Online Learning in the Era of COVID-19: Computer Anxiety and Mental Health Among College Students

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Abstract

The recent outbreak of the coronavirus (COVID-19) pandemic has brought significant changes to higher education. In response to the pandemic, many colleges, and universities around the world, especially in developed countries, are embracing online or distance education. Transitioning to online learning that involves the use of information technology such as the internet and digital platform for course delivery has increased dramatically (World Economic Forum, 2020). However, these sudden changes have left some to speculate that the shift to online learning will change students' level of anxiety, stress, which could result in poor academic performance and low achievement of learning objectives. The purpose of this descriptive cross-sectional study is to investigate undergraduate and graduate students' perceptions of their mental health and computer anxiety in the era of the COVID-19 pandemic. Descriptive statistics such as simple percentages and averages were calculated. Also, a one-way ANOVA was used for analyzing the collected data. Results indicate that general mental health was significantly correlated with computer anxiety. The results also indicate that computer anxiety and perceived stress predicted poor general health. Demographic factors, such as sex, and academic discipline were significant predictors of computer anxiety, but age was not a significant predictor of computer anxiety. Also, the results show that chronic physical disabilities are a significant predictor of computer anxiety, and overall mental health, however, the presence of learning disabilities was not a significant predictor of computer anxiety. Implications and considerations for future research are discussed.

Keywords: anxiety, stress, college students, COVID-19, mental health, online learning

Many believe that following the emergence of COVID-19 pandemic, life has changed for many individuals around the world. The coronavirus outbreak, which was first identified in Wuhan, China in 2019, has presently become a global pandemic with approximately 15.3 million cases and 624,000 deaths (John Hopkins Corona Virus Resource Center, 2020). The continued spread and unabated transmission have affected the economic and social activities of individuals, families, communities, and institutions within countries (Pew Research Center, 2020). The effects, which are far-reaching and unprecedented, include physical and mental health problems, unemployment, business uncertainty and failure, social upheavals, and crisis in social and economic institutions (Centers for Disease Control and Prevention, 2019).

Globally, an important area in society that is significantly affected and undergoing tremendous change is higher education. Since the outbreak of the COVID-19 pandemic, there has been a surge in the number of concurrent users of many remote or online learning platforms that utilize the internet and other digital learning resources (World Economic Forum, 2020), however, some concerns remain about how anxiety, mental health problems, and demographic factors that impact computer-based or online learning in students in higher education especially in the era of COVID-19. Specifically, scholars are speculating that the shift to remote learning will increase students' level of stress and problems with their general health and that would consequently lead to poor academic performance. Stress and anxiety impair cognitive functions, which also affect academic functioning (Steelman et al., 2019; Shen et al., 2013). More importantly, the presence of a diagnosed mental illness such as depression, generalized anxiety disorder, panic disorder, obsessive-compulsive disorder, social anxiety, test anxiety, post-traumatic stress disorder, and so on are likely to worsen a student's computer anxiety and overall mental health state (Wiegner et al., 2015; Sultan & Kanwal, 2017). Although many scholars agree that COVID-19 is likely to increase the mental health challenges experienced by college students, few studies have examined the issues of computer anxiety and mental health in online learning in the era of COVID-19.

Theoretical Framework

The theoretical framework for the study is grounded in the Cognitive Interference theory (Spielberger & Vagg, 1995). Cognitive Interference theory notes that anxiety has a negative impact on working memory, which affects the ability to learn (Paechter et al., 2017). Cognitive interference theory also indicates that highly anxious individuals tend to be more self-centered and self-critical and more likely to make negative responses that interfere with task performances (Sarason et al., 1988). Additionally, stress-related cognitive interference induces performance anxiety, impedes learning memory retrieval or update, and results in poor performance. Anxiety impedes the performance of a specific task by impairing the efficiency of information processing efficiency (Eysenck et al., 2007). Consequently, an understanding of students' perceived stress, general health, and its relations to their computer anxiety can provide insight into the factors that contribute to these heightened concerns, as well as how educators can create, shape, and utilize these ubiquitous platforms to enhance student-learning outcomes.

College Students' Mental Health
Due to the current situation with COVID-19 and the need for social distance, most higher education institutions around the world have begun to offer distance learning to prevent and contain the spread of the virus. However, it is likely that this trend will continue in the future in many universities. This means that, as opposed to the past, college students do not have freedom of choice whether they like or dislike taking online classes. This lack of freedom might

be considered a risk factor increasing the level of anxiety among students. Moreover, many may not feel comfortable using computers and the internet. There is a huge gap in the literature investigating college students' attitudes and comfort level using technology during this period, while it appears that online learning is considered an essential part of the future teaching paradigm. Facing anxiety while using technology might result in experiencing an elevated level of stress among college students and therefore this might negatively impact their academic performance.

Stress

Stress has been identified as the most common health factor impacting students' learning and academic performance (Lazarevic & Bentz, 2020). It has been reported that more than 45% of college students surveyed reported feeling stressed (American College Health Association, 2018). Stress in college students is associated with the development of serious mental health issues such as anxiety and depression and overall poorer quality of life and well-being (Moylan et al., 2013; Ribeiro et al., 2018). Perceived stress has been described as the feelings or thoughts that an individual has about how much stress they are under at a given point in time or over a given period (Robles et al., 2016). Lee et al. (2016) examined the effect of perceived stress on life satisfaction as well as the mediating effect of self-efficacy on the relationship between the aforementioned factors using 282 Korean undergraduate students. The authors found that individuals that perceive their situation as controllable and positively challenging, become more confident in their abilities and as a result, experience improved life satisfaction. The authors also found that self-efficacy mediated between perceived stress and life satisfaction. Relative to learning, stress has a memory-modulatory effect (Schwabe et al., 2012; Simon-Kutscher et al., 2019; Vogel & Schwabe, 2016).

The experience of being stressed can trigger anxiety- a feeling of fear, worry, or unease. In many instances, anxiety could be an individual's reaction to stress. Mamo et al. (2012) found that increased perception of stress might be associated with a moderate level of anxiety. Although anxiety can be considered a normal response to stress, higher levels of perceived stress may result in the development of anxiety disorder (Wiegner et al., 2015). As students experience heightened anxiety, they are more likely to perform poorly, which causes them to question their abilities and further deepens their perceived stress (Racic et al., 2017). Therefore, understanding this dynamic as it relates to college students' perception towards online learning during the era of COVID-19 is essential.

Computer Anxiety

Studies have shown that computer anxiety is common among college students (Stiller & Köster, 2016). Leso and Peck (1992) defined computer anxiety "as a feeling of being fearful or apprehensive when using or considering the use of a computer. In the last decade, interest in and use of online learning has increased among colleges and universities and has transformed the delivery of higher education in many developed countries (Avella, 2016). However, the high level of interaction with computers or internet-related technology in higher educational settings for learning, communication, social interaction, and completion of assignments can be overwhelming for many students. Previous studies have stated that for some individuals, the use of technology and especially, computers, could create strong negative emotional states, not only during interaction but even before, which would result in the individuals developing a negative perception of such technology or engage in behaviors that reduce their likelihood for continued use (Saadé & Kira, 2009). These negative emotional states are likely to affect the capacity of the individual to interact with technology, learn, develop social relationships, and the overall well-being of the individual (Sultan & Kanwal, 2017).

Demographic Factors

Previous research suggests that demographic factors such as age, level of education disability status may also affect individual attitudes towards computers and internet use (Cazan, et al., 2016; Steelman & Tislar, 2019). The literature shows that not all individuals have a positive experience with using computers or technology (Steelman & Tislar, 2019). For instance, some findings show that older adults have a higher level of tech anxiety compared to other group ages (Steelman & Tislar, 2019). Older adults had more anxiety with using the internet and especially with using it to complete tasks and are therefore more reluctant to use digital technologies. Research has also shown females experience a higher level of computer anxiety compared to male users (Chua et al.,1999; Sultan & Kanwal, 2017). Also, young adults and older individuals may have anxiety about keeping up with schoolwork or trouble concentrating on online learning (Abdous, 2019).

Public health experts believe that the presence of diagnosed mental illness can affect the ability of college students to successfully complete their academic programs (American College Health Association, 2015). It has been reported that among students diagnosed with mental illness, technological issues including the use of computers and online learning are a source of anxiety and stress (Saade et al., 2017). These influences and the impact of these factors are likely to be heightened in times of turbulence or uncertainty such as the present era of COVID-19. However, these relationships are unexplored and therefore need to be investigated.

The purpose of this descriptive cross-sectional study, therefore, is to investigate computer anxiety, mental health, and online learning in the era of COVID-19. Additionally, the study aims to investigate relationships among preexisting mental health (e.g., learning disabilities, mental health disabilities) and computer anxiety and its overall impact on students' current mental health. The study will also examine the extent to which demographic variables (e.g., sex, age, academic level, and history of preexisting disabilities) are related to computer anxiety and overall mental health in the era of COVID-19.

To achieve the objectives of the study the following research questions were addressed:

1. Is there a significant relationship between computer anxiety and general mental health and perceived stress among undergraduate and graduate online learners?
2. Do computer anxiety and perceived stress predict undergraduate and graduate online learners' overall current mental health in the era of COVID-19?
3. Do demographic variables (sex, age, academic major, education level, and history of disability) predict computer anxiety?
   The following hypotheses are posed in conjunction with research question 3 above.
I. Sex: (trichotomous as female, male, intersex)- *Hypothesis:* Female learners will report higher computer anxiety (Sultan & Kanwal, 2017; Saade et al., 2005; Chua et al., 1999).
II. Age- *Hypothesis:* Older learners will report higher computer anxiety (Lee et al., 2019; Sultan & Kanwal, 2017).
III. Academic level: (Undergraduate vs graduate)- Hypothesis: Graduate students have lower levels of computer anxiety (Peng, Tsai, & Wu, 2006).
IV. History of any disability: *Hypothesis:* Students with learning disabilities and mental conditions will achieve higher scores in computer anxiety (Conti-Ramsden et al., 2010; Harrysson et al., 2004).

Methodology

Design

A descriptive cross-sectional design in which condition and potentially related factors are measured at a specific point in time for a defined population was used for the study (Smyth, Dillman, & Christian, 2009). A survey instrument was used for the collection of data. Surveys are highly considered as a good method for assessing attitudes, perceptions, and intended behaviors of a sample when direct observation of every member of the population is not feasible (Smyth et al., 2009). A web-based survey resource called Qualtrics, which allows users to store and access data and programs over the internet instead of their computer's hard drive. The survey was accessible via a link to an invitation prompt placed in emails sent to the faculty. The invitation promptly contains information about the researcher, a statement about institutional approval for the study, the nature of the study, and statements about confidentiality and informed consent. Participants completed the survey online anonymously; no personal or identifying information such as email addresses, names, and IP addresses was collected.

Participants

The participants for the study were graduate and undergraduate students who were enrolled at a large Midwestern University during fall 2020. The university is diverse in terms of religious beliefs, race, language, ethnicity, gender, and (dis) ability, and so on. According to recent enrollment data, there were a total number of 16,769, students enrolled in fall 2020. The university offers over 100 undergraduate programs and more than 80 graduate programs. The sample was drawn from an unknown number of enrolled students in one of the large colleges in the university.

Descriptive data revealed there were 155 participants. The age range was 18 -50 years. Of the 155 participants, 23 (14.8%) were male and 123 (79.4) were female. In terms of academic level, 14 (9.0%) were graduates, and 132 (85.2%) were undergraduates. Among the respondents, 80 (51%) were from health services, 47 (30.3%) were from rehabilitation services and rehabilitation counseling, 12 (7.7%) were from health professions education, and 2 (1.3%) from addiction studies. Relative to formal diagnosis, 21(13.5%) reported having a generalized anxiety disorder, 3(1.9%) had obsessive-compulsive disorder, 7(4.5%) reported having panic disorder, 9(5.8%) reported having posttraumatic stress disorder, and 7(4.5%) reported social phobia. Also, 9(5.8%) of the respondents reported having test anxiety, 38(24.5%) reported having depression, 4(2.6%) indicated that they were diagnosed with bipolar disorder and 1(.6%) reported having psychotic disorders including schizophrenia.

Nine (5.8%) of the respondents also indicated that they had a formal diagnosis of chronic physical disabilities, whereas 136 (87.7) reported as not having a chronic physical disability. Participants were also asked if they had any history of learning disabilities. Among all, 2 (1.3%) reported having Dyscalculia, 2 (1.3%), reported Dysgraphia, 4 (2.6%) Dyslexia and 4 (2.6%) Nonverbal learning disabilities. Among all, participants with ADHD (7.1%) and ADD (5.8%) reported as the highest condition among the participants.

Instruments

The data collection instruments consisted of three surveys and a demographic sheet. The following research instruments were used:

1- ***Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983).*** PSS is one of the most commonly used psychological instruments for measuring an individual's

perception of stress. PSS measures the degree to which situations in one's life are considered stressful. The PSS items ask about participants' thoughts and feelings during the last month, and direct queries regarding current levels of experienced stress. The PSS was used for this study because it enables researchers to determine whether "appraised" stress is an etiological or a risk factor in behavioral disorders or disease. For example, we intended to examine if this scale determines whether the unexpected presence of COVID-19 can be appraised as a significant risk factor causing stress in the lives of college students since the pandemic started.

2- ***Short General Health Questionnaire (GHQ 12; Goldberg & Hillier, 1979).*** GHQ is a self-administered questionnaire used in non-psychiatric clinical settings to screen, identify, and quantify possible common psychiatric disorders. GHQ contains two main areas: (1) characteristics that focus on one's inability to function as a "healthy" and/or "normal" individual, (2) the possibility of existing new distressing phenomena (Makowska et al., 2002). The original version contains 60 items, but the shortened 12-Item General Health Questionnaire (GHQ-12) which is also recommended by the World Health Organization (WHO) is the most broadly used version of the GHQ. This instrument is a well-validated psychiatric diagnostic scale and is frequently used to screen common mental health disorders (del Pilar Sánchez-López & Dresch, 2008)

3- ***The Computer Anxiety Rating Scale (CARS; Heinssen, Glass, and Knight (1987).*** The modified CARS instrument (20-item, five-point scale) was used to measure the level of anxieties students report. CARS is a broad, multidimensional scale that enables researchers to conceptualize the level of computer anxiety. Literature shows that CARS is capable of measuring areas of general anxiety about computers, the level of confidence in ability and motivation to learn about computers, and the beliefs towards the power and control of computers.

4- ***A Demographic Questionnaire.*** The demographic questionnaire gathered information about students' sex, academic majors, and formal diagnosis of learning and/or mental disabilities. Students were also asked to rank their level of satisfaction with online classes and their willingness or preference to take online classes on a scale of 0-10. The responses on the demographic and survey instruments were used to provide the researchers with basic information about the respondents of the study and supply data for several variables in the analyses.

Data Collection Procedures

Approval to conduct the study was obtained from the Institutional Review Board (IRB) for ethical protection of all human subjects from the university where the study was conducted. Following the IRB approval, the survey link, research invitation, and the disclosure statement were emailed to faculty who teach 100% online or hybrid undergraduate and graduate courses using the university faculty and staff directory. Faculties were also asked to forward the email to their students and encourage them to complete the online survey during the fall 2020 semester. In order to increase the number of research subjects, faculty offered students who voluntarily self-selected to participate in the study, some incentives (extra credit points), to complete the survey before the completion of the semester. Students completed the survey voluntarily and anonymously, as no personal or identifying information was collected. At the conclusion of data collection, raw data were exported into SPSS software for data analysis.

Data Analysis

Descriptive statistics (simple percentages, means, and standard deviation) were calculated. Regression analysis was completed to assess the relationship between the independent variables and the dependent variables. Specifically, the regression analysis focused on examining the relationships among computer anxiety, perceived stress, demographic variables, and the respondent's overall current mental health in the era of COVID-19. Using ANOVA, the analysis was also focused on finding out differences in computer anxiety, perceived stress, and overall current mental health relative to undergraduate and graduate, college students, and their demographic characteristics.

Results

RQ 1. Is there a significant relationship between computer anxiety and general mental health and perceived stress among undergraduate and graduate online learners?

Table 1
Descriptive Statistics and Correlations among Study Variables (N=155)

Variable	Mean	SD	1	2	3
General Mental Health	28.5325	9.24480	-		
Perceived Stress	34.0390	4.36696	.058	-	
Computer Anxiety	52.8182	19.24913	.499**	-.043	

*p < .05, **p< .01

The results show general mental health was significantly correlated with computer anxiety. This means that students that report poor general mental health are more likely to experience increased computer anxiety. However, perceived stress was not correlated with general mental health.

RQ 2. Do computer anxiety and perceived stress predict undergraduate and graduate online learners' overall current mental health in the era of COVID-19?

Table 2
Relationships Between Computer Anxiety, Perceived Stress, and General Health

ANOVA	df	SS	MS	F	Significance F
Regression	2	3655.958	1827.979	29.301	.000
Residual	151	9420.380	62.387		
Total	153	13076.38			

The results of the regression as shown in Table 2 indicated that taken as a set, the two predictors account for 28% of the variance in computer anxiety. The overall regression model was significant, $F_{(2,151)} = 29.30$. $p < .000$, $R^2 = .28$. It was found that computer anxiety significantly predicted overall current mental health ($\beta = .24$, $p < .05$), as did perceived stress ($\beta = .37$, $p < .05$). Overall, the results seem to indicate that individuals or college students who experience computer anxiety and perceived stress are more likely to have poor overall physical and mental health.

RQ 3. Do demographic variables (sex, age, academic major, education level, and history of disability) predict computer anxiety?

Table 3
Relationships Between Demographic Variables and Computer

ANOVA	df	SS	MS	F	Significance F
Regression	7	47305.858	6757.980	105.798	.000
Residual	147	9389.780	63.876		
Total	154	56695.639			

Table 3 above shows the results of the regression analysis which indicate that collectively, the seven (7) predictors account for 83.4% of the variance in computer anxiety. The overall regression model was significant, $F_{(7,147)} = 105.80$. $p < .000$, $R^2 = .83$. It was found that age was not a significant predictor of computer anxiety ($\beta = .07$, $p > .05$). However, sex was a significant predictor ($\beta = .16$, $p < .05$), as did academic level ($\beta = .50$, $p > .05$). Academic discipline or major was not a significant predictor of computer anxiety ($\beta = .05$, $p > .05$). The results also show that chronic physical disabilities are a significant predictor of computer anxiety ($\beta = .22$, $p > .05$). Mental illness was also a significant predictor of computer anxiety ($\beta = -.06$, $p > .05$. The presence of learning disabilities was not a significant predictor of computer anxiety ($\beta = .03$, $p > .05$). Overall, the results seem to indicate that individuals or

college students who experience computer anxiety and perceived stress are more likely to have poor overall physical and mental health.

In order to further explore the relationships between each of the demographic variables and computer anxiety, we tested the hypothesis that was previously posted. The results indicate that females experienced less computer anxiety (M = 57.12, SD = 7.12) than males (M = 58.00, SD = 7.43). Therefore, the null hypothesis was rejected. Consistent with the hypothesis, relative to age, the results indicated that the older learners (individuals within the age range of 40-50, as well as those that are above 50, had the highest level of computer anxiety (M=58.500, SD= 1.72), (M=40.50, SD=26.16), compared with other age groups: 18-28(M=57.34, SD=6.86), 29-39 (M=57.88, SD=5.09).

With respect to educational levels, the results are consistent with the hypothesis. Specifically, the results showed that undergraduate learners had the highest mean (M=57.50, SD=6.50) compared to graduate learners (M=54.92, SD=11.65). Results also indicated that students with Test Anxiety (M= 61.66, SD=6.56) had higher computer anxiety compared with those with, Panic Disorder (M=60.14, SD=6.87), Post Traumatic Stress Disorder (M=58.33, SD=6.52), OCD (M=58.00, SD= 6.93), Bipolar Disorder (M=56.75, SD=5.91), Generalized Anxiety Disorder (GAD) (M=56.71, SD= 6.24), Depression (M=50.13, SD=18.06), and Social Phobia (M=48.71, SD=30.44). Lastly, the results also indicated that among the list of learning disabilities, ADHD had the highest score reported by the participants (M=69.00, SD=4.96). Other learning disabilities were reported as Dyslexia (M=62.00, SD=8.83), Dyscalculia (M=60.50, SD=3.53) ADD (M=56.78, SD=5.09), Nonverbal learning disabilities (M=55.75, SD=10.75), Dysgraphia (M=55.50, SD=.70) respectively.

Discussion

The purpose of this descriptive cross-sectional study was to investigate computer anxiety, mental health, and online learning in the era of COVID-19. We also examined the relationships among pre-existing mental health (e.g., learning disabilities, mental health disabilities) and computer anxiety and its overall impact on students' current mental health. Additionally, the study also examined the extent to which demographic variables (e.g., sex, age, academic level, and history of preexisting disabilities) are related to computer anxiety and the overall mental health of college students in the era of COVID-19. First, the results show that general mental health was significantly correlated with computer anxiety. This means that students that report poor general mental health are more likely to experience increased computer anxiety. Previous studies such as Beckers et al. (2007) and Maricutoiu (2014) also found that computer anxiety is clearly correlated with the tendency to experience, and report negative emotions such as fears, worries, and anxiety across many situations. This could be because when individuals are predisposed to anxiety and other mental health problems, the additional pressures from the necessity of using technology act as a tipping point, making them feel more insecure and overwhelmed.

Second, the results of the study show that computer anxiety and perceived stress do indeed predict undergraduate and graduate online learners' overall current mental health. This is consistent with the findings of Racic et al. (2017) that high levels of perceived stress predispose college students to anxiety and low quality of life. This is especially the case for undergraduate and graduate students who are first time users of online learning technology, in the current COVID-19 pandemic. As previously mentioned, the pressures from the necessity of using technology can be difficult for first-time undergraduate students or older graduate students,

who may not possess the necessary skills, or have not found the ability to balance the requirements of online learning and other demands.

Third, the results of the study showed that relative to sex, males reported a higher level of computer anxiety than female learners which is inconsistent with the findings of Sultan and Kanwal (2017), that female and older distance learners reported high computer anxiety and low self-efficacy. It could be that the context in which the current study was completed had a large number of female students that were more proficient in the use of computers, and online learning.

It is expected that if more colleges and or degree programs were surveyed, the number of males may have been greater. With respect to age, we also found that older learners had a higher level of computer anxiety compared to other age groups. This is consistent with the findings of Lee et al. (2019), and Sultan and Kanwal, (2017). This could be because older students tend to generally have less computer experience and tend to exhibit more resistance to using computers and other online learning technology (Chien, 2008). We also found that undergraduate learners had a higher level of computer anxiety, which is consistent with Peng et al., (2006). As mentioned earlier, undergraduate students are often unprepared for the high level of technology found in online instruction in colleges. Students would discover their skills are inadequate when it comes to getting information and completing the majority of their coursework online. In this era of the pandemic, many first-year students who are attending college for the first time and are compelled to complete their classes remotely and virtually, are likely to struggle with both the format and the delivery of classes.

Finally, we also found that students with learning disabilities and mental conditions reported higher scores in computer anxiety. This is consistent with the findings of previous scholars (Conti-Ramsden et al., 2010; Harrysson et al., 2004). The presence of a learning disability or mental health condition is likely to impact students' ability to remain focused, positive, and motivated to independently complete their coursework online using a computer. For many students with learning disabilities or mental health conditions, the symptoms, treatment, and self-management tend to be overwhelming, and constant, often impacting every aspect of daily living, including the ability to complete classes online.

Implications for Mental Health Professionals, Faculty and University Administrators
This study has significant implications for college administrators, faculty, and mental health professionals, especially those that work with students with learning disabilities or mental health challenges. First, an important factor for reducing computer anxiety and increasing students' overall mental health wellbeing in the current COVID-19 era might be improving the availability and quality of academic support areas of technical skills, study skills, and time management (Eleftheriades et al., 2020). To successfully achieve this, university administrators should work with faculty to ensure that professors cultivate learning environments that support students' well-being. Faculty may need to meet each student at their level of computer usage or competence and to provide the right type of online course delivery and support that can concurrently take students' challenges into consideration and improve their learning outcomes. Also, university administrators and faculty may need to create alternative formats for course delivery that may reduce the need for the constant use of computers and other online learning platforms to complete coursework. Additionally, administrators and leaders may need to develop policies that protect students who struggle with completing their coursework within the specified time frame due to their struggles with computer anxiety or mental health issues.

Mental health professionals, especially those that work in higher education settings, also need to develop workshops, and programs that would enable students with mental health struggles to learn how to increase their help-seeking behavior. With the increase in online learning, more students with mental health problems including those with computer anxiety are less likely to fall through the cracks, since many are often reluctant to seek help or do not know how to commence the process. It may be necessary for mental health counselors working in university settings to provide self-help tools and support options that students can access on their own and use.

Limitations and Future Recommendations
It is essential to discuss the limitations that exert influence on the results of this study. The first limitation of this study was the sample size. Although we had met the minimum sample size requirement given medium effect size and alpha level.05 we were not able to fully study the complex interactions. That might be due to the nature of the sample, which was not balanced. For instance, of the 155 participants, the number of undergraduate students was 132, whereas there were only 14 graduate students. The same as gender, 23 males versus 123 females. To prevent these inequalities, it is recommended that a larger sample size be included in future similar studies to help with generalizations.

Another limitation was the nature of the method of recruitment. Although the invitation letter and the survey link were emailed to all faculty of the SIHP and they were asked to distribute those with their students during the Fall 2020 semester, the indirect nature of the data gathering through emails only, precluded regular follow-ups. Also, it is usually common to offer rewards in order to increase the research subjects and encourage them to complete a survey, in this case, extra credit opportunities to students. However, in this research, it was not possible to mandate faculty to incentivize their students for participation in the research.

Lastly, in this research, we only targeted students who were enrolled in the School of Health and Interdisciplinary professionals during a specific period in a specific university in a particular region. It is expected that a different set of findings will be achieved if data was gathered from students of

different disciplines or in a different region. Therefore, more cross-cultural studies are recommended to investigate the student's perceptions of online learning.

Conclusion

The impact of COVID-19 on the mental health of college students will be felt both in the immediate and in the future. For students that struggle with additional mental health challenges, including computer anxiety, these challenges may impact students' ability to successfully learn in the present times as well as in the future. As more colleges and universities fully embrace online learning in the era of COVID-19, there is a need for stakeholders to understand the nature of the challenges and measures that can be put in place to address them to improve these learning outcomes and experiences of this population of college students. These measures should be comprehensive, individualized, and should transcend beyond addressing the needs of this population in the current period, as well as in the future. Nowadays, students in higher education are learning online in greater numbers than ever in the past, therefore, instructors would need to possess higher technical (compute or internet) skills and competencies than the basics. Associatively, higher education faculty need to be fully prepared to use pedagogical approaches that guarantee both student's well-being and effective online learning.

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