Enhancing Web Accessibility for Users with Dyslexia: Evaluating Strategies and Inclusive Design Outcomes in Pakistan

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Abstract

Web accessibility remains a critical challenge for individuals with dyslexia, who often experience difficulties in reading, navigation, and information processing in digital environments. Although international standards such as the Web Content Accessibility Guidelines (WCAG) exist, many websites fail to incorporate design features that support users with dyslexia. The present study employed a quantitative within-subject design to examine the impact of accessibility-enhanced web interfaces on usability and cognitive strain among users with dyslexia in Pakistan. The final sample (N = 100) were individuals with a formal diagnosis of dyslexia confirmed by a certified psychologist (M = 21.8 years, SD = 3.5) completed structured web-based tasks under two conditions: conventional web design and enhanced accessibility design. Usability outcomes included task completion time, error rate, and perceived readability, while cognitive strain outcomes included scores on the NASA Task Load Index (NASA-TLX). Paired-sample t-tests indicated that participants completed tasks faster on accessibility-enhanced interfaces (M = 9.1 min, SD = 2.6) than on conventional websites (M = 13.2 min, SD = 3.1), $p < .001$, with fewer errors and higher readability ratings. Cognitive strain scores across all NASA-TLX dimensions were significantly lower under the accessibility condition ($p < .001$). These findings demonstrate that dyslexia-friendly design features, including readable fonts, optimized contrast, and simplified layouts, substantially improve usability and reduce cognitive burden. The study provides evidence-based recommendations for inclusive web design and highlights the need for greater adoption of accessibility focused digital practices in Pakistan.

Keywords: Web accessibility, individuals/users with dyslexia, challenges, adaptive strategies, inclusive design, Pakistan

Introduction

In recent years, web accessibility has become a global priority, as digital platforms are increasingly used for vital functions such as communication, education, and daily activities. The World Wide Web Consortium (W3C, 2016) emphasizes inclusive web designs that allow all users to access content regardless of disabilities. However, only 3 percent of the world's most popular websites comply with the basic Web Content Accessibility Guidelines (WebAIM, 2024). This lack of adherence disproportionately affects individuals with disabilities, including those with dyslexia, who already face challenges navigating the web. Progress toward more inclusive digital spaces has been driven by the European Commission (2024) and updates to the Americans with Disabilities Act (ADA) by the American Foundation for the Blind (2024).

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Nevertheless, many websites still lack features designed that meet the specific needs of individuals with dyslexia, such as readable fonts, customizable text settings, and simple navigation structures.

Dyslexia is a neurodevelopmental condition affecting reading, writing, and language processing. People with dyslexia process verbal and written information differently, making it difficult to read text, differentiate between similar letters, and process long blocks of content. They are particularly affected by inconsistent letterforms, complex fonts, or high-contrast text and background combinations, which increase visual discomfort and reduce readability (Franzen et al., 202; Schneps et al., 2013). Research indicates that dyslexic users read 20 percent better in Sans Serif fonts, such as Arial or Dyslexie, and benefit from moderate color contrast, for example black text on a pastel background (British Dyslexia Association, 2023; Rello & Baeza-Yates, 2012). These findings highlight the specific digital needs of individuals with dyslexia and the importance of designing accessible web interfaces. Cognitive Load Theory (Sweller, 1988) states that human working memory has a limited capacity. High extraneous load occurs when digital environments are cluttered, fonts are inconsistent, or navigation is confusing. For people with dyslexia, these design problems further increase cognitive effort, often resulting in frustration or task abandonment (Berget et al., 2016).

Universal Design for Learning (UDL) and inclusive design principles emphasize considering user needs from the start of the design process. UDL promotes flexible modes of presentation, interactive methods, and adaptive interfaces, such as adjustable font settings or simplified layouts, which improve accessibility for dyslexic users (Jauregui et al., 2023; Priyadharsini & Mary, 2024; Wabil et al., 2019). Emotional responses to inaccessible digital content can also affect usage. The Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) suggests that individuals feel stressed when they perceive tasks as unmanageable. For dyslexic users, repeated difficulties with poorly designed websites can lead to stress, decreased confidence, and avoidance of online activities (Abdelaal & Thani, 2023; McCarthy & Swierenga, 2010). The Technology Acceptance Model (TAM; Davis, 1989) further explains why dyslexic users may avoid digital platforms. According to TAM, users' perceptions of usefulness and ease of use strongly influence adoption. If web interfaces are confusing, poorly organized, or lack supportive tools, dyslexic users are less likely to engage with them, reducing participation in learning or self-directed activities (Charness & Boot, 2020).

In Pakistan, web accessibility challenges are particularly pronounced due to low awareness and limited resources. Internet penetration is 36.5% (Kem, 2023), and 4-6% of school-aged children show signs of dyslexia (Educational Exclusion of Children with Special Needs, 2023). Local websites and applications often lack even the most basic accessibility features, increasing barriers for dyslexic users. Studies indicate that dyslexic students are 40% less likely to engage with e-learning platforms than their peers due to poor readability, cluttered layouts, and absence of supportive tools such as text-to-speech functionality (Qureshi et al., 2024). These issues not only limit access to education and employment opportunities but also contribute to frustration and feelings of exclusion.Despite growing research on digital accessibility, there is limited knowledge about the specific needs of individuals with dyslexia. Most studies focus on accessibility for visually or physically impaired users, while international guidelines such as W3C (2023) provide only general recommendations and do not address dyslexia specific needs. In Pakistan, the lack of localized research and data on dyslexia makes it challenging to design inclusive digital spaces. Many local developers and policymakers are not fully aware of the unique difficulties faced by individuals with dyslexia, resulting in limited targeted interventions.

Research highlights that adaptive web interfaces allowing users to adjust font styles, text sizes, and color schemes can significantly improve reading speed and comprehension for individuals with dyslexia (Pinna & Deiana, 2018; Hata et al., 2023). Similarly, there is minimal research on training programs for web developers that combine WCAG standards with dyslexia-specific adaptations (Jáuregui et al., 2023; Keating et al., 2022). This lack of localized focus demonstrates a need for research that connects global accessibility best practices with the realities of digital environments in Pakistan. This research can provide both conceptual and empirical insights to improve web accessibility and create digital platforms that effectively meet the needs of individuals with dyslexia in the Pakistani context.

Objectives

- To evaluate the impact of web accessibility features on task performance (completion time and error rate) among individuals with dyslexia.
- To investigate the relationship between cognitive strain and usability measures such as readability score, error rate, and task time among individuals with dyslexia.

Hypotheses

H1: Individuals with dyslexia will complete tasks significantly faster on accessible websites compared to conventional websites.
H2: Individuals with dyslexia will exhibit significantly lower cognitive strain scores when interacting with accessible websites.
H3: There will be a significant positive correlation between cognitive strain and error rate among individuals with dyslexia.
H4: There will be a significant negative correlation between cognitive strain and readability scores.

Methods

Research Design

A quasi-experimental within subject design was used because it allows each participant to experience both conventional and accessibility enhanced websites, providing a direct comparison of performance and cognitive load. This design controls individual differences in reading ability, familiarity with technology, or dyslexia severity, which could otherwise confound results in a between-subject design. By having the same participants complete tasks under both conditions, the study ensures that observed differences in outcomes are due to the website accessibility features rather than individual variability.

Sample

Participants were recruited from special education institutes in Pakistan using a purposive sampling strategy. The final sample consisted of n = 100 individuals with a confirmed diagnosis of dyslexia by a certified educational psychologist. The mean age of the sample was 18.7 years (*SD* = 4.3), and the gender distribution was approximately 60% male and 40% female. Purposive sampling was used to ensure that all participants met the specific inclusion criteria of having a professional dyslexia diagnosis, which was essential for examining usability outcomes and cognitive strain in this population.

Inclusion Criteria

Participants were eligible if they:

- Had a formal diagnosis of dyslexia confirmed by a certified psychologist
- Were 18 to 30 years of age
- Reported regular use of web-based content for educational or social purposes
- Possessed basic digital literacy (e.g., browsing, reading, form interaction)
- Were Pakistani nationals

Exclusion Criteria

Participants were excluded if they:

- Had co-occurring neurodevelopmental disorders (e.g., ADHD, autism spectrum disorder)
- Had severe visual impairments requiring screen-reader technology
- Reported limited or no experience with web-based interfaces
- Had any neurological or cognitive condition that could confound task performance

Instruments

Three standardized instruments were used for data collection.

Demographic Questionnaire

A brief self-report questionnaire was used to collect information on age, gender, educational level, and frequency of internet usage.

NASA Task Load Index (NASA-TLX)

Cognitive strain was assessed using the NASA Task Load Index (NASA-TLX) developed by Hart and Staveland (1988). The instrument measures perceived workload across six dimensions which are mental demand, physical demand, temporal demand, effort, frustration, and performance. Participants self-rated each dimension immediately after completing tasks under each web condition using a unipolar 20-point scale ranging from 0 (Very Low) to 20 (Very High). Consistent with established NASA-TLX scoring procedures, raw ratings were linearly converted to a 0 to 100 scale to allow standardized interpretation and comparison across dimensions. The performance dimension was reverse scored so that higher values reflected better perceived task performance. Total cognitive workload scores were computed by averaging the six scaled dimensions. The NASA-TLX was administered twice per participant; once after interaction with the conventional website and once after interaction with the accessibility-enhanced website. The NASA-TLX is widely validated in usability and human–computer interaction research and demonstrates high internal consistency, with reported Cronbach's alpha values typically exceeding α=.80 (Hart & Staveland, 1988; González et al., 2020).

Usability Tasks

A set of structured usability tasks were developed to assess interface effectiveness under both web conditions. Task design was informed by usability testing principles and prior empirical research in human computer interaction and accessibility studies.

Tasks simulated common web-based activities, including:

- Locating specific information
- Reading and comprehending short text passages
- Interpreting written instructions
- Completing simple form-based inputs

Each participant completed the same set of tasks under two conditions:

1. Conventional web design
2. Accessibility enhanced (dyslexia friendly) web design

Design Criteria

- Conventional design reflected standard web layouts commonly used in local websites (default fonts, dense text blocks, limited customization).
- Accessibility-enhanced design incorporated evidence-based dyslexia-friendly features, including:
  - Sans-serif fonts (Arial, Dyslexie)
  - Increased line spacing and text size
  - Moderate color contrast with pastel backgrounds
  - Simplified layout and reduced visual clutter
  - Customizable text settings

These design distinctions were based on established accessibility literature and dyslexia-focused usability guidelines.

Usability Measures

Three dependent variables were recorded for each task session:

1. Task completion time (in minutes)
2. Error rate, defined as the percentage of comprehension or procedural errors
3. Readability score, assessed using a 100-point rubric evaluating font clarity, spacing, layout simplicity, and perceived ease of understanding

To minimize order and practice effects, tasks were administered in a randomized and counterbalanced sequence. Participant interactions were observed and logged for accuracy.

Procedure

The study was conducted in four sequential phases. Informed consent was obtained prior to participation. Participants were screened based on inclusion and exclusion criteria. Participants completed usability tasks using the conventional web interface, followed immediately by completion of the NASA-TLX in the baseline condition. Participants completed identical tasks using the accessibility-enhanced web interface in the intervention conditions. The NASA-TLX was re-administered to assess changes in perceived cognitive strain in the post-intervention assessment.

Ethical Considerations

- The study adhered to institutional and international ethical guidelines for research involving human participants.
- All participants received detailed information regarding the study objectives, procedures, and confidentiality measures prior to participation.
- Participation was voluntary, and individuals were free to withdraw at any time without penalty.

- Data were anonymized to protect participant identity. Ethical approval was obtained from the Institutional Review Board (IRB) of the affiliated institution prior to data collection.

Results

Data were analyzed using SPSS (26) to examine the effects of enhanced accessibility versus conventional web interfaces on task performance, cognitive strain, and usability outcomes among individuals with dyslexia. Descriptive statistics were first computed for demographic variables and all primary measures, including task completion time, error rate, readability scores, and NASA-TLX cognitive strain scores. To test H1 (faster task completion on accessible websites) and H2 (lower cognitive strain on accessible websites), paired-samples t-tests were conducted, as each participant completed tasks under both conditions, allowing direct within-subject comparison. For H3 (positive correlation between cognitive strain and error rate) and H4 (negative correlation between cognitive strain and readability), Pearson correlation analyses were performed, since these hypotheses involved continuous measures expected to be linearly related. Assumptions for parametric testing including normality, linearity, and homogeneity of variance were examined, and effect sizes (Cohen's d for t tests) were reported to indicate practical significance. This analytic approach allowed the study to evaluate both direct effects of accessibility features on task performance and the interrelationships between cognitive load and usability outcomes, thereby addressing all four hypotheses in a manner consistent with the quasi-experimental within-subject design.

Descriptive Statistics

Descriptive statistics were computed separately for each experimental condition (conventional website vs. accessibility-enhanced website). Table 1 presents the mean, standard deviation, minimum, and maximum values for demographic variables and task-based usability outcomes under both conditions.

Table 1

Descriptive Statistics of Study Variables Across Experimental Conditions (N = 100)

Variable	Mean (M)	SD	Minimum	Maximum
Age (years)	21.8	3.5	18	30
Task Completion Time (min) – Conventional Website	13.2	3.1	8.4	19.6
Task Completion Time (min) – Accessible Website	9.1	2.6	5.3	14.8
Error Rate (%) – Conventional Website	22.3	4.2	15.1	30.8
Error Rate (%) – Accessible Website	14.5	3.7	8.9	23.4
Readability Score (100-point scale) – Conventional Website	67.1	8.5	50.2	79.6
Readability Score (100-point scale) – Accessible Website	79.8	7.2	60.4	88.5

Note. These statistics indicate improved task efficiency and readability scores under the accessibility-enhanced condition.

Figure 1

Conventional Vs Accessible Websites

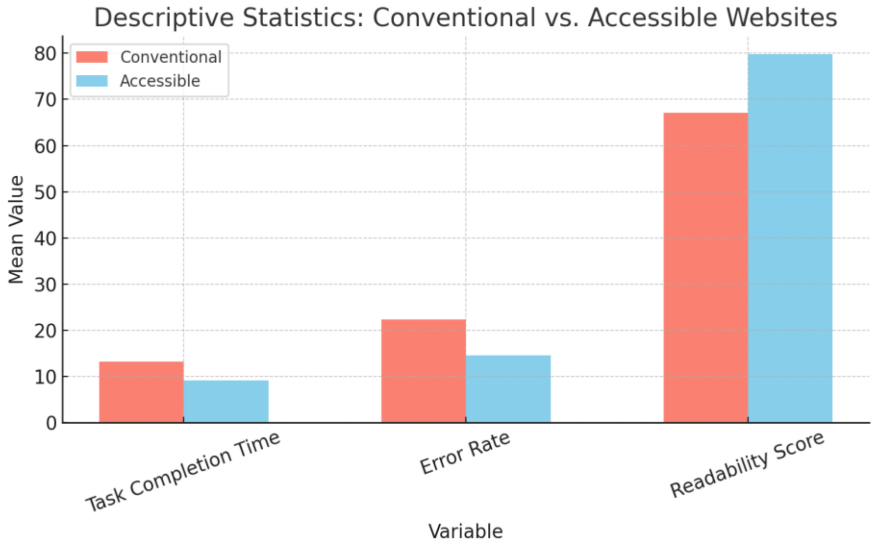


Table 2

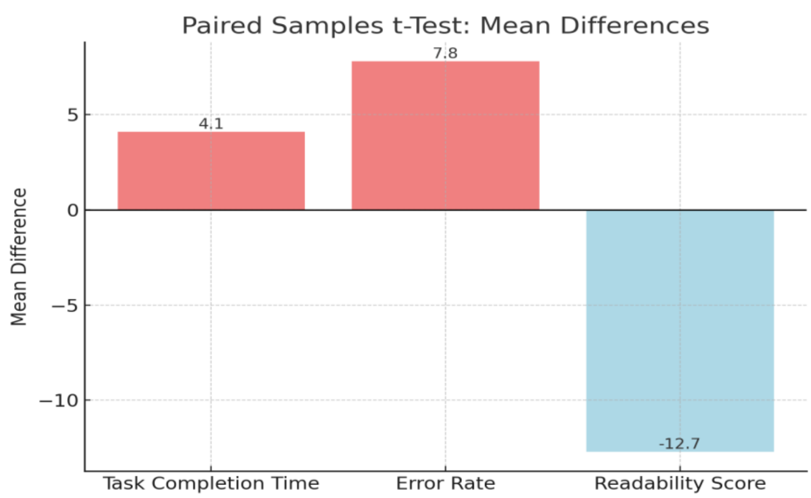
Paired-Sample t-Test Results for Usability Measures

Variables	Mean Difference (Conventional − Accessible)	*SD*	*t (99)*	*p*
Task Completion Time (minutes)	4.1	2.3	11.36	< .001
Error Rate (%)	7.8	3.1	10.52	< .001
Readability Score (100-point scale)	−12.7	5.6	−15.09	< .001

Results demonstrate that accessibility-enhanced web interfaces significantly reduced task completion time and error rates, while significantly improving readability scores.

Figure 2

Paired Sample T-Test Mean Differences



Association Between Cognitive Load and Usability Outcomes

To examine the relationship between perceived cognitive load and task performance, Pearson product moment correlation analyses were conducted using the NASA TLX total score.

Cognitive Load (NASA-TLX)

Cognitive load was assessed using the NASA Task Load Index (NASA-TLX). Participants self-reported their perceived workload immediately after completing tasks under each experimental condition. Following standard NASA-TLX scoring procedures, ratings for six dimensions (Mental Demand, Physical Demand, Temporal Demand, Effort, Frustration, and Performance) were converted to a composite score ranging from 0 to 100.

Table 3

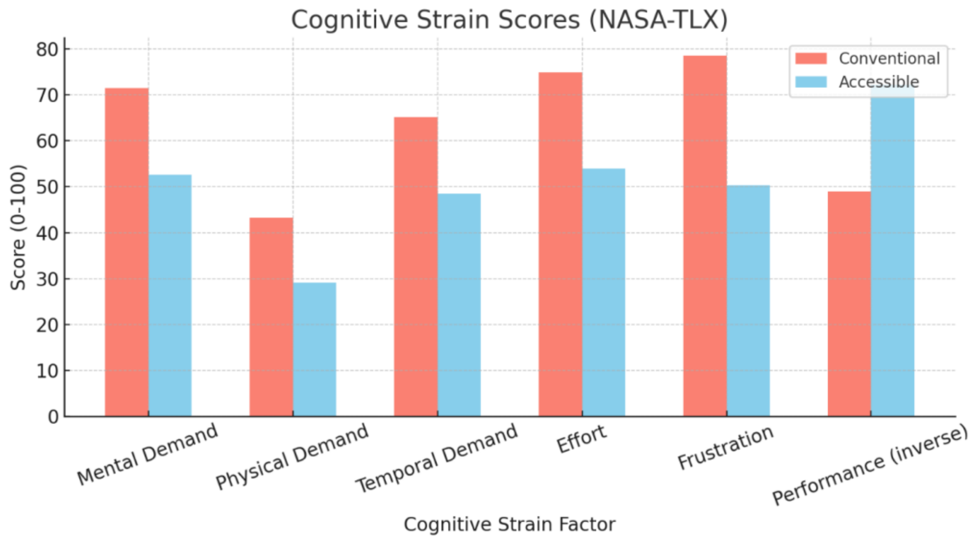
Comparison of Cognitive Load Scores (NASA-TLX) Across Experimental Conditions

Dimensions	Conventional Website *(M ± SD)*	Accessible Website *(M ± SD)*	*t* (99)	*p*
Mental Demand	71.4 ± 8.9	52.6 ± 7.5	9.21	< .001
Physical Demand	43.2 ± 6.7	29.1 ± 5.3	7.84	< .001
Temporal Demand	65.1 ± 7.8	48.4 ± 6.2	8.77	< .001
Effort	74.8 ± 9.2	53.9 ± 6.9	10.34	< .001
Frustration	78.5 ± 8.3	50.3 ± 7.1	11.02	< .001
Performance (reverse-scored)	48.9 ± 7.5	72.2 ± 6.8	−9.56	< .001

Note. Paired sample t-tests indicated significantly lower cognitive load across all NASA-TLX dimensions when participants interacted with the accessibility-enhanced website.

Figure 3

Cognitive Strain Scores



Task Performance Outcomes

Paired-sample t-tests were conducted to examine differences in task completion time, error rate, and readability scores between the two experimental conditions.

Table 4

Correlation Between Cognitive Load and Usability Measures

Usability Measure	*r*	*p*
Error Rate (%)	.72	< .001
Readability Score	−.65	< .001
Task Completion Time (minutes)	.78	< .001

Higher cognitive load was strongly associated with increased error rates and longer task completion times, whereas a significant negative association was observed between cognitive load and readability scores.

Figure 4

Association between Cognitive Strain (NASA-TLX Total) and the Usability Measures

Table 5

Comparison of Web Design Features Before and After Accessibility Implementation

Feature	**Conventional Website (Before Accessibility)**	**Accessibility-Enhanced Website (After Implementation)**
Text presentation	Small, dense text	Larger, readable fonts (e.g., Dyslexie)
Color contrast	Low contrast color combinations	High-contrast color schemes
Assistive features	No text-to-speech support	Text-to-speech enabled
Layout structure	Overcrowded and cluttered layout	Adequate spacing and structured layout

Note. This table summarizes the design features used to differentiate the conventional and accessibility-enhanced web interfaces.

Table 6

Comparison of Cognitive Load and Task Efficiency Across Web Design Conditions

Outcome Indicator	Without Accessibility Features	With Accessibility Features
Reading speed	Slower reading speed	Faster reading speed
Comprehension experience	Higher frustration	Improved comprehension
Cognitive load	Increased cognitive load	Reduced cognitive load
Task efficiency	Lower task efficiency	Higher task efficiency

Note. Outcomes are derived from task performance measures and self-reported cognitive load (NASA-TLX).

The findings of this study indicate that users with dyslexia experience significantly higher levels of cognitive load, increased error rates, and longer task completion times when interacting with conventional web interfaces. In contrast, accessibility enhanced web designs incorporating dyslexia-friendly fonts, improved contrast, and simplified layouts were associated with reduced cognitive strain, improved task efficiency, and higher readability scores. Overall, the results provide empirical support for the integration of adaptive and inclusive web design principles to enhance digital accessibility for users with dyslexia.

Discussion

This work presents and analyzes the most demanding challenges individuals with dyslexia are currently encountering when navigating the contents of conventional websites and the improvements attained by accessibility improved designs. This fits with the previous research showing that accessibility features have a significant negative impact on cognitive strain, a positive effect on task performance, and better user experience in general (for individuals with dyslexia; Rello & Baeza-Yates, 2016).

Impact of Accessibility Features on Task Efficiency

The results indicate that completion of the complete tasks of individuals with dyslexia is significantly faster on accessible websites than conventional ones, reducing average completion time by about 24% from 13.2 minutes to 9.1 minutes. This matches previous research that have shown that dyslexia-friendly fonts, increased contrast, and simplifying layout can help people navigate better and place less mental load (Wabil et al., 2019). Also, the marked lower error rates (22.3% on conventional sites vs. 14.5% on accessible ones) confirm research suggesting that such sites allow for processing of information and decrease visual distractions (McCarthy & Swierenga, 2010). Therefore, above findings suggest that these usability enhancements should be given highest priority to individuals with dyslexia, that is, adjustable font sizes, text to speech options and alternative navigation structures e.g., voice commands and visual cues. Secondly, using simple and clear menu structure can be helpful to the users, facilitating smooth and focused browsing.

Cognitive Load and Web Design

The NASA-TLX scores indicated that accessible websites reduce cognitive strain as much as possible, mental demand and frustration, consistent with cognitive load theory that states that too much extraneous cognitive load results in impairments in task performance among those with reading difficulties (Sweller, 2011). It has been established that high cognitive load further aggravates the reading struggle of individuals with dyslexia, resulting in higher frustration and task abandonment (Rello & Marcos, 2012). With the use of readability enhancing elements like optimized typography, simplified sentence structures, and whitespace usage, web designers can greatly reduce cognitive burden and increase engagement (González et al., 2020). Features such as real time feedback on form entries, predictive text, and guided tutorials can also reduce the cognitive effort required to complete actions taking place across digitally embedded systems making digitally embedded systems more inclusive and quicker for use by dyslexic individuals.

The results of this research also support the theory of Cognitive Load (Sweller, 1998), which argues that decreasing extraneous load e.g. poor layout, confusing navigation, therefore, does not use up psychological capacity, rather, the free mental capacity can be used in genuine understanding and decision making. In the viewable web site setting, less mental effort and frustration was used which underlines the notion that simple interface and dyslexia friendly fonts reduce excessive thinking. This is consistent with a previous study by Berget et al (2016) that states suitable usability-enhancing change can optimize the performance through less working memory overload. Above findings can also be compared to the Universal Design for Learning (UDL) framework, according to which designing systems that can cater to a diversity of learner differences need to be advocated (Davis, 1989). The flexibility in presentation and interest of the UDL is confirmed by the success of personalized elements of visual backgrounds including font choices and color contrasts in the current research case. It proves that the inclusion of inclusive design features is not only efficient but mandatory in terms of cognitive accessibility.

Readability and User Experience

This also gives rise to seeking more readable scores on accessible websites (M = 79.8) rather than the conventional websites (M = 67.1), which verifies the significance of optimizing the digital content for people with dyslexia. One of the most important factors in determining how well users comprehend and retain the data they read is readability, and that readability is a key determiner of reading speed and accuracy (Kuster et al., 2018). Increasing text contrast and line spacing adjustment has been found further to improve reading fluency and hence help to make digital environment more user friendly (Charness & Boot, 2020). Additionally, interactive tools, such as pop-up definitions for difficult words, text chunking to boost speed for scanning, and customizable reading modes (e.g. dark mode or low stimulation mode) could enhance the user experience even more. It also has been demonstrated that people with dyslexia's comprehension and reading fatigue are reduced when site layouts can be personalized, such as background color, and line spacing (Schneps et al., 2013).

Correlations Between Cognitive Strain and Usability

The results of the above-mentioned experiment also indicate a strong positive correlation between cognitive strain (r = 0.72) and error rate (r = 0.78) and task completion time (r = 0.78) and the need for reducing cognitive load in web navigation. However, theory suggests that objective when cognitive demands exceed the processing capacity of a subject, performance of the task will decline (Paas & van Merriënboer, 1994). Furthermore, the moderate negative correlation of readability scores and cognitive strain (r = -0.65) demonstrates the significant relationship between text presentation that optimizes reading and cognitive ease of exploitation.

These correlations drive home the point about web developers and UX designers having to integrate assistive technologies, such as AI driven text simplification tools, voice-based navigation, adaptive learning system that adjusts content complexity according to the user's reading ability. Additionally, above findings also advocate for the promotion of universal design principles that accommodate neurodiverse users because web accessibility is not to be taken for granted which is an integral part of digital inclusivity. In our study, we measured to show the following key differences and benefits of web accessibility to individuals with individuals with dyslexia by these visual representations that improve readability, increase inclusivity, and improve cognitive efficiency respectively.

Notably, the current study also fills up the shortage in literature on the web accessibility in the South Asian and Pakistani fields. Although there are global standards available, such as WCAG, the standards do not consider the disparities in various regions regarding digital literacy, access to education, and language barriers. The current study provides the answer to this gap, as it will be shown that the digital inclusion of dyslexic user can be enhanced using culturally relevant, accessible design in a low-resource environment to a considerable degree. This study responds to the request by Alqahtani et al. (2025) to conduct more indigenous studies that focus on the methods to adapt international accessibility norms to better suit the needs of underrepresented communities. This study in line with Hata et al. (2023) whose findings indicated that digital engagement of students with learning problems in Pakistan is at a persistently alarming stage; this is simply because there is no adaptive content and interface design.

Also, the existing negative relationship between cognitive strain and readability repeats the findings of Kim & Petscher (2020) pointed to the direct influence of enhancing the presentation of texts on user understanding, processing time, and involvement. These overlapping results demonstrate the cross-cultural significance of adding readability-oriented design elements, especially in neurodiverse groups.

These correlation results are consistent with the existing studies that emphasize the complications of bad digital design affecting individuals with dyslexia. To illustrate, according to Liu et al. (2025), learners with dyslexia feel more disengaged in the digital sphere due to some content not being visually understandable or lacking the necessary benefits and aids, like speech-to-text or font customization. Wery & Diliberto (2016) discovered that people with dyslexia have greatly benefited when their layouts were simplified, with sans-serif font and less visual material on the screen (also implemented in our accessible version used in the given study.

Further, it is notable that the observed decrease in the frustration and mental demand scale is in line with accessible designs diminish both mental and emotional fatigue not only cognitive, but also in populations where the informational resources (like adults with reading disabilities) are economically impoverished (Qureshi et al., 2024).This paper makes additions to above conclusions by placing the findings into the context of the Pakistani population, hence providing localized evidence to general international design principles.

Conclusion

This study demonstrates that accessible, dyslexia-friendly web design such as simplified layouts, readable fonts, and higher contrast enhances task performance, reduces cognitive strain, and lowers frustration for individuals with dyslexia. By prioritizing accessibility in web development, digital platforms can become more inclusive, support psychological wellbeing, and promote equitable access to information and services. These findings underscore the importance of designing websites that meet diverse cognitive needs, contributing to a fairer and more user-friendly online environment.

Limitations and Future Directions

While there are valuable insights into how accessible design can help people with dyslexia there are some limitations that should be considered. It would be interesting to study the usefulness of accessibility features for different dyslexia severity populations in future. Moreover, future studies may research the long-term effects of websites with increased accessibility on digital engagement and overall satisfaction of individuals with dyslexia. The current study was age-restricted in a narrow educational environment which was students at special education schools in Pakistan. This reduces the generalizability of the findings to wider age groups or to the individuals with dyslexia beyond formal educational systems. Future studies that involve a variety of age groups or job experiences would help to create a more comprehensive picture of accessibility issues. Only self-report and performance-based measures were used. Although the NASA-TLX and usability testing are highly informative measures with respect to the user experience, it would have been helpful in terms of objective evaluation to incorporate observational studies, or eye-tracking data to better understand user attention and navigation patterns through the interface. The current study relied on pre-prepared tasks, which would not allow a full picture of the breadth of online activities that people with dyslexia would experience in real life.

Implications of the Study

This study highlights the importance of designing websites with increased contrast, simplified layouts, and readable fonts to reduce cognitive strain for individuals with dyslexia. It emphasizes prioritizing user-centered design to create inclusive digital environments, improving usability, wellbeing, and confidence. These findings also inform policymakers and organizations about the need to ensure equitable access to digital content, supporting diversity and social inclusion in education, workplaces, and public services.

Author Declarations

Conflict of interest

No conflict of interest was reported between the authors.

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