


The Transformational Role of Perceived Self-Efficacy in Combating Online Exam Anxiety


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Abstract

Objective: This study investigates how university students' perceived self-efficacy influences anxiety levels during online examinations, a pressing issue amplified by disruptions caused by coronavirus disease 2019 (COVID-19) and the rise of artificial intelligence (AI)-driven assessment concerns. The aim is to analyze the relationship between self-efficacy and online test anxiety, identifying effective strategies to mitigate its effects.

Method: A systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology was conducted. Searches in Scielo, Web of Science, Scopus, ProQuest Education, Google Scholar, and Dialnet databases included peer-reviewed articles in education, psychology, social sciences, and computer sciences, published in Spanish and English. Both open-access and subscription-based articles were reviewed without time restrictions, resulting in the selection of 83 international articles for rigorous analysis and coding.

Results: The findings conclude that perceived self-efficacy plays a key role in the management of anxiety in online tests. Students with higher self-efficacy demonstrate greater emotional regulation and adaptability during assessments, leading to reduced anxiety and improved academic outcomes.

Conclusion: The findings highlight the need to reconceptualize instructional and assessment models in higher education by integrating psychological insights. Enhancing students' self-efficacy is vital to addressing online test anxiety and fostering supportive learning environments, particularly in the evolving context of digital and AI-enhanced education.

Implications: Higher education institutions must adopt strategies to develop students' self-efficacy, such as personalized feedback, psychological support, and inclusive assessment designs. Additionally, leveraging psychological insights can help build transformative models that balance technological advances with students' emotional well-being, ensuring equitable and effective online learning experiences.

Keywords: *online exam anxiety, online test anxiety, self-efficacy, university students, higher education, systematic review*

Date Submitted: November 26, 2024 | **Date Accepted:** November 30, 2025 | **Date Published:** May 4, 2026

Recommended Citation

Pereles, A., & Romero-García, C. (2026). The transformational role of perceived self-efficacy in combating online exam anxiety. *Higher Learning Research Communications*, 16(1), 1–25.
<https://doi.org/10.18870/hlrc.v16i1.1627>

Introduction

Although the coronavirus disease 2019 (COVID-19) pandemic is frequently identified as the latent catalyst for the proliferation of online teaching, interest in and adoption of virtual learning environments had already been progressively advancing on a global scale. The marked difference after that watershed was that it was no longer an option; instead, students and educators were forced to adapt to virtual environments and online resources for which they felt unprepared (Gashi et al., 2022; Gayen & Sen, 2021; Khalid et al., 2021).

Even more, the growing presence of generative artificial intelligence in higher education has introduced new dimensions to both teaching and evaluation. While such technologies offer advantages like personalized feedback and improved student engagement, they also raise critical concerns about ethical use, safety, and their potential to disrupt traditional approaches to knowledge and learning (Ugwu et al., 2024; Yu & Guo, 2023).

These challenges have heightened anxieties among educators, particularly regarding the increasing reliance on AI in assessment practices and its broader implications for academic integrity (Bannister, 2024) while simultaneously exacerbating anxiety problems among students who face academic pressures and the need to adapt to unexpected autonomy in their study processes (Rubio-Tinajero & Zapata-Contreras, 2021; Seladorai & Mohamed, 2021). Likewise, during this time, universities have been inclined to increasingly rely on advances in educational technology, integrating them into the teaching and learning process, even in traditional face-to-face settings (Reed & Reay, 2015). Amid these developments, one of the biggest challenges they have struggled with is how to conduct online exams from both a logistically scalable and ethically secure perspective (Bećirović & Dervić, 2022; Berman et al., 2022).

In this nascent context, there was a latent urgency to understand in depth the psychological factors affecting students in this new educational reality. A focus particularly on online test anxiety and its interaction with perceived self-efficacy is key (García-González et al., 2022; Hedlefs-Aguilar et al., 2021; Mamolo, 2022). However, published research is limited thus far that considers how online testing may affect learning and academic performance. To this end, in this paper, we conducted a review to identify and discuss contributing factors.

Literature Review

Online Test Anxiety

Anxiety in relation to exams is the main focus of several studies in the fields of education and psychology (e.g., Naranjo Pereira, 2009; Pintrich, 2003; Rosário et al., 2014; Valle et al., 2017). Furthermore, the transition to online assessments has introduced new complexities with practical repercussions in need of further scholarly attention. Students now face additional challenges, from adapting to virtual platforms, to navigating in a digital environment that demands specific skills (Cheng et al., 2021; Khalid et al., 2021). The ongoing reliance

on these platforms underscores the need for ongoing skills development to address digital literacy and adaptability challenges.

Online test anxiety is presented as a multidimensional variable spanning concerns about performance, technology, and adapting to new assessment formats. In this way, students experience uncertainty about how to use these resources effectively, which is reflected in an increase of anxiety related to academic performance (Khalid et al., 2022). Therefore, adaptation to the new assessment formats is a key factor to consider (Alibak et al., 2019; Arora et al., 2021) as the transition from traditional face-to-face examinations to online assessments generates uncertainty and doubts about testing expectations and processes (Rizun & Strzelecki, 2020; Slykerman et al., 2022).

The potential impact of online test anxiety is not limited to academic performance. It can also have significant repercussions on students' emotional well-being (Zhang et al., 2020). This can affect the learner's engagement, motivation, and overall satisfaction with the educational process. Motivation, regulation, and emotional components have been related to behavioral beliefs such as task orientation (intention to perform a task), self-efficacy (beliefs about competence/ability to perform a task), perceived difficulty, task value (importance, usefulness, relevance), and self-interest (previous knowledge connection), as has been extensively studied by Cerezo et al. (2018), Covington and Dray (2002), Pintrich and Schunk (2006), and Rosário et al. (2014), among others. The results of these research articles highlight the significance of dealing with online test anxiety as a multifaceted phenomenon that is closely linked to students' emotional, cognitive, and motivational dimensions. Addressing this challenge requires intentional efforts to design learning environments that prioritize emotional support and cultivate key psychological constructs such as self-efficacy, task value, and emotional regulation. In this way, it is possible to mitigate its impact on student engagement, persistence, and the overall educational experience.

Consequently, anxiety can create an emotional barrier that hinders effective engagement with course content, negatively affecting the quality of learning. Contributions in the 1980s are particularly important when the effect of emotional components was observed on students' expectations of academic success and the value they placed on the task. This prompted further empirical studies (e.g., Pintrich, 2000; Ryan & Deci, 2017; Valle et al., 2017) into the relationship between motivation, learning strategies, and emotional components linked to motivational beliefs such as task orientation (intention to perform a task), self-efficacy (beliefs about competency/capacity to perform a task), perceived difficulty, task value (importance, usefulness, relevance) and personal interest (link to prior knowledge).

Other studies explored learner motivation through positive thinking and other elements that promote or enhance intrinsic motivation (Bandura, 1993; Dweck, 2021; Efklides, 2011; Schunk & DiBenedetto, 2020). According to these authors, volitional control and regulation include cognitive and metacognitive activities that the subject engages in to adapt to and use the most appropriate learning strategies (Torrano et al., 2017). Similarly, students can regulate their cognition and control their motivation and anxiety about tasks or exams, while "the congruence between the subject's actual ability and the level of perceived ability will determine whether they have high or low learning expectations" (Valle Arias & Núñez Pérez, 1989, p. 315). The greater the involvement in the learning process, the greater the level of achievement based on the pre-established objectives.

Anxiety stemming from adapting to new methods of testing such as online examinations influences the confidence that students display during assessments and can also have long-term consequences for their perceived self-efficacy. This impact extends beyond specific situations of evaluation, affecting their overall confidence in dealing with academic challenges. This is supported by the relevant literature (Arcoverde et al., 2022; Deer et al., 2018; Hedlefs-Aguilar et al., 2021) as several studies have highlighted the relationship between online test anxiety and perceived self-efficacy. Furthermore, it has been suggested that addressing this specific anxiety is crucial for improving immediate performance in online exams and for cultivating a

resilient and autonomous learning mindset, thus breaking the negative feedback cycle (MacArthur & Santo, 2022).

Perceived Self-Efficacy

Perceived self-efficacy is directly related to the perception of control over one's ability to cope with challenging academic situations (Pintrich, 2003). This belief in personal competence (Bandura, 1993) not only influences overall academic performance but also plays a crucial role in anxiety management, particularly in the context of online assessments (Berman et al., 2022; Huang & Mayer, 2019). Given its importance, self-efficacy is integral to navigating the demands of new educational environments, and addressing it can mitigate the emotional and cognitive challenges students face, ultimately enhancing both academic outcomes and emotional well-being (Zhang et al., 2020).

Perceived self-efficacy acquires a unique dimension in the online education environment that goes beyond conventional academic competence. It involves students' confidence in their ability to deal with academic content and their ability to adapt and succeed in a virtual environment, where technological demands are a constant reality. In the words of authors such as Bandura (1993) and Covington and Dray (2002) or more recent reviews such as Huang et al. (2020), when talking about self-efficacy, it is not only about the general belief in one's own academic abilities; it is also about the specific confidence in facing technological and assessment demands in a virtual environment.

In addition, self-efficacy involves the student's ability to maintain effective focus on the task, despite possible distractions in the online environment (Pandya, 2021). In this context, it becomes an umbrella of traditional academic skills and technological competencies, both of which are essential for success in online assessment. Thus, a student with high perceived self-efficacy in virtual contexts may experience reduced anxiety, as they are confident in their ability to overcome technological and assessment challenges. On the other hand, a low level of perceived self-efficacy in the virtual environment may exacerbate anxiety, creating an additional barrier to successful academic performance. Therefore, together with motivation (Keller & Szakál, 2021), it appears that, in the teaching and learning process, factors that are both internal and external to the individual come into play, conditioning their success and failure.

Connection Between Anxiety and Self-Efficacy

The relationship between online test anxiety and perceived self-efficacy is complex and bidirectional. Anxiety can negatively affect perceived self-efficacy, decreasing students' confidence in their ability to overcome academic challenges (Arora et al., 2021). On the other hand, high perceived self-efficacy can act as a protective resource against anxiety, providing students with the confidence to tackle online exams effectively (Alibak et al., 2019; Zilber et al., 2022).

In the specific issue of online assessment, students may experience anxiety related to technology, time management, and adapting to new exam formats (Mamolo, 2022; Marchand & Gutierrez, 2012). Perceived self-efficacy in these areas may significantly influence how students face and overcome these stresses (Yang et al., 2016). Understanding how these two variables are linked is essential to inform effective educational interventions and psychological support strategies.

Students with high self-efficacy report lower anticipatory anxiety and better coping with the demands of the digital environment, thanks to their confidence in managing both academic content and technological tools (Cicha et al., 2021; Seladorai & Mohamed, 2021). Moreover, this belief in one's own ability favors the use of metacognitive strategies, greater persistence, and a more positive attitude toward learning (Arcoverde et al., 2022). In contrast, low self-efficacy is associated with greater stress, difficulty regulating emotions, and a more threatening perception of elements such as remote monitoring, digital overload, or academic uncertainty (Han et al., 2022). Taken together, this evidence underscores the central role of self-efficacy in the student's emotional experience during online assessments. The relationship between perceived self-efficacy

and online assessment anxiety represents a critical focus of this systematic review, aiming to provide a comprehensive understanding of how these constructs interact and influence each other within today's online educational contexts.

Purpose of the Study

While online test anxiety has been recognized for its impact on academic performance and emotional well-being and self-efficacy has been extensively studied as a key factor in motivation and task management, the interplay between these variables in virtual learning environments remains underexplored. This review seeks to bridge this gap by analyzing their dynamic relationship and uncovering insights relevant to contemporary educational challenges.

To achieve this, the systematic review is guided by the following research questions (RQs):

- RQ1: How does perceived self-efficacy shape students' emotional and cognitive experiences during online assessments, particularly in relation to test anxiety?
- RQ2: Which targeted strategies or interventions, including psychological support, inclusive assessment design, and technological training, have proven effective in reducing online test anxiety while enhancing self-efficacy among diverse student populations?

These questions aim to provide a comprehensive understanding of how perceived self-efficacy affects students' experiences with online exams and to identify practical approaches that can support students in managing test-related anxiety.

Methods

To explore these RQs, the present study aims to explore how test anxiety and perceived self-efficacy are interconnected and how they influence each other in the specific context of online education. To achieve these goals, the first step will be to conduct a comprehensive search of the published literature on the two key concepts (self-efficacy and online test anxiety) at the university level. This allows an analysis of the associated factors and instruments used to assess perceived academic self-efficacy and the influence of online exam anxiety in university students. Finally, the objective is to thoroughly examine how students feel about online exams, their impact on anxiety (impact on results), and how perceived self-efficacy plays a relevant role in the increase or reduction of the emotional component studied in this work (anxiety).

Search Strategy

To realize the above objectives, we conducted a systematic literature review based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Page et al., 2021; Rethlefsen et al., 2021). PRISMA emphasizes transparency and methodological rigor in identifying and analyzing research evidence but does not require or entail statistical data processing unless conducting a meta-analysis. As such, the present review focuses on thematic synthesis based on qualitative findings from the included literature without applying statistical models such as mediation or moderation analyses.

We used the following databases: Dialnet, Google Scholar, ProQuest Education, Scopus, Scielo, and Web of Science. The databases were selected because of their size and the fact that they are the largest and best-known databases for abstracts and bibliographic references in the world scientific literature in our field of work. The search string started by using the following terms: [(online OR virtual) AND (exam OR test) AND (higher AND educ* OR university AND educ*) AND (self-efficacy OR self-efficacy)], yielding a total of 864 results. We conducted an initial review and found that this search returned articles that did not specifically address online test anxiety. As a result, we added a more sensitive filter for the following terms: [(“online

exam anxiety” OR “online test anxiety”) AND (higher educ*) AND (self-efficacy)]. This was applied to all databases reviewed and resulted in 83 items in total. We conducted this search and analysis from October 2022 to January 2024.

Study Selection Criteria

Inclusion criteria (Table 1) covered open access and non-open access articles published in English and Spanish in the fields of education, psychology, and social and computer sciences. Exclusion criteria ruled out journals in the health field linked to the treatment of anxiety with medication. In addition, journals with full articles and peer review were selected to identify the highest quality and impact research. No time limit was set, according to the volume of papers registered. Reference lists of selected articles were manually screened to identify additional studies.

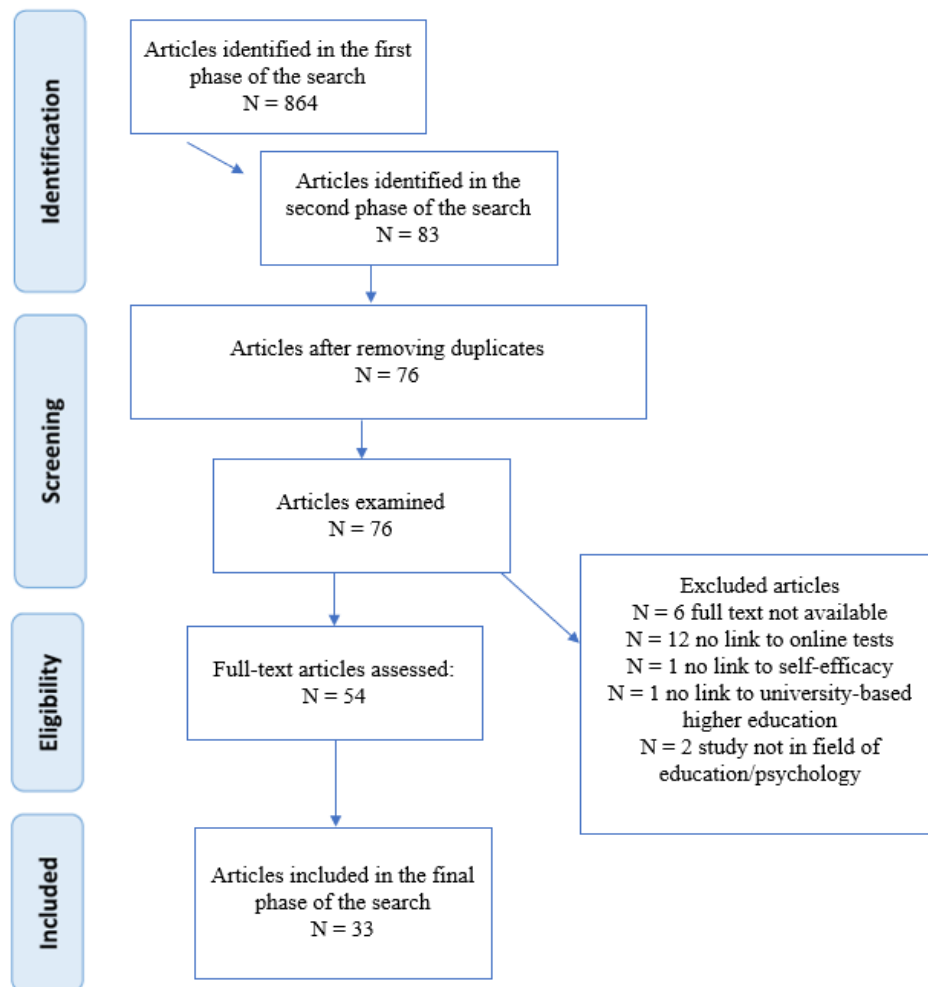
Table 1. *Inclusion and Exclusion Criteria*

Inclusion Criteria	Exclusion Criteria
“Online exam anxiety” OR “online test anxiety” AND (higher educ*) AND (self-efficacy)	No reference to online tests, anxiety, higher education, and self-efficacy
English and Spanish	Other than English or Spanish
Fields of education, psychology, and social and computer science	Health fields in connection with pharmacological treatments for anxiety
Open access and non-open access articles	Potentially relevant studies but whose full text or essential data for eligibility were not available
Peer review	Without peer review or not reporting the existence of double review
Full text	No access to full text

All articles were exported to Zotero software, a free bibliographic manager created by George Mason University (2025). According to its creators, Zotero stands out for its broad support for a wide variety of sources and automatic import from commercial websites. It allows users to create, manage, and cite sources in its database, facilitating the storage of information and the creation of bibliographies. Free to download, it makes the software an accessible alternative for students, being compatible with browsers. Interactive and convenient for students, teachers, and researchers, it allows the import of research in PDF format.

In this sense, the Zotero software and the detailed review of the authors facilitated the selection of the articles following the PRISMA approach (see Figure 1 for the results) based on the guidelines provided by Rethlefsen et al. (2021) and Page et al. (2021). This approach ensures transparency and rigor in the identification, screening, and inclusion of studies. Each of the 83 results obtained in the second, more advanced, search was double-checked against the detailed eligibility criteria, along with articles that were not available in full length and articles that did not specifically refer to online testing, self-efficacy, and/or online test anxiety. We removed duplicate records using the Zotero identification strategy, identifying a total of seven duplicate publications.

Also, since the profile of university students is significantly different from that of students in other educational stages, and since our study focuses on higher education, results where participants did not meet this criterion were excluded. This selection reduced the number of studies to be analyzed, and the results are presented in Figure 1.

Figure 1. PRISMA Diagram

Data Collection

Once we identified the relevant articles, we moved on to a comprehensive data collection phase. This involved an in-depth examination of each selected study, extracting details ranging from authorship and year of publication to sample characteristics, instruments used, and mapping connections between self-efficacy and online test anxiety. To explore this large data domain, the study adopted Braun and Clarke's (2006) thematic analysis framework, a recognized qualitative method (Pérez-Sánchez & Delgado, 2022). With this methodological choice, a systematic and rigorous coding process was expected to ensure that meaningful information was extracted from the data collected. Moreover, this coding process was subjected to a meticulous double check that reinforced the reliability of the analysis.

The reliability measures applied, combined with the systematic approach, facilitated thematic identification. Agreement was reached on the general themes (identification, method, and results), which provided a coherent structure for the subsequent in-depth analysis (see Figure 2). The central theme moved on to the impact of online exams on anxiety, the inherent role of perceived self-efficacy, and an exploration of the factors and instruments employed in the studies reviewed. Here, the connection between anxiety and self-efficacy materialized, revealing emerging patterns and insights that contributed to a deeper understanding of

the complex relationship within the realm of university students' experiences. Findings in this regard are presented below.

Data Analysis

Upon extraction of the relevant data from the selected articles, we undertook a process of analysis and reflection to establish the appropriate links between the documents. This step, combined with the reliability measures applied and the systematic approach employed, facilitated the identification of central themes and patterns.

Thematic identification was guided by a systematic examination of study elements, focusing on three overarching dimensions: identification (author, year of publication), methodological approaches (objectives, sample group, means of assessment), and results reported in the literature results (perceived self-efficacy and online test anxiety; see Table 2). We reached a consensus, ensuring a structured and coherent basis for in-depth analysis.

Central to this analysis is the impact of online exams on anxiety, the integral role of perceived self-efficacy, and the contextual factors or instruments used in the reviewed studies. These aspects illuminate the connection between anxiety and self-efficacy, revealing recurring patterns and emergent insights. This systematic approach contributes to a nuanced understanding of the relationship between these concepts in the context of university students' online educational experiences.

The findings derived from this thematic analysis are presented in detail in the following section.

Results

As previously analyzed, the flowchart outlines the systematic article selection process. Initially, 864 articles were identified, with an additional 83 found in the second phase. After duplicates were removed, 76 articles were screened, and 54 full-text articles were assessed. Ultimately, 33 articles were included. Exclusions were made due to lack of full text (6), irrelevance to online testing (12), no link to self-efficacy (1), no focus on university education (1), and being outside the fields of education or psychology (2). This process ensures the inclusion of relevant, high-quality studies for the review.

Building on this selection process, the research outcomes, as illustrated in Table 2, include the development and validation of tools to measure online test anxiety, the exploration of factors influencing academic performance, and the analysis of interventions to combat anxiety in various learning environments during the COVID-19 pandemic.

Table 2. *Characteristics of the Analyzed Articles*

Identification			Method		
Author	Year	Objectives	<i>n</i>	Institution	Measuring Tools
Alibak et al.	2019	Develop a tool for online test anxiety.	157	Isfahan University of Technology and University of Isfahan	TAI, OTAI
Alkiş & Temizel	2018	Comparison of personality, motivation impact in b-learning.	316	Middle East Technical University	BFI, MSLQ, NetClassR LM
Arcoverde et al.	2022	Investigate learning strategies, self-efficacy in students.	220	Brazilian Federal Education	LASSI, Self-Efficacy for Learning Form

				Institution in the state of Piauí, Brazil	
Arora et al.	2021	Analyze the impact of COVID-19 on student anxiety.	434	India: University of Delhi, Indraprastha University, Indian Institute of Technology and Management, and Amity University	CAS, General Self-Efficacy Scale, Personal Coping Strategy Scale and OEAS
Broadbent et al.	2023	Create self-report tool for self-regulated learning.	634	Anonymous University	SRL-O
Chang et al.	2014	Study self-efficacy, motivation impact on performance.	87	University in the north of Taiwan	OCTS, CIS
García-González et al.	2022	Produce theory on pandemic's distance-learning effects.	641	Andalusian universities (Spain)	Fear of COVID-19 Scale, SWLS, IUS-12, DASS-21, MSLQ, UTAUT
Kolagari et al.	2018	Analyze online tests' effect on nursing students' anxiety.	39	Golestan University of Medical Sciences, Iran	STAI, TAS
Han et al.	2022	Study anxiety, emotionally intelligent communication in class.	615	Public and private universities in China	FLCA, CE, EIC, AS
Hedlefs-Aguilar et al.	2021	Determine cognitive function patterns in test anxiety.	140	Mexican universities	Ad hoc questionnaire
Huang and Mayer	2016	Evaluate anxiety-reduction techniques in math learning.	54	University in the Midwest USA	Ad hoc questionnaire
Huang & Mayer	2019	Understand self-efficacy, task anxiety in learning.	147	University in the Midwest USA	Ad hoc questionnaire
Kanwal & Rehman	2017	Evaluate critical factors in e-learning adoption.	354	Virtual University of Pakistan	Ad hoc questionnaire (PELAM)
Keller & Szakál	2021	Analyze intervention effects on grades and anxiety.	15,539	University of Szeged, Hungary	Ad hoc questionnaire
Khechine & Lakhali	2018	Determine technology acceptance determinants, outcomes.	377	Université Laval Business School, Quebec	UTAUT and ad hoc

Lakhal et al.	2021	Verify UTAUT model's influence on online course persistence.	759	Université Laval and Université de Sherbrooke, Quebec	UTAUT
Li et al.	2021	Develop online course anxiety measurement tool.	170	University in the southwest of the USA	SOCA
MacArthur & Santo	2022	Explore statistics on anxiety's quadratic effects, gender moderation.	111	University in the Midwest USA	STARS
Mamolo	2022	Investigate online learning's effect on motivation and anxiety.	42	STEM and ABM Baybay City, Leyte, Philippines	MMQ, MS, Anxiety Questionnaire
Marchand & Gutierrez	2012	Examine relationships between self-efficacy, instruction relevance.	363	University in the southwest of the USA	AEQ, MSLQ, ad hoc questionnaire
Mohammed et al.	2021	Analyze COVID-19's impact on on-campus students' anxiety.	2,111	A research-intensive institution in the southwest of the USA	Ad hoc questionnaire
Morales-Martinez et al.	2021	Study information integration in Mexican engineering students' anxiety.	474	University in Mexico	Ad hoc questionnaire
Phanphech et al.	2022	Examine anxiety in synchronous, asynchronous online learning.	99	Professional training institution in Thailand	OTAI
Prakasha et al.	2021	Determine online test anxiety's effect on performance.	200	International Baccalaureate, India	OTAI
Rizun and Strzelecki	2020	Investigate factors influencing distance learning acceptance.	1,692	University of Economics in Katowice, Poland	SmartPLS GmbH and GETAMEL
Samruayruen et al.	2013	Study motivation, learning strategies, self-regulation.	88	Chulalongkorn University in Thailand	MSLQ
Savoji	2013	Evaluate motivational beliefs' impact on achievement.	394	Iran University of Science and Technology, Tehran	MSLQ
Slykerman et al.	2022	Examine pandemic's effect on online learning perceptions.	483	University of Auckland, New Zealand	Perceived Stress Scale; STAI6, WHO-5
Wang & Zhan	2020	Investigate relationships between beliefs, anxiety in	475	Beijing Foreign Studies University, Beijing	Chinese English as a foreign language learners' MSSQ,

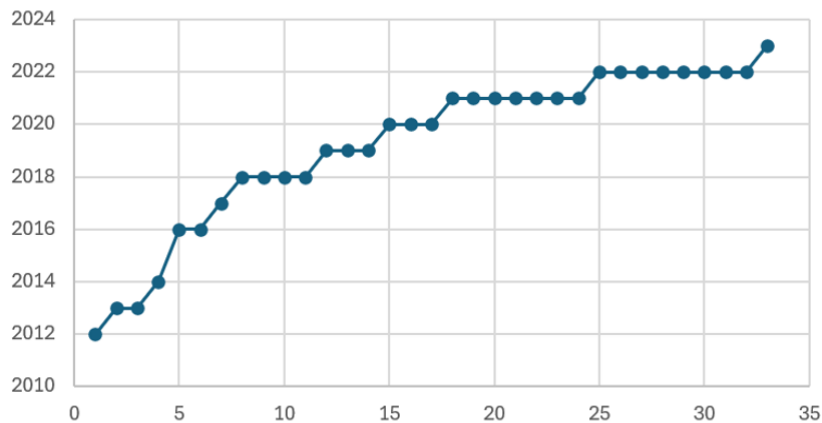
		online English learners.			Foreign Language Classroom Anxiety Scale, Beliefs About Language Learning Inventory, OSEL-Q
Woldeab & Brothen	2019	Assess online proctored exam's impact on anxiety and performance.	631	University in the Midwest USA	WTAS and ad hoc questionnaire
Yang et al.	2016	Investigate achievement goal model's utility in predicting test anxiety.	209	Public university in the southeast of the USA	3×2 Achievement Goal Questionnaire, MSLQ
Zilber et al.	2022	Examine self-efficacy, uncertainty, anxiety in nursing graduates.	352	University in Israel	Spielberger's STAI, Students' uncertainty and ad hoc
Zimmerman & Austin	2018	Predict final exam outcomes based on attitudes and anxiety.	1,112	Pennsylvania State University, USA	STARS

Note: AC = academic success; AEQ = Achievement Emotions Questionnaire; BFI = Big Five Inventory; CAS = Coronavirus Anxiety Scale; CE = classroom environment; CIS = Course Interest Survey; COVID-19 = coronavirus disease 2019; DASS-21 = Depression Anxiety Stress Scale 21; EIC = emotional intelligence communication; FLCA = Foreign Language Classroom Anxiety Scale; GETAMEL = General Extended Technology Acceptance Model for E-Learning; IUS-12 = Intolerance of Uncertainty Scale-12; LASSI = Learning and Study Strategies Inventory; MMQ = Mathematics Motivation Questionnaire; MS = Mathematics Self-Efficacy.; MSLQ = Motivated Strategies for Learning Questionnaire; MSSQ = Motivational Self-System Questionnaire; OCTS = Online Computer Technology Survey; OEAS = Online Exam Anxiety Scale; OSEL-Q = Online Self-regulated English Learning Questionnaire; OTAI = Online Test Anxiety Inventory; PELAM = Pakistan E-Learning Adoption Model; SOCA = Scale of Online Course Anxiety; SRL-O = Self-Regulation for Learning Online; STAI = State-Trait Anxiety Inventory; STARS = Statistics Anxiety Rating Scale; SWLS = Satisfaction With Life Scale; TAI = Test Anxiety Inventory; TAS = Thompson Attitude Survey; USA = United States of America; UTAUT = Unified Theory of Acceptance and Use of Technology; WHO-5 = World Health Organization-Five Well-Being Index; WTAS = Westside Test Anxiety Scale.

Study Overview: Identification and Characteristics

We selected a total of 33 peer-reviewed studies through a rigorous screening process based on predefined inclusion criteria, ensuring methodological quality and thematic relevance. A time trend analysis showed a steady increase in publications since 2012 (Marchand & Gutierrez, 2012), with a notable surge from 2021 onward, coinciding with the rise of COVID-19 and the intensification of research on student anxiety and self-efficacy in online learning environments (Mohammed et al., 2021), exploring the moderating role of cognitive processes, coping strategies, cognitive functions, intervention effects, and the influence of different models on persistence in online courses (Arora et al., 2021; Hedlefs-Aguilar et al., 2021; Prakasha et al., 2021).

Figure 2. Increase in Number of Publications



This growth aligns with the core objectives of this review, which seeks to examine how perceived self-efficacy shapes students’ emotional and cognitive experiences during online assessments (RQ1) and to identify effective strategies to reduce test anxiety while enhancing self-efficacy (RQ2).

Table 3 presents the main findings derived from the analyzed articles in relation to the RQs, with a particular focus on the relationship between self-efficacy and anxiety in students’ evaluative experiences within digital environments. The compilation shows the methodological and contextual diversity of the research, as well as the consistency of certain patterns that highlight the role of psychological, pedagogical, and technological factors in the evaluative experience of students in digital environments.

Table 3. Factors and Relationships Identified in Relation to RQs

Author and Year of Publication	Results: Factors and Relationships Identified	RQ Addressed
Alibak et al. (2019)	Key factors such as time pressure, virtual environment, and digital skills were identified as significant influences on anxiety.	RQ1
Alkiş & Temizel (2018)	Intrinsic motivation and personality awareness positively correlated with academic performance.	RQ1
Arcoverde et al. (2022)	Metacognitive strategies and high self-efficacy predicted better academic outcomes.	RQ1 and RQ2
Arora et al. (2021)	A significant increase in anxiety was observed due to academic uncertainty, isolation, and digital overload.	RQ1
Broadbent et al. (2023)	A reliable scale was validated; self-regulation was positively linked to academic success.	RQ1
Chang et al. (2014)	Self-efficacy and intrinsic motivation acted as mediators between effort and performance.	RQ1
García-González et al. (2022)	Factors such as social isolation, limited teacher-student interaction, and technological difficulties increased anxiety and demotivation.	RQ1
Han et al. (2022)	Emotionally intelligent teacher communication reduced perceived anxiety and improved student participation.	RQ2

Hedlefs-Aguilar et al. (2021)	A decline in executive functions (working memory, attention) was observed in students with high anxiety.	RQ1
Huang & Mayer (2016)	Coping techniques such as cognitive restructuring and distributed practice reduced anxiety and improved mathematics performance.	RQ2
Huang & Mayer (2019)	High self-efficacy reduced anticipatory anxiety and enhanced performance in complex learning tasks.	RQ1
Kanwal & Rehman (2017)	Ease of use, attitude toward technology, and institutional support were key factors for the acceptance of e-learning.	RQ2
Keller & Szakál (2021)	A mindfulness-based intervention reduced academic anxiety and improved final grades.	RQ2
Lakhal & Khechine (2018)	Intention to use was mediated by perceived usefulness, positive attitude, and ease of use; all influenced academic performance.	RQ1
Kolagari et al. (2018)	Higher anxiety was reported in online formats, particularly due to fear of technical failure and remote proctoring.	RQ1
Lakhal et al. (2021)	Persistence was predicted by performance expectancy, effort, and social support, in line with the UTAUT model.	RQ1
Li et al. (2021)	A new scale identified dimensions of anxiety related to navigation, content, and online assessment.	RQ1
MacArthur & Santo (2022)	Non-linear relationship: moderate anxiety was optimal for performance; gender moderated the effect.	RQ1
Mamolo (2022)	Students with low self-regulation reported higher anxiety and lower motivation in virtual settings.	RQ1
Marchand & Gutierrez (2012)	Perceived relevance of content increased self-efficacy and subject engagement.	RQ1
Mohammed et al. (2021)	Anxiety significantly increased during lockdowns, associated with limited connectivity and reduced social contact.	RQ1
Morales-Martinez et al. (2021)	The difficulties in analyzing and synthesizing technical information caused considerable anxiety, especially in evaluative contexts.	RQ1
Phanphech et al. (2022)	Higher anxiety was found in synchronous settings due to time pressure and social exposure; asynchronous settings offered greater comfort and time control.	RQ1
Prakasha et al. (2021)	High anxiety levels negatively correlated with online exam outcomes, highlighting the need for emotional and technical support.	RQ1 & RQ2
Rizun & Strzelecki (2020)	Technological self-efficacy and institutional support were the main predictors of positive acceptance of remote education.	RQ2
Samruayruen et al. (2013)	Students with high intrinsic motivation and frequent use of self-regulation achieved better academic results.	RQ1

Savoji (2013)	Self-efficacy, achievement goals, and academic control beliefs were linked to higher achievement and lower anxiety.	RQ1
Slykerman et al. (2022)	Perceptions of the effectiveness of remote learning were mixed; anxiety increased among students with less technological experience.	RQ1
Wang & Zhan (2020)	Positive beliefs about online learning reduced language anxiety; low self-efficacy increased stress levels.	RQ1
Woldeab & Brothen (2019)	Online monitoring significantly increased anxiety: it was associated with poor performance, particularly among students with prior anxiety.	RQ1
Yang et al. (2016)	Students with mastery-oriented goals reported lower anxiety than those with performance-avoidance goals.	RQ1
Zilber et al. (2022)	Professional uncertainty and low self-efficacy predicted high anxiety levels during the transition to the workplace.	RQ1
Zimmerman & Austin (2018)	Positive attitudes toward the course and low initial anxiety predicted better performance in the final exam.	RQ1

Note: RQ = research question; UTAUT = Unified Theory of Acceptance and Use of Technology.

RQ1: Perceived Self-Efficacy and Emotional-Cognitive Experience

Most studies ($n = 28$) addressed how students' perceived self-efficacy impacts their levels of test anxiety during online assessments. Consistent patterns emerged, showing that higher self-efficacy is associated with lower anxiety and better academic performance (Chang et al., 2014; Huang & Mayer, 2019; Zimmerman & Austin, 2018). Emotional regulation, metacognitive strategies, and beliefs about academic control also emerged as variables influencing the emotional and cognitive responses to online evaluations (Arcoverde et al., 2022; Savoji, 2013).

Additionally, the digital context introduces new stressors that amplify anxiety—such as perceived surveillance (Woldeab & Brothen, 2019), technical difficulties (Kolagari et al., 2018), and social isolation (García-González et al., 2022)—particularly among students with low digital self-efficacy (Slykerman et al., 2022). These findings support the central premise of RQ1 by confirming the pivotal role of perceived competence in shaping emotional responses during virtual assessments.

Factors Influencing Online Test Anxiety and Self-Efficacy (RQ1)

Research has ultimately addressed online test anxiety, help seeking, achievement goals and their relationship with academic performance, and the impact of attitudes and anxiety on test scores in virtual and face-to-face contexts (Savoji, 2013; Yang et al., 2016). The analysis revealed that students' emotional and cognitive experiences during online assessments are shaped by multiple, interrelated factors. A prominent theme relates to students' perceived self-efficacy, which strongly influenced their ability to manage academic stress. Those with higher self-efficacy were more likely to report lower levels of test anxiety and greater confidence navigating online platforms (Chang et al., 2014; Huang & Mayer, 2019). These studies have also examined how individual differences in motivational beliefs and learning strategies are related to performance in different learning environments and how students' perceptions of online learning are associated with their psychological health (Savoji, 2013; Wang & Zhan, 2020).

Demographic and contextual factors such as gender, age, academic discipline, and socioeconomic background significantly influenced students' experiences of anxiety. Studies by Arcoverde et al. (2022) and Lakhali et al. (2021) found that female students reported higher anxiety levels, particularly in science, technology, engineering, and mathematics fields. Socioeconomic status also played a key role, with students from lower-income backgrounds facing greater pressure due to financial stress and limited access to resources, which in turn impacted self-efficacy and academic performance. As noted by García-González et al. (2022), students from lower economic backgrounds tend to face additional stressors, such as limited access to infrastructure for online education and greater vulnerability to pandemic-related uncertainty. These factors contribute to heightened academic anxiety and may even affect their overall self-efficacy and performance.

Learning environments, particularly in the context of online education, show a distinct relationship between students' self-efficacy and emotional experiences. Students who reported higher confidence in their academic abilities tended to engage more positively with digital tools and platforms, which contributed to a more effective and less stressful learning process (Chang et al., 2014; Huang & Mayer, 2019). Similarly, those who adopted clear learning goals and self-regulated strategies displayed greater emotional balance and perseverance in online contexts (Samruayruen et al., 2013; Savoji, 2013). In this context, self-confidence becomes especially relevant, as students with higher self-efficacy are more likely to adapt positively to these new learning modalities and technological demands, enhancing their overall learning experience.

In contrast, many students experienced heightened anxiety in remote settings, often linked to the uncertainty of the digital environment, technological difficulties, and reduced peer interaction (Han et al., 2022; Kolagari et al., 2018). Particularly, anxiety related to online exams was more intense than the general stress caused by the broader academic disruptions of the pandemic (Berman et al., 2022; Han et al., 2022). The distinct nature of online exams, such as technical glitches, lack of personal interaction, and the perceived inadequacy of online proctoring methods, appeared to exacerbate feelings of uncertainty and stress. As online learning continues to be a central mode of education, understanding these anxiety triggers and their relationship with academic performance is crucial. This finding also points to the need for further investigation into the ways in which students cope with the uncertainties inherent in online learning and evaluation systems.

RQ2: Effective Interventions to Reduce Anxiety and Boost Self-Efficacy

Regarding RQ2, multiple studies reported on targeted interventions aimed at reducing online test anxiety. These include instructional strategies such as redesigned assessments to reduce time pressure (Phanphech et al., 2022), the application of cognitive coping techniques like cognitive restructuring (Huang & Mayer, 2016), and mindfulness-based programs to reduce anxiety and improve outcomes (Keller & Szakál, 2021). Emotionally intelligent teaching practices also proved effective, with teacher-student communication mitigating perceived anxiety (Han et al., 2022).

Strategies and Interventions to Reduce Anxiety and Boost Self-Efficacy (RQ2)

A range of strategies has been identified across the literature to mitigate online test anxiety and support student self-efficacy. One effective approach involved the implementation of psychological support and mindfulness-based interventions, which reduced anxiety and enhanced academic outcomes (Keller & Szakál, 2021).

From a pedagogical perspective, interventions that foster motivation, self-regulation, and clarity in assessment design were found to improve student outcomes. Studies showed that students who received explicit instruction in self-regulated learning reported lower levels of anxiety and higher academic confidence (Broadbent et al., 2023; Marchand & Gutierrez, 2012).

At an institutional level, technological support and efforts to enhance students' digital self-efficacy were effective in improving confidence and academic persistence (Lakhal et al., 2021; Rizun & Strzelecki, 2020). For example, training in how to navigate digital platforms and manage remote assessments helped alleviate test-related anxiety and promoted a sense of control over the learning process.

The COVID-19 pandemic significantly shaped students' emotional and cognitive experiences during online assessments, particularly by increasing levels of anxiety and uncertainty. Several studies (García-González et al., 2022; Mohammed et al., 2021; Zilber et al., 2022) observed a heightened awareness around the challenges students faced, especially in terms of self-efficacy and emotional regulation in remote learning environments. These findings are relevant to RQ1, as they reflect how the pandemic context negatively influenced students' perceived ability to perform well in online assessments.

In response to these challenges, research has also documented the emergence of targeted strategies aimed at reducing test anxiety and strengthening self-efficacy (Lakhal et al., 2021; Rizun & Strzelecki, 2020). These include the implementation of more inclusive assessment designs, improved technological support, and initiatives focused on digital self-efficacy. This directly informs RQ2, highlighting how the post-pandemic landscape has encouraged the adoption of multifaceted interventions tailored to students' emotional and technological needs. These approaches were especially beneficial for diverse and vulnerable student populations, including those with limited access to technology or higher risk of social isolation.

The findings of the selected papers show that students' self-confidence plays a decisive role in the management of their emotional and cognitive reactions to online tests. Greater self-confidence is correlated with greater confidence, better emotional regulation, and better academic performance. In the online world, students who practice self-study and show their knowledge and skills in a targeted way are more open to the outside world. However, digital environments also bring with them unique stress factors—such as, for example, the need for surveillance, technical problems, and isolation—which are strongly affected by the lack of digital self-sufficiency. Demographic and contextual factors such as gender, socioeconomic status, and academic discipline have a further impact on the level of education and self-contained competence. These challenges have been further strengthened by COVID-19, particularly for students from socially disadvantaged backgrounds but also for the development of targeted interventions. Some effective strategies include psychologically supportive teaching practices, inclusive and transparent assessment approaches, and digital literacy training. These approaches have shown promise in reducing anxiety and increasing self-efficacy, especially when tailored to the diverse needs of students in evolving digital learning environments.

Discussion and Conclusion

Research on online test anxiety and its impact on students is highly relevant in today's educational context as it directly addresses the growing challenges students face with the shift to online assessments (Alibak et al., 2019; Prakasha et al., 2021). This issue is further emphasized by studies exploring its connections to self-efficacy, motivation, and learning strategies, as seen in the works of Arcoverde et al. (2022) and Mamolo (2022), underscoring its significant influence on academic performance and well-being.

With the rapidly growing adoption of digital platforms for learning, especially amplified by the COVID-19 pandemic and the integration and impact of AI (Bannister, 2024; Han et al., 2022; Zilber et al., 2022), understanding how psychological factors influence academic performance has become crucial in the current educational context. The abrupt transition to remote learning and the associated uncertainty generated widespread anxiety among students. However, the specific challenges of online assessments appear to be the most stressful, requiring particular attention (Jen et al., 2022).

The findings of this review underscore a pivotal concern: online test anxiety emerges as a distinct and pressing issue that not only surpasses the broader uncertainties of the pandemic but also threatens to undermine the broader goals of equitable and effective online education. This revelation demands a paradigm shift in how educators and institutions conceptualize and implement online assessments. Unlike traditional test anxiety, online test anxiety is exacerbated by factors such as technological complexities, perceptions of surveillance, and a lack of immediate interpersonal support. These nuances necessitate bespoke approaches to mitigate its impact on students' academic performance and mental well-being.

The collective findings of the reviewed studies reveal several converging trends that shape current research on online test anxiety. First, consensus is growing that self-efficacy and emotional regulation are central to how students experience and manage online assessments, with high self-efficacy consistently associated with reduced anxiety and improved performance (Chang et al., 2014; Zimmerman & Austin, 2018). Second, the shift to digital learning environments has introduced new stressors—such as technological difficulties, perceived surveillance, and asynchronous communication—that compound traditional academic pressures (Kolagari et al., 2018; Woldeab & Brothen, 2019). As a response, recent research emphasizes multilevel interventions, including teacher training in emotional intelligence (Han et al., 2022), supportive course design (Phanphech et al., 2022), and institutional efforts to foster digital confidence and persistence (Lakhal et al., 2021; Rizun & Strzelecki, 2020). These contributions enrich the field by highlighting the complexity and specificity of online test anxiety and pointing to the need for systemic, context-sensitive strategies that address both individual and structural dimensions of the problem.

Along these lines, we have aimed to answer the initial questions that were the starting point for the research:

RQ1: The Relationship Between Perceived Self-Efficacy and Online Test Anxiety

Students with higher self-efficacy are better equipped to manage the stressors of digital testing environments, viewing challenges as opportunities rather than threats (Cicha et al., 2021; Pandya, 2021). Technological confidence enhances focus on academic content by reducing anxiety related to external factors such as unfamiliar tools or platform navigation (Seladorai & Mohamed, 2021).

Research also suggests that students with low self-efficacy struggle more with attention, emotion regulation, and motivation during online assessments, making them particularly vulnerable to the stress induced by digital formats (Arcoverde et al., 2022; Mamolo, 2022). Moreover, studies point out that differences in learning strategies, program characteristics, and institutional practices can influence how self-efficacy develops among student populations, especially in under-resourced contexts (Fonteyne et al., 2017).

RQ2: Strategies and Interventions to Mitigate Online Test Anxiety

The reviewed studies show that the most effective interventions for reducing online test anxiety and strengthening self-efficacy combine psychological strategies (e.g., mindfulness, cognitive restructuring), inclusive pedagogical design (focusing on clarity, formative feedback, and learner autonomy), and strengthening digital competence through technology training and institutional support (Arpaci & Basol, 2020; Mamolo, 2022; Seladorai & Mohamed, 2021). These strategies have shown benefits not only in general contexts but also in populations with higher levels of emotional vulnerability or less technological experience, contributing to a more equitable and effective educational experience (Fonteyne et al., 2017; Keller & Szakál, 2021).

Additionally, pedagogical strategies that foster student autonomy, such as flipped learning, peer collaboration, and formative feedback, have been shown to lower anxiety and increase academic engagement (Mamolo, 2022; Samruayruen et al., 2013). Other interventions focused on math anxiety and social anxiety demonstrate that structured support programs can have a measurable impact on student performance and well-being

(Huang & Mayer, 2016; Keller & Szakál, 2021; Polat et al., 2022). These findings point to the importance of comprehensive, systemic strategies that integrate emotional and cognitive support across academic disciplines.

Evidence also supports that teacher training in emotional intelligence and digital pedagogy is essential for creating supportive environments. Educators who are aware of emotional cues and capable of adapting instruction help reduce perceived threat and increase learners' sense of control, which is fundamental for self-efficacy and emotional regulation (Han et al., 2022).

Recent research has increasingly explored the impact of anxiety and self-efficacy on academic performance. For their part, Fonteyne et al. (2017) highlight that both cognitive and contextual factors, including self-efficacy and test anxiety, predict academic success. In the same vein, Joo et al. (2015) highlight the mediating role of flow in performance, while Polat et al. (2022) suggest that reducing social anxiety through instructional models such as flipped learning improves students' self-efficacy and engagement.

A proactive approach may involve embedding psychological support systems within online platforms, integrating stress management workshops, and designing assessments that are perceived as fair and transparent. Furthermore, findings that link economic, gender, and age-related disparities to academic stressors (Arcoverde et al., 2022; Mohammed et al., 2021; Pandya, 2021) reveal the need for nuanced interventions tailored to diverse student demographics.

Beyond individual student interventions, the broader implications extend to institutional practices and policies. Educators must be equipped with advanced technological and emotional skills to manage the dynamics of online learning environments effectively (Arpaci & Basol, 2020). Similarly, institutions must invest in robust frameworks that prioritize ethical AI deployment in online education. Addressing concerns such as academic integrity and critical thinking, as highlighted by studies on generative AI (Tzirides et al., 2023), is essential to balance innovation with accountability. Such measures ensure that technology supports rather than detracts from the learning process.

Therefore, this review highlights the necessity of addressing online test anxiety as a distinct phenomenon within the broader scope of online education. By leveraging insights from tools and fostering environments that bolster self-efficacy, institutions can create assessment strategies that reduce anxiety while maintaining academic rigor. These findings underscore the importance of a holistic approach, integrating emotional well-being, technological adeptness, and ethical considerations into educational practices.

Online Test Anxiety Limitations and Future Prospects

The review of studies on online test anxiety reveals several limitations. First, various studies had small sample sizes, which undermine the statistical power and may not capture the full variability of student experiences. For instance, Huang and Mayer (2016) and Phanphech et al. (2022) included only 54 and 99 participants, respectively, potentially leading to biased results. Moreover, many studies relied on self-reported data, which are subject to recall bias and may not accurately reflect true anxiety levels (Arora et al., 2021; Mamolo, 2022). Even more, the study population was predominantly young university students. This demographic bias limits the applicability of the results to a broader student population (Alibak et al., 2019; Han et al., 2022; Kolagari et al., 2018).

Methodological weaknesses also include the use of ad hoc questionnaires, which might not be as reliable as standardized tools (Hedlefs-Aguilar et al., 2021; Morales-Martinez et al., 2021). The lack of longitudinal data is another significant limitation. Few studies measured the long-term effects of online test anxiety, restricting the ability to draw conclusions about its sustained impact over time (Huang & Mayer, 2019; Keller & Szakál,

2021). Additionally, the review was limited to studies published in English and Spanish, potentially missing important research in other languages.

Despite these limitations, the review provides valuable insights, but future research should address these biases and methodological weaknesses to enhance the reliability and applicability of the findings.

While the research provides valuable information on the impact of online test anxiety, it would benefit from a more critical analysis of its sources. Evaluating the limitations and potential biases of existing studies could provide a deeper understanding of the underlying nuances involved. Furthermore, future research should consider longitudinal studies to examine how interventions over time can alleviate online test anxiety and enhance student outcomes. Adopting a global and critical perspective, the academic community can better support students navigating the complexities of online learning environments.

Future research, especially in terms of exploring in detail the use of specific measurement tools such as the Online Test Anxiety Inventory (OTAI; Alibak et al., 2019), would be beneficial to enrich understanding among these psychological factors (anxiety and self-efficacy) that, at both academic and personal levels, affect and impact academic performance and motivation toward learning (Chang et al., 2014; Keller & Szakál, 2021). The emphasis on teacher training in educational technology is consistent with the necessary nature of dealing with changing educational landscapes (Khechine & Lakhali, 2018). In addition, the importance of helping students manage uncertainties and manage anxiety (Berman et al., 2022) highlights the importance of integrative educational approaches, especially in the dynamic field of distance education.

Further research should deepen the exploration of demographic-specific interventions and continue to refine measurement tools to capture the evolving nature of online education challenges. Ultimately, the goal is to transform online education into a more inclusive and psychologically supportive environment, ensuring that technological advances, including AI, enhance rather than hinder student success.

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