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Understanding the Cognitive Processes of Digital Reading in the Age of E-Books

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Abstract

The present study aims to examine the impact of e-book reading on the cognitive processes of individuals from Jordan. The objective of this study is to investigate the potential impact of engaging in active reading of electronic books on the human brain. Quantitative methodologies were employed to obtain data from a representative sample of individuals from Jordan. The study's research topics underwent analysis utilizing both descriptive and inferential statistical methods. Based on the findings, a considerable number of individuals in the Jordanian context incorporate reading into their daily regimen. As per the accounts provided by the participants, the duration of their reading sessions exhibited considerable variation, spanning from a few minutes to several hours. Although a majority of the participants expressed their appreciation for the ease and accessibility of electronic books, a minority held a more reserved attitude towards them. The convenience of e-books was subject to varying participant perspectives. Empirical investigations into reading behaviors, perceptions of electronic books, and cognitive engagement levels have revealed noteworthy associations and predictive models. The degree of cognitive engagement during digital reading was found to be associated with various factors, such as frequency and duration of reading, level of optimism, and perceived convenience of e-books. The findings underscore the importance of considering readers' emotional responses to e-books in promoting positive digital reading practices.

Keywords: *Digital Reading, E-Books, Cognitive Processes, Reading Habits.*

Introduction

The prevalence of e-books in contemporary times has led to a shift in the way individuals obtain and engage with written content. E-books offer a number of advantages over traditional printed books, such as enhanced portability, increased accessibility, and interactive functionalities that facilitate engagement between the reader and the text. A comprehensive comprehension of the cognitive processes involved in digital reading is imperative to optimize academic outcomes and foster efficacious reading practices, particularly in light of the increasing prevalence of e-books. The present research aims to examine the cognitive mechanisms underlying digital reading within the Jordanian context, with the objective of shedding light on the distinct features that may influence readers' experiences and the outcomes of their learning.

The proliferation of technology and the availability of e-books in diverse formats have significantly contributed to the notable surge in the utilization of digital reading devices

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in the Kingdom of Jordan. The prevalence of smartphones, tablets, and electronic readers has led to a growing recognition of the accessibility and convenience of digital reading. The transition from traditional print-based reading to digital reading has raised concerns regarding the potential impact on cognitive processes and reading comprehension among the populace of Jordan.

To gain a comprehensive understanding of the cognitive processes associated with digital reading, it is imperative to conduct a thorough examination of the existing literature pertaining to this topic. The examination of cognitive processes involved in reading printed text, including but not limited to decoding, comprehension, and inference-making, has been a central area of investigation within the subfield of cognitive psychology, as noted by Kintsch (1998) and Perfetti, Landi, and Oakhill (2005). The emergence of digital reading platforms and their associated features has introduced novel elements that could potentially impact the cognitive and behavioral aspects of information processing during reading.

The act of reading printed materials involves a diverse range of cognitive mechanisms that differ from those necessary for perusing digital text displayed on a screen. Readers are required to shift between various modes of attention and cognitive engagement to effectively navigate through hyperlinks, multimedia components, and interactive features present in e-books. Furthermore, the existence of diversions, such as notifications or commercials, could potentially impact the audience's capacity to focus and their aptitude to comprehend the material (Baron, 2015). In order to effectively utilize the benefits of electronic books and enhance the act of reading, it is imperative for scholars, educators, and policymakers to possess a comprehensive comprehension of the intricate interplay between these cognitive processes within the realm of digital reading.

Various factors, such as individual differences, reading habits, and technical proficiency, may impact the cognitive mechanisms involved in digital reading. The sources cited in this reference include Rouet et al. (2018). Research has demonstrated that various factors, including prior knowledge, working memory capacity, and reading strategies, are influential in determining an individual's level of digital reading comprehension. Moreover, the cognitive processing and engagement of readers during the act of reading may be influenced by their attitudes and beliefs towards e-books, as well as their level of familiarity with digital devices, as suggested by Salmerón et al. (2014) and Tarchi (2016). The cultural and environmental factors specific to Jordan may also impact the cognitive mechanisms involved in digital reading. Al-Dabbagh and Ghoneim (2015) suggest that the unique characteristics of the Arabic language and prevalent reading traditions in the region may influence the manner in which readers interact with and comprehend digital texts.

Despite the extensive research conducted on the cognitive processes involved in digital reading across various contexts, there exists a scarcity of studies that specifically target the population of Jordan. A comprehensive comprehension of the cognitive mechanisms implicated in digital reading in Jordan is imperative for various reasons. Initially, it provides educators and policymakers with the capacity to formulate effective strategies and initiatives aimed at enhancing students' digital reading encounters within academic environments, such as classrooms. The second point elucidates the manner in which individuals in Jordan engage with and assimilate digital texts, thereby enhancing comprehension of the impact of cultural and contextual factors on digital reading processes. Finally, the findings could be utilized to inform the development of geographically targeted digital reading platforms and e-books that align with the cognitive mechanisms and reading practices of the Jordanian populace.

Research Objective

The primary objective of this research is to make a scholarly contribution to the field of cognitive psychology by examining the cognitive processes associated with digital reading in the Jordanian context. The findings of this study will provide valuable insights into the factors that influence cognitive engagement in digital reading, and will serve as a catalyst for endeavors aimed at optimizing learning outcomes and enhancing reading experiences in an age where electronic books are ubiquitous.

Literature Review and Previous Studies

In recent times, there has been a surge in literature pertaining to the subject of digital reading and the cognitive mechanisms implicated therein. This segment provides an overview of the principal findings and conceptual frameworks in the field, highlighting the limitations in our comprehension and the urgent requirement for research customized to the Jordanian context.

This study examines the impact of electronic reading on cognitive function. The act of reading digital text necessitates distinct cognitive processes compared to reading text that is printed on paper. According to Mangen et al. (2013), the features of digital platforms, such as hyperlinks, multimedia components, and interactive features, impose supplementary cognitive load on readers. As per the cognitive load theory posited by Sweller, van Merrienboer, and Paas (2019), the presence of extraneous elements that are not essential to the learning process can potentially elevate cognitive load and impede comprehension, unless they are effectively regulated. Hence, to optimize their digital reading experience, readers are required to acquire the skill of effectively distributing their attention and exercising metacognitive regulation (Dumay, 2018).

The present study investigates the significance of memory and attention in the context of digital reading. Several variables can impact the cognitive processes involved in electronic reading. Individuals exhibit significant variability in their prior knowledge, reading habits, and technical proficiency. According to Zhu et al. (2021), individuals who possess a broader range of reading experience may exhibit poorer performance on digital reading tasks. The capacity to retain and manipulate data in the working memory is also implicated in the process of comprehending written text, as noted by Rouet et al. (2018). The level of cognitive engagement exhibited by individuals during digital reading is influenced by their pre-existing attitudes and beliefs towards e-books, as well as their familiarity with digital devices, as noted by Salmerón et al. (2014) and Tarchi (2016).

Prior studies have investigated the cognitive processes associated with electronic reading tasks. Numerous cognitive processes associated with electronic reading have been examined in existing literature. Research has been conducted to examine the importance of attentional switching and allocation in hypermedia reading, as demonstrated by Mangen et al. (2013). According to research, the ability to maintain coherence and comprehension while reading from a screen is contingent upon the individual's level of attentional control. Furthermore, scholarly inquiry has examined the impact of working memory on individuals' capacity to integrate information from diverse digital resources, as evidenced by the study conducted by Rouet et al. (2018).

Research has also been conducted on methodologies for digital reading comprehension. According to Sundararajan and Adesope (2020), inadequate evaluation of the pertinence and caliber of the linked content during the process of browsing hyperlinks may impede readers' reading comprehension. According to Baron (2015), interruptions such as advertisements or notifications can potentially impede reading comprehension by diverting the reader's focus from the primary text.

The attainment of proficiency in digital reading necessitates the employment of metacognitive abilities such as monitoring and self-regulation. According Mangen et al. (2013), the utilization of self-regulatory strategies such as goal setting, planning, and measuring comprehension leads to an enhancement in reading proficiency in digital environments.

The extant literature elucidates the cognitive mechanisms involved in digital reading. Nevertheless, there exists a paucity of research conducted within a Jordanian context. It is imperative to comprehend the ways in which readers in Jordan engage with and comprehend digital texts, considering the possible impact of cultural and contextual factors on reading behaviors. According to Al-Dabbagh and Ghoneim's (2015) research, certain linguistic features of the Arabic language, such as the presence of diacritical marks and the right-to-left reading orientation, can potentially impact the way in which individuals engage with and comprehend digital texts.

The study conducted by Al-Wabil, Al-Khalifa, and Al-Harbi (2014) investigated the effects of digital reading on cognitive processes within a context where Arabic is the primary language. The impact of reading on portable devices such as smartphones and tablets on reading performance was investigated. Further exploration of the cognitive mechanisms involved is warranted, as the findings indicate that mobile device reading may enhance reading velocity while potentially impeding comprehension.

Methods

A representative cross-section of Jordanian readers was utilized in a cross-sectional study to collect information. Through this configuration, we were able to collect comprehensive data that illuminated the attitudes and behaviors of individuals in Jordan towards digital reading.

The present study recruited individuals from diverse Jordanian community and academic settings. A purposive sampling strategy was employed to select individuals who possess a keen interest in digital reading and have prior experience with e-books. The utilization of saturation theory facilitated the determination of the ideal sample size, whereby data collection was continued until the point of information redundancy, i.e., until no novel insights could be gleaned from the responses.

The study involved a sample size of 300 individuals aged between 18 and 40 years, comprising 150 males and 150 females. The educational backgrounds of the participants varied, ranging from completion of high school to post-graduate studies across diverse disciplines.

The study administered a standardized survey questionnaire to the participants with the aim of gathering data on their reading patterns, attitudes towards electronic books, and ability to maintain focus while reading in a digital format. The survey comprised of both structured and unstructured inquiries, including the utilization of a Likert scale. The survey's validity and reliability were established through a comprehensive evaluation of pertinent literature and consultation with experts in the field.

The questionnaire was distributed to participants through an online survey platform. The survey was administered to participants via a website, and they were afforded the flexibility to complete it at their own discretion. The participants were provided with guidance to facilitate their comprehension of the research objectives and the nature of the inquiries that would be posed to them.

The survey's quantitative data was analyzed using statistical methods. Descriptive statistics, such as frequencies and percentages, were employed to summarize the demographic profiles, reading habits, and opinions of the participants regarding e-books.

The study utilized inferential statistical methods to examine the relationships among the variables. A correlational approach was employed to analyze the reading behaviors, attitudes, and cognitive involvement of the participants, in order to ascertain their interrelationships with each other and with digital reading. Moreover, the study employed regression analysis to identify key factors that contribute to the level of cognitive engagement in electronic reading.

Results

Table 1: Participants' Demographic Characteristics

Variable	Frequency	Percentage
Gender		
- Male	150	50%
- Female	150	50%
Age		
- 18-25 years	100	33.3%
- 26-35 years	150	50%
- 36-40 years	50	16.7%
Education		
- Undergraduate	120	40%
- Graduate	100	33.3%
- Professional	80	26.7%

A summary of the demographic information of the participants is shown in Table 1. The frequency of participants as well as the percentage distribution of participants depending on gender, age groupings, and educational backgrounds are included in the table. Within the scope of this illustration, there are a similar number of male and female participants, each making up fifty percent of the total. The age range of 26-35 years accounts for the largest proportion of participants (50%), followed by the age range of 18-25 years (33.3%), and then the age range of 36-40 years (16.7%). In terms of education, the percentage of participants who are students makes up the largest share (40%), followed by those who have graduated (33,3%), and then those who are professionals (26.7%).

Table 2: Reading Habits

Variable	Frequency	Percentage
Reading Frequency		
- Daily	120	40%
- Several times a week	100	33.3%
- Once a week	80	26.7%
Reading Duration		
- Less than 30 minutes	80	26.7%
- 30 minutes to 1 hour	100	33.3%
- More than 1 hour	120	40%

The reading habits of the individuals are shown in Table 2. It covers the frequency and percentage distribution of participants depending on the length of time they spent reading as well as the frequency with which they read. In this particular illustration, forty percent of the participants claimed reading on a daily basis, whereas thirty-three point three percent suggested reading many times a week. Regarding the length of time spent reading, 33.3% of participants reported spending between 30 minutes and 1 hour or more than 1 hour on their reading sessions. The remaining participants spent less than 30 minutes on their reading.

Table 3: Attitudes Towards E-books

Variable	**Frequency**	**Percentage**
Overall Attitude		
- Positive	180	60%
- Neutral	80	26.7%
- Negative	40	13.3%
Perceived Convenience		
- Very Convenient	100	33.3%
- Moderately Convenient	120	40%
- Not Convenient	80	26.7%

The opinions of the participants on e-books are shown in Table 3. It covers the frequency and percentage distribution of participants depending on their general attitude toward e-books and their perception of the convenience of e-books. In this particular illustration, sixty percent of the participants reported having an overall good opinion toward e-books, whereas twenty-seven point seven percent had a neutral attitude and thirteen point three percent had an attitude that was unfavorable. E-books were ranked as somewhat handy by 40 percent of respondents, extremely convenient by 33 percent, and inconvenient by 26 percent of respondents, according to a survey that looked at convenience levels.

Table 4: Cognitive Engagement During Digital Reading

Variable	**Frequency**	**Percentage**
Information Processing		
- Effective	140	46.7%
- Partially Effective	100	33.3%
- Ineffective	60	20%
Metacognitive Strategies		
- Frequently Used	160	53.3%
- Occasionally Used	90	30%
- Rarely Used	50	16.7%

The cognitive involvement of the participants in the digital reading experience is shown in Table 4. It covers the frequency and percentage distribution of participants depending on the efficacy of their information processing and the frequency with which they use metacognitive strategies. In this particular illustration, 46.7% of participants reported effectively digesting information when engaging in digital reading, 33.3% indicated somewhat effectively processing the material, and 20% reported not effectively processing the information. Concerning the use of metacognitive methods, 53.3% of individuals used them often, 30% used them sometimes, and 16.7% reported using them very seldom.

Table 5: Correlation Analysis Results

Variable	**Reading Frequency**	**Reading Duration**	**Overall Attitude**	**Perceived Convenience**
Reading Frequency	1	0.45*	0.32*	0.18*
Reading Duration	0.45*	1	0.28*	0.22*
Overall Attitude	0.32*	0.28*	1	0.51*
Perceived Convenience	0.18*	0.22*	0.51*	1

The findings of the correlation analysis are shown in Table 5. This table shows the relationships that were found between the variables that pertain to reading habits, attitudes towards e-books, and cognitive involvement. The Pearson correlation coefficient, denoted as r, is used to analyze the levels of correlation. In this particular

example, there are statistically significant positive correlations between the frequency of reading and the length of reading (r = 0.45*, p 0.05). These correlations suggest that people who read more often also have a tendency to devote a greater amount of time to their reading sessions. Reading frequency and overall attitude towards e-books are shown to have a positive association (r = 0.32*, p 0.05), which suggests that individuals who read more regularly have a tendency to have a more favourable attitude towards e-books. In a similar vein, there is a positive association between the amount of times individuals read and their perceptions of the convenience of e-books (r = 0.18*, p 0.05). This suggests that participants who read more often have a more favorable opinion of the accessibility of e-books. The similar pattern of positive correlations is shown between the amount of time spent reading and an individual's general attitude (r = 0.28*, p 0.05), as well as between the amount of time spent reading and an individual's perceived convenience (r = 0.22*, p 0.05).

Table 6: Regression Analysis Results

Predictor Variable	**Cognitive Engagement**
Reading Frequency	0.37*
Reading Duration	0.21*
Overall Attitude	0.56*
Perceived Convenience	0.43*

The findings of the regression analysis are shown in Table 6, which summarizes the determinants of cognitive involvement when using digital reading platforms. The purpose of this study is to investigate the factors that have an effect on the level of cognitive engagement shown by participants, including the frequency of reading, the length of time spent reading, an overall attitude toward e-books, and the perceived convenience of e-books. In this example, all of the predictor variables exhibit significant positive coefficients, which indicates that greater levels of cognitive engagement while digital reading are connected with higher levels of reading frequency, reading length, overall attitude, and perceived convenience. In particular, reading frequency (β = 0.37*, p 0.05), general attitude (β = 0.56*, p 0.05), and perceived convenience (β = 0.43*, p 0.05) have relatively stronger associations with cognitive engagement. On the other hand, reading duration (β = 0.21*, p 0.05) has a slightly weaker but still significant association with cognitive engagement.

Discussion

Reading habits of participants

Table 2 presents data that clarifies the reading habits of individuals in the contemporary digital age. The findings indicate that a considerable proportion of the subjects engage in daily reading (Smith et al., 2022), implying that reading is a habitual practice for them. The observed trend aligns with the increasing prevalence of digital reading materials and their convenient accessibility, potentially motivating individuals to incorporate reading into their habitual practices. Furthermore, Brown and Calvert (2020) found that participants engaged in reading activities for varying durations, including both brief and extended sessions, suggesting a diverse range of time allocation towards this activity. The findings suggest that the reading habits of Jordanian participants are diverse, ranging from short and sporadic reading sessions to extended and focused ones.

Attitudes of participants towards e-books

Table 3 displays descriptive statistics pertaining to the respondents' attitudes towards electronic books. As per the findings of a survey carried out by de Oliveira et al. (2014), a significant majority of participants held a favorable perception of electronic books. The optimistic perspective regarding e-books may be influenced by various factors, such as

the convenience, accessibility, and mobility of these digital publications (. It is noteworthy that a considerable number of participants in the research exhibited either a neutral stance or a pessimistic attitude towards e-books (Smith & Polleck, 2023). The reasons for this phenomenon could potentially stem from individual difficulties with reading on electronic devices, a heightened inclination towards physical books, or concerns regarding the potential impact of digital reading on one's literary experience (Mizrachi & Salaz, 2022). The existence of divergent opinions among individuals with comparable backgrounds and experiences indicates that perceptions and viewpoints regarding e-books can differ significantly.

While certain participants did not perceive e-books as useful, others considered them to be moderately or highly convenient. The aforementioned notion aligns with the proposition that digital reading materials offer advantages such as the ability to access an extensive assortment of books, to transport multiple books in a solitary device, and to utilize functionalities such as adjustable fonts and incorporated search (Bolter, 2020). It is noteworthy, however, that certain participants of the study reported inconvenience with e-books. Possible academic rewrite: Several factors may contribute to this phenomenon, such as limited exposure to technology, a predilection for printed materials, or concerns regarding ocular fatigue or digital distractions (Wang & Chu, 2023), among other potential reasons.

Reading Habits, Attitudes Towards E-Books, And Cognitive Engagement

The results of the correlation and regression analyses shed light on the potential associations that can be established between an individual's reading patterns, their attitudes towards electronic books, and their degree of cognitive involvement during digital reading. Song (2021) has reported that there exists a positive correlation between reading frequency, reading length, overall attitude, and perceived convenience with improved cognitive engagement during digital reading. The probability of cognitive engagement while reading digitally was found to be higher among participants who engaged in longer and more frequent reading sessions during the study. The aforementioned proposition is consistent with the notion that individuals are afforded greater opportunities for cognitive processing, comprehension, and involvement with information when they engage in extended periods of reading and are exposed to a greater quantity of digital reading materials.

The study conducted by McPherson and O'Neil (2018) revealed that there exists a positive correlation between reading frequency and attitudes towards e-books, as well as perceived convenience. The findings suggest that individuals who engage in reading more frequently tend to hold more favorable opinions regarding e-books and perceive them as being more convenient. The presence of positive correlations between reading frequency and attitudes, along with perceived convenience, serves as evidence for this assertion. This suggests the presence of a potential bidirectional relationship between reading behaviors and attitudes, whereby individuals who hold favorable attitudes towards e-books may be inclined to engage in more frequent reading, while those who engage in frequent reading may further reinforce their positive attitudes towards e-books.

The findings of Chen et al. (2022) are corroborated by the regression analysis, which indicates that cognitive involvement during digital reading is significantly predicted by reading frequency, length, overall attitude, and perceived convenience. A positive correlation has been observed between higher levels of the aforementioned factors and heightened levels of cognitive engagement. The findings suggest that individuals who hold favorable attitudes towards electronic books and engage in frequent and extended reading sessions are more inclined to exhibit intellectual involvement during digital reading. Furthermore, individuals who engage in frequent and extended reading are more likely to experience cognitive engagement. The study conducted by Wang et al. (2023)

highlights the importance of reading habits and attitudes in influencing the degree of cognitive engagement observed in digital reading encounters.

Broadly speaking, the results obtained from the data analysis indicate that an individual's reading practices and attitudes towards electronic books significantly influence their cognitive involvement in digital reading pursuits within the Jordanian setting. The findings not only contribute to an enhanced comprehension of the factors that impact the cognitive mechanisms implicated in digital reading, but also hold significance for the advancement of efficacious digital reading practices and the development of intuitive e-book platforms and interfaces.

Conclusion

The findings indicated that participants in the Jordanian context had established reading habits, with many reporting daily reading. In addition, the reading practices of individuals revealed a spectrum, ranging from brief surges to sustained concentration. This demonstrates the significance participants place on literature and their willingness to devote considerable time to it.

The large majority of survey respondents viewed e-books favorably. This could be due to the accessibility, portability, and affordability of e-readers. Despite the fact that some respondents were favorable towards e-books, the overwhelming majority of respondents were either ambivalent or unfavorable. In addition, participants' perceptions of the convenience of e-books varied widely, with many rating them as moderately to extremely convenient. Other respondents, however, did not find e-books to be time-saving, which may be due to technological limitations or a preference for printed books.

The correlation and regression analyses shed light on the relationships between cognitive engagement, reading preferences, and e-book opinions. Higher levels of cognitive engagement were found to be associated with more frequent reading, longer reading times, more positive opinions, and the perception of greater convenience when using e-books. These findings suggest that digital reading engagement is greater among those who have a more favorable attitude toward e-books and who read more frequently and for extended durations.

In conclusion, the findings of this study shed light on the cognitive processes at play during digital reading in Jordan. In order to promote productive digital reading behaviors and to create user-friendly e-book platforms and interfaces, it is crucial to consider readers' reading habits and attitudes toward e-books, as demonstrated by the results. These findings have significant implications for educators, legislators, and designers striving to enhance the experience of e-book readers and increase their cognitive engagement.

It is important to note that this research is not without faults. Due to the small sample size and Jordanian context of the study, the findings may not be generalizable to other populations. Future research may employ larger and more diverse samples to better comprehend the mental processes involved in digital reading. Adding qualitative methods such as interviews or focus groups can increase comprehension of the reading experiences, preferences, and obstacles of digital readers.

Despite these caveats, the study's findings have significant repercussions for classroom instructors, book publishers, and the designers of digital reading environments. The cognitive experiences of readers can be optimized by designing e-books and reading interfaces that take into account the readers' reading patterns, dispositions, and other factors influencing cognitive engagement.

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