondents experience an increase in academic scores during online learning.

Discussion

The excessive use of video conferencing can have an impact on physical and mental health. The majority of respondents already know what Zoom Fatigue is. Zoom is the most common application used to carry out lecture activities with an intensity of time for more than five days a week, and more than four hours a day. The majority of respondents use a PC or laptop during video conferencing. The impact of Zoom Fatigue that is felt when using video conferencing is feeling tired, feeling bored when doing video conferencing for a long duration, feeling anxious or uncomfortable

during video conferencing, feeling more comfortable and calm when turning off the camera during video conferencing, experiencing eye health problems due to too frequent video conferencing, having back spinal health problems, and having headaches while video conferencing is going on.

The use of video conferencing platforms has resulted in several changes in the academic conditions of students. Based on the data collected, it can be stated that the use of video conferencing platforms as online learning media causes learning loss for students. This learning loss can be in the form of decreased productivity, reduced motivation to learn and understand the material, and difficulty concentrating. Even so, the learning loss that has been faced by the students is inversely proportional to the academic condition during online learning. Based on questionnaire data, most of the students stated that the condition of their academic scores during online learning tended to be neutral and increased. This shows that there are learning supporting factors outside the activity of material given by the lecturers during the lecture hours. Based on observations, one of the supporting factors is the internet. The development of technologies allows students to easily search for sources of information through the internet, where the information can be used to complete the understanding that might not be obtained through online learning so that the students can maintain or improve their academic achievement.

CONCLUSION

The Zoom Fatigue phenomenon can have an impact on students' health conditions during online class learning. This can be concluded from the frequency of respondents who agree that doing video conferencing with high intensity can affect physical and mental health. The results of the questionnaire also showed that the majority of respondents experienced several symptoms of physical and psychological health problems, which have been described in the discussion section. Using the video conferencing platform also causes learning loss for students but doesn't significantly affect the condition of student academic scores. This is an anomaly because the dimensions of student behavior and the results of academic scores are out of sync. Therefore, this finding can be a topic for further research to reveal the factors that cause the asynchronous learning loss experienced by students with the academic conditions achieved during online learning during the pandemic.

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