



The Interplay between Anxiety and Comprehension in EFL Digital Reading Contexts

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Abstract

This study explores the impact of digital reading anxiety on the reading comprehension of English as a Foreign Language (EFL) learners. While it is established that reading anxiety can impede EFL learners' comprehension—especially when using digital devices—there is limited research on this issue's extent. To fill this gap, the study assessed 152 first-year university EFL students. Participants completed a background questionnaire, a reading comprehension test that included literal, inferential, and evaluative comprehension levels, and a digital reading anxiety scale specifically designed for EFL learners. This scale measured digital reading anxiety across seven dimensions: cognitive challenges, emotional responses, technological issues, physical discomforts, language-related anxiety, confidence, and task management. The results revealed that students generally experience moderate anxiety when reading on digital devices. Notably, students with stronger comprehension skills reported lower levels of digital reading anxiety, particularly in relation to inferential comprehension. However, no significant relationship was found between evaluative comprehension and anxiety. An independent samples t-test demonstrated that students with higher comprehension scores experienced significantly lower digital reading anxiety compared to those with lower scores. These findings provide valuable insights into the role of digital devices in EFL reading instruction and suggest that addressing anxiety may enhance reading comprehension outcomes.

1. INTRODUCTION

The relationship between anxiety and reading comprehension, particularly in the context of a foreign language, is a complex issue that involves cognitive, emotional, and contextual factors. Anxiety can arise from various sources, including personal characteristics, text features, and the reading environment itself. One significant factor is the format of the text, whether digital or printed. Studies indicate that students held positive attitudes toward digital reading and wanted to continue to read from mobile phones due to their convenient built-in functions and portability; these positive attitudes do not always lead to effective reading practices or improved comprehension (Clinton, 2019; Yu et al., 2022).

Digital texts offer unique benefits and challenges for English as a Foreign Language (EFL) readers. Research indicates notable differences in students' reading comprehension performance when comparing digital devices to printed materials (Park & Lee, 2021; Yu et al., 2022; Florit et al., 2023; Al-Seghayer, 2024). EFL participants demonstrated significantly better understanding of printed texts over e-texts across literal, inferential, and evaluative reading comprehension levels (Al-Seghayer, 2024). This finding is further corroborated by the study conducted by Yu et al. (2022), which revealed that EFL learners achieved higher reading comprehension accuracy when engaging with printed materials versus mobile phones. Conversely, research by Park and Lee (2021) suggests that EFL learners experienced an

improvement in literal reading comprehension when utilising tablets compared to printed texts. However, inferential reading comprehension and grammatical knowledge advancements were greater among those reading printed books than those using tablets. Al-Obaydi et al. (2024) further demonstrate that online oral reading activities can improve comprehension by reducing anxiety and fostering a positive classroom climate, suggesting the value of integrating such practices into digital learning environments. While reading on digital devices provides accessibility and convenience, it also presents challenges related to focus and sustained engagement (Hargreaves et al., 2022).

Despite the growing prevalence of digital reading in education, studies suggest that digital texts might heighten reading anxiety. Dunifa (2023) points out that certain features of digital texts, such as their complexity and unfamiliarity, can raise anxiety levels among readers. Kesson (2020) further explains that while digital environments provide opportunities for extensive reading, they also need effective engagement strategies to alleviate the discomfort and disorientation often reported by readers. Numerous links in web text led to cognitive overload and increased frustration (Al-Seghayer, 2024). This discomfort can impede comprehension. For example, findings by Bakkaloglu (2023) prove a significant negative relationship between reading anxiety and comprehension, indicating that higher levels of anxiety correlate with lower comprehension levels. Dang and Nguyen (2023) add that while reading anxiety is prevalent among most EFL learners, its relationship with performance outcomes may depend on specific demographic and contextual factors. This relationship highlights the importance of addressing emotional factors such as anxiety in educational settings, especially as students meet the challenges posed by digital texts.

Given the increasing use of digital texts in education, exploring the underlying factors contributing to reading anxiety among EFL learners with varying reading comprehension levels is crucial. Zhang (2023) underscores the importance of digital literacy, noting that teachers' attitudes toward and skills with technology significantly influence their effectiveness in supporting learners' comprehension. Understanding how anxiety differs between higher- and lower-ability EFL readers is particularly important, as there is a notable gap in the literature regarding these aspects. Therefore, this study aimed to investigate the underlying factors of reading anxiety experienced by EFL learners when reading from digital devices, measure their levels of digital reading anxiety, and examine the differences in digital reading anxiety between higher and lower-proficiency readers in digital contexts.

2. LITERATURE REVIEW

Integrating digital texts into English as a Foreign Language (EFL) education has significantly affected reading comprehension and learner anxiety. The Broaden-and-Build Theory of Positive Emotions and Cognitive Load Theory provide a relevant framework for examining the relationship between digital reading anxiety and reading comprehension in EFL learners.

The Broaden-and-Build Theory of Positive Emotions (Fredrickson, 2001) suggests that positive emotions expand an individual's cognitive and attentional resources, while negative emotions, such as anxiety, tend to narrow them. When applying this theory to EFL learners, anxiety stemming from digital reading can restrict cognitive resources, making it more difficult for them to process and understand texts. This framework proves how emotional responses to digital reading environments—such as frustration or stress—can impede comprehension.

On the other hand, Cognitive Load Theory (Sweller, 2011) emphasises the mental effort needed to process information. Digital texts, with their non-linear structures, multimedia elements, and potential distractions (e.g., scrolling, hyperlinks, pop-ups), can increase cognitive load. This heightened load can further complicate learners' ability to comprehend texts effectively, especially with language difficulties in EFL contexts. The role of EFL teachers' digital literacy, including attitudes toward technology, skills to use technology, and access to digital tools, also intersects with the cognitive and emotional aspects of reading comprehension ([Zhang, 2023](#)).

The interaction between the emotional aspects highlighted in the Broaden-and-Build Theory and the cognitive demands outlined in Cognitive Load Theory offers a comprehensive framework for exploring how anxiety affects digital reading comprehension. While anxiety can limit cognitive ability, the design and complexity of digital texts also elevate cognitive demands, intensifying the challenges EFL learners encounter. Research emphasises that fostering digital literacy skills among students and teachers can alleviate cognitive load and support reading comprehension (Zhang, 2023). This integrated framework allows for a thorough analysis of not only the emotional impact of anxiety but also the structural and cognitive obstacles presented by digital texts in EFL education.

2.1. Reading Anxiety and Reading Performance

Recent studies have increasingly highlighted the significant impact of Foreign Language Reading Anxiety (FLRA) on the reading comprehension abilities of EFL learners. Research consistently proves that elevated levels of FLRA correlate with poorer reading comprehension outcomes. For instance, Tarigan (2023) emphasises that FLRA is a critical barrier for EFL students, inhibiting their ability to grasp reading material effectively, thus leading to diminished comprehension performance (Tarigan, 2023). This aligns with findings from (Hamada & Takaki, 2022), who confirm the psychometric properties of the Foreign Language Reading Anxiety Scale (FLRAS) and confirm that psychological factors measured by the FLRAS are closely related to foreign language reading proficiency (Hamada & Takaki, 2022).

Conversely, recent studies also suggest that managing anxiety can lead to improved reading outcomes. For example, Smith et al. (2022) found that inducing positive affective states during reading can enhance comprehension by fostering deeper connections with the text (Smith et al., 2022). This suggests that interventions to reduce anxiety, such as mindfulness practices or positive reinforcement, may benefit EFL learners. Additionally, Mohammed (2023) highlights the role of speed-reading techniques in enhancing reading comprehension, suggesting that effective strategies can mitigate the adverse effects of anxiety (Mohammed, 2023). Notably, studies exploring the effects of online oral reading interventions show that reducing classroom and reading anxiety can significantly improve reading comprehension scores, as demonstrated by Al-Obaydi et al. (2024). Their findings underscore the importance of personalised, anxiety-reducing practices in EFL classrooms.

2.2. Digital Reading Environment and Reading Performance

The transition to digital texts in assessing reading comprehension has introduced unique benefits. Digital texts can promote engagement and interactivity, which may improve comprehension. For example, Park and Lee (2021) found that multimedia elements in e-books provided contextual support that enhanced EFL learners' comprehension. Similarly, Rochanaphapayon (2024) argued that digital literacy skills, such as navigating and using digital tools, significantly improved reading comprehension among EFL learners. Digital texts also offer adaptive features that can support individual learner needs, especially helping learners with disabilities or visual impairments.

The digital environment can also introduce challenges that exacerbate anxiety and hinder comprehension. Tsai and Lee (2018) noted that unfamiliar vocabulary and complex text structures increase FLRA, and these difficulties are often amplified in digital formats due to factors like hyperlinks and multimedia elements. Furthermore, Al-Seghayer (2024) found that digital features such as scrolling and links further limit focused reading time, impair comprehension, prove distracting, increase frustration, and intensify anxiety. Mudra and McKinnon (2022) underscore the importance of fostering a positive attitude toward digital reading to address these challenges. They suggest that a well-designed digital text, including a thoughtful layout and interactive features, can help learners manage their anxiety. Mudra and McKinnon (2022) emphasise the importance of fostering a positive attitude toward digital reading to address these challenges. Their findings suggest that well-designed digital texts, including thoughtful layouts and interactive features, can help learners manage their anxiety (Mudra & McKinnon, 2022).

2.3. Digital Reading Anxiety and Differences in Reading Comprehension

Digital reading anxiety has appeared as a notable concern in EFL education, particularly regarding its effects on reading comprehension. Studies suggest that digital reading anxiety levels vary significantly between learners of different ability levels, impacting comprehension abilities. However, the literature lacks studies addressing the relationship between digital reading anxiety and proficiency-based comprehension levels. While some studies explore digital reading across various learner groups, few examine how anxiety interacts with ability levels in EFL contexts. For example, Dang and Nguyen (2023) revealed that while 96.6% of students experience moderate reading anxiety, no statistically significant correlation between FLRA and reading test scores was observed in their Vietnamese context (Dang & Nguyen, 2023). Chow et al. (2017) found that higher EFL ability correlates with lower reading anxiety, suggesting that more proficient learners experience reduced anxiety. This finding aligns with Zhang's (2019) meta-analysis, which shows that although anxiety persists across proficiency levels, its intensity differs.

As digital texts become increasingly important in education, there are both benefits and challenges associated with their use. However, there is a gap in the literature concerning how reading ability impacts digital reading anxiety in EFL settings. This study aims to investigate the underlying factors contributing to digital reading anxiety among EFL learners and to examine how this anxiety varies among students with distinct levels of reading comprehension ability. Specifically, this study addresses the following research questions:

- RQ1: What are the underlying factors of EFL digital reading anxiety experienced by EFL learners?
- RQ2: What are learners' levels of EFL digital reading anxiety?
- RQ3: Do learners with distinct levels of reading comprehension ability exhibit similar levels of EFL digital reading anxiety?

3. METHODS

3.1. Participants

Data were collected from 193 Arabic-speaking first-year female students at a university in Saudi Arabia. Their ages ranged from 17 to 23, with seven participants older than 23 ($M = 19$ years). Forty-one students were excluded from the analyses and reported later because they missed one or more of the measures due to withdrawal. All participants were enrolled in an English course for academic purposes. The choice to focus on female students was influenced by the fact that the researcher is female, and in the context of a Saudi university, the female campus is separate from the male campus. The participants came from various undergraduate majors, including Chemistry, Biology, Physics, Mathematics, and Early Childhood Education. They used different types of digital devices: 75% used cell phones, 24.3% used tablets, and 0.7% used computers.

3.2. Measures

The participants completed measures to gather data on their demographic information, EFL Digital Reading Anxiety, and EFL passage comprehension at three levels (i.e., literal, inferential and evaluative). Before implementing these measures on a larger scale, they were piloted with 10 first-year students from the same university who did not later participate in the study. Participants were asked to comment on difficulties they met while completing the measures. The piloting stage aimed to assess the clarity and relevance of each question, test internal consistency (i.e., using Cronbach's alpha), and refine or reword any items based on feedback from the learners.

3.2.1. Background questionnaire

The researcher designed a background questionnaire to gather demographic information about the participants, including their age, gender, significance, and year in college. The

questionnaire was distributed to participants via digital devices and took less than five minutes to complete.

3.2.2. Reading comprehension Test

The Gates-MacGinitie Reading Tests, Fourth Edition (Form S) (MacGinitie, MacGinitie, Maria, & Dreyer, 2000) were used to measure reading comprehension. This test was chosen because it includes distinct texts and questions measuring literal, inferential and evaluative comprehension. Two reading passages were selected from Level 5 of the test, based on the researcher's expertise in local students' reading ability and findings from a pilot study. One passage was informational, while the other was narrative, ensuring a balanced representation of text types.

Each passage included ten multiple-choice questions, resulting in 20 questions (10 for literal comprehension, 6 for inferential comprehension, and 4 for evaluative comprehension). The test was administered in a 45-minute session. Participants received one point for each correct answer and zero points for incorrect or missing responses. The Cronbach's alpha for reliability was .756.

The total reading comprehension score is decided by summing the scores of all 20 items, resulting in a maximum possible score of 20. Based on the mean score, a cutoff point categorises responses into "high" and "low" reading comprehension levels. Participants were divided into two groups according to their reading comprehension test scores, with the mean score ($M = 11.28$) serving as the cutoff point. Scores equal to or below the mean were categorised as 'low proficiency,' while scores above the mean were categorised as 'high proficiency.' This method allowed for a comparative analysis of digital reading anxiety across distinct levels of comprehension ability.

3.2.3. EFL Digital Reading Anxiety Scale

The Foreign Language Reading Anxiety Scale (FLRAS) is widely used for measuring reading anxiety among language learners. It has been specifically adapted for digital reading contexts by incorporating questions related to seven themes:

1. Cognitive Challenges in Understanding and Retaining Information
2. Emotional Responses and Anxiety in Digital Reading
3. Technological and Interface-Related Issues
4. Physical and Environmental Discomforts
5. Grammar, Vocabulary, and Pronunciation-Related Anxiety
6. General Confidence, Enjoyment, and Interest
7. Task and Time Management Anxiety

The scale comprises 35 items, with five dedicated to each theme. Participants respond using a five-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Three items (numbers 26, 27, and 28) are coded reversely.

The total anxiety score is calculated by summing the ratings of all 35 items, resulting in possible scores that range from 35 to 175. Based on cumulative scores, a cutoff point categorises the responses into "high" and "low" anxiety levels. A high score shows a high level of reading anxiety, while a low score reflects a low level of reading anxiety. Each item has a minimum score of 1 and a most significant score of 5, culminating in a total possible score of 175 points. The midpoint of the scale, which ranges from 1 to 5, is 3, representing a "neutral" level of anxiety for each item. Therefore, a midpoint score across all items would be 105. Scores from 35 to 105, where most responses are below the midpoint for each item, show low levels of

reading anxiety. In contrast, scores from 106 to 175, where most responses are above the midpoint per item, show high levels of reading anxiety.

The researcher developed the scale, a language learning expert, based on a review of existing literature and the FLRAS measure. Adding themes and items tailored to digital reading sent the scale to two language learning experts for evaluation and feedback before the pilot study. The input from these experts helped refine the scale further, and adjustments were made following the pilot study. A translation professor translated The final scale versions into Arabic to increase participation rates, as students are generally more comfortable responding in Arabic. Completing the scale takes approximately 10 minutes, with an average time of 6 minutes reported. The scale's reliability, as measured by Cronbach's α , was .943, showing that the instrument is a highly reliable measure of reading anxiety.

3.3.Procedure

The researcher was invited into EFL classes to explain the research to potential participants and outline their roles in the study. Data was collected using the participants' digital devices like cell phones, tablets, and computers. Participants scanned a QR code on their devices to access the forms. The data collection was divided into two sessions. The first session began with a background questionnaire and a reading comprehension test that lasted approximately one hour. The second session, scheduled for a different time, involved completing an anxiety scale and took about 20 minutes. The entire data collection process was completed over one month.

Ethical approval was obtained from Taif University's research department. A statement explaining the participants' ethical considerations was included at the beginning of the online questionnaire. This statement provided details about the study, emphasised that participation was voluntary, explained the right to withdraw at any time, and outlined measures to ensure confidentiality and anonymity, such as not requiring participants to provide their names or university identification numbers.

4. DATA ANALYSIS

Descriptive statistics were employed to summarise the participants' responses and analyse the collected data. Bivariate correlations between the variables were examined. Additionally, an independent t-test was conducted to find any statistically significant differences between the anxiety scores of participants with higher and lower levels of reading proficiency.

5. RESULTS

5.1.Descriptive Statistics

As proved in Table 1, all measures were normally distributed, as indicated by skewness and kurtosis estimates falling within the rule-of-thumb values of ± 2 for univariate normality. The Comprehension Level measures displayed slightly lighter tails, suggesting fewer extreme values than a normal distribution. In contrast, the Reading Anxiety scale appeared to have an approximately normal distribution. Overall, the measures are nearly symmetric, with Anxiety, Total Reading, Literal Comprehension, and Inferential Comprehension exhibiting nearly perfect symmetry. However, Evaluative Comprehension showed a slight left skew.

5.2.The Underlying Factors of EFL Digital Reading Anxiety

The Reading Anxiety Scale was used to examine distinct aspects of reading anxiety among EFL learners when reading from digital devices. The scale included seven themes, each a unique factor contributing to reading anxiety. These themes are:

1. Cognitive Challenges in Understanding and Retaining Information
2. Emotional Responses and Anxiety in Digital Reading
3. Technological and Interface-Related Issues

4. Physical and Environmental Discomforts
5. Grammar, Vocabulary, and Pronunciation-Related Anxiety
6. General Confidence, Enjoyment, and Interest
7. Task and Time Management Anxiety

Table 1 summarizes the descriptive statistics of the Reading Anxiety Scale and each theme. The mean scores for the themes ranged from 12.44 for Enjoyment and Interest (Theme 6) to 16.13 for General Confidence (Theme 5). The standard deviations showed moderate variability around the mean, with Theme 1 (Cognitive Challenges) having a standard deviation of 4.53 and Theme 6 (Enjoyment and Interest) having a standard deviation of 2.94. These findings show that all these factors contribute to reading anxiety among EFL learners. While most learners generally reported similar anxiety levels, there were some individual differences, particularly about enjoyment and interest in digital reading.

5.3.EFL Digital Reading Anxiety Levels

Table 1.
Measures and Descriptive Statistics

	N	Mean	SD	Rel. (α)	Skewness		Kurtosis	
					Statisti cs	Std. Error	Statistic s	Std. Error
Reading comprehension	20	11.28	3.9	.756	-.001	.197	-.632	.391
Literal comprehension	10	6.30	2.33	-	-.140	.197	-.798	.391
Inferential comprehension	6	2.97	1.55	-	.022	.197	-.810	.391
Evaluative comprehension	4	1.98	1.11	-	-.217	.197	-.651	.391
Anxiety scale	35	102.6	23.22	.943	.094	.197	-.156	.391
Theme 1	5	15.02	4.52	-	-.063	.197	-.500	.391
Theme 2	5	14.26	4.67	-	.394	.197	-.201	.391
Theme 3	5	14.69	4.23	-	.076	.197	-.439	.391
Theme 4	5	14.51	4.61	-	.167	.197	-.271	.391
Theme 5	5	16.13	4.70	-	-.093	.197	-.425	.391
Theme 6	5	12.44	2.94	-	.753	.197	1.361	.391
Theme 7	5	15.54	4.05	-	-.038	.197	-.133	.391
Reading Time	-	20.51	8.40	-	1.122	.198	.937	.394

Note. N = number of test items; SD = standard deviation; Rel. (α) = Reliability (Cronbach's α).

Overall, participants proved relatively low levels of EFL digital reading anxiety, with a mean score of 102.6 out of 175, as shown in Table 1. The distribution of scores across each theme in the EFL Digital Reading Anxiety scale was approximately normal, with skewness values generally close to zero for most themes, indicating a symmetrical distribution of data. However, Theme 6, which focuses on Enjoyment and Interest, displayed a positive skewness of 0.753. This suggests that a more significant number of participants reported lower anxiety levels related to enjoyment and interest, while fewer experienced higher levels of anxiety.

The kurtosis values for most themes fell within the expected range for a normal distribution, except for Theme 6, which had a kurtosis value of 1.361. This shows a slightly peaked distribution, meaning that responses in this theme were more concentrated around the mean. As a result, most participants reported low anxiety related to enjoyment and interest in digital reading.

In conclusion, the descriptive statistics show that, while General Confidence (Theme 5) was linked to higher levels of anxiety compared to Enjoyment and Interest (Theme 6), most learners showed moderate and relatively consistent levels of anxiety across the different themes. There was variability in their emotional and cognitive experiences during digital reading.

5.4.Higher and Lower EFL Reading Comprehension Levels and Digital Reading Anxiety

The participants showed low levels of EFL reading comprehension overall and in its subcategories: literal comprehension, inferential comprehension, and evaluative comprehension. Their scores were as follows: 11.28 out of 20 for overall reading comprehension, 6.30 out of 10 for literal comprehension, 2.97 out of 6 for inferential comprehension, and 1.98 out of 4 for evaluative comprehension. Based on the percentage of correct answers, it is unsurprising that participants performed significantly better in literal comprehension than inferential and evaluative comprehension (see Table 1). Table 3 illustrates the differences in mean EFL Digital Reading Anxiety scores between groups with higher and lower reading comprehension, with scores of 97 and 107, respectively.

Table 2.

Bivariate Correlations Between All Measured Competences

	1	2	3	4	5
Reading comprehension	–				
Literal comprehension	.881**	–			
Inferential comprehension	.770**	.472**	–		
Evaluative comprehension	.667**	.409**	.382**	–	
EFL Digital Reading Anxiety	-.235**	-.164*	-.267**	-.127	–

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2 presents the bivariate correlations among the variables of reading comprehension, literal comprehension, inferential comprehension, and evaluative comprehension. Notably, reading comprehension is positively and significantly correlated with literal comprehension ($r = .881$), inferential comprehension ($r = .770$), and evaluative comprehension ($r = .667$), all with p -values less than .01. Furthermore, literal comprehension is positively and significantly correlated with inferential comprehension ($r = .472$) and evaluative comprehension ($r = .409$), both also with p -values less than .01. Additionally, inferential comprehension is positively and significantly correlated with evaluative comprehension ($r = .382$) at $p < .01$, showing that students who excel in inferential comprehension also tend to perform better in evaluative comprehension.

Moreover, reading comprehension is negatively and significantly correlated with EFL Digital Reading Anxiety ($r = -.235$) at $p < .01$. Although this correlation is weak, it suggests that students with higher reading comprehension generally experience lower anxiety levels. This finding is further supported by the correlation between literal comprehension and anxiety ($r = -.164$) at $p < .05$. The relationship becomes more assertive with inferential comprehension and anxiety ($r = -.267$) at $p < .01$, suggesting that higher inferential comprehension is associated with lower anxiety. However, the correlation between evaluative comprehension and anxiety is negative and not significant ($r = -.127$), implying no meaningful relationship between evaluative comprehension and anxiety.

Table 3*Descriptive Statistics of EFL Digital Reading Anxiety*

	N	Mean	Std. Deviation	Std. Error Mean
Reading comprehension				
EFL Digital Reading Anxiety Lower	79	107.341	23.645	2.660
Higher	73	97.493	21.779	2.549

An independent samples t-test was conducted to compare EFL Digital Reading Anxiety scores between students with higher and lower reading comprehension.

As shown in Table 4, Levene's test for equality of variances was insignificant, $F(1, 150) = 0.842$, $p = .360$, indicating that the assumption of equal variances was met. The t-test for

Independent Test Results

	Levene's Test for Equality of Variances		t-test for Equality of Means				95% Confidence Interval of the Difference			
	F	Sig.	T	Df	Significance p	Mean Difference	Std. Error	Lower	Upper	
Anxiety	Equal variances assumed	.842	.360	2.661	150	.004	9.848	3.696	2.544	17.152
	Equal variances are not assumed.			2.671	149	.004	9.848	3.684	2.568	17.128

equality of means revealed a significant difference between the groups, $t(150) = 2.664$, $p = .009$ (two-tailed). The mean difference was 9.85 (95% CI: 2.54 to 17.15), suggesting that one group had a significantly higher EFL Digital Reading Anxiety score. These results show a statistically significant difference in EFL Digital Reading Anxiety scores between the two groups, with the mean score in the lower reading comprehension group being notably higher (see Table 3).

6. DISCUSSION

6.1. The Underlying Factors of EFL Digital Reading Anxiety

The study found specific factors associated with digital texts that can increase reading anxiety among EFL learners. These factors include cognitive challenges, emotional responses, technological issues, physical discomforts, language-related concerns, lack of general confidence, and difficulties in task management. Each plays a crucial role in shaping EFL learners' experiences of digital reading anxiety.

This finding supports earlier research. Studies have shown that complex text structures and unfamiliar vocabulary, often found in digital formats, can contribute to reading anxiety (Tsai & Lee, 2018; Pardede, 2019; Kesson, 2020). Additionally, the nonlinear nature of digital texts, combined with distractions typical of digital environments—such as notifications and pop-ups—can further increase cognitive load and anxiety (Nur Asima Sidabutar et al., 2022; Haddock et al., 2020). This aligns with cognitive load theory, which posits that when learners are overwhelmed by cognitive demands, their ability to process information effectively declines (Sweller, 2011).

Moreover, Al-Seghayer (2024) highlights that features like scrolling and hyperlinks exacerbate anxiety by increasing distractions. This aligns with the study's finding that technological challenges majorly contribute to EFL digital reading anxiety (Al-Seghayer, 2024). Additionally, studies have emphasised the importance of digital literacy among both learners and teachers in reducing anxiety levels by improving familiarity with digital tools (Zhang, 2023). This suggests that targeted training in digital literacy could be an effective intervention to mitigate anxiety.

The results of this study, along with earlier findings, show that reading anxiety in digital formats does not stem from a single factor. Instead, the combined effect of cognitive challenges, emotional responses, technological issues, physical discomfort, language-related concerns, lack of self-confidence, and difficulties in task management all contribute to digital reading anxiety among English as a Foreign Language (EFL) learners. This multifaceted perspective underscores the need for holistic approaches to address these interconnected issues in EFL contexts.

6.2. EFL Digital Reading Anxiety and Reading Performance

The current study results show that reading anxiety significantly affects comprehension, especially in digital contexts. Although EFL learners in this study showed moderate levels of digital reading anxiety, this anxiety negatively correlated with their overall reading comprehension performance and with two specific levels of comprehension: literal and inferential understanding. These findings align with earlier research that has found a negative correlation between reading anxiety and comprehension outcomes, particularly in foreign language settings (Soomro et al., 2019; Bakkaloglu, 2023).

In contrast, Dang and Nguyen (2023) observed no significant correlation between reading anxiety and test scores in their study, suggesting that the relationship between these variables may vary based on context and participant characteristics (Dang & Nguyen, 2023). Another study by Kartika and others (2023) revealed no significant correlation between students' reading anxiety and reading comprehension with the correlation coefficient or R-value. These differences highlight the complexity of the relationship between anxiety and performance, particularly in digital contexts.

Integrating oral reading interventions into online classrooms, as demonstrated by Al-Obaydi et al. (2024), can help reduce reading anxiety and enhance comprehension performance. This suggests that classroom strategies could minimise anxiety and significantly benefit EFL learners in digital environments.

6.3. Higher and Lower Reading Comprehension and EFL Digital Reading Anxiety

The data showed that when EFL learners were divided into higher and lower groups based on their reading comprehension levels, there were significant differences in their levels of digital reading anxiety. The group with better reading comprehension reported lower digital reading anxiety scores, while the lower comprehension group experienced higher anxiety. This suggests that anxiety may hinder cognitive processing and comprehension abilities. These findings align with other studies (e.g., Bakkaloglu, 2023). Additionally, they support the Broaden-and-Build Theory, which asserts that anxiety restricts cognitive resources, thereby impairing comprehension (Fredrickson, 2001).

Chow et al. (2017) further confirm this relationship, finding that more proficient EFL learners experience reduced anxiety, facilitating better comprehension. Similarly, Zhang (2019) observed that while anxiety persists across all proficiency levels, its intensity is significantly lower in more advanced learners. This suggests that improving reading proficiency may be a viable strategy to reduce anxiety and enhance overall comprehension.

6.4. Implications

The findings of this study emphasize the critical role of reading anxiety in shaping EFL learners' comprehension abilities, particularly in digital reading contexts. Digital reading anxiety is multifaceted, encompassing factors such as cognitive load, emotional responses, technological challenges, and confidence-related issues. Educators and curriculum designers should address these factors when developing digital reading tasks. Strategies such as using user-friendly platforms and minimising distractions can help reduce students' anxiety and enhance their comprehension, especially at literal and inferential levels. The negative correlation between anxiety and comprehension underscores the importance of alleviating digital reading anxiety to improve overall reading outcomes. Additionally, the significant differences in anxiety levels between high- and low-comprehension groups highlight the need for tailored interventions. Learners with lower reading ability may benefit from more intensive support, including scaffolded learning experiences that build confidence and reduce anxiety. For instance, tutorials and practice sessions can help students navigate digital texts effectively. Jeong's (2012) study found that familiarity with digital reading environments reduces anxiety and improves comprehension. Integrating digital literacy training into EFL curricula is essential to equip learners with the skills to engage with digital texts confidently. By reducing the novelty effect and associated anxiety, digital literacy activities can foster positive reading attitudes and enhance comprehension outcomes for all learners, particularly those with lower ability levels.

6.5. Limitation and Future Direction

This study has several limitations that should be acknowledged when interpreting the results. Firstly, the sample size and demographic characteristics may restrict the generalizability of the findings, as they are a specific group of EFL learners in particular contexts. Future research could address this limitation by examining more diverse populations to decide whether these patterns are consistent across various cultural and educational settings. Secondly, the reliance on self-reported measures of reading anxiety introduces potential biases, such as social desirability effects. Employing more objective methods, such as eye-tracking or physiological measures like skin conductance, could offer deeper insights into digital reading anxiety. Furthermore, longitudinal studies tracking changes in reading anxiety and comprehension over time would be particularly valuable, as they could provide insights into how digital reading anxiety evolves with increased digital literacy and familiarity. These findings could guide educators in developing effective, long-term strategies to support EFL learners in digital reading environments.

7. CONCLUSION

This study aimed to explore the underlying factors of reading anxiety experienced by EFL learners when reading from digital devices. It examined the learners' levels of digital reading anxiety. It analysed the differences in anxiety levels between those with higher proficiency and

those with lower proficiency in reading comprehension in digital contexts. The research contributes to our understanding of how anxiety affects reading comprehension among EFL learners in digital environments.

The findings indicate that reading anxiety significantly hinders comprehension, particularly for learners with lower ability levels. The unique characteristics of digital texts, including their complexity and the cognitive demands they impose, can exacerbate anxiety and impede effective reading practices.

To tackle these challenges, educators must implement strategies that enhance digital literacy and create a positive reading environment. Providing scaffolded learning experiences and integrating digital literacy into the curriculum can help empower learners to navigate digital texts with greater confidence, ultimately leading to improved reading comprehension. Future research should continue investigating the intricate relationship between anxiety, comprehension, and digital reading, especially within diverse educational contexts.

Availability of data and materials

The data is available upon request by contacting the author.

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Author Contributions

Mona Alshehri was the principal investigator of the study. The author confirms full responsibility for the following: study conception and design, data collection, analysis, interpretation of results, and manuscript preparation.

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