

Online Learning Anxiety and Academic Self-Efficacy During the COVID-19 Crisis

Wisam A. Chaleila

Al-Qasemi Academic College, Baqa-El-Gharbia, Israel

Enas Qadan

Al-Qasemi Academic College, Baqa-El-Gharbia, Israel

Lena Gnaim-Abu Touma

Al-Qasemi Academic College, Baqa-El-Gharbia, Israel

Ibtihal Assaly

Al-Qasemi Academic College, Baqa-El-Gharbia, Israel

Usnat Atamna

Al-Qasemi Academic College, Baqa-El-Gharbia, Israel

Halah Habayib

Al-Qasemi Academic College, Baqa-El-Gharbia, Israel

Abstract

This study investigated the relationship between students' online learning anxiety (OLA) and academic self-efficacy (ASE) amid global challenges posed by the COVID-19 crisis. Participants in this quantitative research included 718 tertiary education students from 28 countries who responded to a standardized questionnaire. Despite the crisis' widespread negative impact, the adoption of innovative online teaching models created positive learning environments that significantly enhanced students' self-efficacy. The results of this research revealed a positive correlation between ASE and OLA, contrary to Bandura's social-cognitive theory. This unexpected relationship challenged the notion that anxiety arises directly from low self-efficacy beliefs. The findings also partially aligned with existing research on positive correlations between online learning and anxiety, as well as between sociodemographic factors and OLA. This study contributes to the plethora of research conducted about online learning, anxiety, and self-efficacy in times of crisis.

Keywords: COVID-19, innovative online learning, anxiety, academic self-efficacy, international students

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The COVID-19 pandemic precipitated a global state of emergency, necessitating the immediate implementation of social distancing measures in various communal spaces. Terms such as “lockdowns,” “masks,” “quarantines,” and “physical distancing” became ubiquitous globally over the past three years. This new reality forced businesses, universities, schools, and other establishments to close to prioritize public safety (Burgess & Sievertsen, 2020). Consequently, online learning, traditionally viewed as a supplemental educational method, swiftly evolved into the primary mode, gaining universal prominence across different levels and regions worldwide (Dhawan, 2020). In the United States alone, over a thousand universities and colleges transitioned to exclusively online formats, affecting millions of students (Pragholapati, 2020). The sudden shift to a technology-based learning environment has given rise to a generation of online learners, triggering anxiety and panic among large segments of the population (Knolle et al., 2021), especially among students and professors (Weyandt et al., 2020; Wakui et al., 2021). Many postsecondary students have struggled with unconventional and advanced online materials, prompting our research, which is novel for several reasons. First, while extensive research has addressed anxiety, online learning, and academic self-efficacy (ASE) individually (Saadé & Kira, 2009; Hauser et al., 2012; Castro & Tumibay, 2021), our study uniquely evaluates these three aspects together, particularly examining anxiety in its current manifestation, termed "Online Learning Anxiety" (OLA), on a global scale. Second, despite existing studies demonstrating positive correlations between ASE and online learning (Dangal & Bajracharya, 2020; Basheti et al., 2021), no research to our knowledge has explored the relationship between OLA and ASE during crises such as COVID-19. This absence highlights the need for a scale to measure learning anxiety as it specifically pertains to synchronous and asynchronous learning rather than hybrid or blended learning.

Literature Review

Online Learning During COVID-19

Vayre and Vonthorn (2017) expressed concerns about online learning, highlighting the increased responsibility placed on students and potential quandaries such as a "lack of interaction and feedback, difficulty initiating and maintaining communication, ambiguity in posted messages, and technical disruptions" (p. 199). The COVID-19 crisis significantly accelerated the integration of the internet into higher education, impacting both students and educators (Gültekin et al., 2020; Castro & Tumibay, 2021). Despite these challenges, numerous studies indicated positive outcomes for students' academic self-efficacy (ASE) in terms of online and digital learning (Martin & Bolliger, 2018; Heckel & Ringeisen, 2019; Schaefer et al., 2020; Yang X et al., 2021; Nasir, 2020; Alghamdi et al., 2020; Yang J et al., 2021; Al-Kumaim et al., 2021). For instance, Yang J et al. (2021) concluded that e-learning positively affects students' academic self-efficacy and motivation for learning. Several studies revealed a reciprocal positive relationship between ASE and online learning, suggesting that students overcame the dilemmas of isolation and embraced productive, self-directed learning, online self-efficacy beliefs, positive expectations, and technology use (Bates & Khasawneh, 2007; Prior et al., 2016). Additionally, emotional abilities were recognized as crucial alongside cognitive capabilities in students' ability to cope with the demands of higher education, endorsing academic success (Shenaar-Golan et al., 2020).

Online Learning, ASE, and Anxiety

Extensive research underscored the profound impact of the COVID-19 crisis on students' mental, emotional, and social well-being, manifested in increased levels of depression, anxiety, and stress (Chandasiri, 2020). The frequent use of computers without anxiety-reducing mechanisms was associated with elevated anxiety levels (Marakas, et al., 1998; Hauser, et al., 2012). Technology use, when not balanced, resulted in feelings of frustration, confusion, anger, and anxiety, influencing productivity, learning, social relationships, and overall well-being (Saadé & Kira, 2009).

While Bandura (1988) suggested a negative correlation between academic self-efficacy (ASE) and anxiety, Cassady and Finch (2020) argued against viewing this relationship as inherently inverse (p. 10). Despite well-established detrimental effects of test anxiety on memory, attention, and performance, some studies indicated that students increasingly relied on their own abilities for studying and time management (Tobias, 1985; Wigfield & Eccles, 1989). Along these lines, German students' perceived probability of success in remote learning, ASE, and lecturer preparedness were identified as relevant variables (Hoss et al., 2022) and an Israeli study found positive correlations between ASE, social support, and academic success, emphasizing the need for universities to enhance preparedness for online learning environments (Warshawski, 2022). However, other studies showed that in Germany, the rapid shift to digital platforms during the crisis exposed the limitations of existing strategies and highlighted the importance of a comprehensive and supportive framework for digital transformation in education (Kerres 2020). Likewise, in Israel, a 2022 study revealed that 63.2% of 4,710 university students encountered challenges with online learning during COVID-19, triggering the urgency of establishing targeted services to offer tangible support to students in similar cases (Schiff et al., 2022). In the United States, the transition to exclusive online instruction raised apprehensions about the quality of remote educational delivery. Earlier research cautioned that remote courses could disproportionately impact the academic performance of students already facing challenges. Furthermore, studies indicated that as many as 20% of college students had encountered difficulties accessing essential technology, such as functioning laptops and reliable high-speed internet (Smalley, 2021).

Similarly, the experience with online learning contributed to higher online ASE as noted by Panergayo and Mansujeto (2021), while research across six studies demonstrated a positive correlation between online communication and ASE (Peechapol et al., 2018). Elliot and Sheldon (1997) even argued that failure-related anxiety might enhance students' performance in certain cases. Unexpectedly, findings from an OECD study (2020) challenged assumptions about failure-related anxiety predicting academic performance. The study suggested that students who had reported higher degrees of failure-related anxiety achieved higher grades than those who had expressed less anxiety about failing. Moreover, students with the lowest ASE outperformed those with the highest ASE in terms of grades.

Online Learning as a Moderating Factor of Anxiety

While some studies presented divergent views on the impact of online learning, with arguments for both detrimental and constructive effects (Wang et al., 2021; Maqableh & Alia, 2021), a substantial body of research suggested that students' anxiety could be mitigated through appropriate training (Martin & Bolliger, 2018; Heckel & Ringeisen, 2019; Schaefer et al., 2020; Yang X et al., 2021; Nasir, 2020; Alghamdi et al., 2020; Al-Kumaim et al., 2021; Yang J et al.,

2021). This moderation of anxiety was attributed to the supportive measures implemented by professors and institutions during the pandemic, including streamlined course loads and open-book exams (Son et al., 2020). Creating a supportive online environment appeared crucial in helping students manage and neutralize anxiety, minimizing its impact as a threatening factor. Al-Kumaim et al. (2021) indicated that accessible and interactive online learning platforms had allowed 72.4% of students to control the adverse effects of anxiety. Other research, such as Shuster et al. (2021), suggested that anxiety naturally diminished over time. Consequently, the adoption of online learning methods played a significant role in reducing students' cognitive anxiety and concurrently enhancing their academic self-efficacy (ASE) and self-motivation.

Research Objectives and Hypotheses

In pursuit of a more profound understanding of the prevailing online pedagogy amid the COVID-19 crisis, and recognizing the scarcity of research specifically exploring students' Academic Self-Efficacy (ASE) and its association with Online Learning Anxiety (OLA) during the pandemic, our study aimed to investigate three research hypotheses:

- Hypothesis One: We hypothesize a significant statistical relationship between ASE and OLA, suggesting that students' academic self-efficacy may be associated with their levels of online learning anxiety.
- Hypothesis Two: We postulate a significant statistical relationship between students' anxiety rates and online learning, aiming to explore the potential link between overall anxiety levels and engagement with online educational platforms.
- Hypothesis Three: We anticipate a significant statistical relationship between sociodemographic factors and OLA, acknowledging the potential influence of demographic variables on students' experiences of online learning anxiety.

Materials and Methods

Participants' Sociodemographic Details

This cross-sectional study employed a snowball sampling technique via an online questionnaire for participant recruitment. It is crucial to acknowledge that in snowball sampling, the number of the overall population is unknown (Raina, 2015). A total of 718 higher education students from various universities and colleges in 28 countries responded to the questionnaire. Notably, 45.8% of response (n=329) came from Israel, 15.5% (n=111) from Germany, and the rest 38.7% (n=278) from 26 other countries. Respondents' ages ranged from 18 to 74 years with 30.6% (n=220) identifying as male and 68% (n=68) as female. Regarding marital status, 70.8% (n = 508) were single, 13.8% (n = 99) were married, and 3.6% (n=26) were married with children. In terms of academic levels, the majority (65.7%, n= 472) were first-degree students, 16.2% (n=116), were second-degree students, 3.6% (n=26) were third-degree students, and the remaining 14.5%, (n=104) were enrolled in other tracks.

Procedure

To maximize the response rate, collaborative efforts were made with national and international fellow researchers across 31 institutions to disseminate the online questionnaire to their students. Utilizing the snowball sampling technique, the sampling process extended through referrals from participating students, ultimately encompassing 109 institutions. Participants were provided with detailed information about the study's objectives, the estimated time required for questionnaire completion (approximately fifteen minutes), and an assurance of anonymity. The questionnaire was presented in English. Data collection took place from April 5th to May 9th, 2021, at the height of the pandemic outbreak and the subsequent shift to online learning.

Measures

Given the preliminary nature of this research, and the absence of readily available questionnaires aligning with the proposed research hypotheses, the study necessitated the development of a pilot questionnaire. Drawing from the literature review and incorporating elements from three previously-validated scales—the 11-item Self-Regulated Learning Scale (Zimmerman et al., 1992), the 8-item Academic Self-Efficacy Inventory (Chemers, Hu, & Garcia, 2001), and the 36-item Test of e-Learning Related Attitudes (TeLRA) scale (Kisanga & Ireson, 2016)—a 75-item pilot questionnaire was devised.

The questionnaire comprised three measuring instruments: A Sociodemographic Scale and general questions about online learning; OLA Scale; ASE Scale. Both the ASE and OLA scales were adjusted as four-point Likert-type scales, commonly used for attitude measurement. Importantly, the phraseology of all items was modified to align with the reality of online learning. For instance, in the OLAS, the phrase “During online learning ensued from the Covid-19 crisis” preceded all items, and all statements were framed to specifically address online learning concerns (e.g., “I am concerned that online assignments will take longer to complete compared to those given in frontal lectures”).

Given the absence of precise and suitable existing instruments addressing both COVID-19 and online learning, a group consensus approach was adopted utilizing the Delphi method (Linstone & Turnoff, 1975) for face and content validity. Six professionals in statistics, psychiatry, and education evaluated the questionnaire, ensuring a comprehensive and representative assessment (Cohen, et al., 2011). Following this process, two ambiguous and three repetitive items were discarded, resulting in a finalized 70-item questionnaire that attained consensus. In addition, the study employed Cronbach's alpha to assess the reliability and internal consistency of the adapted measurement instruments. The online anxiety scale showed high consistency $\alpha = 0.961$.

Socio-Demographic Scale and General Questions About Online Learning

This instrument consisted of two sections: Eight items focused on gender, age, marital status, citizenship, first language, location of university, study track, academic year level, and specialization, whereas 11 questions focused on online learning practices (e.g., which device do you use for online lectures?). It is noteworthy that ethnicity and race were deliberately omitted from this study. The primary objective was to examine students' anxiety, and including such inquiries could potentially discourage students from completing the questionnaire. The emphasis

was placed on aspects directly relevant to the study's central aim rather than investigating the demographic specifics of ethnic or racial backgrounds.

OLA Scale

The reliability coefficient for the 36-item OLA measuring instrument was calculated to be $\alpha = 0.96$. The subscale used a four-point Likert-type scale ranging from (1) strongly disagree to (4) strongly agree: (e.g., “I get overwhelmed by loneliness and lack of human contact”).

ASE Scale

The 16-item ASE Scale was modified to assess the impact of online learning during the COVID-19 pandemic. Each item was prefaced by the phrase “In your opinion, online learning resulted from COVID-19 has affected...” These items were presented on a 4-point Likert-type scale, with values ranging from 1 (very positively) to 4 (very negatively). The reliability coefficient for this modified scale was calculated to be $\alpha = 0.929$. This high alpha value suggests a robust internal consistency among the items within the ASE Scale, indicating that the adapted questions are highly correlated, and that participants’ responses are consistent.

Results

Data Analysis

The data analysis for this study was conducted using statistical software SPSS 23.0. Descriptive analysis was employed to summarize and present the characteristics of the data. In addition, a t-test and an ANOVA test were utilized for comparative analyses, and reliability statistics were computed to assess the internal consistency of the measurement instruments. ROC analysis was performed for diagnostic accuracy assessment, and multivariate analysis was conducted for examining relationships among multiple variables. The threshold for statistical significance was set at $p < 0.05$.

Table 1

Means, Standard Deviations, and Correlations Among Anxiety (Sub-)Scales

| (Sub-) Scales | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|-------|--------|---------|---------|---------|---------|--------|---|---|
| 1 ASE Scale | 2.636 | 0.645 | 1.0000 | | | | | | |
| 2 OLA Scale | 2.875 | 0.6330 | 0.154** | 1.0000 | | | | | |
| 3 Academic Assessment of Online Learning | 2.862 | 0.689 | 0.164** | 0.848** | 0.299** | 1.0000 | | | |
| 4 Anxiety about Online Academic Failure | 2.850 | 0.833 | 0.055 | 0.834** | 0.109** | 0.727** | 1.0000 | | |

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|--|--|
| 5 Anxiety about Online Technical Problems | 3.033 0.702 0.157** 0.884** 0.239** 0.699** 0.586** 1.0000 |
| 6 Anxiety about Communication Problems with Lecturers | 2.747 0.702 0.195** 0.834** 0.310** 0.751** 0.682** 0.668** 1.0000 |

Correlation is significant at the 0.01 level (2-tailed**)

Based on Table 1, there were significant positive correlations between ASE and three categories of OLA: online academic assessment, technical problems, and communication with lecturers (0.164, 0.157, 0.195, respectively; $p < 0.001$). The Spearman’s correlation coefficients indicated moderate and significant positive correlation ($p < 0.001$) between the scales, suggesting that as OLA increased, ASE also increased. Furthermore, ASE demonstrated moderate and significant correlations with all variables except for anxiety about academic failure. This implies that students’ confidence in their academic abilities was associated with various aspects of OLA.

Table 2

Means and Differences of Anxiety Between Low/High Levels of ASE

| | (Sub-) Scales | ASE | | | | |
|---|--|--------|-------|--------|-------|----------|
| | | LOW | | HIGH | | F |
| | | M | SD | M | SD | |
| 1 | OLA | 2.8264 | 0.607 | 2.9752 | 0.672 | 8.842** |
| 2 | Anxiety about Academic Assessment of Online Learning | 2.790 | 0.685 | 3.010 | 0.675 | 16.365** |
| 3 | Anxiety about Academic Failure | 2.824 | 0.812 | 2.904 | 0.874 | 1.447 |
| 4 | Anxiety about Technical Problems | 2.9927 | 0.668 | 3.1165 | 0.761 | 4.932* |
| 5 | Anxiety about Communication Problems with Lecturers | 2.6819 | 0.677 | 2.8815 | 0.735 | 12.875** |

Based on Table 2, students were classified into two cohorts based on their ASE scale scores: those with low ASE (means below 2.861904761 and those with a high level of perception of ASE (means above 2.861904762) determined through ROC analysis. The data revealed that 481 (66.9 %) fell into the low ASE category, while 237 (33.1 %) presented a very high level of perception of ASE. Differences between the two cohorts (high & low) were examined in relation

to the five categories of OLA scale. A significant difference ($p < 0.001$) was observed in three categories: anxiety about academic assessment of online learning, anxiety about technical problems, and anxiety about communication problems with lecturers. Students with high ASE had more OLA than those with low ASE ($p = 0.003$). However, no significant differences were found between both cohorts in the categories of academic failure {(low($X = 2.861904761$) high($X = 2.861904762$))} and somatic-psychological OLA {(low($X = 2.8619$) high ($X = 2.903$)). Therefore, there were no significant differences for the level of ASE in these sub-categories.

Table 3

Correlations Between Scales and Sociodemographic Factors

| SCALE | Age | Gender | Marital Status | Study track | Academic year | Specialization |
|-------|---------|---------|----------------|-------------|---------------|----------------|
| OLA | **-.101 | 0.155** | **0.150- | 0.051 | 0.145** | 0.028 |
| ASE | *0.052- | 0.021 | -0.024 | 0.042- | **0.155- | 0.076** |

Based on Table 3, a significant positive correlation was observed between average anxiety levels and both gender and academic year level. Specifically, women exhibited higher levels of anxiety compared to men, and anxiety levels increased with higher academic year levels. Conversely, a significant negative correlation was identified between average anxiety and both age and marital status. Notably, as age increased, there was a corresponding decrease in anxiety levels. Marital status also showed a significant negative correlation, indicating that individuals who were married tended to experience lower levels of anxiety. Additionally, the analysis revealed a significant negative correlation between ASE mean and both age and academic year level. This suggests that as students age and progress through higher academic years, their perceived ASE tends to decrease. Lastly, a significant positive relationship was found between ASE and the choice of specialization. Students with a non-scientific specialization demonstrated higher ASE levels compared to their counterparts with a scientific specialization. These findings demonstrate the complex relationship between demographic and academic factors in shaping anxiety and ASE among the study participants.

Table 4 |

Descriptive Statistics for Participant Sociodemographic Characteristics

| <i>Variables</i> | OLA MEAN | PV | Self-Efficacy MEAN | PV |
|------------------------|-------------|----------|-----------------------|----------|
| Age (mean (SD), range) | | 0.000=Pv | | 0.083=Pv |
| 1 | 2.9385 | | 2.6320 | |
| 2 | 2.7175 | | 2.6659 | |

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|-----------------------|--------|----------|--------|----------|
| 3 | 2.6999 | | 2.7380 | |
| 4 | 2.5756 | | 2.4531 | |
| Gender | | 0.001=Pv | | 0.633=Pv |
| Men | 2.7216 | | 2.6308 | |
| Women | 2.9422 | | 2.6485 | |
| Marital Status | | 0.000=Pv | | 0.010=Pv |
| single | 2.9394 | | 2.6337 | |
| married | 2.8662 | | 2.7034 | |
| married with kids | 2.4000 | | 2.4147 | |
| In a relationship | 2.6154 | | 2.5156 | |
| Study track | | 0.001=Pv | | 0.001=Pv |
| B.A./B.Sc./M.D. | 2.8757 | | 2.6547 | |
| M.A./M.Sc. | 2.8750 | | 2.6247 | |
| Ph.D. | 2.5463 | | 2.3233 | |
| Academic year | | 0.000=Pv | | 0.000=Pv |
| 1 | 2.7841 | | 2.7971 | |
| 2 | 3.0487 | | 2.6362 | |
| 3 | 2.8921 | | 2.4995 | |
| 4 > | 3.2880 | | 2.7344 | |
| Specialization | | Pv=0.405 | | 0.074=Pv |
| science | 2.8656 | | 2.6137 | |
| other | 2.8939 | | 2.6762 | |

Based on Table 4, first- and second-degree students showed a notably higher average anxiety ($X = 2.875$) compared to third-degree students, who reported a relatively lower OLA average ($X = 2.546$). These distinctions are statistically significant ($PV > 0.001$), indicating a meaningful variation in anxiety levels across different stages of academic progression. Furthermore, the analysis highlighted variations in average anxiety concerning students in

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different academic years. Freshmen and preparatory year students emerged as the least anxious, with an average anxiety level of 2.784. In contrast, sophomores and juniors demonstrated higher anxiety levels, averaging 2.636, while seniors and those in advanced academic years reported the highest average anxiety at 3.288. These differences are statistically significant ($PV > 0.001$), underscoring the impact of academic progression on anxiety levels. Examining ASE, freshmen reported an average ASE of 2.797, which decreased among sophomores (2.636) and juniors (2.499). However, there was a subsequent increase in ASE among seniors and above, reaching an average of 2.7344.

Table 5

Descriptive Data About Participants' Online Learning Quality

| <i>Variables</i> | OLA MEAN | <i>PV</i> | Self- Efficacy MEAN | <i>PV</i> |
|--|---------------------|-----------|------------------------------------|-----------|
| Did you take online learning courses (fully or partially) before the Covid-19 Crisis? | | 0.233 | | 0.831 |
| NO | 2.8600 | | 2.6251 | |
| YES | 2.9010 | | 2.6558 | |
| Which device do you use for online lectures? | | 0.000 | | 0.336 |
| Home Computer/ Laptop | 2.8281 | | 2.6324 | |
| Smartphone | 3.1260 | | 2.6472 | |
| Tablet | 2.9384 | | 2.7622 | |
| Other | 2.7707 | | 2.4063 | |
| What are your preferred learning methods for online learning? | | 0.840 | | 0.493 |
| Synchronous lectures that can be recorded and uploaded to the course website | 2.9172 | | 2.6609 | |
| Partially synchronous lectures | 2.8511 | | 2.5983 | |
| Asynchronous lectures that are pre-recorded and can be found on the course website | 2.8877 | | 2.5775 | |
| Receiving reading materials | 2.8735 | | 2.6495 | |
| Most professors hold synchronous lectures: | | 0.040 | | 0.993 |

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|---|--------|-------|--------|-------|
| At the lectures' designated timeslot | 2.8640 | | 2.6369 | |
| At another time and by prior arrangement with students | 2.9767 | | 2.6373 | |
| Most professors respond to questions and inquiries within: | | 0.062 | | 0.000 |
| A few hours | 2.8564 | | 2.7229 | |
| A day | 2.8631 | | 2.6213 | |
| A few days | 2.9059 | | 2.6117 | |
| A week | 2.9182 | | 2.4089 | |
| other | 2.8768 | | 1.6875 | |
| How do you generally evaluate professors' response? | | 0.000 | | 0.001 |
| They do not respond | 3.2229 | | 2.3906 | |
| Bad | 3.1332 | | 2.3141 | |
| Unsatisfactory | 3.0294 | | 2.5729 | |
| Good | 2.8269 | | 2.6664 | |
| You prefer completing the course assignments: | | 0.101 | | 0.003 |
| Alone | 2.8527 | | 2.5946 | |
| In groups | 2.9085 | | 2.6977 | |
| My institution applies student attendance policy | | 0.000 | | 0.000 |
| NO | 2.9658 | | 2.6711 | |
| YES | 2.8290 | | 2.5366 | |

As shown in Table 5, students reported that 90.5% of lecturers responded to their questions within a reasonable timeframe of 1-3 days; 78% students described the quality of such responses as “good.” It was reported that 61.6% of the education institutions applied student attendance policy during the pandemic while 27.7% did not. The data revealed that most students (69.3%) favored synchronous lectures, whereas only 12.4% preferred asynchronous ones.

Discussion

First, the findings of this research align partially with previous studies (e.g., Dangal & Bajracharya, 2020), revealing a positive correlation between ASE and OLA during the crisis, supporting Hypothesis One. Notably, students with high OLA displayed higher ASE than those with low OLA, except in health or somatic-psychological state. In this specific aspect, ASE

levels showed no correlation with OLA, suggesting that in cases of existential anxiety or anxiety related to failure or uncertainty about the future, both cohorts exhibited similar anxiety levels. In addition, this positive correlation between OLA and ASE extended to technical issues, academic evaluation, and communication with lecturers, with significant differences between cohorts in these areas. It is evident that despite the anxiety, actions taken by institutions during the crisis, such as enhancing prevalence and adaptation along with cooperative and dynamic communication, effective administrative policies, and educational support systems, may have contributed to the improvement of ASE (Bashir et al., 2021; Biwer et al., 2021). Second, students' reports about varying levels of anxiety related to online learning were consistent with Hypothesis Two. That is, around 33.2% reported low anxiety, 34.5% reported moderate anxiety, and 32.1% reported high anxiety. Third, sociodemographic factors (marital status, gender, age, academic year level, and specialization) demonstrated varied correlations, partially supporting Hypothesis Three while the "study track" factor did not show a statistically significant relationship with either OLA or ASE. As for age and academic year level, a negative correlation was observed with ASE. Freshmen and females exhibited higher overall anxiety levels, while being older, married, or a parent correlated with lower overall anxiety. This finding could potentially be explained by assuming that older and married students might have higher psychological well-being and resilience (Yin, et al., 2018; Gove, et al., 1983), and higher resilience may result in lower anxiety (Leys, et al. 2021). Another potential reason could be that marital status might function as a protective factor (Jace and Makridis, 2021). As for gender, several studies confirm that being a female online learner is associated with higher levels of anxiety (Pelucio et al., 2022; Zhang et al., 2022). One possible explanation for this pattern could be that biological distinctions between males and females appear to be crucial in interpreting the variations in anxiety-related feelings (Metin et al., 2022). As for age, one study consistent with our findings revealed that COVID-19 was associated with a greater increase in anxiety among younger adults compared to older adults (Collier Villaume et al., 2023).

Another significant sociodemographic factor was specialization. The findings revealed that students with non-science specializations were less anxious in terms of somatic-psychological anxiety than those with science specializations and more anxious when it came to technical problems. We argue that since most students with science specializations were not subject to a student attendance policy, they were more relaxed and less stressed and, hence, technical problems were not an issue. One plausible interpretation of this result might be that during the lockdown these students were possibly more isolated and therefore had less human interaction. Human interaction with lecturers and with other students probably enhanced participants' well-being and resilience (Shah et al., 2021) and may explain why they were more anxious in the somatic-psychological category.

Limitations of the Study

The innovative nature of this study underscores the potential for adaptation and the establishment of supportive digital adjustments in online learning pedagogy to mitigate the adverse consequences of crises, such as the COVID-19 pandemic. However, certain limitations should be reported, and future research efforts should address these considerations:

Disproportionate Response Rate

The higher number of responses from Israel and Germany compared to other countries may be attributed to several factors, including the degree of encouragement from fellow researchers, students' self-motivation, and the availability of free time and dedication.

Small Sample Size

The study's sample size, varying from small to more significant across countries, may be deemed relatively small for an international study. First, the voluntary nature of questionnaire participation and the absence of a specific target population resulted in a diverse but limited participant pool. That is, the study did not target a specific population of students, nor did it focus on their differences, but rather targeted participants who were all students and who were all enrolled in Higher Education Institutions, and all experienced online learning and lockdowns during the crisis in different geographical zones. Although some studies argued that statistical tests were designed for sample analysis rather than population studies (Faber & Fonseca, 2014), we believe that a larger sample size should be considered in subsequent studies for the sake of generalization and therefore some additional measures should be enacted to increase the number of participants.

Timing

The impending end of lockdowns and pandemic restrictions in Israel, scheduled for June 1, 2021, led to a decreased response rate as global patient numbers declined. As a result, data collection was initiated promptly. Future studies should explore strategies to secure more extended participation periods or adapt to changing circumstances.

Sociodemographic Factors

Certain sociodemographic factors, specifically "location of university" and "citizenship," were not thoroughly examined due to the complexity of transnational comparisons. Future research endeavors should include these factors, providing a more comprehensive understanding of their potential influence on the study variables.

Conclusion and Recommendations

Although the current study did not provide data regarding the support offered by governments or administrations, it did provide data regarding professors' support with respect to their commitment to timetables and responses to students' enquiries. Findings obtained from the general questions regarding learning and teaching indicated the significance of student-teacher and student-student interactions, but also indicated that asynchronous lectures were more demanding and required more preparation and individual work and therefore higher ASE. The above-mentioned moderating factors, together with those mentioned earlier such as contextual and didactical variables related to online learning quality, possibly played a significant moderating role of the anxiety-self-efficacy relationship. In this sense, Despite the pandemic, the combination of guided instruction and professors' cooperation proved efficient in facilitating an innovative online learning environment, ultimately positively impacting the educational process. These findings suggest that the adaptation process, coupled with the prevalence of COVID-19, may have mitigated the crisis's adverse effects. However, for future studies, we suggest that more factors should be measured when investigating OLA, including the length of time during which

students are exposed to a threatening situation (COVID-19) and the quality of online teaching delivery modes. We believe that these factors are essential in modulating the negative effects elicited by crises.

Based on the above, this study brings new insights into the current body of research about anxiety and online learning and about students' ASE during a crisis. Advocating studies by Bates and Khasawneh (2007) and Prior et al. (2016) to make the learning experience more effective and innovative in times of crisis in general, we recommend that pivotal steps should be undertaken at four levels:

- 1. Students' Learning Method Adjustments:** Numerous studies propose various approaches to reduce anxiety, thereby enhancing Academic Self-Efficacy (ASE). However, when anxiety transforms into a persistent trait intertwined with our lives, it becomes imperative to explore strategies for managing its negative effects. In this context, experts recommend coping mechanisms such as behavioral coping, mindful coping, and coping through social media (Barron et al., 2021). These strategies aim not only to alleviate anxiety but also to equip students with practical tools to tackle the challenges induced by anxiety, fostering a more resilient and empowered approach to learning. As students adapt and integrate these coping strategies into their learning methods, it is anticipated that they may experience a positive impact on their overall ASE, contributing to a more effective and fulfilling educational experience.
- 2. Professors' Instructional Adjustments:** Aristovnik et al. (2020) maintain that the teaching staff has a significant role in mitigating the adverse impacts of COVID-19 and enhancing learning environments. Hence, there is a pressing need to enhance and refine existing pedagogical practices by professionally and efficiently equipping professors to employ alternative teaching approaches. Professors need to actively advocate and endorse online learning, fostering a broader implementation of interactive online learning methods across all academic levels. Moreover, each course should be systematically developed to accommodate various scenarios, allowing for online learning mode, hybrid mode, or traditional face-to-face mode. A seamless and straightforward transition between these instructional modes is needed to ensure adaptability to changing circumstances and provide students with a flexible and enriched educational experience. This proactive approach to instructional adjustments not only addresses the challenges caused by the pandemic but also positions educators to enhance the overall quality and accessibility of education in diverse learning environments.
- 3. Institutional Level:** In a post-crisis reality, higher education institutions should earnestly contemplate retaining elements of online learning, given its observed positive impact on maintaining students' ASE despite anxiety. Punjani and Mahadevan (2021) emphasize the benefits of online learning, advocating for a deliberate orientation towards its continued integration. To achieve this, institutions are encouraged to proactively advance, expand, and extend online teaching methods and strategies. This can be facilitated through the establishment of qualification programs for professors, ensuring they are adept in utilizing online instructional tools effectively. Moreover, institutions should establish clear and consistent attendance policies and explore alternative attendance options.

Creating dedicated support units, particularly for freshmen who may require additional assistance in navigating online learning, is crucial for fostering a supportive educational environment. Moreover, institutions should consider initiating emergency services tailored to the needs of both students and professors who may require mental health care support. Additionally, preparedness for potential mental health setbacks faced by the academic community and the establishment of emergency hotlines becomes imperative. These hotlines are vital resources for individuals requiring immediate assistance and guidance in times of heightened stress or crisis.

4.

Ministerial and Governmental Level: Governments worldwide have demonstrated agility and effectiveness in making administrative decisions to handle the conundrums triggered by the new situation, as highlighted in the UNESCO Annual Report (2020). However, there is a pressing need for the development of more advanced and guided educational platforms and support systems to better prepare for and address future emergencies. This comprehensive approach aims to assist students, not only pedagogically and technically but also emotionally, acknowledging the multifarious nature of the hurdles faced in contemporary education. To achieve this, governments are encouraged to provide aid and counseling services to both professors and students. This support can be facilitated through the creation of digital kits comprising manuals and resources that offer guidance on navigating the complexities of online learning and managing associated stressors. Furthermore, the introduction of progressive mobile applications and digital appliances can enhance accessibility and streamline the learning experience for both educators and learners.

Statement and Declaration

I) Ethical approval: This study was carried out in accordance with the recommendations of the Ethics Committee of our academic institution. All subjects submitted written informed consent.

II) Funding details: There is no funding.

III) Conflict of interest: There is no potential conflict of interest.

IV) Data and materials are available upon request.

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