THE IMPACT OF ONLINE LEARNING FATIGUE ON STUDENTS' CONTINUOUS USE OF ONLINE LEARNING

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ABSTRACT

The shift from face-to-face learning to online learning (OL) becomes more challenging due to the emergence of so-called OL fatigue. Simply, OL fatigue is the degree to which students feel a sense of overload from immersion in the use of OL. Despite the importance of OL fatigue in education, it can be observed that there have not been many studies on the role of OL fatigue and the potential impact on students' continuous use of OL. This study addresses a significant gap in OL literature by examining the impact of OL fatigue on students' continuous use of OL. The analysis of 233 respondents using partial least squares structural equation modeling reveals that four aspects of OL fatigue have negative significant impact on students' continuous use of OL. The OL fatigue aspects include the burden of the online course (e.g., poorly designed OL courses and weak interaction with instructors and fellow students), psychological challenges (e.g., feelings of isolation, loneliness, stress, and anxiety), lack of sensory requirements during OL (e.g., inability to see and hear educators perfectly and the absence of the physical campus sensation), and the home learning environment. These factors explain around 52.6% of the variance in students' continuous use of OL, which could be considered relatively substantial in studies that seek to predict human behavioral intentions, as is the case in our study. The current study results highlight the necessity of addressing OL fatigue to ensure long-term OL usage. The study complements and extends the understanding of factors influencing students' continuous use of OL by considering the impact of OL fatigue that has not been previously widely examined. The findings and recommendations provide higher education policymakers with a clearer understanding of students' OL fatigue, which should be reflected in current and future OL policies and regulations.

Keywords: *Online learning, E-Learning, Online learning Fatigue, Continuous use, Post-Adoption*

1. INTRODUCTION

Online learning (OL) usage has skyrocketed — to be sure, it has been accelerated by the COVID-19 pandemic. OL is considered in the current study as a teaching approach that delivers learning courses fully online, whether synchronously and/or asynchronously, with no in-person class attendance. This approach relies on various technology platforms (e.g., Zoom, MS Teams, Google Meet, and Classroom) to facilitate communication between faculty and students. In the post-pandemic era, concerns about students' continued use of OL have emerged, with several studies indicating less-than-optimistic findings [1], [2], [3].

With the easing of COVID-19 containment measures and the reopening of educational institutions for face-to-face learning, examining the suitability of OL in the post-pandemic era is critical.

Mainly, whether students will continue using OL or prefer a return to traditional in-person instruction [1], [4]. Recent studies indicate that retaining students in OL environments presents a significant challenge in the post- COVID-19 era, warranting further investigation [1], [5]. New evidence has appeared that continuance use of OL is related to various factors, not necessarily technical but also related to a mix of psychological issues and OL environment, specifically related to OL fatigue [1], [3], [6]. Therefore, this study focuses on OL fatigue, a topic that has received attention but not in a coherent and integrated manner concerning the continuous use of OL [3], [7].

Simply, OL fatigue is the degree to which students feel a sense of overload from immersion in the use of OL, creating mental and physical dynamics that result in less efficient, possibly even uncomfortable [3]. Students' growing sense of OL fatigue has been notably reported [6], [7], [8]. The literature on OL

fatigue is fragmented, with some studies offering only superficial coverage. While some studies briefly address the influence of OL fatigue on students' continuous use of OL, there is a lack of in-depth exploration of this phenomenon [1], [3], [7]. Therefore, the current study aims to *investigate the impact of OL fatigue on students' continuous use of OL.*

To better understand these issues, we propose a self-developed model covering specific aspects of OL fatigue that are carefully compiled from closely related studies. These aspects include the burden of the online course, psychological challenges, lack of sensory requirements during OL, home learning environment, and the evaluation/assessment methods. Further discussion of the research model is presented in Section 3.

The study contributes to the OL literature as it concerns understanding students' continuous use of OL, a research topic that is still in its early stages [9] compared to studies on students' acceptance and initial use of OL [10], [11]. Unlike previous studies that primarily focused on students' acceptance and initial use of OL, our study offers a novel perspective by exploring students' continuous use of OL. Hence, the study enriches OL literature by understanding students' continuous use of OL rather than solely investigating their initial use or adoption [1], [4], [12]. Further, while the COVID-19 pandemic necessitated the use of OL, the post-COVID-19 era seems appropriate to explore the suitability of the OL approach. Although some studies have explored the continuous use of OL, they primarily collected data shortly after the emergency shift to OL during the pandemic [13], a time when students faced uncertainty and pressure. As the pandemic subsides, it is timely to examine the suitability of OL approaches. This study conducted after the COVID-19 pandemic. Now, students are confronted with the choice of continuing OL or returning to traditional face-to-face learning. Considering this argument, little is known about whether students will choose to continue using OL and what factors influence their decisions regarding this choice.

In the literature review (see Section 2), few studies have examined students' growing experience of OL fatigue and its potential influence on their continuous use of OL [3], [7]. The current study assume that a full understanding of OL fatigue is necessary for better design and implementation of OL, thus, ensuring long-term usage [3], [6], [7].

While this research assumes that students' experiences and perceptions of OL fatigue are shaped by their prior exposure to both online and face-to-face learning environments, it is important to note that some students may not have experienced traditional learning settings. Additionally, the factors considered do not encompass all potential influences factors on students' decisions regarding OL, including personal motivations and OL systems technology characteristics. Furthermore, while our study provides valuable insights, it does not explicitly measure the correlation between OL fatigue and specific learning outcomes, which is a valuable direction for future research. Additional limitations and future research details are discussed in section 6.2.

The research findings would greatly benefit university administrators and management in making future decisions concerning the implementation of OL programs.

This paper is structured as follows. Section Two presents a review of recent studies on OL. Section Three describes the research model and hypotheses development. Section Four details the research methodology, followed by the presentation of study results in Section Five. Section Six discusses the findings, including implications, limitations, and potential directions for future research. Finally, Section Seven concludes the paper.

2. LITERATURE REVIEW

The OL literature showed a deep interest in investigating the acceptance and use (or adoption) of OL as has been confirmed by many previous studies [10], [11], [14], [15], [16]. The calls for investigating students' continuous use of OL rather than only focus on acceptance or/and current use (adoption) of OL have been raised recently by many studied e.g., [4], [4], [12], [16], [17]. The idea is that, although initial acceptance or initial use of OL is an important first step, the success and long-term viability of OL hinges on the continuous use rather than initial use or adoption for a short time.

The research topic of understanding students continuous use of OL has gained of increasing interest in recent years [1], [9]. However, as shown in many literature reviews e.g., [9], [16], [18], the majority of research related to students continuous use of OL are dominated by adopting well-known information system/ information technology adoption theories, namely expectation-confirmation model (ECM) [19], TAM [20], and UTAUT [21].

Additionally, ECM model was integrated with other theories such as TAM as per in several OL studies e.g., [22], [23], with D&M IS success model as adopted by the studies of [24], [25], and with TPB as adopted in the study of [26]. In result, many technological, personal, and social factors have been identified. Specifically, perceived usefulness, perceived ease of use, social norms, and satisfaction [9], [23], [25], [27], [28]. Other factors have been also clarified that could influence students continuous use of OL e.g., self-efficacy [29], [30], and compatibility of technology [27], [30]. Despite such well-significant theories/studies and the prominent influence of the constituent models and factors, further efforts are needed to reveal other important perceptive and factors that would add significant contributions to understand students' behavior towards the continuous use of OL, specifically, OL fatigue. [3], [31], [32], [33].

Students' learning experience has a strong influence on their intention to continue using OL [34]. The change in the form of teaching from traditional face-to-face learning to OL approach has posed several challenges as it reduces social contact, creates cognitive and emotional issues, and induces a sense of chronic fatigue [7], [8], [35]. In general, fatigue refers to a subjective feeling of tiredness and a state of exhaustion [36]. It occurs when an individual is overexposed to the same situation over time [37]. The OL fatigue could be seen as a student's feeling of tiredness and exhaustion caused by the use of OL. Some recent studies declare a sense of students growing experience fatigue during OL [3], [7] had negative effects on students psychological states such as depression, anxiety, and stress [31], [32] as well as it contributed to the inhibition of OL motivation over time [3].

New research results show a low degree of students' mental resilience after the pandemic and indicate that the majority of students feel that OL has ruined their social relationships by isolating them from their peers and instructors [38], [39], [40]. This highlights the need for improved social interaction strategies in OL environments. Research also indicates that students were also suffered from scopophobia (sense of being watched), poor overall sleep [41] and fatigue [7], [8].

Many recent studies calls to consider various OL fatigue aspects when investigating students' continuous use of OL such as the burden of OL, course overload, poor interaction [42], psychological issues such as, isolation, stress, anxiety, and depression [38], [39], [40], [43], [44], [45], learner-instructor interaction and course design quality [46],

home [47], [48], and evaluation/assessment methods [49], [50].

It can be observed that there have not been many studies on the role of OL fatigue on shaping students' continuous use of OL. Therefore the link between OL fatigue and continuous use of OL needs a specific investigation. In conclusion, to bridge the gap existing in prior studies, the present study investigates the impact of OL fatigue on students' continuous use of OL.

3. RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

This section presents the research model (as shown in *Figure 1*, Appendix) and discusses the development of related hypotheses. Scant amount of literature is available specifically determine OL fatigue aspects/dimensions and very few research has been specifically dedicated to investigate the influence of OL fatigue on students' continuous use of OL [3], [7]. Hence, a self-developed model considered various OL fatigue aspects that carefully compiled from closely related studies. In the present study, the authors proposed that the OL fatigue aspects/dimensions includes burden of the online course [42], psychological challenges [38], [39], the lack of sensory requirements during OL [4], the non-suitability of home learning environment [47], [48], and the non-suitability of evaluation/assessment methods [49], [50]. The study model suggests that the abovementioned OL fatigue aspects/dimensions often create negative influence on students' continuous use of OL. Based on the research proposed model, we have the following five research hypotheses.

3.1 Burden of OL Course

The shift to OL had created a burden for the students. Some studies refer to the burden of the online course in terms of course content, workload and student-instructor interactions [15], [42]. The burden of OL typically linked to OL courses design in terms of OL course structure, content presentation, interaction with the instructor and interaction with peer students as well as timely feedback [51]. Prior studies have shown that poor course design negatively impact students' satisfaction, which in turn negatively impact students' performance [51], [52]. Several OL studies have demonstrated that poorly designed OL course usually cause students' dissatisfaction, weak performance, weak

engagement, and low usage of OL [42], [51], [52], [53], [54]. A recent study of [42] found that course overload and poor interaction are significant factors contributing to students' discontinuation of OL, compared to technology factors such as poor internet connectivity, technology literacy, and lack of adequate devices.. Further, the interaction between instructor and student during OL had significant effects on continuous use of OL [55], [56]. Students who struggled with the lack of social interaction, they reported missing regular in person interaction with peers [57]. Recent studies have found that the weak interaction during OL causes students' low intention to continue use OL [42], [58], [59]. Thus, we propose the following hypothesis:

H1. The greater burden of the online course will significantly and negatively impact students' continuous use of online learning.

3.2   Psychological Challenges

While OL comes with many advantages, it also comes with negative consequences. Many studies pointed out to that fact that the majority of students who experienced OL have suffered from many psychological issues like stress, anxiety, depression, and isolation from friends and acquaintances [38], [39], [40], [43], [44], [45]. The results of recent studies by [60], [61] found that the high levels of anxiety, depression, and stress among OL students during the COVID-19 pandemic have been widely reported in OL publications, especially those focus on student stress and mental health topics during OL.

The psychological issues have negative influence on students' ability to learn online [62], on the level of knowledge, reduced motivation to learn and academic performance [38], and increase difficulties and challenges to cope with OL approach [63]. Several research find that the isolation from friends and acquaintances during the OL has a negative impact on students' intentions to continue using OL [47], [64]. Other studies referred to psychological issues faced students during online courses negatively impact the quality of the learning experience [47], [47], [50], [65]. Thus, we propose the following hypothesis:

H2. The greater psychological challenges of the online course will significantly and negatively impact students' continuous use of online learning.

3.3   Sensory Requirements Absence

During OL, students have experienced the sense of missing traditional classroom feelings and difficulty in satisfying sensory requirements in terms of perfectly seeing and hearing educators and fellow students during OL, which in result negatively impact the intention of students' to continue using OL [47], [64]. The missing feeling of traditional learning in campus has been reported [47], [64]. The study of Alarabiat et al., (2023) has found that online learning might face great challenge to simulate or satisfy the sensory requirements of the learning process (include the sensation of being at the physical campus, clearly seeing and hearing educators and fellow students during OL lectures) similar to those campus lectures. Another study reveals that the absence of sensory requirements increase students resistance to continue using OL [66]. The sensory requirements factor has recently gained scholar attention in several context e.g., remote working [67] and sharing economy practices like peer to peer accommodation services [68]. Thus, we propose the following hypothesis:

H3. The greater students' sensory requirements absence will significantly and negatively impact students' continuous use of online learning.

3.4   Home Learning Environment

A significant issue has gotten growing attention in OL research related to the condition of learning space available for students during OL, namely the learning environment at home [47], [48]. New studies has found that students usually experienced distractions at home and difficulties in selecting the best time and area for learning at home, therefore, students did not have a conducive learning environment at home [48], [69], [70]. The learning environment at home has been identified as one of the greatest challenges of OL as it is not always a suitable location for education [47], [62], [71], [72], [73]. A study by [47] has found that the learning environment at home is a greater challenge than a technological challenge faced by students while experiencing OL. Students still reported the challenge in balancing work, family, and other daily responsibilities while pursuing their education [74]. The unsatisfactory home learning environment might be due to the lack of physical learning space (e.g., private room for students), noisy background (e.g., private room for the students), noisy background and inadequate infrastructure such as home internet network [62], [73]. Other issues related to, privacy, household work or chores,

especially for female students [48]. Consequently, their studies were adversely affected and left them in dejection and despair. Therefore, it is proposed that:

H4. The greater non-suitability of the home learning environment will significantly and negatively impact students' continuous use of online learning.

3.5 Evaluation/Assessment Methods

The assessment is considered one of the most essential components of any educational system. Assessment where instructors measure learning activities to ascertain the instructional objectives through test, quiz and examination [49]. Assessment is, no doubt, vital to any learning, either face-to-face or OL. A convenient and fair assessment tools and process often has a positive impact on the usefulness of OL, in turn it is believed to encourage students to adopt and continue using OL [53]. To ensure this, the assessment process must adhere to the principles of integrity, equity, and fairness. Failure to do so can lead to significant challenges.

As OL has grown in popularity, the assessment has become a problem and more complicated. Recently, students concern related to assessment methods (evaluation and exams) of OL courses has been widely reported [49], [50], [70]. Several studies highlight the difficulties in maintaining fairness in online assessments [75]. A major drawback of OL is related to academic dishonesty and the perceived lack of fairness, with issues such as cheating, plagiarism, falsification of academic assignments, and deception during assessments being particularly problematic [49], [76]. According to several studies, assessment/evaluation methods of online learning (evaluation and exams) have a significant influence on students' intention to continue using OL [22], [42], [77]. Therefore, it is proposed that:

H5. The greater non-suitability of evaluation/assessment methods will significantly and negatively impact students' continuous use

4. RESEARCH METHODOLOGY

4.1 Survey and Development of Measures

Five constructs were measured. Measures items for each construct were obtained/adapted from close related research and the wording was modified to fit the research context to reinforce construct validity as follows. The items of burden of the online course

were developed based on [15], [42], psychological challenges items were adapted from [38], [39], the sensory requirements during OL items were fetched from [4], the home learning environment items were modified from [47], [48], and evaluation methods items were adjusted from [49], [50].

The research instrument was first developed in English language and has been translated to Arabic language since the study is conducted in Arabic-speaking community, Jordan. The translation process followed Brislin's backward-translation approach to ensure equivalence. Distributing the survey in Arabic is expected to increase the understanding level, which make answering it easier and, accordingly, increase the response rate. Questionnaire instrument content validity was evaluated by a panel of three experts involved in the e-learning field at the department of Management Information System (MIS) in one university in Jordan. The questionnaire was then piloted on 20 students from outside the study sample and modifications were made according to the respondents' suggestions. This pre-test aims to ensure that research instrument will work as a live project through its application. The pilot study showed general evidence regarding satisfactory level of reliability and validity of the items, however, some amendments to the wording of some items were necessary in aspects of revising some items to enhance their clarity and understandability.

4.2 Sample and Data Collection

This is a quantitative study using online-based surveys for data collection. A survey targeting undergraduate students in public universities in Jordan was distributed through the online platform "Google forms" survey. The survey invitation was posted in several social media groups (e.g., Facebook and WhatsApp) related to undergraduate students groups. Some colleagues from various universities were very collaborative and share the survey link with their students. The data collection last for around 30 days during March and April 2024. All items were measured using a five-point Likert scale ranging from "strongly disagree" to "strongly agree." The targeted respondents were all undergraduate students who are currently or experienced online learning from various public universities in Jordan. A random sample technique was employed. This type of sampling technique offers an equal probability of each member of the study population to participate, thereby ensuring eliminating or reducing sampling bias, and helping generalize the findings. The questionnaire begin with

a filter question to ensure that respondents are or have experiencing/experienced online classes as follows; "Are you currently or have you ever experiencing/experienced attending/attended online classes" with a request to terminate the participation in the survey if they never used the OL.

Our goal was to achieve to reach a representative sample that accurately reflects the study population with more than 200 participants. We considered the suggested sample size to be greater than 15 times the number of predictors [78]. Our model consists of five predictors and paths, therefore the sample size should be larger than 105. Further, the best effort will be devoted to collecting sample responses from public universities in Jordan with considering different study fields and majors, study levels, and places of residence. In total, 233 responses were obtained, surpassing our initial goal. *Table 1* (see Appendix) summarizes the sample characteristics. *Table 1* shows that the majority of respondents (66.9%) were male, while 33.1% were female. Most respondents studied social and humanities majors (64.81%), while 35.19% studied health and scientific majors. The sample profile indicates that slightly more than two-thirds of respondents (67.38%) were in their third or fourth year of study, with the remaining (32.62%) in their first or second year. Regarding place of residence, most participants (83.7%) were from urban areas (cities and big towns). With respect to experience using OL, most respondents (68.24%) had more than 2 years of experience.

5. RESULTS

To analyze the collected data and test the proposed research hypotheses, the study use the Statistical Package of Social Sciences (SPSS) version 23 and the partial least squares structural equation modeling (PLS-SEM) method (SmartPLS 3.0 software).

5.1 Assessment of Measurement Model

For the measurement model, the constructs reliability, convergent validity, and discernment validity were assessed by using several measurements. First, the constructs reliability was assessed by evaluating Cronbach's alpha (Alpha) coefficients for each constructs. As shown in *Table 2* (Appendix), all the items have Cronbach's alpha values > 0.70, exceeding the threshold of 0.7 as suggested by [79]. Second, the convergent validity was considered by assessing factor loading (FL), composite reliability (CR), and average extracted

variance (AVE). The factor loading for each item is within recommended threshold > 0.70 [79]. As shown in ***Error! Reference source not found.***, composite reliability values range from 0.843 to 0.932. Those values ensure the minimum thresholds of greater than 0.70 and lower than 0.95 [79]. The Average extracted variance value range from 0.642 to 0.764, surpassing the threshold of 0.5 as suggested by [79]. Our results presented indicate that the entire above threshold was successfully achieved and thus confirmed the reliability and convergent validly of the model. Further, we also detect the Multicollinearity issue by determining variance inflation factor scores. The analysis found that variance inflation factor values range from 1.055 to 3.1, all below the recommended threshold of 5 [80]. The result demonstrates that collinearity is not a problem in our model.

Third, in order to ensure the model constructs discernment validity, we have adopted Fornell-Larcker criterion. The Fornell- Larcker criterion suggests that the square root of average extracted variances should be greater than the correlation between each pair of constructs. As per *Table 3*, the square root of the AVE for each construct (diagonal and bold) is greater than the correlation coefficients with other constructs (off-diagonal elements).

5.2 Assessment of The Structural Model

The structural model verifies the main causal relationships hypothesized. The results of all path coefficients and their significance as estimated by PLS-SEM are presented in *Table 4* (Appendix). Table 4 shows that four hypotheses (H1-H4) were supported, whereas one hypothesis (H5) was not. The significant factors collectively explain 52.6% ($R^2 =0.526$) of the variance in CONTUSE. While the R^2 value of 52.6% reveals a model with moderate explanatory power ($0.33 \geq R^2 \geq 0.67$) as suggested by [81], it could be also considered relatively substantial in studies that seek to predict human behavioral intentions, as is the case in our study, as suggested by a recent study by [79]. The analysis shows that the burden of OL ($\beta = -0.473$; $p < 0.000$) has greatest influence on students' intention to continue using OL, followed by sensory requirements ($\beta = -0.289$; $p < 0.000$) and psychological challenges ($\beta = -0.274$; $p < 0.005$) respectively. Finally, while the evaluation has a little significant impact ($\beta = -0.083$; $p < 0.000$), the home environment has no impact ($\beta = -0.190$; $p < 0.249$).

6. DISCUSSION

The findings of this study make a significant contribution to the existing literature on OL by offering an understanding of OL fatigue. This holistic approach identifies key factors, including the burden of online coursework, psychological challenges, the lack of sensory requirements during OL, and the influence of the home learning environment. It highlights the interconnectedness of these factors and how they exacerbate students' OL fatigue, ultimately leading to decreased student continuous use of OL. This understanding can inform the development of strategies to mitigate OL fatigue and improve student experiences in online learning environments.

The study results confirmed the direct, negative, and significant impact of the burden of OL on students' intention to continue using it. The burden of OL typically caused by poorly OL course structure, content presentation, and week interaction with the instructor and with peer students. The results indicate that the burden of OL has the largest significant impact on reducing students' continuous use of OL, compared to other factors in our study model, which is shown by the high value of Beta (β = -0.473). This result adds to the credibility of the findings and consistent with prior studies, reinforcing the argument that poorly designed OL courses and weak interactions usually cause low intention to use/continuous use of OL [42], [52], [54]. Weak interaction with instructors and fellow students was consistently shown to reduce engagement in OL environments, corroborating findings from prior studies OL [42], [58], [59]. The absence of these interactions makes it difficult to develop creative, dynamic, and effective OL environments [82].

The study results demonstrate that psychological challenges (e.g., issues like stress, anxiety, depression, and isolation from friends and acquaintances) face students during OL would significantly diminish students' continuous use of OL. This is important for understanding the holistic experience of students in OL environments. Our result is consistent with previous studies findings that students who experienced psychological challenges during OL courses are more likely to discontinue using OL [59], [60], [83]. Other related prior studies have found that the majority of students feel that OL has ruined their social relationships by isolating them from their peers and instructors [38], [39], and decrease students satisfaction with OL [84]

The study analysis confirms that the weak/absence of sensory requirements in OL environment — in terms of struggling of seeing and hearing educators and fellow students as well as missing feeling of traditional learning in campus— has a significant impact on reducing students' continuous use of OL. This finding could be interpreted that students who expected OL to replicate the sensation of being on a physical campus were less likely to continue using it. The research result matches recent OL research finding in this regards [4], [47]. Those research have revealed that missing traditional classroom feelings and absence of sensory requirements in terms of perfectly seeing and hearing educators and fellow students during OL would significantly reduce students' intention to continue using OL [4], [47] and, simultaneously, increase their resistance to continue use OL [66]. The importance of sensory requirements in creating an interactive OL atmosphere underscores the complexity of replicating traditional classroom experiences in an online format, which may increase students' resistance to continue using OL [66]. Our results are consistent with previous studies' findings that OL environments might not be able to fully replace traditional learning environments due to the difficulty of delivering a similar feeling to being on campus [47], [71].

Regarding the role of home environment, the study results also showed a significant direct negative effect of home environment on students' continuous use of OL. Students reported a difficulty in finding ideal place at home for participating in OL lectures or activities (e.g., attending online courses, participating in online discussions, and completing online group homework) with no disturbance from family or a nearby outside environment [47], [62], [72], [73]. They also reported "home" as a place for relaxation, not for learning. This makes it difficult to balance activities between personal life and learning [74]. This interpretation is consistent with previous OL studies that confirmed the challenge of considering home as a conducive learning environment [70], [71], [85]. Interestingly, the finding that the home learning environment significantly impacts students' continuous use of OL aligns with some previous studies e.g., [71] but contrasts with others that found less emphasis on this factor e.g., [72]. This discrepancy suggests a need for further research to explore how home environments can be optimized for effective OL. The identification of home environment as a barrier to effective OL is a crucial insight as it emphasizes the need for supportive learning environments. Students' families would support OL through creating conducive

environments for OL, reinforcing the importance of a supportive home learning atmosphere.

Finally, contrary to our expectations, and in contrast to previous studies which found that assessment and evaluation methods (such as exams and other evaluations) significantly influence students' intention to continue using OL[22], [42], [77], our findings reveal no significant impact of these methods on students' continued use of OL. This discrepancy suggests that students may place less importance on evaluation and assessment methods in OL for several reasons. As OL becomes more mainstream, students might have adapted to various assessment methods, reducing concerns about fairness. Other factors, such as the overall burden of online courses, psychological challenges, lack of sensory engagement, and home learning environments, could have a greater impact on students' intentions to continue using OL. Additionally, the effectiveness of assessment methods may vary by course type, with methods suited for humanities potentially being less effective for medical or engineering courses. Cultural and contextual differences might also explain the results, as the study was conducted in a specific educational setting. These findings point to the need for further qualitative research, such as interviews or focus groups, to explore students' perceptions of assessment methods and their impact on learning and motivation.

One of the key strengths of this study is its comprehensive approach to examining OL fatigue, integrating factors such as the burden of online courses and psychological challenges that have been less emphasized in previous research [1], [2], [3].

The study complements and extends the understanding of factors influencing students' continuous use of OL by considering the impact of OL fatigue that has not been previously widely examined. The study analysis established the significant impact of the burden of the online course, psychological challenges, the lack of sensory requirements during OL, and the home learning environment on shaping students' continuous use of OL. The study results are significant for eliciting knowledge about OL fatigue. Consequently, university policymakers can use our insights and recommendations to mitigate such concerns, making OL more interactive and attractive. This, in turn, supports better design and implementation of OL programs, ensuring long-term usage. Educational institutions should fully understand that OL is different from face-to-face learning. Effective OL requires time to develop and necessitates more

reflection and communication. Academic institutions need to redesign students' learning experiences and consider OL fatigue.

6.1   Implications For Theory and Practice

This study highlights a shift in OL research from initial acceptance to continuous use [1], [4], underscoring the need to explore OL fatigue. As many studies have focused on technological and managerial factors, this research addresses a significant gap by investigating the influence of OL fatigue on students' continuous use of OL. This research is an attempt in this direction. We argue the need further consideration of OL fatigue when investigating students' continuous use of OL.

The collected data for OL continuous use studies often been collected during the emergency shift to OL due to the COVID-19 pandemic [13]. The pandemic necessitated the use of OL, making 2019, 2020, and 2021 significant years for data collection. However, during this period, students faced an uncertain environment and pandemic pressures. It is critical to examine the suitability of the OL approach in the post-pandemic era to determine if students would continue using OL or prefer face-to-face learning. This study, conducted after the COVID-19 pandemic, reflects students' perspectives free from pandemic pressures.

The study calls for necessary modifications in delivering OL courses. One of recommended actions to be followed is to create a supportive and inclusive culture in OL lessons. This can be done by encouraging students to share their feelings, opinions, and experiences, and listening to them with compassion and empathy. Another recommended action is to create online spaces and activities where they can interact with teachers and fellow students. This could done by organizing group projects, discussions, games, or events that align with the teaching course goals and learning outcomes. Such action is expected to help students overcome isolation, loneliness, stress, and anxiety. Using social media platforms, chat rooms, and video calls (if possible) would facilitate online communication and collaboration and is expected to diminish psychological challenges faced by students during OL, address the sensory requirements, and fostering a sense of community. As a result is anticipated to increase students' intention to continue using OL. Students' families/parents would play an important role in OL. They are recommended to set up an environment and space conducive for OL, minimize distractions, set up a designated learning space and

more care and affection. Harmonious family environment, long-term emotional support, and capability support among family members can contribute to the formation of good OL normative consciousness and behaviors, which will greatly improve students' OL engagement. Given the significant negative impact of home environment and weak interaction, institutions should invest in creating more structured support systems for students learning from home, such as designated quiet study spaces or virtual peer interaction hubs.

6.2 Limitations and Future Research

Despite the contributions, this study has notable limitations. The reliance on self-reported data may introduce response biases, as students might underreport their experiences or challenges in OL environments. To the best of our knowledge, there is no specific set of OL fatigue aspects and very few research has been specifically dedicated to investigate the influence of OL fatigue on students' continuous use of OL [3], [7]. Consequently, some OL fatigue aspects, although carefully compiled from closely related studies, could not be comprehensive and additional aspects would be emerged and used in future. It would be interesting to conduct additional studies that could integrated in the research model; thus, arguably, increase the explanatory power of the research model developed herein.

The study model does not consider other technological, personal, and psychological factors such as perceived ease of use, perceived usefulness, self-efficacy, OL system quality, and satisfaction, which would provide further insights on the factors influencing continuous use. Future work could expanded the study mode. Further, the study does not examine correlation between OL fatigue and specific learning outcomes. This is a valuable direction for future research. Hence, investigating such correlation can provide insights into how OL fatigue affects academic performance. Qualitative studies may yield deeper insights into students' lived experiences of OL fatigue. Finally, the results herein could be an outcome of the oriental cultural characteristics of the study context, as the study conducted in one Middle Eastern country – Jordan. Our sample may not fully represent the diversity of experiences within OL. This suggests a need for caution when interpreting the results and highlights areas for future research to explore different student populations. In future studies, the sample could need to be further expanded to investigate students across

various cultural contexts to improve the generalizability of the findings.

7. CONCLUSION

Recent evidence identifies OL fatigue as a significant challenge students' face during their online studies, leading to a low intention to continue using the OL approach. This study addresses this issue by investigating the impact of OL fatigue on students' continuous use of OL. In doing so, the study offers a novel perspective through a deeper understanding of the phenomenon of OL fatigue and students' continuous use of OL.

Unlike previous OL studies have often adopted a technological perspective using traditional information systems and technology theories such as TAM, UTAUT, and ECM—which usually reported common factors such as perceived usefulness, perceived ease of use, social norms, system quality, and self-efficacy factors, etc.—the current study goes beyond these conventional frameworks and repeated factors. This study explores new factors that have not been frequently reported in the OL literature but could significantly influence students' continuous use of OL. Specifically, the burden of online coursework, psychological challenges, lack of sensory engagement, and the impact of the home learning environment. By integrating these factors into a comprehensive framework, our research not only extends the theoretical understanding of OL fatigue but also provides actionable insights for educators and policymakers aiming to enhance student engagement and retention in OL environments. This contribution is particularly relevant in the context of the ongoing evolution of learning practices in the post-COVID-19 pandemic era, where understanding the unique challenges of OL is essential for fostering effective and sustainable learning experiences.

In light of the ongoing shift toward electronic or digital education, the study also highlights the need for educational institutions to reimagine students' OL experiences by recognizing the unique challenges posed by OL fatigue. Effective OL requires not only time for development but also increased reflection, communication, and interaction. Institutions should prioritize fostering a supportive and inclusive OL culture, where students can share their feelings, engage in meaningful interactions with peers and instructors, and participate in collaborative activities that align with course goals. Creating online spaces for interaction, using social media platforms, and

encouraging peer engagement can help mitigate the negative psychological impacts of OL and improve student retention.

8.   ACKNOWLEDGMENT

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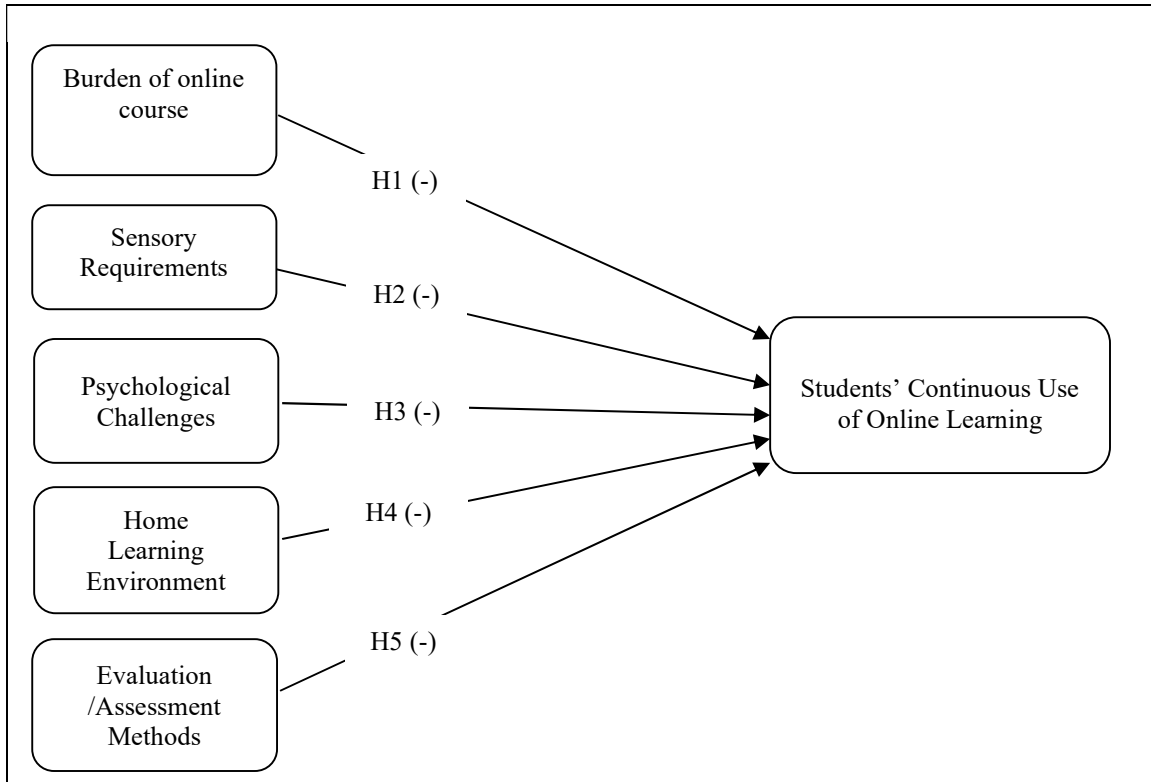
APPENDIX

Figure 1. The Study Proposed Model

Table 1. Sample demographic profile

Item		Frequency	Percentage (%)
Gender	Male	156	66.90
	Female	77	33.10
Major	Health and Scientific majors	82	35.19
	Social and Humanities majors	151	64.81
Education Level	First year	34	14.60
	Second year	42	18.02
	Third year	68	29.18
	Fourth year	89	38.20
Place of Living	Urban areas (cities and big towns)	195	83.7
	Rural areas (small towns and villages)	38	16.3
Experience with Using OL	Less than 1 year	34	14.60
	More than 1 year -less than 2 years	40	17.16
	More than 2 years -less than 3 years	72	30.90
	More than 3 years	87	37.34

Table 2. The assessment of measurement model results

Construct	Items	FL	R	AVE	Alpha
Burden of OL Course	BURDEN 1	.735	..844	.644	.852
	BURDEN 2	.752			
	BURDEN 3	.782			
	BURDEN 4	.774			
	BURDEN 5	.718			
	BURDEN 6	.796			
Psychological Challenges	PSYCHOL 1	.839	..932	.734	.931
	PSYCHOL 2	.845			
	PSYCHOL 3	.903			
	PSYCHOL 4	.883			
	PSYCHOL 5	.810			
Sensory Requirement	SENSORY 1	.874	..928	.764	.927
	SENSORY 2	.879			
	SENSORY 3	.854			
	SENSORY 4	.888			
	SENSORY 5	.901			
Home Learning Environment	HOME 1	.814	..874	.698	.909
	HOME 2	.855			
	HOME 3	.836			
Evaluation/Assessment Methods	EVALUATION 1	.790	..843	.642	.866
	EVALUATION 2	.859			
	EVALUATION 3	.751			
Students Continuous Use of OL	CONT USE 1	.921	.891	.735	.920
	CONT USE 2	.941			
	CONT USE 3	.924			

Table 3. Fornell and Larcker's discriminant validity test

	BURDEN	PSYCHOL	SENSORY	HOME	EVALUATION	CONT USE
BURDEN	0.802					
PSYCHOL	.492	0.856				
SENSORY	.268	.486	0.74			
HOME	.488	.779	.494	0.835		
EVALUATION	.537	.726	.306	.579	0.801	
CONT USE	.008	-.305	-.423	-.244	-.111	0.857

Table 4. Hypotheses analysis results

Hypothesis	Beta (β^)	T-value	P-value	Conclusion
H1: BURDEN → CONTUSE	-0.473	-9.169	0.000*	Supported
H2: PSYCHOL → CONTUSE	-0.274	-2.810	0.005**	Supported
H3: SENSORY → CONTUSE	-0.289	-4.859	0.000*	Supported
H4: HOME → CONTUSE	-0.190	0.095	0.000*	Supported
H5: EVALUATION → CONTUSE	-0.083	1.109	0.249 (NS)	Not supported
* Significant at p ≤ 0.001, ** Significant at p ≤ 0.05, NS: not significant				