Kesmas

Volume 17
Issue 2 *May*

Article 10

5-31-2022

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Recommended Citation

Lestari PW , Fayasari A . Zoom Fatigue during the COVID-19 Pandemic: Is it Real?. *Kesmas*. 2022; 17(2): 151-156
DOI: 10.21109/kesmas.v17i2.5707
Available at: https://scholarhub.ui.ac.id/kesmas/vol17/iss2/10

Lestari, *et al. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*. 2022; 17 (2): 151-156
DOI: 10.21109/kesmas.v17i2.5707

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Zoom Fatigue during the COVID-19 Pandemic: Is it Real?

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic has caused drastic changes to social lives moreover the activities done outside, such as work and school. The policy of large-scale social restrictions (LSRR)/*Pembatasan Sosial Berskala Besar* (PSBB), which makes people stay at home, also plays an important role in changing the face-to-face activity online. As a solution to the major change, people use video conferencing to keep in touch and still feel like doing "offline" activities. The increasing use of video conferencing has raised concerns about the resulting fatigue, termed "Zoom fatigue." This study aimed to describe Zoom fatigue during the COVID-19 pandemic and the factors contributing to it. This study used a cross-sectional design with 376 participants. Data were gathered by completing a 45-item online questionnaire, which was analyzed using univariate, bivariate (Chi-square), and multivariate (binomial logistic regression) analyses. It was found that 68.6% of respondents experienced Zoom fatigue at a moderate to a high level. Respondents complained of several symptoms related to activity, motivation, and physical weakness after using the video platform. In brief, Zoom fatigue is real, and the frequency of video platform use is related to the incidence of Zoom fatigue.

Keywords: COVID-19, impact, zoom fatigue

Introduction

A new disease caused by a novel coronavirus, called COVID-19, emerged at the end of December 2019. Currently, 224 countries and territories worldwide have been infected with this virus.[1] This pandemic has drastically changed social life.[2] To curb its transmission, the public has been advised to follow various health protocols, such as physical distancing, large-scale social restrictions (LSRR)/*Pembatasan Sosial Berskala Besar* (PSBB), and masking. According to the Centers for Disease Control (CDC), prevention of COVID-19 includes getting vaccinated, wearing a mask, remaining six feet away from others, avoiding poorly ventilated rooms and crowds, and washing hands.[3]

This virus has caused fear, anxiety, and uncertainty across the globe leading to provisions for social distancing and an increasingly challenging economic reality.[4] Changes, such as working from home (WFH),[5,6] studying from home (SFH), terminating employment contracts, losing one's job, and lack of physical contact with families residing outside the city, which are extremely necessary for maintaining mental health, are enough to alter an individual's lifestyle. The educational sector has also experienced certain changes during the pandemic. Usually known to carry out face-to-face learning activities, this field adopted an online procedure,[7,8] using various media, such as Zoom, Google Meet, Cisco Webex, Skype, and other video platforms.

The COVID-19 pandemic has led to increased screen time.[9-11] In addition, reports have shown that Zoom usage rose by 360% in 2020.[12] The word "Zooming" has become a widespread verb to replace video conferencing, just like "Googling," which is equivalent to a web search. The increasing use of video conferencing has raised concerns about fatigue caused by video conferencing, termed "Zoom fatigue,"[13] caused by the complexity of interpersonal interactions because of particular spatial dynamics in video conferences.[14]

Bailenson's study discusses the theoretical arguments for the causes of Zoom fatigue, explaining that Zoom fatigue is caused by four dimensions of interpersonal connection (eye gaze at close distance, cognitive load, all-

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Received : January 17, 2022
Accepted : April 27, 2022
Published : May 31, 2022

day mirror, and reduced mobility) changed as a result of video conferencing.[15] The use of video conferencing for an extended period has a high risk of causing stress,[16] and mental health issues, such as tiredness and anxiety.[17] However, those study was still hypothetical. Despite the findings of previous studies, almost none have been directly tested. There is still limited research discussing Zoom fatigue and the factors affecting it. Therefore, this study aimed to describe the occurrence of Zoom fatigue and the factors that contributed to it during the COVID-19 pandemic.

Method

This study was a cross-sectional study using convenience sampling, and this method is based on the availability and ease of obtaining respondents. The sample size was calculated based on the following Formula 1.

$$n = \frac{\left(Z\alpha\sqrt{2PQ} + Z\beta\sqrt{P_1 Q_1 + P_2 Q_2}\right)^2}{(P_1 - P_2)^2}$$

Formula 1. Sample Size Calculation

Based on previous research, the population proportion 1 (P1) was 0.36, and the population proportion 2 (P2) was 0.50.[18] With a significant level of 0.05 and a power of 95%, the minimum sample size of this study was 323. The sample size of this study was 376, which surpassed the minimal sample adequacy requirement. Data collection began in July and ended in October 2020.

The dependent variable was Zoom fatigue. In this study, "Zoom fatigue" is defined as the fatigue that occurs after video conferencing using Zoom, Google Meet, Skype, FaceTime, Cloud X, Go to Webinar, Microsoft Teams, Cisco Webex. The independent variables were frequency of use of video platforms (days/week), frequency of use of video platforms (hours/day), frequency of rest, length of rest, the tool used for video platforms, audio device, sitting position (lying around or sitting), and multitasking.

Data was collected through a questionnaire on Google Forms. The link to the online questionnaire was distributed through various social media. Individuals over 17 years old, have worked or studied from home, and are willing to fill out the questionnaire were sampled.

The questionnaire included 45 questions: seven questions about the characteristics of the respondents, eight questions about the determinants of Zoom fatigue, and 30 questions about Zoom fatigue. Questions about the determinants of Zoom fatigue included frequency of use per week (≤ three days/week or > three days/week), frequency of use per day (≤ three hours/day or > three hours/day), number of breaks (one time or ≥ two times), duration of a break (< 15 minutes or ≥ 15 minutes), the equipment used (smartphone vs. computer/laptop, used audio device or not), posture (lying around or sitting), and whether the respondent does other work while video conferencing (multitasks or not). Zoom fatigue was measured with an instrument in subjective self-rating, designed by the Industrial Fatigue Research Committee (IFRC).[19] The Subjective Symptoms Test (SST) questionnaire consisted of 30 questions in which the first, second, and last ten questions were based on weakening activities, motivational, and physical attenuation, respectively. In addition, an assessment design with a Likert scale scoring; "never" (never in one week), "sometimes" (one–two days in one week), "often" (three–four days in one week), and "always" (almost every day in one week), was also included. The accumulated values and results were grouped into low (30–52), moderate (53–74), high (75–98), and very high (99–120) to determine the fatigue level.

This study primarily employed univariate, bivariate, and multivariate regression analyses using SPSS 22.0 free trial version. Univariate analysis tabulated the frequency of characteristics and demographic statistics, such as sex, age, and occupation. The Chi-square test or Fisher's exact test was used to assess the association between independent (frequency of use in days/week, frequency of use in hours/days, frequency of rest, length of rest, equipment, audio device, posture, and multitasking) and dependent variables (the level of Zoom fatigue); a p-value<0.05 was considered significant at a 95% confidence interval (CI). Variables with a p-value more than 0.25 were considered for multivariate (binomial logistic regression) with backward stepwise regression. With a 95% confidence interval (CI), the results of the interpretation of the prevalence ratio (PR) values were as follows:

1. If the PR was greater than one, the 95% CI did not include a value of one, indicating that the factor under consideration was a risk factor.
2. If the PR was greater than one, the 95% CI included a value of one, indicating that the factor studied was not a risk factor.
3. If the PR was less than one, the 95% CI did not include a value of 1, indicating that the factor studied was a protective factor.

Results

A total of 376 respondents, consisting of 50 (13.30%) male and 326 (86.70%) female, participated in this study. The respondents' mean, mode, youngest, and oldest ages were 22, 20, 16, and 57 years, respectively. Most respondents were students (80.60%). The prevalence of moderate to high levels of Zoom fatigue was 68.6%,

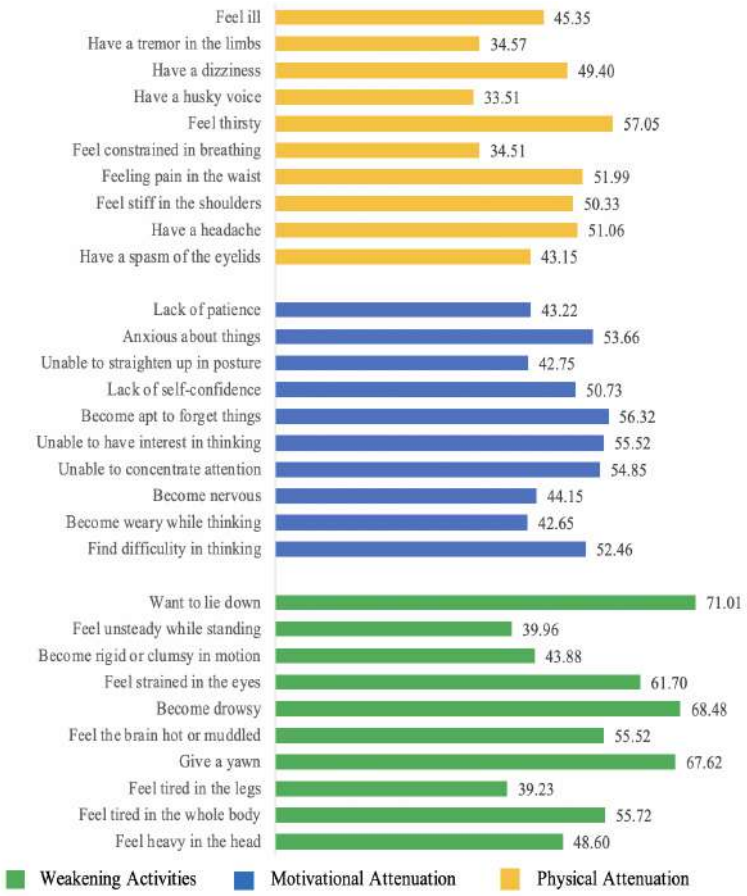

Figure 1. Zoom Fatigue Symptoms

based on the criteria in the total sample.

Zoom fatigue occurs after video conferencing with Zoom, Google Meet, Skype, FaceTime, Cloud X, Go to Webinar, Microsoft Teams, Cisco Webex. The Subjective Symptoms Test (SST) consisted of 30 questions, in which the first, second, and last 10 questions were centered on weakening activities, motivational, and physical attenuation, respectively. These 30 questions aimed to ascertain the extent of fatigue that occurred after using the online platform. This study found that the classic indicators of weakening activities were a desire to lie down, drowsiness, yawning, and eye strain. Forgetfulness, lack of interest in cognitive activities, and low concentration were all prevalent motivational attenuation symptoms. In addition, a majority of the respondents reported physical weakening symptoms, such as thirst, pain in the waist, and headaches (Figure 1).

This study measured eight factors contributing to Zoom fatigue: frequency (days/week), frequency (hours/day), frequency of rest, length of rest, equipment, audio device, posture, and multitasking. Most respondents had a high frequency of using video platforms and had sufficient time to rest. Audio devices were widely used, respondents reported a good sitting posture, and most respondents multitasked. The Chi-square test showed that the frequency of use of video platforms (days/week) (p-value = 0.046), frequency of use of video platforms (hours/day) (p-value = 0.010), and equipment (p-value = 0.038) indicated a significant association with Zoom fatigue (Table 1). Respondents who frequently use video platforms were more likely to experience "Zoom fatigue."

The authors conducted a multivariate analysis with a binomial logistic regression test to explore the factors contributing to Zoom fatigue. Four variables matched the criteria for the multivariate analysis (p-value = 0.25): frequency of video platform use (days/week), frequency of video platform use (hours/day), frequency of rest, and video platform equipment. The frequency of usage of video platforms (days/week) and the frequency of rest were both eliminated from the multivariable model based on the findings. The results of the multivariate analysis showed that the frequency of use of video platforms

Table 1. Factors Contributing to Zoom Fatigue Based on Bivariate Analysis (n = 376)

Variable	Category	Zoom Fatigue			p-value	PR (95% CI)
		Moderate to High	Low	Total		
Frequency (days/week)	>3 days/week	163	61	224	0.046	1.164 (1.005–1.349)
	≤3 days/week	95	57	152		
Frequency (hours/day)	>3 hours/day	158	54	212	0.010	1.214 (1.048–1.406)
	≤3 hours/day	97	61	158		
Frequency of rest	1 time	78	48	126	0.061	0.860 (0.735–1.0006)
	≥2 times	180	70	250		
Length of rest	<15 minutes	48	21	69	0.965	1.017 (0.855–1.210)
	≥15 minutes	210	97	307		
Equipment	Smartphone	119	68	187	0.038	0.865 (0.754–0.993)
	Computer/laptop	139	50	189		
Audio device	No	88	46	134	0.424	0.935 (0.807–1.083)
	Yes	170	72	242		
Sitting position	Lying around	14	4	18	0.550	1.141 (0.883–1.475)
	Sitting	244	114	358		
Multitask	Yes	150	64	214	0.551	1.051 (0.914–1.210)
	No	108	54	162		

Notes: CI = Confidence Interval, PR = Prevalence Ratio.

Table 2. Multivariate Analysis Factors Contributed to Zoom Fatigue (n = 376)

Variable	β	Sig.	Exp (B)	95% CI for Exp (B)
Frequency (>3 hours/day)	0.594	0.009	1.811	1.157–2.834
Equipment (Smartphone)	-0.479	0.037	0.619	0.395–0.971
Constant	-0.837	0.000	0.433	

Note: CI = Confidence Interval

(hours/day) contributed more to Zoom fatigue than equipment. Zoom fatigue was more likely to occur when using a video platform for more than three hours per day than for less than three hours per day (AOR = 1.811; 95% CI = 1.157–2.834). At the same time, respondents who used smartphones had more protective factors against Zoom fatigue than those who used computers or laptops (AOR = 0.619; 95% CI = 0.395–0.971) (Table 2).

Discussion

At the onset of the pandemic, every individual was required to practice social distancing and communicate with others using various tools. Therefore, face-to-face communication was replaced with video platforms. However, the enhancement and accessibility of using this new means of communication has caused a physiological and psychological impact, referred to as Zoom fatigue. The term Zoom fatigue has caught on quickly as a result of the rapid rise in the use of Zoom or other video conference platforms, which have become a part of the growing concern over screen exhaustion.[13]

This study reported that only 31.4% of respondents experienced low fatigue. Conversely, the others experienced moderate to very high fatigue (68.6%). Common symptoms of weakening activities included wanting to lie down, drowsiness, yawning, and eye strain. Commonly experienced motivational attenuation symptoms were forgetfulness, lack of interest in cognitive tasks, and low concentration. Moreover, most respondents complained of physical weakness symptoms, including feeling thirsty, pain in the waist, and headaches.

Based on the findings of this study, Zoom fatigue is real and occurs due to the use of video platforms. Under normal conditions, communicating with others aids in acquiring additional information obtained from gestures or facial expressions. In addition, these are an essential part of nonverbal feedback, which shows whether an individual is listening and whether the communication is going as planned. Moreover, the brain focuses on the words being voiced during the conversation, although additional meanings are derived from various nonverbal cues, such as the interlocutor's expressions. These nonverbal cues help paint a holistic picture of the conveyed message and the listener's response. Because humans are social creatures, understanding these cues comes naturally, although less effort is required to break them down for emotional intimacy with others. However, additional

obstacles, such as noise, signal interference, and the inability to see the opponent's expressions, especially when interacting with several individuals, are encountered when using a video platform. This condition leads to confusion, energy wastage, and eventually, fatigue. Therefore, it is a challenge to stay focused in a video conference. However, when several individuals are present, the platform becomes heavier, and everyone has a smaller screen size.[20] The limited screen view from head to shoulder makes it difficult for an individual to notice hand movements or other body languages.

Gaze is the most potent nonverbal cue available on a video call and tends to have adverse effects when carried out over a long time.[21] In addition, multiple screens that appear during video conferences can also cause fatigue. Furthermore, the 'Gallery View,' in which each meeting participant simultaneously engages, tends to cause certain challenges to the brain's central vision, forcing it to decode many individuals simultaneously, which no one understands, not even the speaker.[21] Individuals tend to focus on the screen during video conferencing, which causes the eye and ciliary muscles around the lens to contract. This results in increased lens curvature and near-visual stress.[22]

In face-to-face communication, individuals interact and respond to each other. Nevertheless, this interaction is less visible when using a video platform because most microphones or displays are muted to reduce noise. This impedes verbal responses spontaneously, which, from the communication perspective, tends to be negatively interpreted by the listener.[23] Furthermore, viewers are often distracted by other things such as notifications from smartphones, e-mail, or social media during video conferencing. This interference causes them to respond to the devices twice as much.[22]

Zoom fatigue is even more of a problem when video chat rooms are less collaborative and panel-like, with only two individuals speaking while the rest are listening. Consequently, a parallel conversation is impossible because each participant uses the same audio stream and is aware of every sound. The prolonged distraction causes confusion and drains energy in some individuals, making it seem like nothing was achieved. The brain becomes exhausted due to overstimulation and, at the same time, attempts to focus on finding impossible nonverbal cues.

Another effect caused by the increased use of social media and online platforms as a means of communication is mental health issues. The absence of feedback from conversations, off-screen behavior, time spent on standby even when not talking, and satiation can be underlying causes.[24] Some of the visible effects, such as high screen time through online platforms, have been proven to disrupt mood and increase depression in Asians.[25] Other preliminary studies have shown that students find it difficult to focus during online classes. Several complaints such as feeling lonely, anxious, and depressed have also been reported.[20] Communication through video platforms is challenging because many students are less active in class.[26] Teachers also tend to feel stressed because they do not receive the expected feedback during the course.[26]

This study showed that prolonged use of video platforms increases the risk of Zoom fatigue. It involved the simultaneous use of multiple video conferencing methods. It is due to a person's focus becoming disrupted, as well as signal and sound problems caused by holding two or more video conferences simultaneously. Instead of attending multiple video conferences, setting aside a certain time to participate in online meetings could enhance well-being and resilience. Video conferences could also be recorded so that individuals can see the outcomes of the recording instead of attending several video conferences at the same time.

This study had several limitations. First, the number of references related to Zoom fatigue was limited. This is because the emergence of Zoom fatigue only received attention after increased video conferencing use during the COVID-19 pandemic. Second, the data were collected using self-reported questionnaires, leading to reporting bias. To overcome bias, the authors determined the criteria for the research sample, explained the objectives, guaranteed the confidentiality of the respondents, and used a valid questionnaire. Despite these limitations, this study provided valuable information regarding Zoom fatigue and its determinants, allowing individuals to take preventive measures. This study potentially paves the way for future studies, such as utilizing a case-control or cohort design to study Zoom fatigue, or examining the long-term effects of video conferencing, not just on Zoom fatigue but also on physical and mental health.

Conclusion

This study indicates that Zoom fatigue is real, as evidenced by the symptoms of weakened activity, weakened motivation, and physical weakness. The frequency of use of video platforms, such as Zoom, Google Meet, and Microsoft Teams, impacts Zoom fatigue. Therefore, some recommendations are to reduce the frequency of daily use of this platform, including avoiding attending multiple video conferences simultaneously. Video conferencing should only be used when absolutely necessary and avoided on occasions where phone calls or e-mails suffice.

Abbreviations

COVID-19: coronavirus disease 2019; LSRR: Large-scale Social Restrictions; PSBB: *Pembatasan Sosial Berskala Besar*; CDC: Center for Disease Control; WFH: Working From Home; SFH: Studying From

Home; IFRC: Industrial Fatigue Research Committee; SST: The Subjective Symptoms Test; CI: Confidence Interval; PR: Prevalence Ratio.

Ethics Approval and Consent to Participate

This study was approved by the Malang Health Institute Ethics Committee (number 956/KEPK-POLKESMA/2020) and all participants provided informed consent. The respondents were informed of the aim of the study at the beginning of the questionnaire. They were required to complete the informed consent by selecting "yes" in the online questionnaire for the question: "Are you willing to be a respondent for this research?". Respondents were informed that their identity would be kept confidential and that the data would only be used for research purposes.

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

Data and information used as study materials were from the original study conducted by the corresponding author.

Authors' Contribution

PW conceptualized, design, and prepared the manuscript. AF provided additional analysis for the manuscript.

Acknowledgment

The authors are grateful to the Directorate of Research and Community Service of Binawan University.

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