SELF-REPORTED ZOOM EXHAUSTION AND FATIGUE LEVELS AMONG PHYSICAL EDUCATION TEACHER EDUCATION STUDENTS IN A STATE UNIVERSITY IN THE PHILIPPINES

Julius Ceazar G. Tolentino
John Paul P. Miranda✉

Don Honorio Ventura State University, Philippines

✉ jppmiranda@dhvsu.edu.ph

ABSTRACT

The study determined the self-reported Zoom exhaustion and fatigue (ZEF) levels of physical education teacher education (PETE) students in the Philippines who are attending a flexible learning setup (i.e., synchronous and asynchronous learning) offered by their university as a solution to continue classes during the coronavirus disease (COVID)-19 pandemic. Utilizing a cross-sectional comparative research design, the study indicates that PETE students were very tired and exhausted both in general and visually after a series of video conferencing within a semester. Furthermore, they were socially-, motivationally-, and emotionally- moderately tired and exhausted. It was observed that students in the PETE program experienced moderate to very tired and exhausted levels of fatigue whenever they participated in synchronous online classes, such as attendance at a video teleconferencing platform. Exploration of how specific mental aspects relate to their general health with regard to their culture and habits is worth exploring, either for students, teachers, or professionals in general.

KEYWORDS

Self-reported, Zoom exhaustion and fatigue, synchronous and asynchronous learning, teacher education students

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Highlights

- *PETE students experienced moderate to very high levels of fatigue, especially during synchronous online classes, with visual fatigue being the most reported issue.*
- *Visual fatigue was linked to extended exposure to devices used for attending virtual classes and contributes to students' exhaustion.*
- *Male PETE students exhibited higher level of exhaustion compared to their female counterpart.*

INTRODUCTION

The coronavirus disease (COVID-19 pandemic) has posed multiple challenges in a plethora of sectors all around the world. The education sector is no exception, as this was massively affected by the global health crisis. For this reason, a major paradigm shift in the delivery of instruction to learners worldwide prompted educational leaders to take affirmative actions and, therefore, requires solutions that would enable the continuity of learning. While closures of educational institutions were frequent at the height of the pandemic, transitioning to a distance learning approach was deemed necessary.

The transition from a traditional classroom setting to a virtual learning modality has led to the utilization of existing and emerging technologies that may essentially provide solutions to connect to learners and continuously deliver instruction (Henritius et al., 2019). With this, the use of video conferencing platforms, for one, became a common means to teach learners synchronously despite location or time zone differences. This allows students and teachers to communicate in real-time, various ways of teaching can be administered, and learning can ultimately occur (Rasouli et al., 2020). For instance, the utilization and support of Microsoft Teams, Zoom, Cisco Webex, and Google Meet, among others, often create lively and interactive learning environments even in a virtual world (Iannizzotto et al., 2020). Furthermore, these educational application tools generate a more feasible and viable method to

continuously pursue education amidst the challenges brought by the global health crisis.

However, despite the advantageous reasons for the use of video conferencing tools for teaching and learning, scholars started to investigate an emerging phenomenon of possible fatigue or exhaustion caused by periodic attendance to virtual meetings, which is referred to in contemporary studies as video conferencing or Zoom fatigue (Fauville et al., 2021). The need to investigate this phenomenon, particularly among college students, is of vital interest to consider mechanisms that would lead to the more effective delivery of learning processes that will not compromise their welfare in terms of emotional, mental, social, and general states. Looking into this dimension of learning in a virtual ecology would lead to a well-structured learning plan that is affirmative of students' needs and will maximize learning outcomes.

LITERATURE REVIEW

COVID-19, Remote Learning, and Videoconferencing in Higher Education

At the onset of the COVID-19 pandemic, many educational institutions shifted from in-person to online learning (Alvarez, Abel, 2020; K. A. Bird et al., 2022; Lim et al., 2022). As mentioned by Rotas and Cahapay (2020), the impact of COVID-19 on online and remote learning, in general, is substantial. Bird et al. (2022) suggested that teachers with a considerable amount of teaching experience with the same course for a long time do not even mitigate the negative effects of this sudden shift to virtual learning. the pandemic has brought the need for more video calls for learning or work-related matters. Studies conducted in 2021 found that the increase in screen time during the pandemic was significantly higher than before (Ganne et al., 2021; Pandya & Lodha, 2021).

Meanwhile, Asurion (2019) reported that, on average, Americans check their devices, particularly smartphones, 96 times a day - a 20% increase even before the pandemic occurred. Onn the other hand, Filipinos spent at least 10 hours and two minutes daily in 2019, mostly browsing the Internet or visiting social media platforms (Gonzales, 2019; Balita, 2024). In another study, Nagata et al. (2022) reported that screen time among children has doubled during the pandemic as most of them rely on their devices to conduct various activities (e.g., entertainment, socialization, and education). Similar findings have also shown a drastic increase in total screen time during the pandemic (Pandya & Lodha, 2021). This is alarming, partly because it was reported that an increase in screen time often leads to higher eye strain among students, particularly those attending online classes (Ganne et al., 2021; Sundarasen et al., 2020). Moreover, increased screen time often negatively impacts people's physical and mental well-being (Pandya & Lodha, 2021).

Remote learning adversely affects students and teachers in general (Bautista et al., 2021). Rotas and Cahapay (2020) mentioned that the sudden shift to online learning has also impacted teachers. The uncertainty of when the pandemic will end also increases anxiety in higher education (Jung et al., 2021). These things are attributed to making online teaching and learning even more challenging for both teachers and students. Despite this, Bolatov et al. (2021) believed that the shift to online learning not only helped to lessen the spread of COVID-19 but also provided some positive benefits to the students' mental health. This is supported by a recent study indicating that medical students in Saudi Arabia received the sudden shift to online learning (Khalil et al., 2020). On the contrary, the abrupt shift from online to in-person learning has been found to negatively affect student academic performance (K. A. Bird et al., 2022).

Furthermore, Gonzales-Ramirez et al. (2021) claimed that remote learning makes students more exhausted. They also believed that it has far-reaching implications for the students, both mentally and physically (Sundarasen et al., 2020). On the other hand, Li et al. (2021) suggested that people's life satisfaction and mental health are also at risk when they overuse social media and the internet to compensate for many things they cannot do, especially during lockdowns (e.g., lack of physical interaction).

Students' Weariness Towards Online Learning

During the pandemic, there has been an increase in gadget usage for both online learning and entertainment. This has caused the prevalence of digital eye strain among students. This is true particularly when they are compared to the general public (Ganne et al., 2021). Moreover, students are sometimes tended or forced to learn and are tempted to multitask despite attending online classes (Alibudbud, 2021; Baticulon et al., 2021), mainly when this is done at home (Baticulon et al., 2021).

Several studies have also indicated that barriers to online learning also contribute to the physical and psychological state of the students (Baticulon et al., 2021; Ortega et al., 2022; Peper et al., 2021; Sundarasen et al., 2020). For example, poor communication related to their schooling contributes to the students' weariness during the conduct of online classes (Baticulon et al., 2021; Peper et al., 2021; Sundarasen et al., 2020). Frustration due to the lack of necessities such as food, conducive space, limited access to devices, and a reliable internet connection is part of why students feel more exhausted than ever (Alvarez, 2020; Baticulon et al., 2021; Rotas & Cahapay, 2020; Sundarasen et al., 2020). Increased workload, and other activities unrelated to learning were also seen to contribute or to students' overall fatigue and exhaustion (Peper et al., 2021). Another issue related to student weariness is that in an online learning setup, students are most of the time forgotten or unable to do physical activities they used to do in an in-person classroom setting. Common physical activities that require movement, such as walking, running, and standing, are considered important and a usual part of a person's daily life much more so with student life. Peper and Lin reported in 2021 that students who do physical activities significantly increase their subjective energy and increase their attention levels.

An increase in social isolation is also seen among students during the period of online learning. It is perceived as one of the contributing factors to student weariness (Li et al., 2021; Peper et al., 2021). The lack of social interaction among students, teachers, and with their peers often contributes to their physical and mental exhaustion (Peper et al., 2021).

In connection, De Oliveira Kubrusly Sobral et al. (2022) found that students attending hybrid methodology tend to have a higher frequency of wanting to be alone after attending a video conference. Furthermore, it was found in the study by Martínez-Líbano et al. (2021) that Chilean social science students' exhaustion during the COVID-19 pandemic showed that their study stipulates that the students had higher levels of exhaustion and believed that their mental health deteriorated during the pandemic. The abrupt shift to online learning makes burnout and other negative mental symptoms prevalent among students (Bolatov et al., 2021). Other challenges that contribute to this phenomenon include pressure to concentrate during attendance to online learning while the threat of the COVID-19 pandemic is ongoing (Peper et al., 2021), overloaded activities (Rotas & Cahapay, 2020), and lack of control over various issues (i.e., technical issues) related to online learning (Peper et al., 2021).

Despite this, several studies have recommended countering student weariness in online learning. For example, Alibudbud (2021) suggested that regular breaks and avoiding multitasking are necessary to prevent burnout when attending online learning and to improve concentration among students attending such classes. Furthermore, limiting screen time is also a good option to potentially address this issue (Ganne et al., 2021). Alternatively, Räisänen et al. (2018) believed that identifying students' profiles is imperative to help students who need support in their learning. The key findings in their study, for example, suggested that students who already have self-regulated problems paired with high levels of peer learning and peer support tend to have higher study-related exhaustion. Another option is the intervention that lawmakers and policymakers can provide to address this issue, which is crucial (Ganne et al., 2021). Their intervention is needed as the challenges and problems related to student weariness may persist even after the pandemic subsides (De Oliveira Kubrusly Sobral et al., 2022).

In light of existing literature and studies, there is a need to further expand the knowledge on how students, particularly those who specialize in a movement-dominated discipline like physical education in the Philippines, perceive and assess their levels of exhaustion in multiple spectra of fatigue when attending classes via a video teleconferencing platform. This research documented the fatigue levels of pre-service physical educators in a Philippine-based public university and determined whether constructs underlying this emerging type of fatigue in contemporary times had statistically significant differences when their demographic profiles were considered. The study was an attempt to uncover this phenomenon, which may eventually serve as a data-driven and empirical basis for developing appropriate modalities for students, either in distance or blended learning. Through this, more proactive and tangible programs for curriculum delivery and instruction may be institutionalized toward a well-rounded learning experience for pre-service teachers in physical education.

THEORETICAL BACKGROUND

The theoretical framework of this study explores the potential interconnections between sex, class level, and Zoom exhaustion and fatigue (ZEF), aiming to shed light on their collective influence. Incorporating sex and class-level variables into the study objectives serves to address a pivotal research context. Existing literature has indicated that various demographic factors, including sex and class level (Dacillo et al., 2022; Purba et al., 2022; Fauville et al., 2023; Oducado et al., 2022; Salim et al., 2022; Usta Kara & Esroy, 2022), could contribute to shaping individuals' experiences of ZEF. Notably, gender has been implicated in Zoom-related fatigue studies (George et al., 2022; Ratan et al., 2021; Shockley et al., 2021). Emerging research also suggests potential disparities in how individuals perceive and navigate challenges within online interactions based on these factors (Dacillo et al., 2022; Purba et al., 2022; Ratan et al., 2021; Usta Kara & Esroy, 2022). In the context of the rapid expansion of virtual communication platforms like Zoom, comprehending the intersections between these variables and ZEF holds substantial academic and practical significance. This study, by delving into the potential impacts of sex and class level on ZEF, particularly among students engaged in active tasks, seeks to contribute to a nuanced comprehension of the intricate dynamics underpinning individuals' fatigue during virtual engagements.

This investigation into the potential effects of ZEF, particularly in educational settings, based on sex and class level could offer a more comprehensive understanding of its impact on individual students. Both sex and class level may exert influence by shaping students' experiences, stressors, coping mechanisms, and overall mental well-being. Research has suggested sex-based variations in coping mechanisms among students (Christiansen et al., 2022; Grace, 2019; Graves et al., 2021; Mahmoud et al., 2015; Scott-Young et al., 2020), potentially leading to different manifestations of fatigue and stress. As men and women are distinct in their psychological makeup and socialization patterns, societal expectations may engender divergent responses (L. J. Bird et al., 2023; Cislaghi & Heise, 2020; Ellemers, 2018; Grace, 2019; Newsome et al., 2016). Class-level, likewise, has been linked to varying workloads and expectations that could contribute to Zoom-related fatigue (Bare et al., 2023; Bird et al., 2023; Grace, 2019; Labrague, 2013; Rotas & Cahapay, 2020). For instance, earlier studies underscore that first-year students grappling with a transition phase and novel learning environments may necessitate greater support (Blair, 2016; Honkimäki & Kálmán, 2012; Mahmoud et al., 2015; Maymon et al., 2019; Meehan & Howells, 2018; Nyar, 2021). Concurrently, class-level disparities may correlate with Zoom-related fatigue, as students at different academic stages may possess distinct focuses, possibly impacting susceptibility to burnout, fatigue, stress, and related outcomes (Bird et al., 2023; Little et al., 2021; Mahmoud et al., 2015; Nyar, 2021).

AIMS OF THE STUDY

The researchers aimed to report the levels of ZEF as perceived by students in a pre-service teacher education (PETE) institution situated in a state university in Pampanga, Philippines. Specifically, the following research questions were answered:

1. How may the self-reported levels of ZEF among PETE students be described in terms of (a) emotional fatigue, (b) motivational fatigue, (c) social fatigue, (d) visual fatigue, and (e) general fatigue?

2. Are there statistically significant differences in the individual ZEF levels of the respondents when grouped according to their sexes and class level?

METHODOLOGY

Research Design

The study adopted a comparative cross-sectional survey design to collect data on the self-reported levels of ZEF among PETE students. A cross-sectional approach allows for collecting data from multiple respondents at a single point in time, providing a snapshot of their experiences in a particular phenomenon, the Zoom exhaustion fatigue in this context. Apart from the descriptive nature of the design, it particularly centred on establishing a thorough analysis of the differences in the ZEF levels of PETE students when grouped according to their sex and class levels.

Respondents

The study was conducted in a teacher education institution in a public university in Pampanga, Philippines. For the whole academic year 2021 - 2022, the university offered full online learning, particularly employing a combination of synchronous and asynchronous sessions as a modality to deliver lecture and laboratory courses. The courses are offered either as a three-hour lecture or as a five-hour laboratory. There were 37,398 students in the whole university enrolled at the time of the study. The study utilized a purposive random sampling technique among 555 students enrolled in the physical education teacher education program. The said student groups are of interest as their program demands actual and physical demonstration of skills, which may seem to be challenging in a virtual context. Using the list provided by the university, with a 99% confidence level and a five percent margin of error, a minimum of 303 respondents are needed for the study. To reduce the attrition, 350 prospective respondents were invited to answer the short electronic and self-administered survey sent to their respective institutional email accounts the day before the end of the academic year to immediately assess their perceived fatigue level concerning the online modality employed for their learning.

Respondents' Demographics

As seen in Table 1, 303 respondents were included in the study. Their age ranged from 19 to 21 years old. Based on the total respondents, 196 are females (64.7%), and 107 are males (35.3%). Furthermore, almost a third of them are either first-year (n = 94) or fourth-year students (n = 92).

Variables	Frequency	Percentage
Age (mean ± *SD*)	20 ± *1.626*	
Sex		
Male	107	35.3%
Female	196	64.7%
Year Level		
First Year	94	31.0%
Second Year	61	20.1%
Third Year	56	18.5%
Fourth Year	92	30.4%
TOTAL	303	100.0%

Table 1: Respondent's profile

As illustrated in Figure 1, 40% of the respondents participated in a video conference about once a day before the conduct of this study (n = 124). Furthermore, roughly a third of the respondents said their average daily participation in video conferences was at least once a day. More than half said these video conferences lasted over an hour (Figure 2). Meanwhile, when respondents were asked about the average interval between each video conference within the day, a third of them mentioned that the gap was more than an hour (Figure 2).

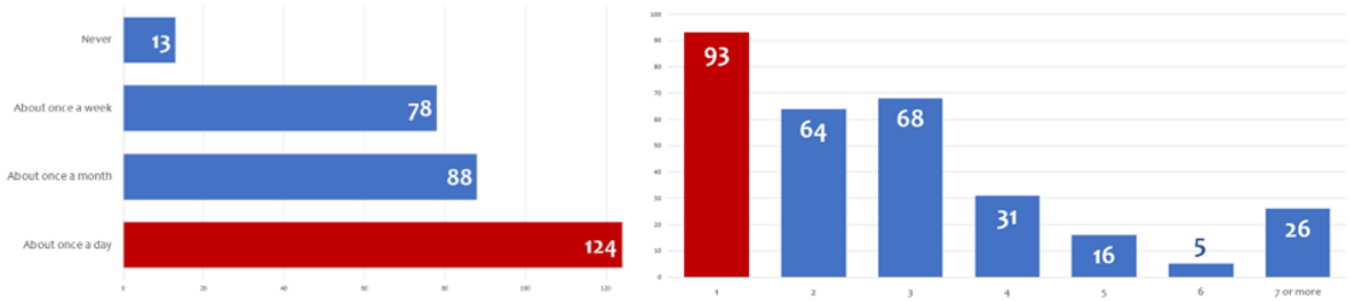

Figure 1: Average length (left) of each video conference, including their interval (right)

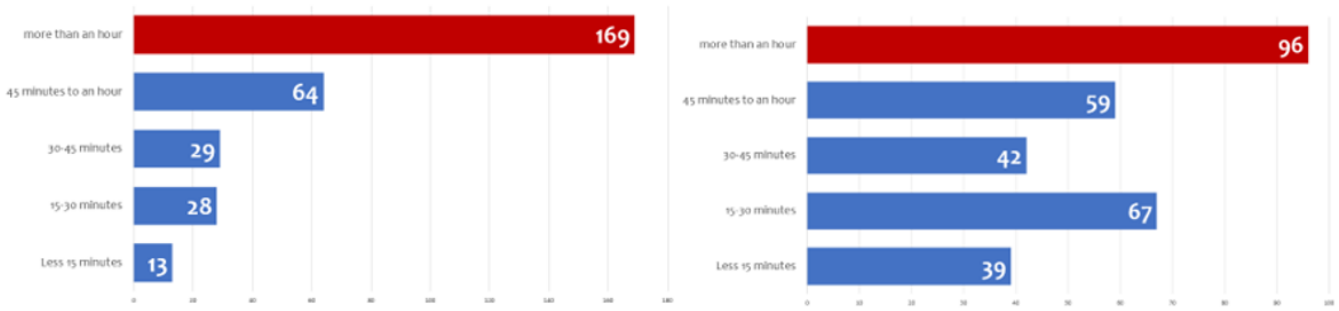

Figure 2: Overall (left) and daily average (right) participation in video conferences

Instrument

The primary instrument utilized in this study was the Zoom Exhaustion and Fatigue (ZEF) scale, developed by Fauville et al. (2021). No modifications were made to the instrument, and it was utilized without any translation, validity checks, or additional reliability testing for this particular study. The instrument's prior validation and reliability testing by Fauville provided a foundation for its applicability. Within the context of this study, ZEF denoted the fatigue arising from frequent participation in videoconferencing, regardless of the platform. This 15-item instrument was structured around five distinct dimensions: general, visual, social, motivational, and emotional aspects. Each dimension encompassed three questions, yielding a total of 15 items. The ZEF utilized English as a medium of instruction in its administration (hence, translation was no longer needed). This is applicable in the context of the Philippines because English is one of the country's two official languages by virtue of the 1987 Constitution (along with Filipino), which is deemed used for "purposes of communication and instruction," and this cascades from basic to higher education.

The dimensions of the ZEF instrument were crafted to evaluate various dimensions of exhaustion and fatigue specifically attributed to Zoom interactions. The instrument's reliability was substantiated by Fauville et al. (2021), who reported robust indices such as Cronbach's alpha (ranging from .82 to .90) and composite reliability (ranging from .83 to .90). These indices surpassed the conventional threshold of .70, underscoring the instrument's dependable reliability.

The collected data underwent analysis to extract meaningful insights. Descriptive statistics, including mean, standard deviation, and percentage, were computed to provide an overview of the data distribution. A normality test was conducted to ascertain the data's adherence to normal distribution utilizing IBM Statistical Package for Social Sciences (SPSS) version 25.0. Subsequently, non-parametric tests were applied, specifically the Mann-Whitney and Kruskal-Wallis tests. These tests were selected to explore potential variations in the self-reported ZEF levels based on two variables: respondents' sex and class level. These non-parametric tests were chosen due to the distribution characteristics of the ZEF data. The interpretation of the analysis outcomes drew upon the insights provided by Table 2. This table detailed the Likert scale employed, its corresponding range, and the verbal interpretation associated with each mean score.

Scale	Range Value	Verbal Interpretation
5	4.50 - 5.00	Extremely tired and exhausted
4	3.50 - 4.49	Very tired and exhausted
3	2.50 - 3.49	Moderately tired and exhausted
2	1.50 - 2.49	Slightly tired and exhausted
1	1.00 - 1.49	Not at all tired and exhausted

Table 2: Five-point Likert rating scale and its interpretation

Ethical Considerations

All respondents were assured that they could discontinue answering the survey at any given time and that all the data collected from them were strictly confidential and solely intended for this study. Furthermore, all the data will be destroyed one year after the study is conducted in compliance with the existing data privacy laws in the Philippines.

RESULTS AND DISCUSSION

Self-reported Levels of ZEF among PETE Students

This study examined the self-reported ZEF levels of PETE students attending synchronous and asynchronous classes in a public university in the Philippines. The results indicated that students are mostly exhausted across ZEF constructs (i.e., general, visual, motivational, social, and emotional). Figure 5 indicates the respondents' ZEF-reported levels. It shows that PETE students are very tired and exhausted both in the general sense ($\bar{x}$ = 3.50, SD = 0.97) and visually ($\bar{x}$ = 3.64, SD = 0.99) after a series of video conferencing within a semester. Furthermore, PETE students are moderately tired and exhausted in terms of social ($\bar{x}$ = 3.45, SD = 0.93), motivational ($\bar{x}$ = 3.47, SD = 0.92), and emotional ($\bar{x}$ = 3.31, SD = 0.99) domains. This is consistent with De Oliveira Kubrusly Sobral et al. (2022) findings, where half of the students surveyed experienced Zoom fatigue. Another reason for this fatigue is because of higher screen time among

students, particularly during the COVID-19 pandemic, when most students rely on their devices to do almost everything (Nagata et al., 2022). This is supported by previous studies where they posited that this kind of fatigue will persist even after the pandemic (De Oliveira Kubrusly Sobral et al., 2022; Nagata et al., 2022). Several studies have offered some kind of treatment to solve this. For one, Alibudbud (2021) recommended that regularly providing a short break every thirty minutes and avoiding multitasking while attending online classes can improve student concentration. This is supported by previous studies indicating that performing some physical activities, even for a minute, can increase positive mental well-being (Peper et al., 2021). Moreover, revisiting and revising the course activities and outcomes to adjust these recommendations are necessary to avoid student burnout (Alibudbud, 2021). In addition, lifestyle modification and self-imposed limitations to the use of digital media are seen to have positive effects on better health and well-being (Ganne et al., 2021; Li et al., 2021; Pandya & Lodha, 2021). Providing adequate support to teachers and promoting mental health training are also seen as important factors in fostering a healthy school environment. This intervention is seen to have a direct and indirect impact on reducing fatigue and exhaustion among students (Alibudbud, 2021; Bautista et al., 2021).

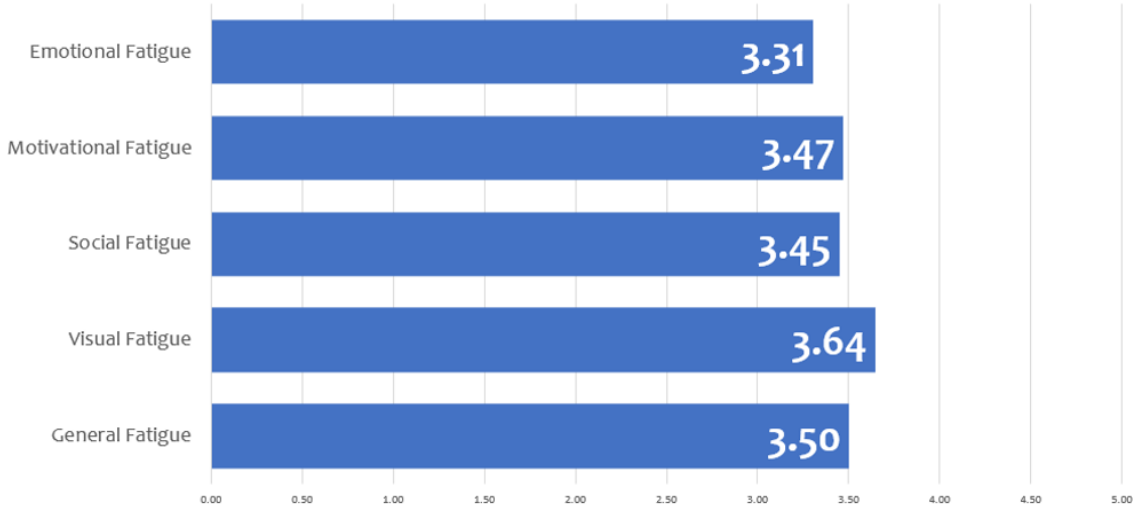

Figure 3: Self-reported levels of ZEF among PETE students

Table 3 shows that there are no statistically significant differences in the self-reported individual ZEF levels of PETE students when grouped according to their sex and year level. All PETE students' self-reported ZEF levels when grouped according to sex are the same in terms of their general ($U = 10{,}263.5$; $p = 0.757$), visual ($U = 9{,}287.5$; $p = 0.097$), social ($U = 9{,}442$; $p = 0.149$), motivational ($U = 9{,}288$; $p = 0.097$), and emotional exhaustion and fatigue ($U = 9{,}160$; $p = 0.067$). This is contrary to previous results by other studies that suggest women, in particular, have higher levels of Zoom-related fatigue and exhaustion compared to their counterparts (Purba et al., 2022; Fauville et al., 2023; Oducado et al., 2022; Usta Kara & Esroy, 2022). When grouped according to their year level, PETE students also reported higher levels of general ($x^2 = 5.975$; $p = 0.113$), visual ($x^2 = 3.652$; $p = 0.302$), social ($x^2 = 0.231$; $p = 0.972$), motivational ($x^2 = 3.753$; $p = 0.289$), and emotional exhaustion and fatigue ($x^2 = 2.088$; $p = 0.554$).

	ZEF by sex (*df* = 1)				
	General	Visual	Social	Motivational	Emotional
Mann-Whitney *U*	10,263.5	9,287.5	9,442.0	9,288.0	9,160.0
p Value	0.757	0.097	0.149	0.097	0.067
Z Score	-0.309	-1.660	-1.444	-1.659	-1.834
	ZEF by Year Level (*df* = 3)				
Kruskal-Wallis H (x^2)	5.975	3.652	0.231	3.753	2.088
p Value	0.113	0.302	0.972	0.289	0.554

Table 3: Test of difference on PETE student's zoom fatigue

CONCLUSION AND RECOMMENDATIONS

The study was conceived to assess the physical education teacher education students' self-reported ZEF levels and determine whether differences exist between males and females and the class level they were in at the time of the study. It was concluded that by and large, students in the PETE program experienced moderate to very tired and exhausting levels of fatigue whenever they participated in synchronous online classes, such as attendance to a video teleconferencing platform. Evidence derived from the study also indicated visual fatigue with the highest mean score, indicating that students feel very tired or exhausted when

their eyes are exposed to a certain extent in the device they use to attend virtual synchronous classes. This is coherent with the findings of other studies that other than attending virtual classes, students are also exposed to extended periods as they usually use their devices for many things other than learning (e.g., socialization and entertainment).

The findings of this study may have direct implications for the physical education teacher education program and, therefore, cannot be generalized to other teacher education students. The context may vary, considering that PETE students have relatively more movement-based courses than the other education programs, given the nature of physical education as a performance-based program. Methodologically, the context was also limited to the fact that the cross-sectional survey was facilitated as a design of the study. While the design may establish comparisons between variables, it cannot determine causality associated with the phenomenon. Moreover, it cannot track temporal changes since the data collection was limited to a specific point in time only, particularly at the height of the pandemic. At the same time, classes were transitioned to full online modality. Also, cohort effects were likewise viewed as potential confounding variables that were not included in the study as age-associated differences, because of historical and social contexts, may influence changes in the results, hence making the results particular to the context of the PETE program only.

Many aspects of the ZEF still need further exploration. For example, due to the late implementation and resumption of online learning in the Philippines, many previous studies conducted might not apply to the country, not to mention that the country has very different economic, infrastructural, and cultural aspects that can also affect the ZEF levels of the students. Moreover, the country also implemented a very different and more flexible type of learning that tried to accommodate all types of learners. The same might be true when similar studies are conducted on teachers in different regions of the country. Further studies are also warranted to understand how ZEF affects teachers, particularly in those in public and private schools. An exploration of how specific mental aspects relate to their general health with regard to their culture and habits is worth exploring, either for students, teachers, or professionals in general.

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