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Predictors of Videoconference Fatigue: Results from Undergraduate Nursing Students in the Philippines[1]

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Abstract

Driven by the need for remote learning, the COVID-19 pandemic led to the rise of use of videoconferencing tools. Scholars began noticing an emerging phenomenon of feeling tired and exhausted during virtual meetings. This study determined the predictors of videoconference or Zoom fatigue among nursing students in a large, private, non-sectarian university in the Philippines. This cross-sectional online survey involves 597 nursing students in the Philippines using the Zoom Exhaustion and Fatigue Scale. Multiple linear regression analysis was used to examine predictors of videoconference fatigue. Results indicated that nursing students experienced high levels of videoconference fatigue. Gender, self-reported academic performance, Internet connection stability, attitude toward videoconferencing, frequency, and duration of videoconferences predicted videoconference fatigue. The regression model explained 25.3% of the variances of the videoconference fatigue. Videoconference fatigue is relatively prevalent and may be taking its toll on nursing students. Developing strategic interventions that can protect or mitigate the impact of fatigue during virtual meetings is needed.

Keywords: COVID-19, fatigue, nursing, Philippines, students, videoconferencing, Zoom Exhaustion and Fatigue Scale

The COVID-19 pandemic greatly affected nursing education and other health science programs that relied heavily on in-person clinical experiences and trainings (Michel et al., 2021; Guillasper et al., 2021; Oducado et al., 2021a). In a developing country such as the Philippines, the sudden transformation in the educational landscape during the pandemic has been challenging (Cleofas & Rocha, 2021). Schools were closed, students were sent home, and faculty and students turned to remote learning using technology to substitute for in-person meetings (Guillasper et al., 2020; Massner, 2021). This resulted in a paradigm shift in nursing education and rapid growth of online, distance, and remote learning (Balatayo et al., 2021; Oducado & Soriano, 2021). Despite there being pieces of evidence on the use of videoconferencing in the undergraduate nursing programs even before the COVID-19 health crisis (Pirkey et al., 2012; Celikkan et al., 2013; Chipps et al., 2012), the pandemic made face-to-face interactions impossible and

has forced a massive increase in the use of virtual meetings and videoconference platforms like Zoom, Microsoft Teams, and Google Meet (Bailenson, 2021; Rößler et al., 2021). Driven by the need for remote learning, videoconferencing became a part of the daily activities of students and faculty, a new normal in the delivery of instruction, and was an indispensable tool that allowed schooling to continue amidst a national lockdown and social distancing mandates around the world (Massner, 2021). Because of the global pandemic, it has been observed that Google Meet videoconferencing service added about three million users per day in April 2020 (Moreno, 2020) and Zoom daily meeting participants increased from 10 million in 2019 to 300 million in April 2020 (Iqbal, 2021). Indeed, the nursing school experience of students is taking a new form.

While moving classes online has made schooling possible despite the pandemic, it has not come without any problems or challenges. Difficulty adjusting to online learning during the pandemic was an emerging theme in 2020 and 2021 (Michel et al., 2021). Because of the unexpected shift from face-to-face to virtual instruction, researchers and media began looking into a novel phenomenon of feeling exhausted and tired during or after videoconferencing or synchronous virtual meetings, known as videoconference fatigue or Zoom fatigue (Bailenson, 2021; Bennett et al., 2021). The use of "Zoom" as a replacement for videoconferencing resulted in the ubiquity of the Zoom platform in videoconferences, although Zoom fatigue refers to the fatigue attributed to videoconferencing with any platform (Bailenson, 2021; Fauville et al., 2021a). For instance, in the current study, Google Meet videoconferencing service was popularly used by students and faculty.

Staring at a computer or mobile screen for most of the day can be tiring, draining, and exhausting. As online learning will most likely continue to play a significant role in instructional delivery methods even beyond the pandemic, it is necessary to explore and discover videoconferencing fatigue in the context of education (Massner, 2021). Understanding Zoom fatigue and its predictors are important in strategically planning future educational interventions using videoconferencing platforms and ensuring satisfactory learning experiences in the virtual learning environment without compromising students' physical and mental health.

Meanwhile, although there are recent reports on videoconference fatigue

(Fauville et al., 2021ab; Queiroz et al., 2021), these studies were conducted outside of the Philippines among convenience samples including the general college population. And while the study of Massner (2021) specifically looked into videoconference fatigue in the educational context, the author used a qualitative case study approach done in a higher education context. To our knowledge, this study is among the earliest to look into videoconference fatigue among nursing students amidst the COVID-19 pandemic. We aim to contribute to the body of knowledge on this emerging topic. Given that Zoom fatigue is a relatively new phenomenon, the purpose of this study was to determine the predictors of videoconference or Zoom fatigue among nursing students in the Philippines in the online learning and COVID-19 pandemic era.

Methodology

Research Design and Sample

This was a cross-sectional study. We computed the minimum required sample size at 122, given the 11 predictors in the model, anticipated Cohen's f^2 (1988) effect size of .15, desired probability level of .05, and desired statistical power level of .80 (Soper, 2021). We invited all 1,316 nursing students in one large private, non-sectarian university in the Central Luzon region of the Philippines to join the study. This is a high-powered study with five hundred ninety-seven (N=597) students that answered the web-based survey. Our inclusion criteria for this study include (a) consent to participate in the study, (b) be currently enrolled, (c) be a full-time student.

Survey Instruments

We adopted the Zoom Exhaustion and Fatigue (ZEF) scale by Fauville et al. (2021a) for this study. We were granted permission to use the ZEF scale by the tool developers. The ZEF scale includes 15 items. All items were answerable on a 5-point Likert scale. The computed reliability coefficients of the ZEF scale in this study were the following: entire scale (α=.91), general (α =.89), visual (α=.89), social (α=.78), motivational (α=.70), and emotional (α=.87). Sample items on the ZEF scale are: "How tired do you feel after video conferencing?" and "How exhausted do you feel after video conferencing?" We also asked about respondents' attitude toward videoconferencing

(i.e., "How much do you like participating in videoconferences?") and the usage of videoconferences in a typical day in terms of frequency or number of videoconferences ("On a typical day, how many videoconferences do you participate in?" with a 7-point Likert-scale response option ranging from 1 = *1* to 7 = *7 and more*), duration or length of typical videoconferences ("On a typical day, how long does a typical videoconference last?" on a 5-point Likert-scale with response options from 1 = *less than 15 minutes*, 2 = *15 to 30 minutes*, 3 = *30 to 45 minutes*, 4 = *45 minutes to an hour*, and 5 = *more than an hour*), and burstiness, interval, or the time in between videoconferences ("On a typical day, how much time do you have between your videoconferences?" on a 5-point Likert-scale with response options from 1 = *Less than 15 minutes*, 2 = *15 to 30 minutes*, 3 = *30 to 45 minutes*, 4 = *45 minutes to an hour*, and 5 = *more than an hour*), based on the work of Fauville et al. (2021a). We also collected students' demographic data (age, gender, year level, evaluation of family income status), device used during videoconferencing on a typical week, Internet stability ("How stable is your internet connection?"), and self-reported academic performance ("Over the past semester, how would you rate your academic performance as compared with your peers or classmates?" on a 5-point Likert-scale with response options from 1 = *very low* to 5 = *very good*) (Oducado & Estoque, 2021).

Data Collection and Ethical Considerations

We obtained administrative clearance from the private university where the study was conducted to conduct academic research. A brief introduction about the study was included at the start of the survey. The students were asked for their voluntary consent to participate before proceeding with the online administration of the survey in June 2021. The survey link through Google Forms was sent to the students' email addresses and posted on students' exclusive social media groups. Sharing the survey link with their classmates was also encouraged. We did not collect names, email addresses, and other identifiable information to promote confidentiality and anonymity.

Statistical Analysis

We employed descriptive statistics, one-way ANOVA with Scheffe post hoc test for multiple comparisons, t-test for independent samples, Cohen's *d*, eta squared, and Pearson's correlation for data analysis via SPSS version 23. We extend our analysis in

this report using step-wise multiple linear regression analysis. We set the level of significance at .05 alpha.

Results

Five hundred ninety-seven (*N*=597) nursing students responded to the survey. It is shown in Table 1 that participants had a mean age of 20.09 (*SD*=2.07) years. The majority were female (72%), in second-year level (40.7%), considered themselves to be of middle-income status (66%), had a somewhat stable Internet connection (75.9%), and acceptable self-reported academic performance (49.6%).

Table 1

Profile of Nursing Students (N=597)

Variables	Range	*M*	*SD*	*n*	%
Age	18 to 42	20.09	2.07		
Gender					
Male				153	25.6
Female				430	72.0
Prefer not to say				14	2.3
Year level					
First Year				156	26.1
Second Year				243	40.7
Third Year				144	24.1
Fourth Year				54	9.0
Family income status					
Low				203	34.0
Middle				394	66.0
High				-	-
Internet connection stability					
Not stable				95	15.9
Somewhat stable				453	75.9
Very stable				49	8.2
Self-reported academic performance					
Very low or Low				76	12.7
Acceptable				296	49.6
Good or Very good				225	37.7

Table 2 shows that 53.3% of videoconferences are mostly or all taken from a mobile device in a typical week. About half (49.1%) reported that videoconferences last for more than an hour on a typical day; 25.5% and 23.6% answered that on a typical day, they had 45 minutes to an hour and more than an hour between videoconferences, respectively. Moreover, on a typical day, students participate to an average of 3.54 (*SD*=1.61) videoconferences. The attitude toward videoconference had a mean score of 3.11 (*SD*=0.75).

Table 2

Device, Frequency, Duration, Interval, and Attitude Toward Videoconferences

Variables	*M*	*SD*	*n*	%
Device				
Computer			151	25.3
Both computer and mobile device			128	21.4
Mobile device			318	53.3
Duration	4.26	.90		
Less than 15 minutes			5	.8
15 to 30 minutes			33	5.5
30 to 45 minutes			56	9.4
45 minutes to an hour			210	35.2
More than an hour			293	49.1
Interval	3.21	1.41		
Less than 15 minutes			95	15.9
15 to 30 minutes			119	19.9
30 to 45 minutes			90	15.1
45 minutes to an hour			152	25.5
More than an hour			141	23.6
Frequency	3.54	1.61		
Attitude toward videoconferences composite score	3.11	.75		

It is shown in Table 3 that the majority (46.9%) of the participants in this study experienced a high level of videoconference fatigue with a mean composite score of 3.82 (*SD*=0.70) on the ZEF scale. Additionally, 3.2% had low, 30.2% had moderate, and 19.8% had very high levels of videoconference fatigue. Among the five constructs of

ZEF, students obtained the highest level in the general fatigue subscale (*M*=3.97, *SD*=0.84) with 41.2% and 28.5% reporting high to very high general fatigue. This is followed by visual fatigue (*M*=3.86, *SD*=0.98) with 36.3% and 30.8% reporting high and very high levels, motivational fatigue (*M*=3.85, *SD*=0.83) with 41% and 24.8% experiencing high and very high levels, social fatigue (*M*=3.75, *SD*=0.92) with 32.7% and 26.5% having high and very high levels, and emotional subscale (M=3.68, SD=0.95) with 33.5% and 23.1% reporting high to very high levels of fatigue.

Table 3

Level of Videoconference Fatigue Among Nursing Students (N=597)

Level of videoconference fatigue	General		Visual		Social		Motivational		Emotional		Composite	
	3.97±.84		3.86±.98		3.75±.92		3.85±.83		3.68±.95		3.82±.70	
	n	%	n	%	n	%	n	%	n	%	n	%
Very low	1	0.2	13	2.2	7	1.2	2	0.3	11	1.8	-	-
Low	29	4.9	49	8.2	48	8	32	5.4	56	9.4	19	3.2
Moderate	151	25.3	134	22.4	189	31.7	170	28.5	192	32.2	180	30.2
High	246	41.2	217	36.3	195	32.7	245	41	200	33.5	280	46.9
Very High	170	28.5	184	30.8	158	26.5	148	24.8	138	23.1	118	19.8

Using t-test for independent samples and one-way ANOVA, Table 4 shows that there were significant differences in the videoconference fatigue experience according to gender (F=12.77, p<.001, quite small to medium effect size of η^2=.04), family income status (t=2.01, p=.045, small effect size of d=.16), stability of Internet connection (F=8.12, p<.001, large effect size η^2=.12), and self-reported performance (F=13.71, p<.001, quite small to medium effect size of η^2=.04). Post hoc analysis (Scheffe test) revealed that compared to the male gender, females (p<.001) and those who prefer not to disclose their gender (p=.012) had significantly higher videoconference fatigue. Participants with unstable Internet connectivity had significantly higher videoconference fatigue than those with somewhat stable (p=.026) and very stable (p<.001) Internet connectivity. The difference between those with somewhat stable

and very stable Internet connections was also statistically significant (p=.034). Regarding self-reported academic performance, those with very low and low (p<.001) and those with acceptable (p<.001) academic performance experienced significantly higher videoconference fatigue than those with very high and high academic performance. Table 4 also shows the bivariate analysis using Pearson's correlation coefficient revealing medium negative significant correlation between attitude toward videoconferences (r=-.370, p<.001) and videoconference fatigue. Moreover, duration of videoconferences (r=.147, p<.001) and frequency of videoconferences (r=.166, p<.001) had small positive significant relationship with videoconference fatigue.

Table 4

Differences in and Correlates of Videoconference Fatigue Among Nursing Students

Variables	*M*	*SD*	Test statistics	*p*	Effect size
Gender[b]			12.770*	.000	.04††
Male	3.51	.73			
Female	3.89	.67			
Prefer not to say	4.17	.73			
Year level[b]			.078	.972	.00††
First Year	3.85	.71			
Second Year	3.81	.69			
Third Year	3.81	.69			
Fourth Year	3.82	.78			
Internet connection stability[b]			8.120*	.000	.12††
Not stable	4.02	.73			
Somewhat stable	3.81	.69			
Very stable	3.54	.68			
Academic performance[b]			13.712*	.000	.04††
Very low or Low	4.05	.66			
Acceptable	3.90	.69			
Good or Very good	3.64	.70			

Table 4

Differences in and Correlates of Videoconference Fatigue Among Nursing Students

Device[b]			.642	.633	.00††
Computer	3.80	.72			
Both computer and mobile device	3.86	.71			
Mobile device	3.82	.69			
Family income status[a]			2.005*	.045	.16†
Low	3.90	.74			
Middle	3.78	.68			
Duration[c]			.147*	.000	
Interval[c]			-.030	.468	
Frequency[c]			.166*	.000	
Attitude toward videoconferences[c]			-.370*	.000	

NOTE:
M: Very low (1.00-1.50), Low (1.51-2.50), Moderate (2.51-3.50), High (3.51-4.50), Very High (4.51-5.00)
[a]t-test for independent samples, [b]ANOVA with Scheffe post hoc test, [c]Pearson's r
†Cohen's d, ††Eta²
**p<.05*

The regression model explained 25.3% of the variance of the videoconference fatigue (F=33.30, p<.001). When all significant variables were entered for regression analysis, attitude toward videoconference (β=-.321, p<.001), frequency (β=.081, p<.001), gender (β=.268, p<.001), duration (β=.107, p<.001), self-reported academic performance (β=-.130, p=.001), and Internet connection stability (β=-.116, p=.028) were the significant predictors of videoconference fatigue among Filipino nursing students (Table 5).

Table 5

Predictors of Videoconference Fatigue Among Nursing Students

Independent variables	β	*t*	*p*	95% CI
(Constant)	4.121	19.375	.000	3.703 to 4.539
Attitude	-.321	-9.215	.000	-.389 to -.252
Frequency	.081	5.164	.000	.050 to .112
Gender	.268	5.095	.000	.165 to .371
Duration	.107	3.864	.000	.053 to .162
Self-reported academic performance	-.130	-3.334	.001	-.207 to -.053
Internet connection stability	-.116	-2.207	.028	-.220 to -.013

NOTE: R=.503, r^2=.253, Std. Error of the Estimate=.609, F=33.30, p<.001

Discussion

We demonstrated in this study that videoconference fatigue was prevalent, and Zoom fatigue was a real phenomenon among nursing students in the period of online learning to curb the rapid transmission of COVID-19. In our study, more than half had high to very high levels of videoconference fatigue. The composite mean score (M=3.82) in the ZEF scale obtained in our sample was relatively higher when compared to the mean score of samples reported in the studies of Fauville et al. (2021ab) among survey respondents using the Lucid platform and student research pool at Stanford University (M=2.99), 204 conveniently chosen sample during their scale development process (M=2.73), and large scale survey involving 10,591 participants (M=3.02). Our results may suggest that nursing students in the Philippines experience videoconference fatigue to a greater extent. Correspondingly, a study reported that those who use videoconferences mainly for education experience are more fatigue (Queiroz et al., 2021). It may be possible that higher fatigue may be attributed to the general negative, indifferent, or ambivalent attitude and satisfaction of nursing students and allied health courses towards online classes reported in some other studies conducted

during the COVID-19 pandemic (Abbasi et al., 2020; Diab & Elgahsh, 2020; Li et al., 2021; Oducado & Estoque, 2021; Oducado, & Soriano, 2021; Sasmal & Roy, 2021). A study among faculty and students in higher education similarly reported dissatisfaction with teaching and learning through videoconferencing (Massner, 2021). Dissatisfaction was primarily with regards to the practical and clinical learning component of the course (Dutta et al., 2021). It is noteworthy that in this study, among the different predictive variables, attitude toward videoconferences came out to be the strongest predictor of videoconference fatigue. We found that the more positive the attitude, the less fatigue is experienced during videoconferences. This finding once more corroborates the result of Fauville et al. (2021a). Moreover, our analysis found that among the five constructs of the ZEF scale, students had the highest level of fatigue in the general fatigue subscale, followed by visual and motivational fatigue subscales. Similarly, the study of Fauville et al. (2021a) noted highest mean score in the general fatigue subscale, followed by the motivational then visual subscales. Also, in our study, more than half of our sample reported high or very high levels of visual and motivational fatigue associated with videoconferencing. Similarly, many nursing students in India reported feeling overloaded and eye strain after e-learning (Sasmal & Roy, 2021). Motivation was also noted as a major barrier to learning online among first-year nursing student in a public university in the Philippines (Nobis et al., 2021). Our study suggests the need to consider the negative impact of videoconferences on nursing students and correctly identify factors and interventions that can protect students against videoconference fatigue. Our results also point to the importance of properly identifying how to strategically interact with students in online environments.

Based on the intensity of use of videoconferences, we found frequency and duration to be significant predictors of videoconference fatigue. We found that the more and the longer the videoconference, the higher is fatigue experienced. Our result is in accordance with that of Fauville et al. (2021ab) and Queiroz et al. (2021). Although interval between meetings did not predict fatigue in our current study, our finding similarly suggests that videoconference duration is more important than interval and frequency.

With regards to demographic variables, gender predicted videoconference

fatigue wherein females reported higher videoconference fatigue than males. While a third gender category ("prefer not to say") was included in our ANOVA test analysis, we exercised caution in interpreting this result for there were few respondents in this category. We believe that difference by gender found in our study was mostly between the male and female categories. Nonetheless, our result is similar to the findings of other scholars (Fauville et al. 2021b; Queiroz et al., 2021). Researchers explained that women are more self-focused and experience more negative affect (Fauville et al., 2021b). Women also tend to report higher emotional reactions than men (Oducado, 2021). Additionally, females are likely to have greater mirror anxiety associated with the self-view in videoconferencing and use more first-person singular pronouns compared to males (Bailenson, 2021; Fauville et al., 2021b). It must be noted that while we initially considered age as a predictor of videoconferencing fatigue, the variable was not included in the final analysis because of its narrow dispersion and skewed distribution.

It is also significant to note that videoconference fatigue was predicted by Internet connection stability in this present investigation. Students with unstable Internet connections experienced higher videoconference fatigue. Other scholars cited pressures of poor connectivity and high data cost as barriers to online education in medical, nursing, and health sciences education during and before the pandemic (Baticulon et al., 2021; Diab & Elgahsh, 2020; O'Doherty et al., 2018; Oducado & Estoque, 2021; Oducado, & Soriano, 2021). Perhaps, the poor quality of videoconferences due to limited or slow connectivity, and the micro delays in audio and the extended focus on poor quality images contribute to fatigue (Schroeder, 2021). Videoconferencing application users may need to work double in sending and receiving communication cues or signals, increasing cognitive load (Bailenson, 2021).

Interestingly, our results revealed that self-reported academic performance was associated with and predicted videoconference fatigue. Those who reported low academic performance experienced higher fatigue levels. Prior research found that stress and fatigue in other forms influence students' academic performance and achievement (Nagane, 2004; Oducado & Estoque, 2021; Smith, 2018). Our findings show the likely influence of the two variables. Nursing schools should consider the

negative association of videoconferences on the academic performance of students.

Finally, it is important to note that while videoconference fatigue initially varied based on family income status as earlier reported by authors (Oducado et al., 2021b), it did not remain a significant predictor in the regression analysis. This may due to the fact that the p-value of the income status in the multiple comparisons was approaching above significance level. Nonetheless, there is 25.3% variability explained by the model in our study.

We were able to identify limitations from this study. First, although we determined a-priori sample size in this study, our sample only included students from a large private nursing school in the Philippines, and the study was conducted amid a pandemic. While our results affirmed prior findings on videoconference fatigue research, generalizations cannot be made at this point. Second, while we found evidence linking some predictor variables in this study, the cross-sectional study design cannot determine cause-and-effect between variables. A cross-sectional design also has temporal limitations, and temporal variations have been noted in Zoom fatigue research (Bennett et al., 2021). Thirdly, the self-reported bias and social desirability cannot be neglected from the use of online survey questionnaires. Finally, other factors influencing videoconference fatigue among nursing students may be considered in future research. Because of these limitations, we warrant caution when interpreting and using the findings of this study. However, as few studies have explored videoconference fatigue, further research is still needed to confirm or validate the current study results.

Conclusion

Zoom fatigue is real in the context of the educational enterprise. And while videoconferencing tools have made schooling possible in the midst of a pandemic, it has come without a challenge that may have undesirable consequences specifically among nursing students. Certain measures should be implemented to minimize or alleviate videoconference fatigue during schooling. Our study affirms the findings of earlier research on videoconference fatigue. In our study, Internet connectivity

(unstable), gender (female), academic performance (poor), attitude toward videoconferencing (negative), and longer and frequent videoconferences predicted videoconference fatigue. Early identification, extra attention, and support should also be provided to students experiencing more significant fatigue during videoconferences. Given the benefits of videoconferencing and considering that this learning platform is expected to continue beyond the COVID-19 global health crisis, it is hoped that the findings in this study may be considered in planning and in developing policies and strategies in the use of videoconferences in the delivery of instruction in nursing education. Investigating the impact of videoconference fatigue on mental health and a comparison between social context and school-related videoconferences may be made in future studies. Also, studies testing interventions that can lessen fatigue during virtual conferences are needed.

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